Contingency Management and Stimulant Use

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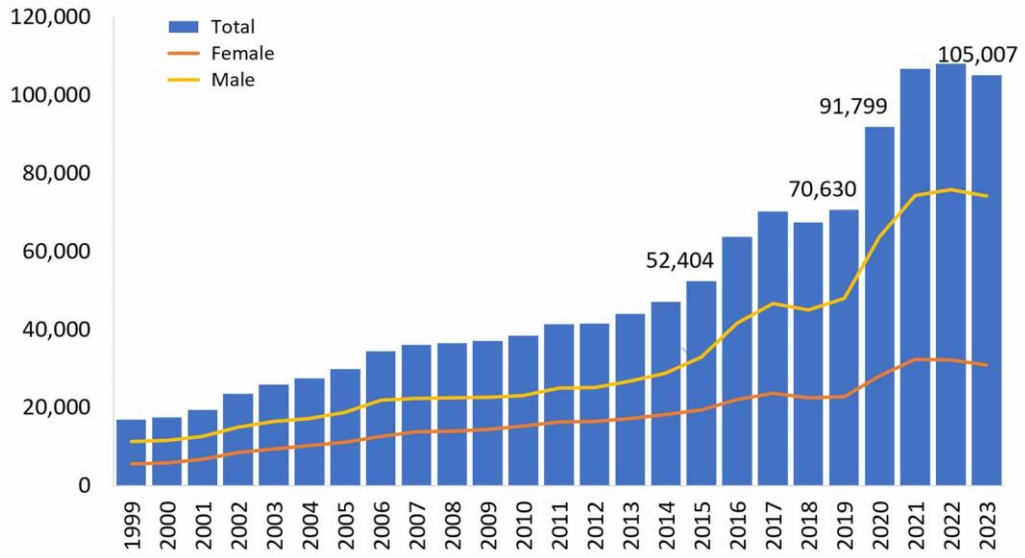
Learning Objectives

1. Review the current role of stimulant use in fatal drug poisonings
2. Describe stimulant use and clinical challenges to the treatment of stimulant use disorders
3. Briefly describe stimulant use disorders as a brain disease
4. Describe what is known about Contingency Management (CM) as an evidence-based treatment
5. Review outcomes of CM compared to other types of stimulant treatment
6. Describe the "why" