

The New Neurobiology of Addiction

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Community Opioid Symposium

Woman's Foundation & Acadiana Area Human Services District

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Disclosures

I have no competing interests in this presentation.

Learning Objectives

1. Identify the origins and current state of the opioid crisis in America.
2. Describe the basic elements of drive and cognition in the neurobiology of addiction.
3. Discuss the clinical use of pharmacotherapy and psychosocial interventions in the treatment of substance use disorders.

Outline

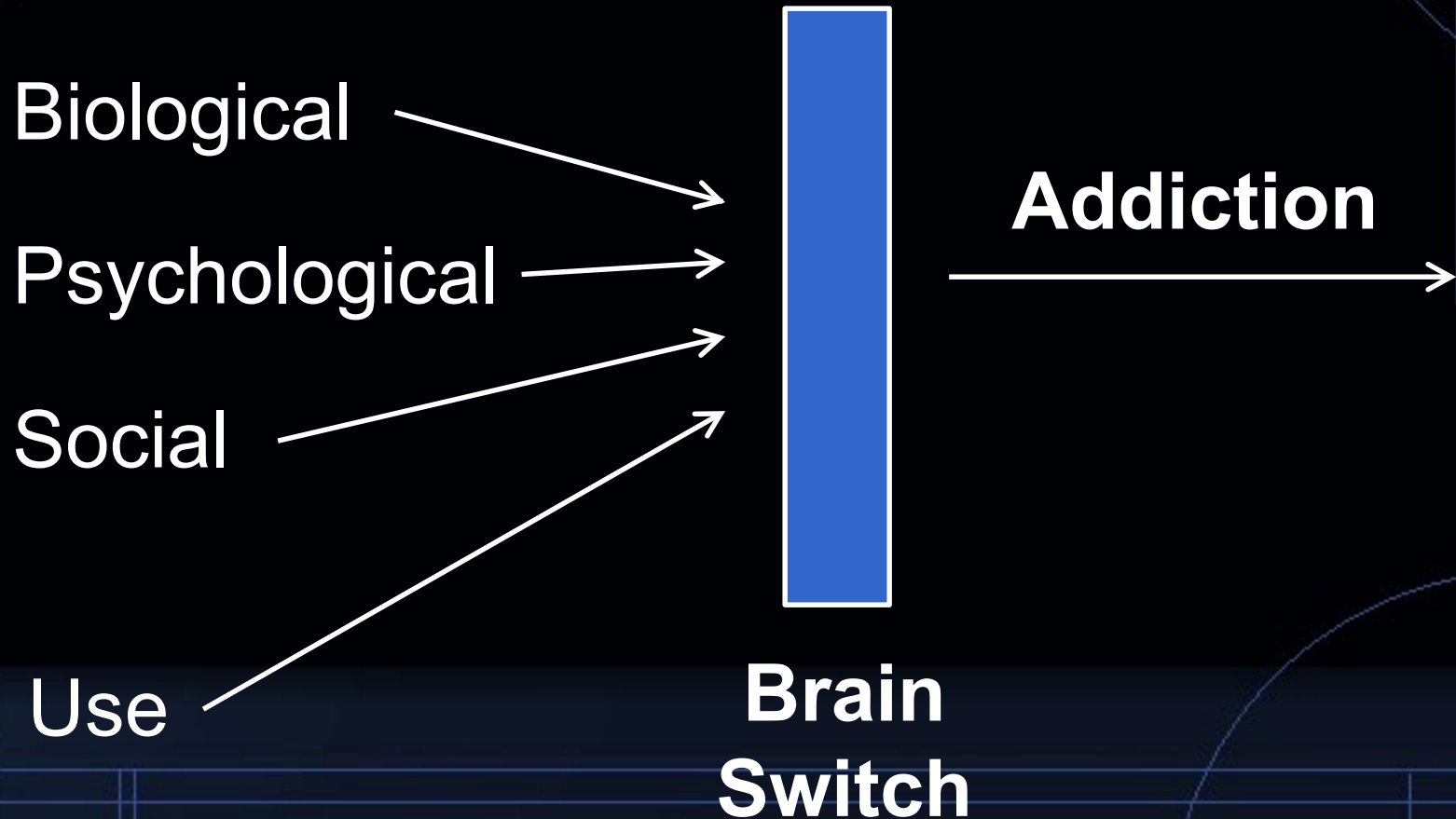
1. The Basic Model
2. Neurobiology
3. New Neurobiological Concepts
4. Treatments
5. New Directions
6. Conclusions

1

The Basic Model

~ 1980

A Biopsychosocial Illness



The Root Cause of the Disaster

ADDICTION RARE IN PATIENTS TREATED WITH NARCOTICS

To the Editor: Recently, we examined our current files to determine the incidence of narcotic addiction in 39,946 hospitalized medical patients¹ who were monitored consecutively. Although there were 11,882 patients who received at least one narcotic preparation, there were only four cases of reasonably well documented addiction in patients who had no history of addiction. The addiction was considered major in only one instance. The drugs implicated were meperidine in two patients,² Percodan in one, and hydromorphone in one. We conclude that despite widespread use of narcotic drugs in hospitals, the development of addiction is rare in medical patients with no history of addiction.

JANE PORTER
HERSHEL JICK, M.D.
Boston Collaborative Drug
Surveillance Program

Waltham, MA 02154

Boston University Medical Center

1. Jick H, Miettinen OS, Shapiro S, Lewis GP, Siskind Y, Slone D. Comprehensive drug surveillance. *JAMA*. 1970; 213:1455-60.
2. Miller RR, Jick H. Clinical effects of meperidine in hospitalized medical patients. *J Clin Pharmacol*. 1978; 18:180-8.

The False Promise

FREEDOM FROM PAIN!

Extra strength pain relief
free of extra prescribing
restrictions.

- Telephone prescribing in most states
- Up to five refills in 6 months
- No triplicate Rx required

Excellent patient acceptance.

In 12 years of clinical experience, nausea, sedation and constipation have rarely been reported.¹

COMPARATIVE PHARMACOLOGY OF TWO ANALGESICS					
	Constipation	Respiratory Depression	Sedation	Emesis	Physical Dependence
HYDROCODONE		X			X
OXYCODONE	XX	XX	XX	XX	XX

Blank space indicates that no such activity has been reported. Table adapted from Facts and Comparisons 1991 and Catalano RB. The medical approach to management of pain caused by cancer. *Semin. Oncol.* 1975; 2: 379-92 and Reuler JB, et. al. The chronic pain syndrome: misconceptions and management. *Ann. Intern. Med.* 1980 588-96.

The heritage of VICODIN,[®] over a billion doses prescribed.²

- VICODIN ES provides greater central and peripheral action than other hydrocodone/acetaminophen combinations.
- Four to six hours of extra strength pain relief from a single dose
- The 14th most frequently prescribed medication in America²

vicodin ES 

(hydrocodone bitartrate 7.5mg (Warning: May be habit forming) and acetaminophen 750mg)

Tablet for tablet, the most potent analgesic you can phone in.

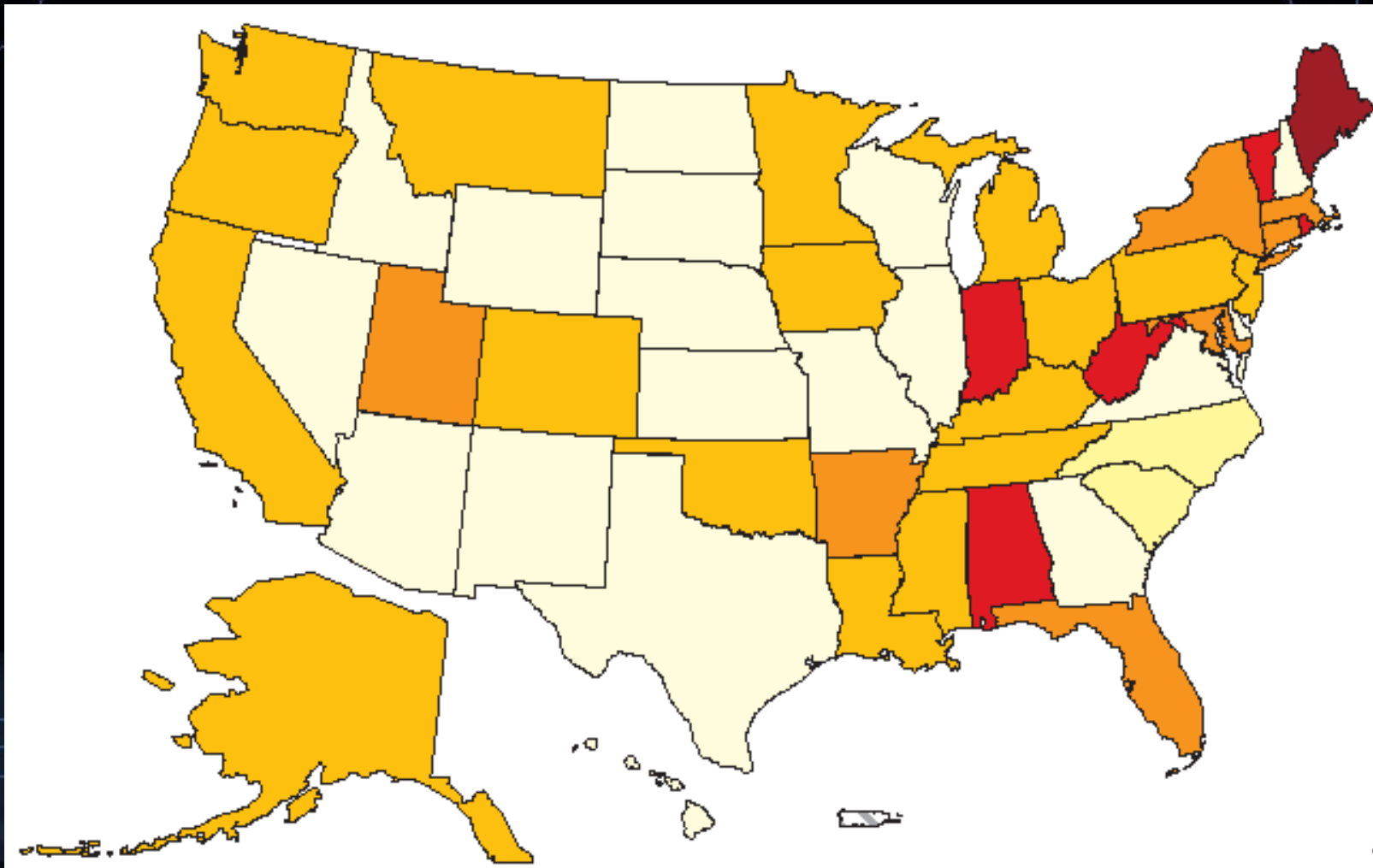


Money and Influence



Admissions: 1999

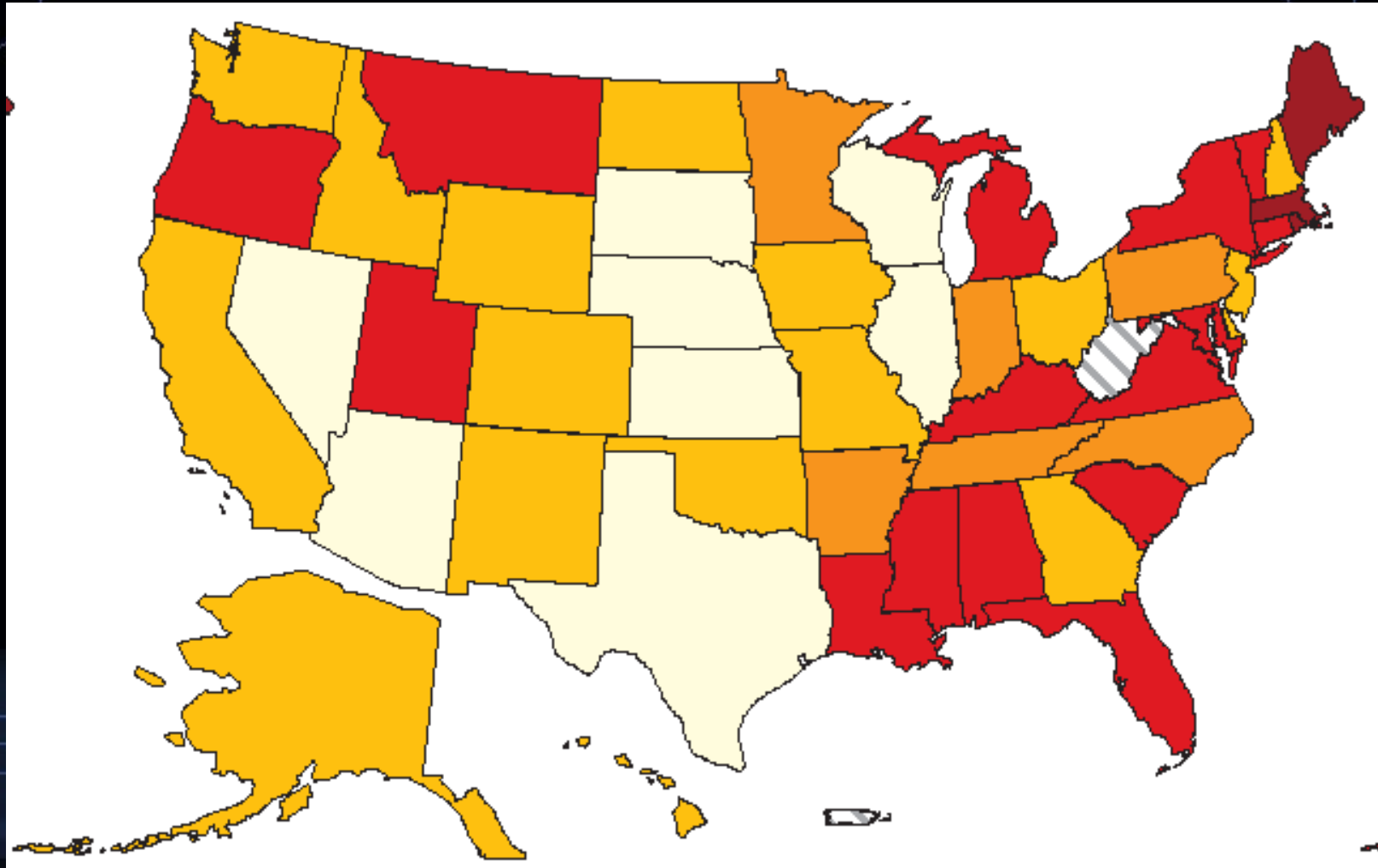
Primary non-heroin opioid admission rates (per 100,000)



< 8		15 - 18		45 or more		SOURCE: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, Treatment Episode Data Set (TEDS). Data received through 11.03.10.
8 - 14		19 - 44		Incomplete data		

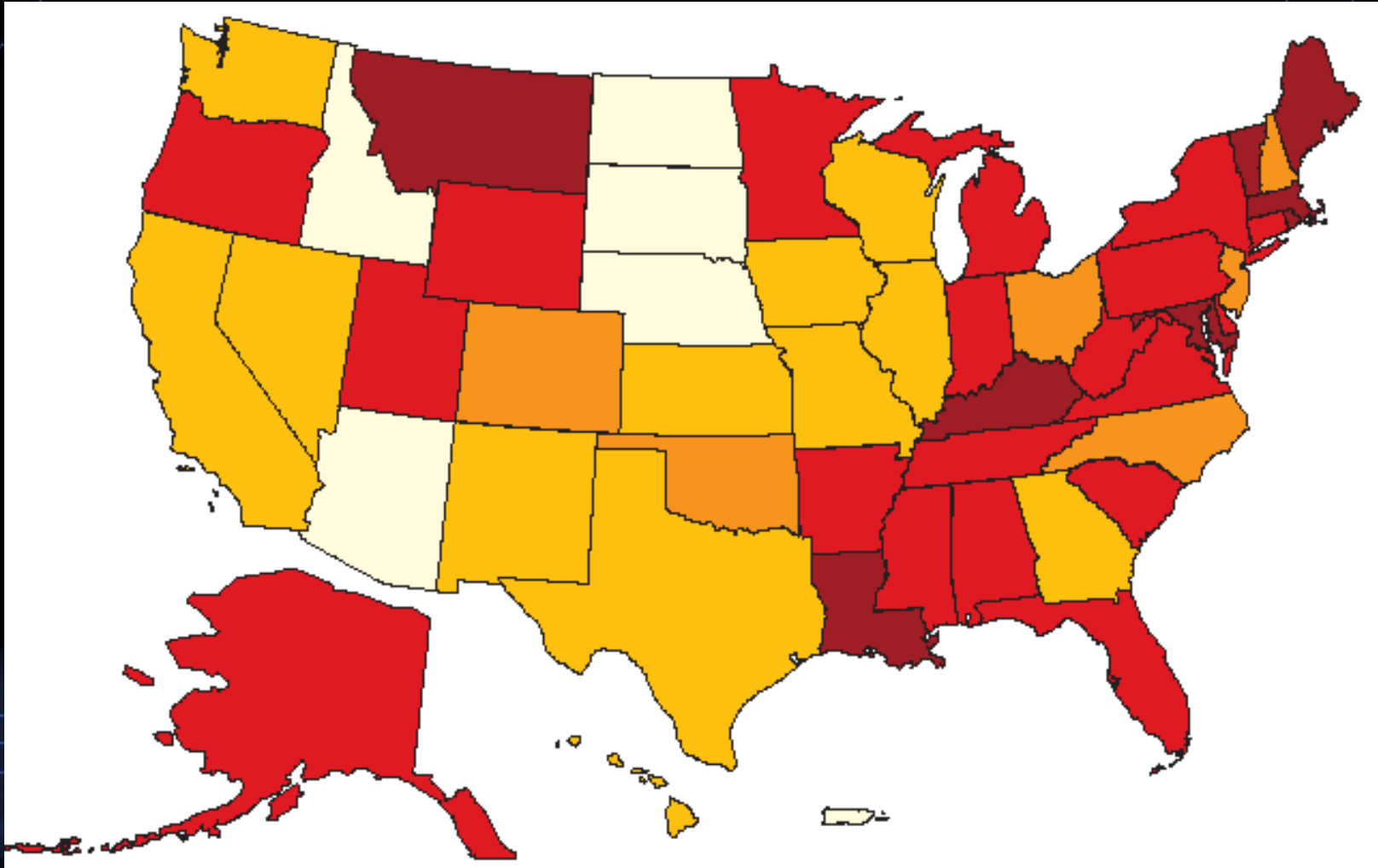
Admissions: 2001

Primary non-heroin opioid admission rates (per 100,000)



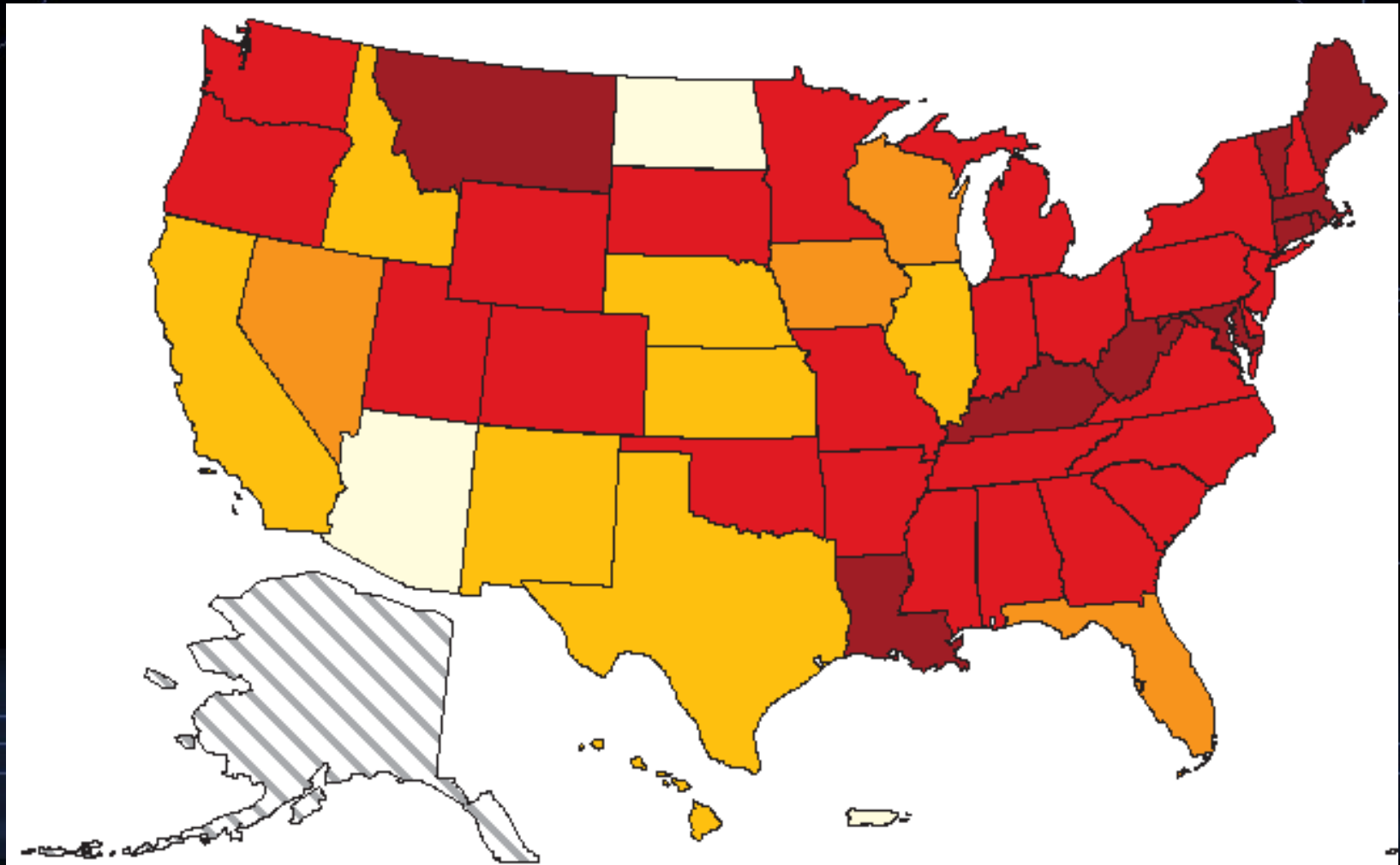
Admissions: 2003

Primary non-heroin opioid admission rates (per 100,000)



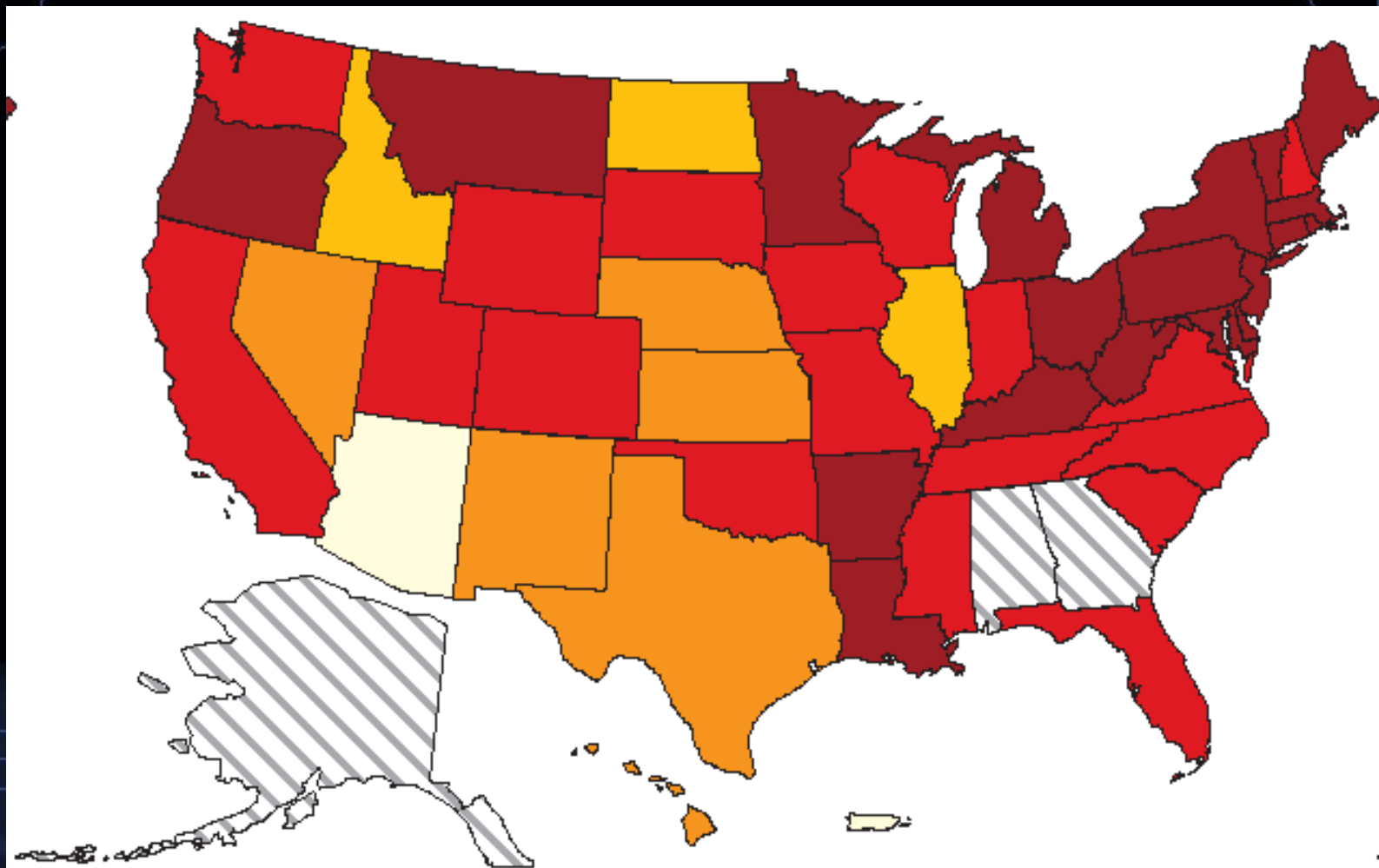
Admissions: 2005

Primary non-heroin opioid admission rates (per 100,000)



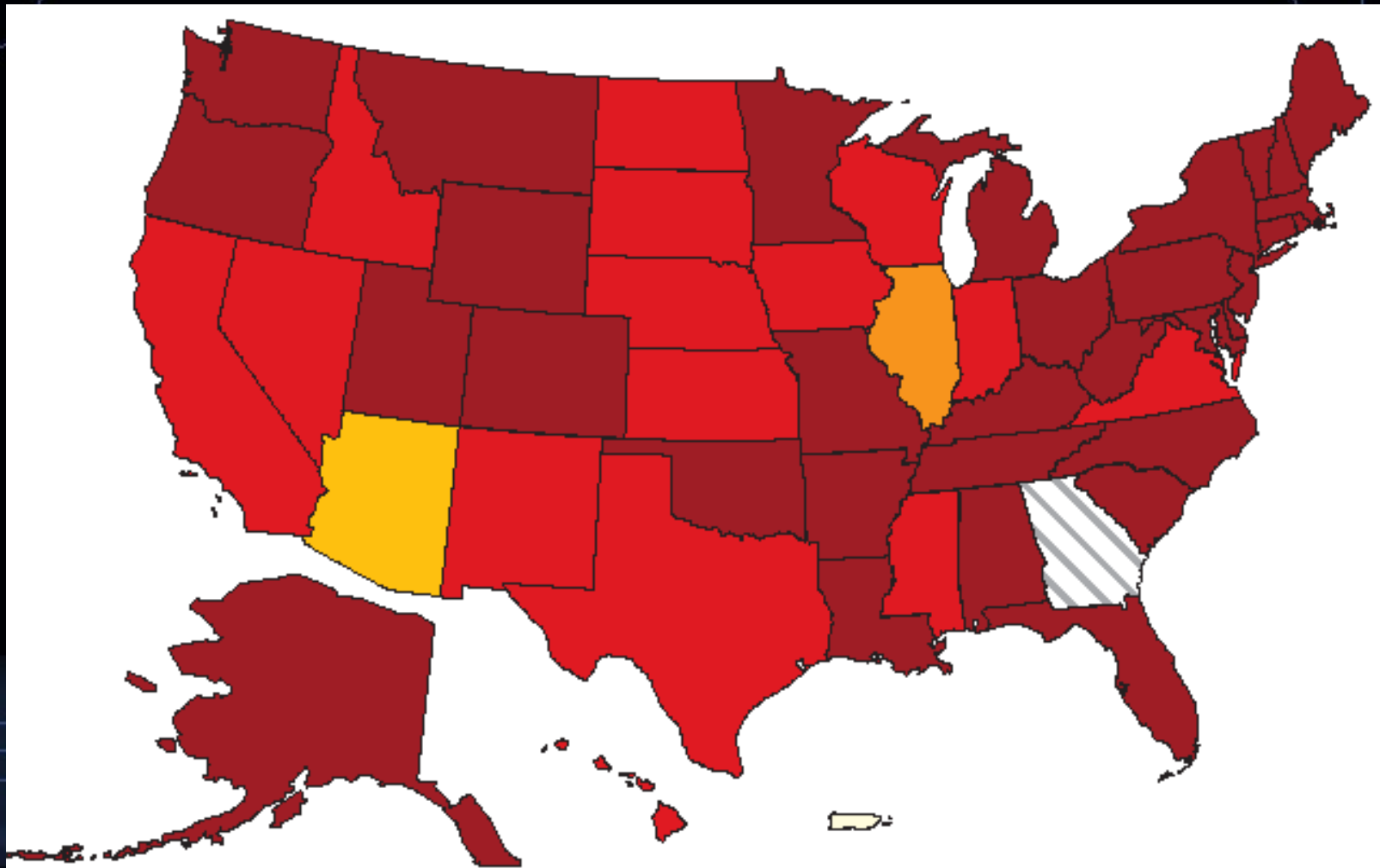
Admissions: 2007

Primary non-heroin opioid admission rates (per 100,000)

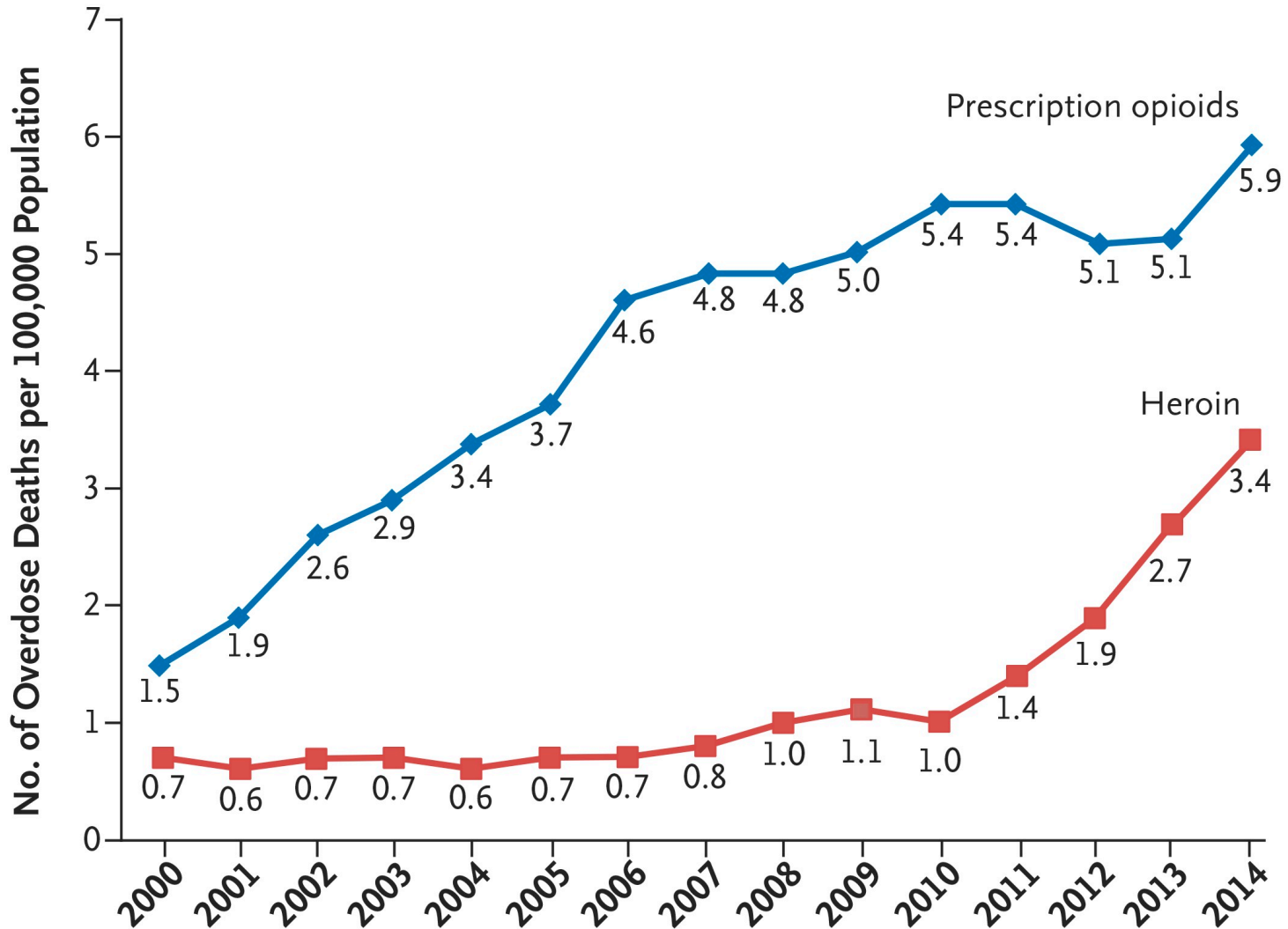


Admissions: 2009

Primary non-heroin opioid admission rates (per 100,000)

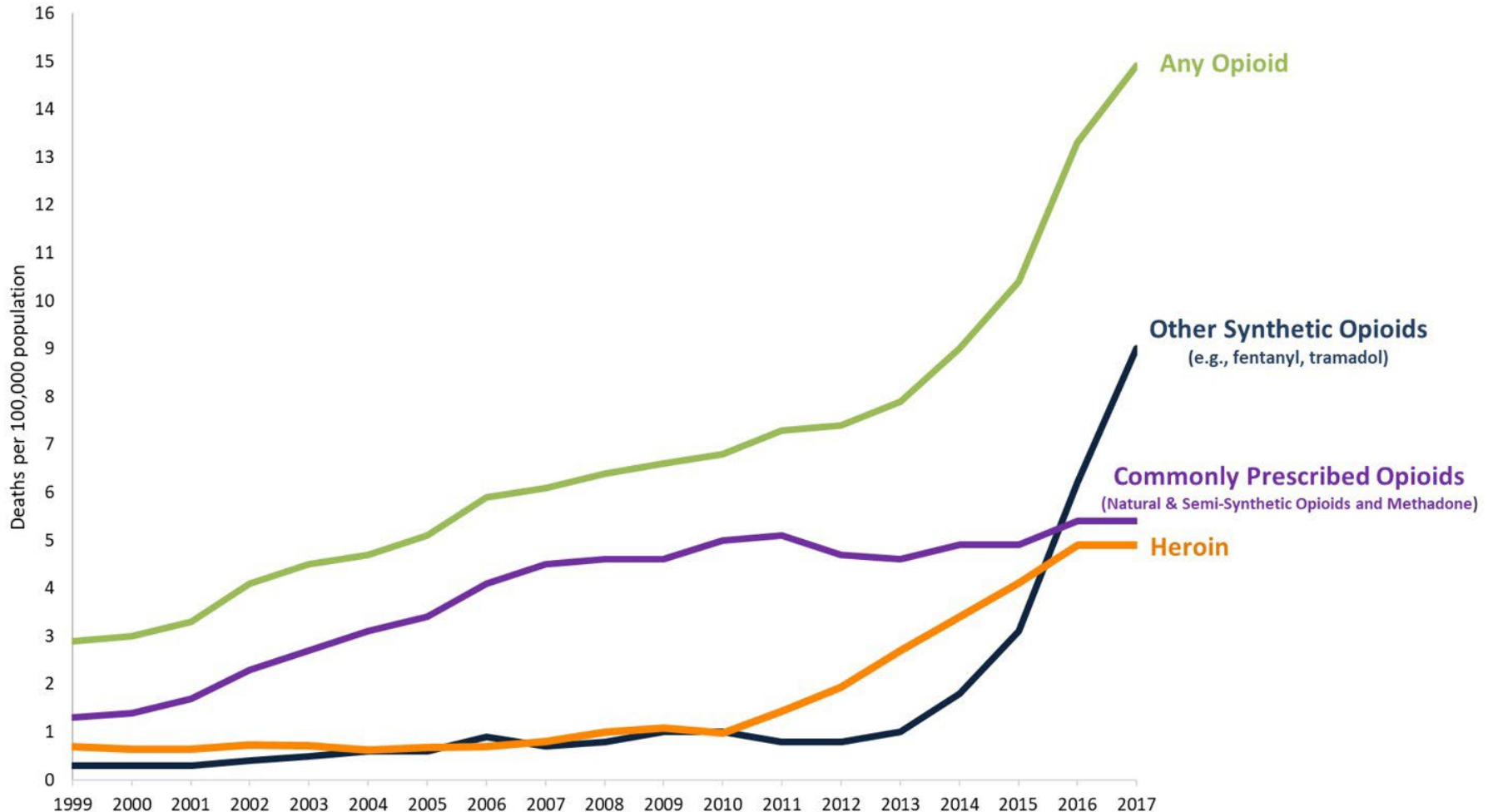


From Pills to Heroin

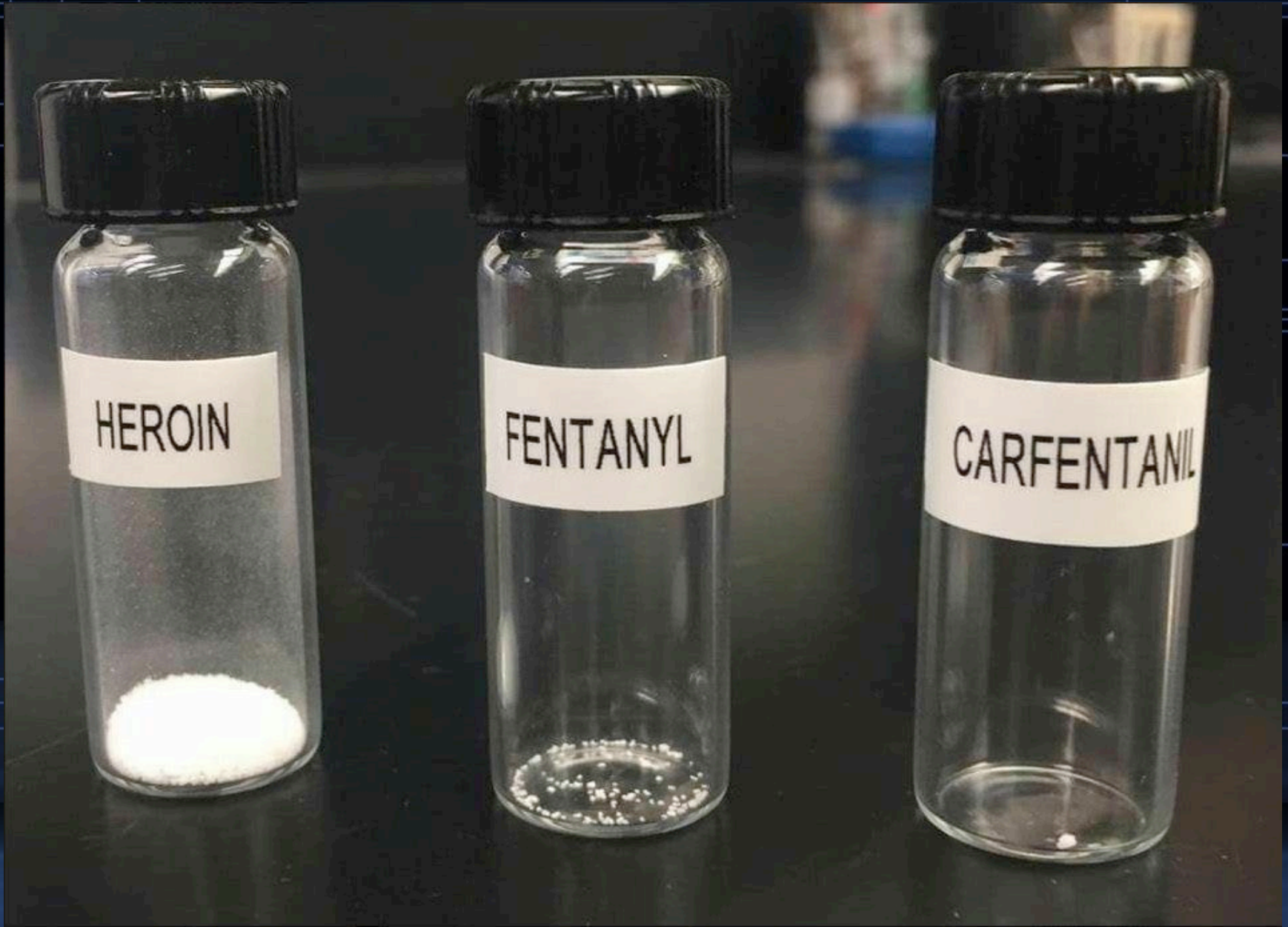


From Heroin to Fentanyl

Overdose Death Rates Involving Opioids, by Type, United States, 2000-2017



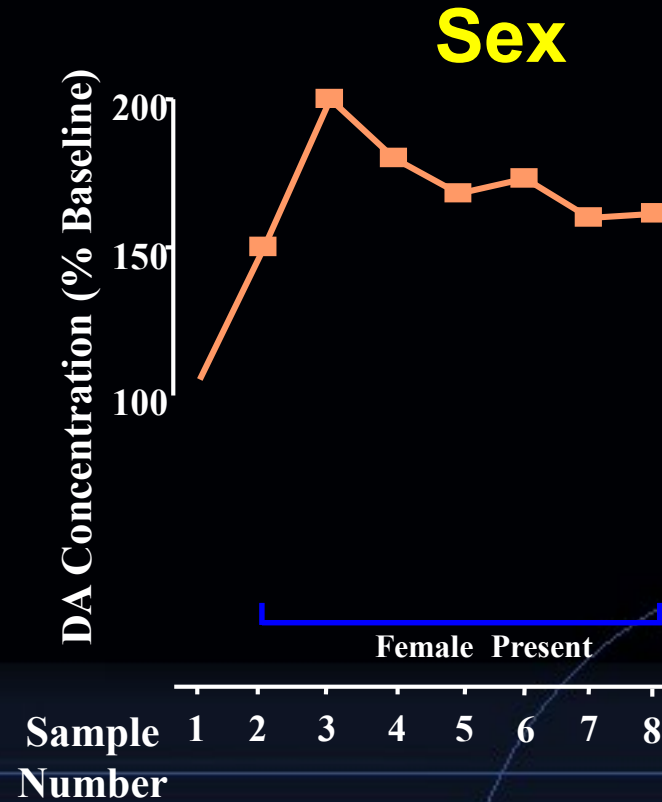
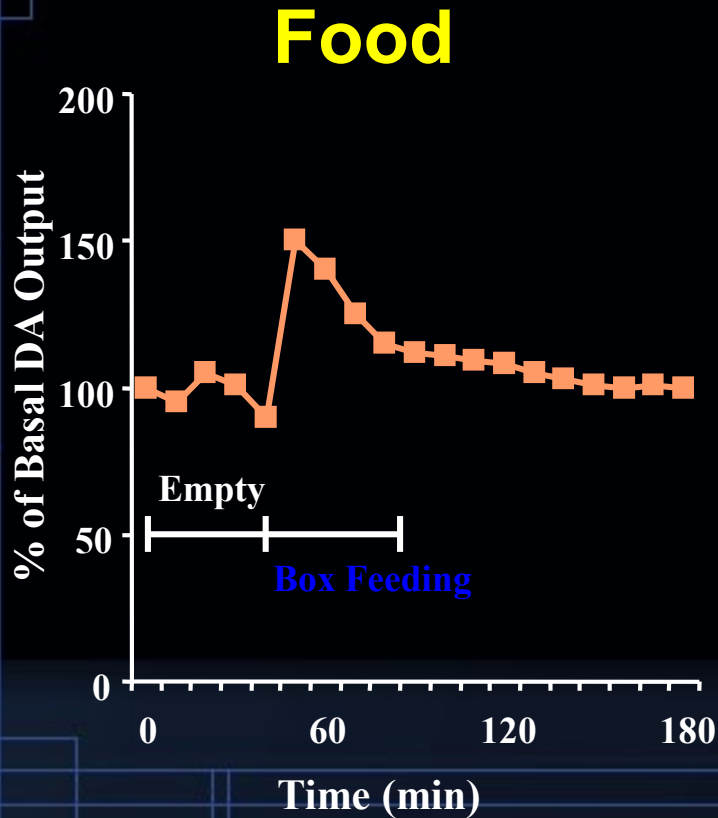
From Fentanyl to Carfentanil



2

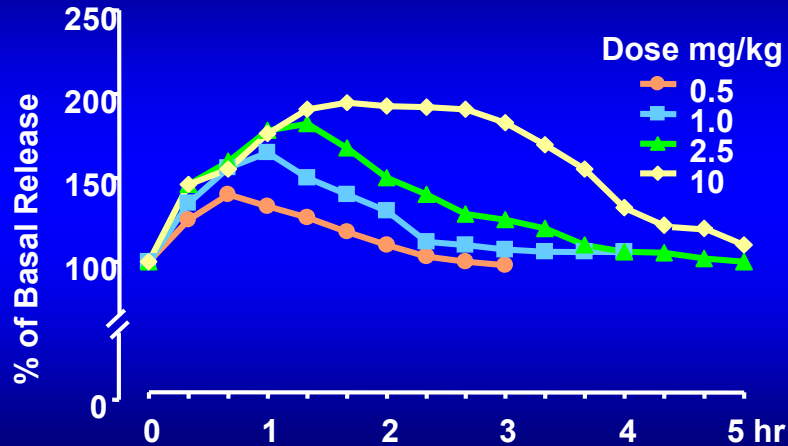
Neurobiology

Natural Rewards

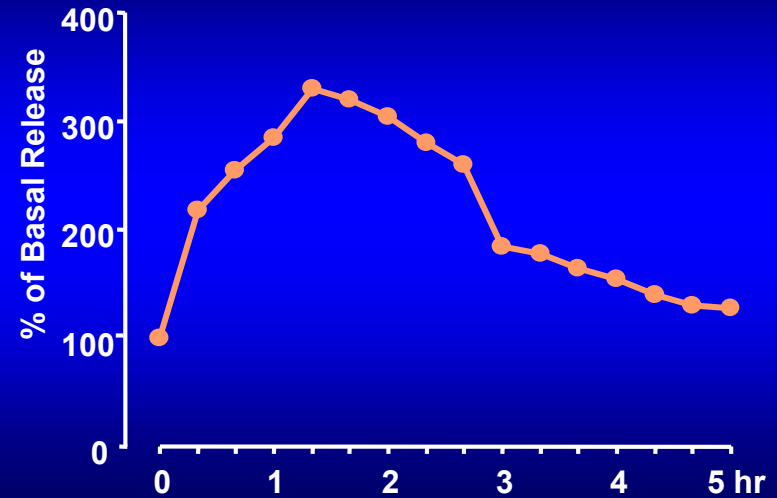


Effects of Drugs on Dopamine Levels

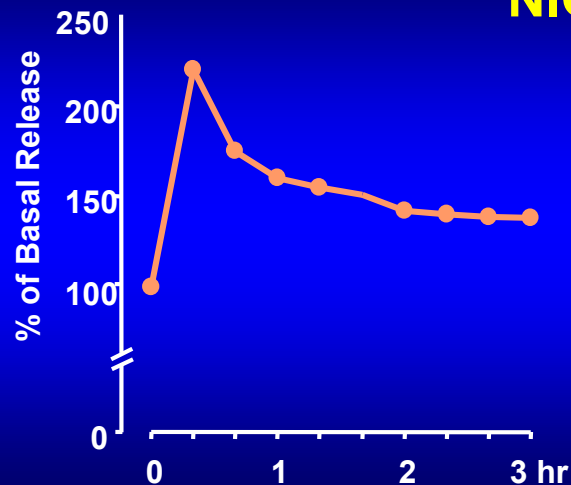
MORPHINE



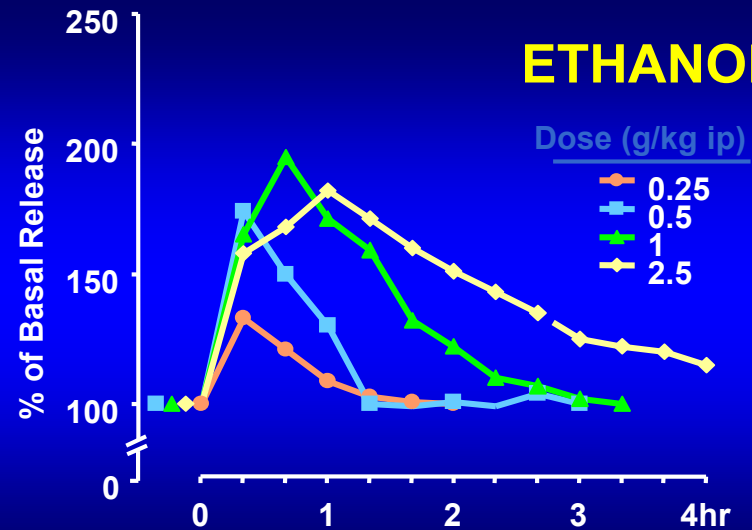
COCAINE



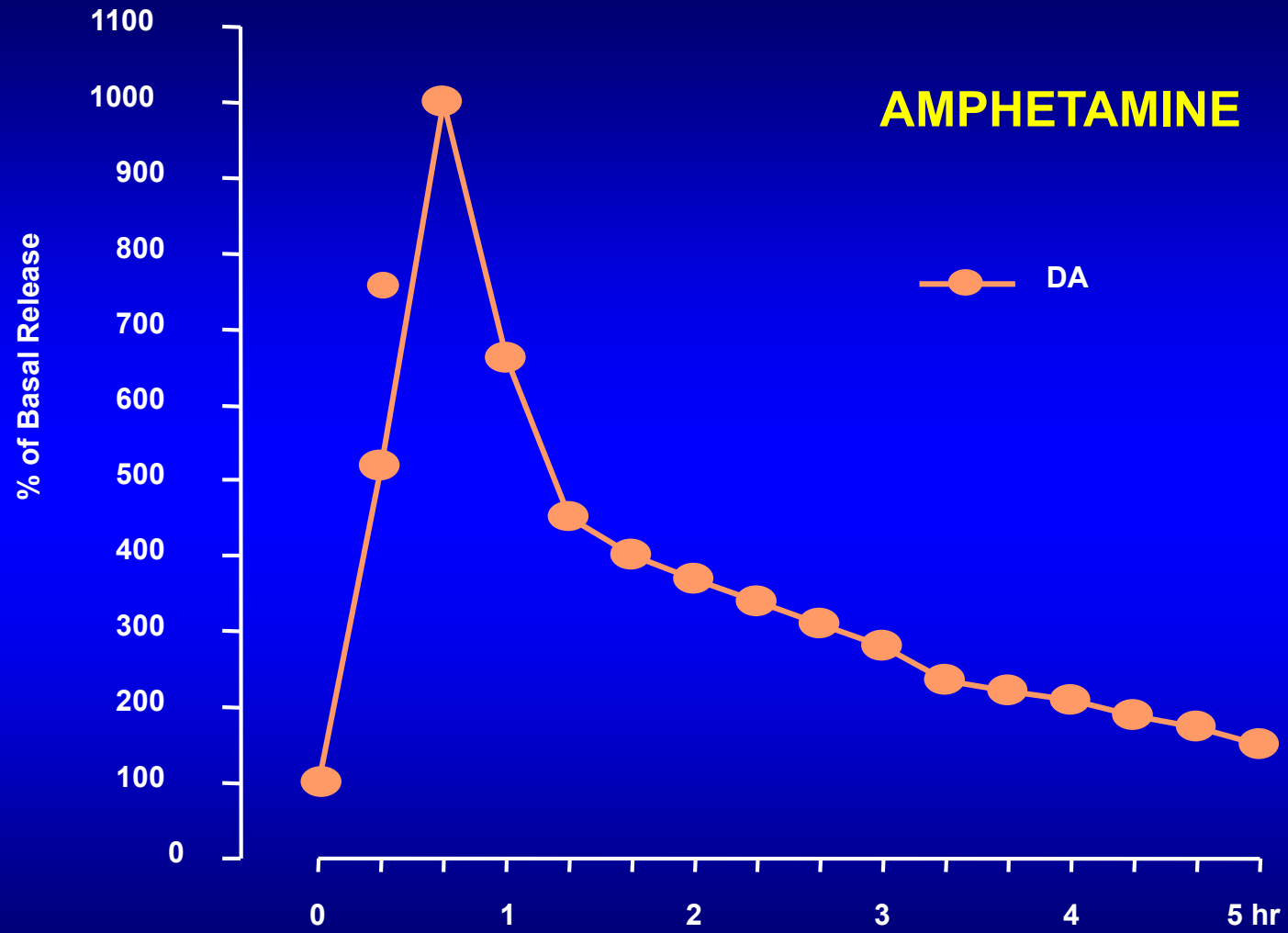
NICOTINE



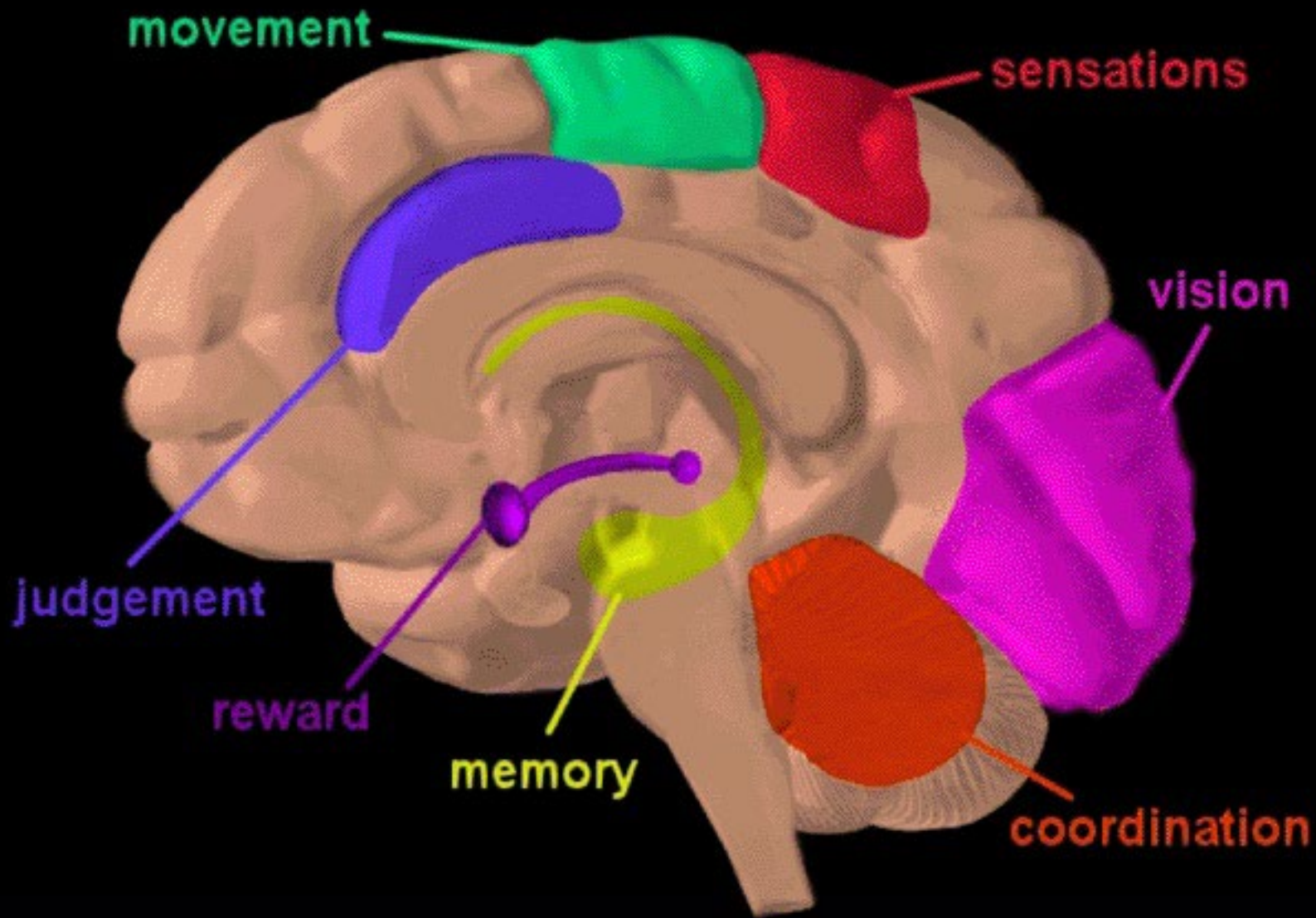
ETHANOL



Effects of Amphetamines on Dopamine Levels



Pleasure-Reward Pathways



3

New Neurobiological Concepts

The background is a dark blue gradient with a light blue grid pattern. There are several large, faint circles and squares overlaid on the grid, creating a technical or architectural feel.

2019

Three Novel Areas

- ✓ Motivational Circuitry
- ✓ Antireward Pathways
- ✓ Interoception

Motivation: The Stinking Thinking Part



Reward Systems



GAME 1

- A. A sure gain of \$250.
- B. 25% chance to gain \$1,000,
75% chance to gain nothing.

Reward Systems



GAME 1

A. A sure gain of \$250.

84%

B. 25% chance to gain \$1,000,
75% chance to gain nothing.

16%

Antireward Systems



GAME 2

- A. A sure loss of \$750.
- B. 25% chance to lose nothing,
75% chance to lose \$1,000.

Antireward Systems



GAME 2

A. A sure loss of \$750.

13%

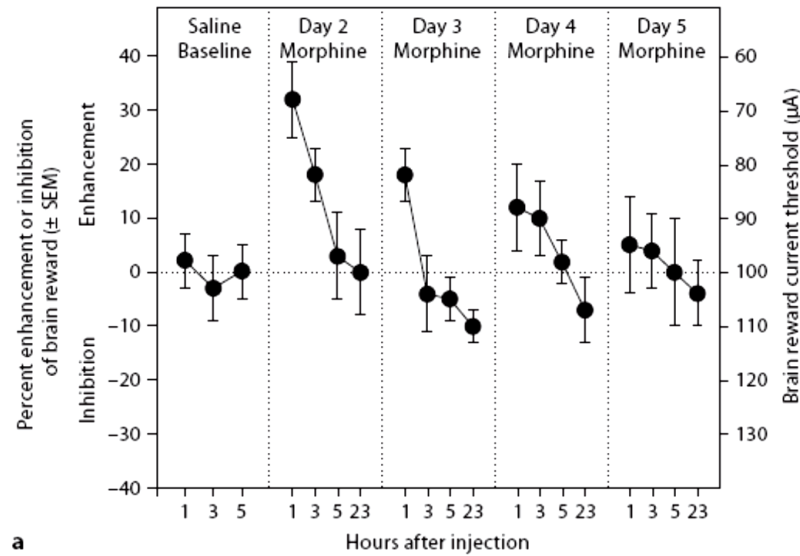
B. 25% chance to lose nothing,
75% chance to lose \$1,000.

87%

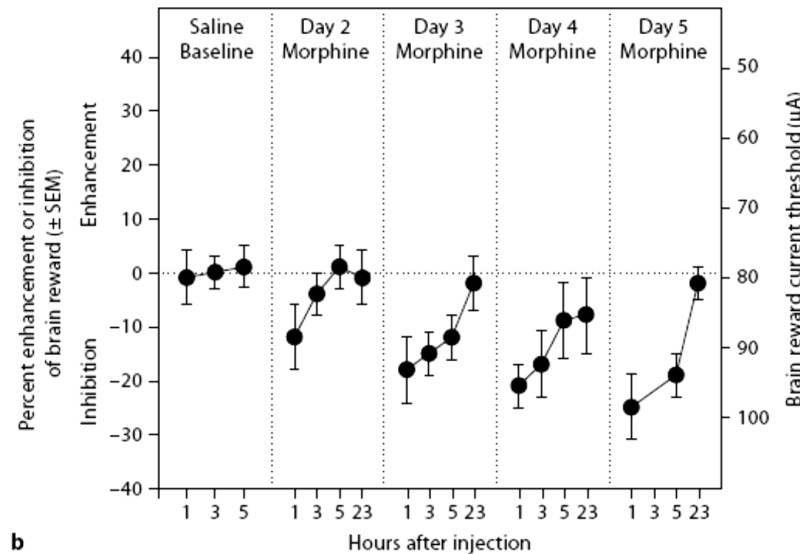
Human Nature

- People avoid risks to ensure gains (even small gains).
- People take risks (even big risks) to avoid definite losses.
- Psychology trumps probability.

Reward and Antireward Systems



a



b

sensual touch

thirst

temperature

INTEROCEPTION

PAIN

hunger

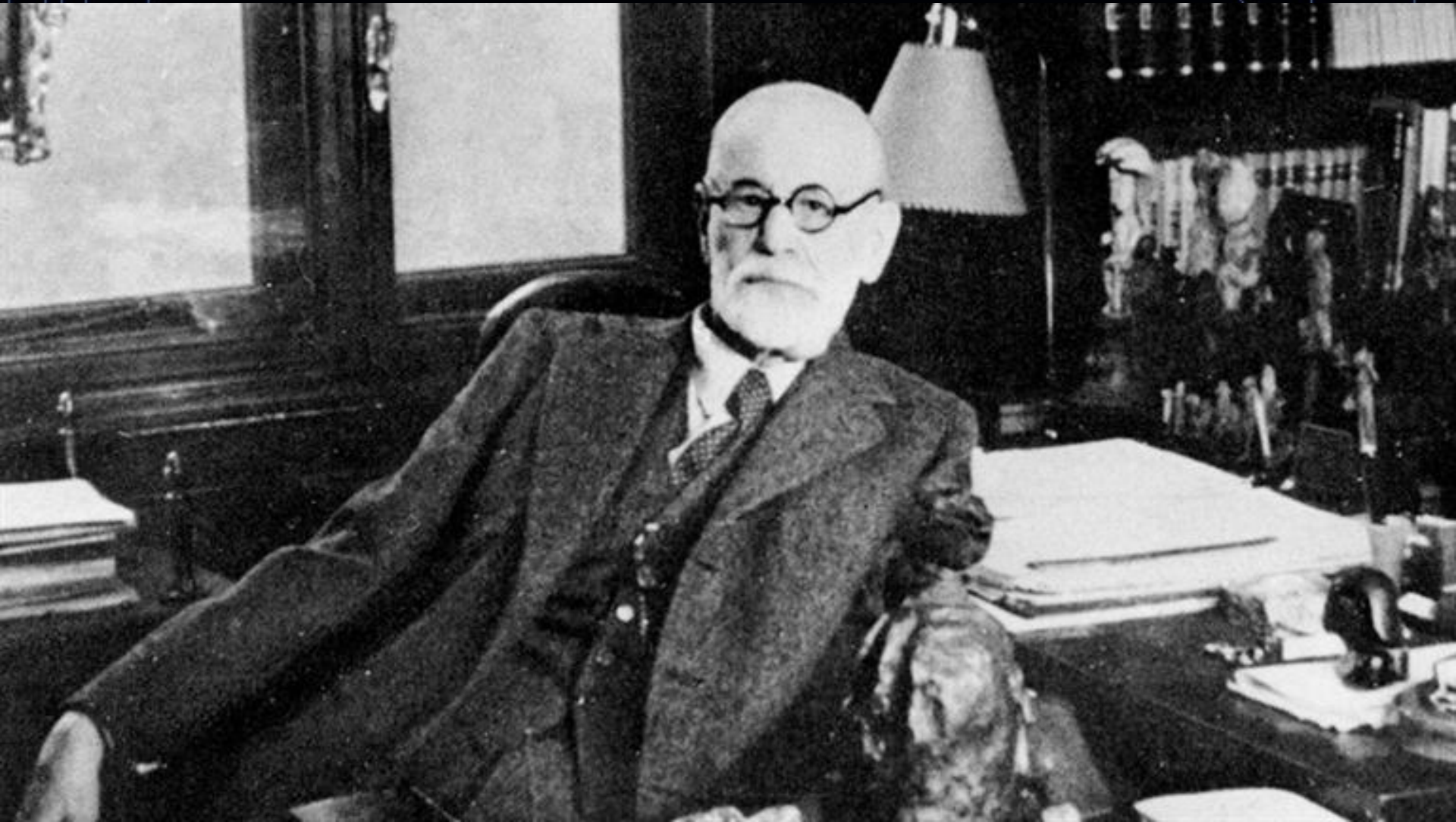
itch

breathlessness

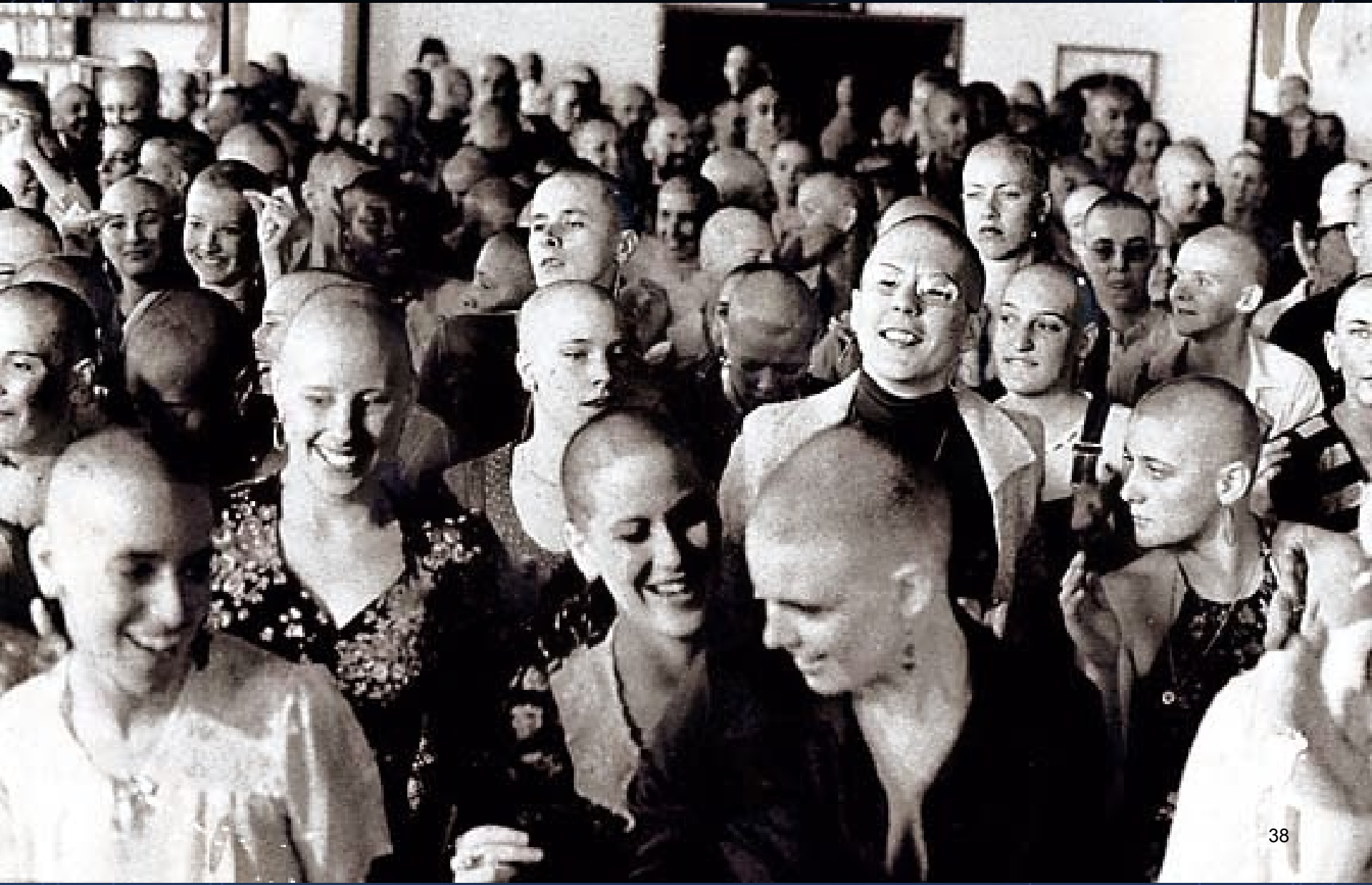
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Treatments

1st Wave: Psychoanalysis



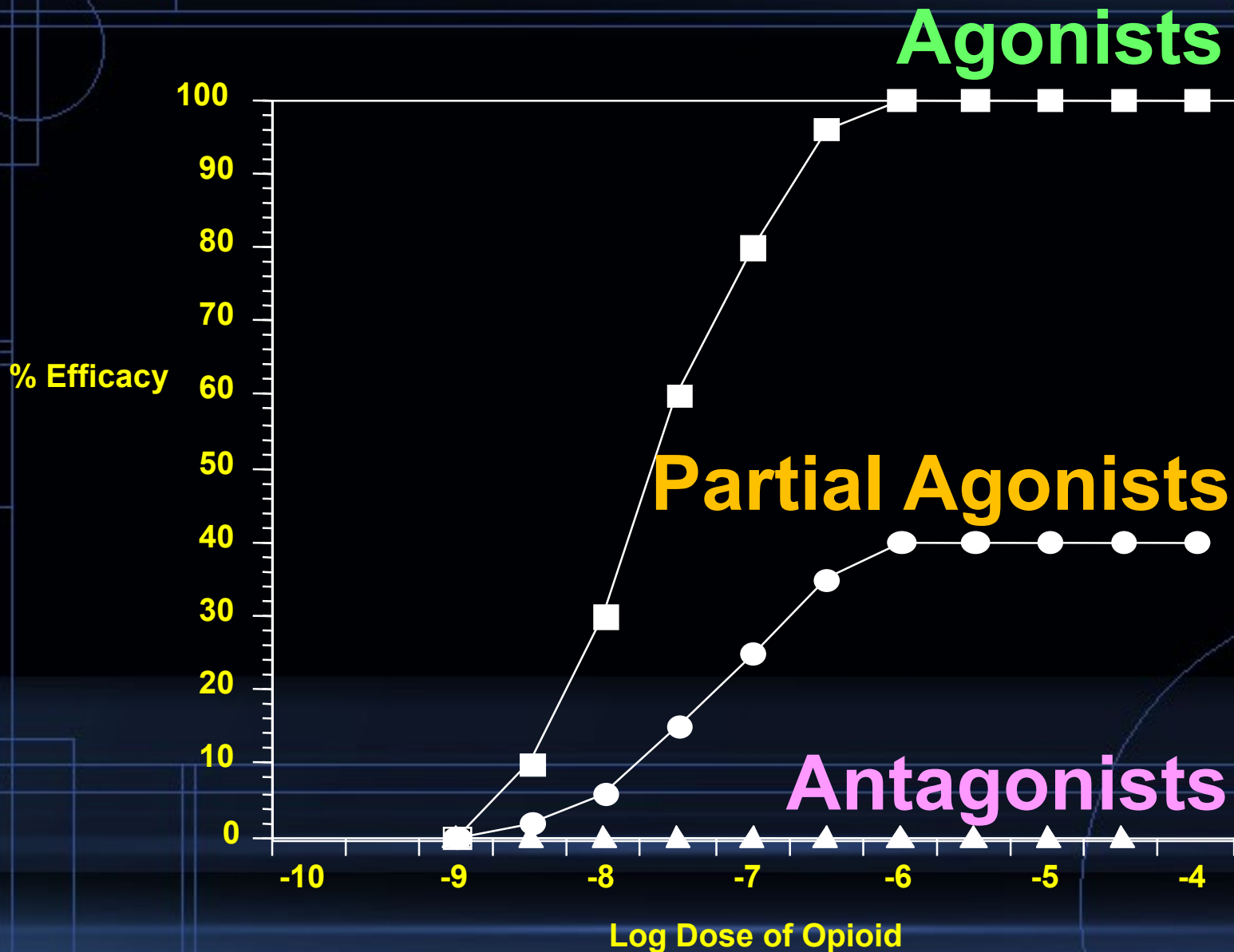
2nd Wave: Boot Camps



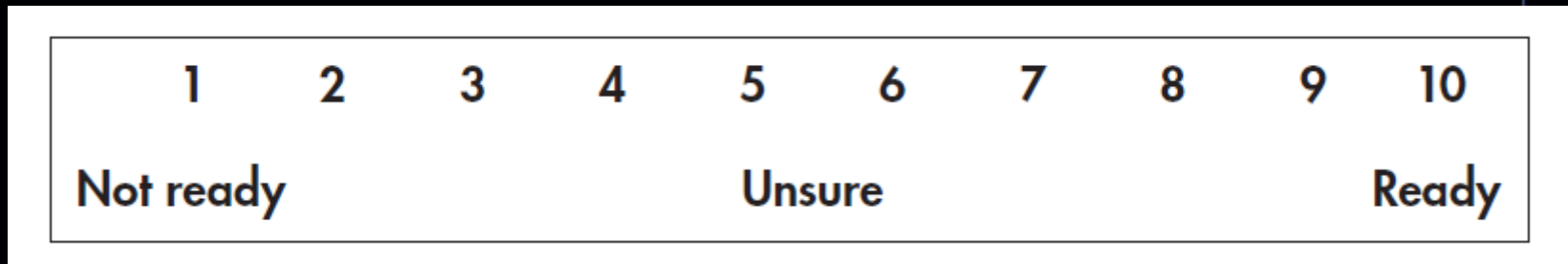
3rd Wave: The Current Approach

- ✓ Medications
- ✓ Counseling & Psychotherapy
- ✓ Mutual Help

Medications



Motivational Interviewing



Attitudes Towards AA

What Med Staff Think Patients Think

MEDICAL STAFF

1. Housing
2. Government
3. Medical Services
4. Outpatient Treat.
5. Job
6. Community
7. Trusting People
8. Inner Peace
9. God
10. Spirituality
11. AA

PATIENTS

1. Inner peace
2. God
3. Medical Services
4. AA
5. Housing
6. Spirituality
7. Outpatient Treat.
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1. Housing
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5

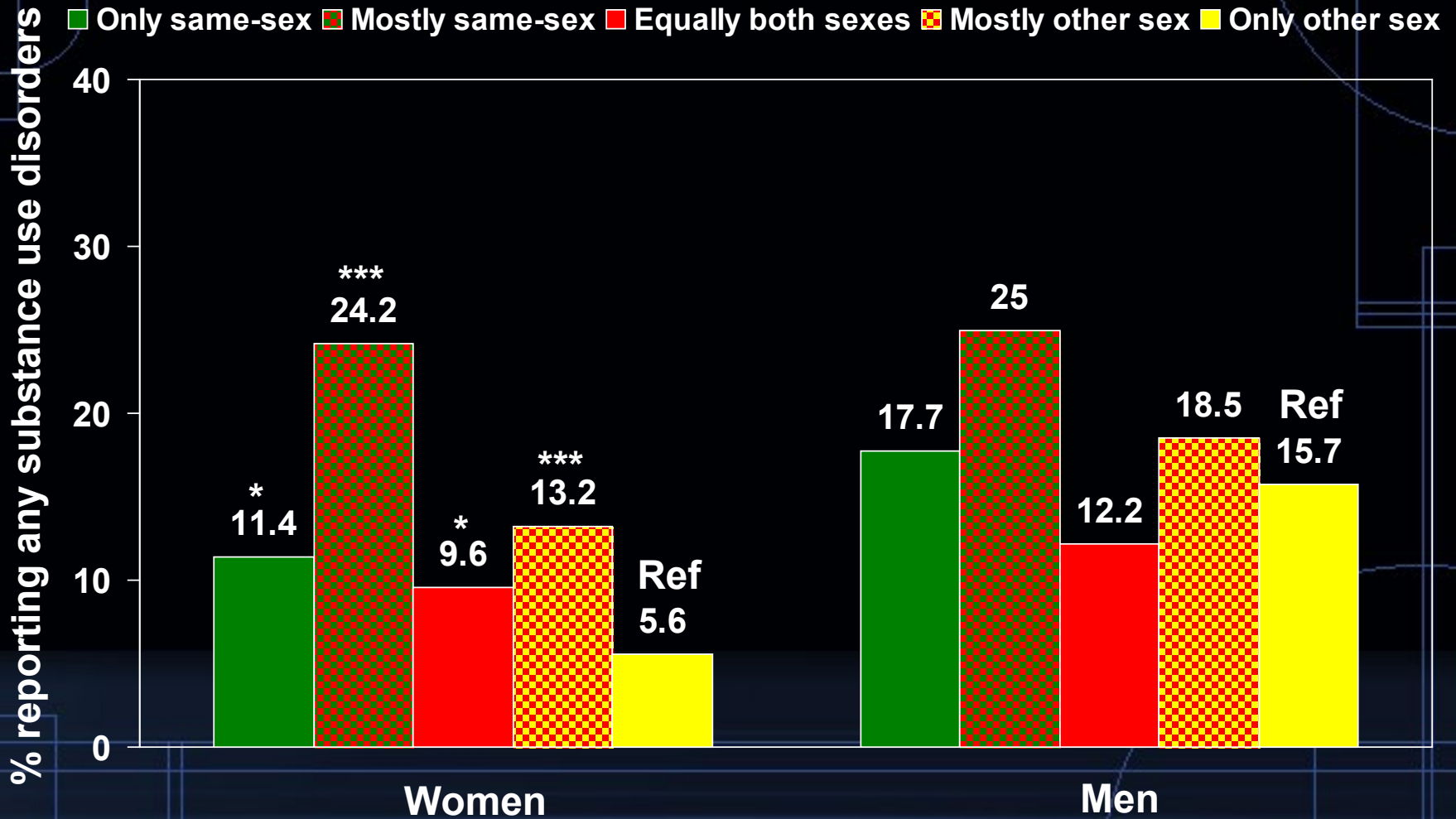
New Directions

4th Wave: Mindfulness

“Between stimulus and response there is a space. In that space is our power to choose our response. In our response lie our growth and our freedom.”

Viktor E. Frankl

And Back to Psychodynamics...



*p<0.05, ***p<.001 based on logistic regression analysis adjusted for race, age, educational level, personal income, employment status, relationship status, health insurance status, geographic location, MSA, age at alcohol onset, and family history of AOD problems. Reference group was "heterosexual" group.

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Conclusions

1. A medical mistake, a greedy industry, and a tricky brain are primarily responsible for the opioid epidemic.
2. Addiction is the war between the hijacked pleasure/reward pathways of the brain and the frontal lobes.
3. Motivational circuitry, the anti-reward pathways, and interoception complete the STOP-GO model of addiction.
4. Partial agonists, Motivational Interviewing, and 12-step work are the first line interventions in 2019.
5. Mindfulness and a renewed consideration for psychodynamic psychotherapy are next frontiers in the psychosocial treatment of addiction.

Thank you

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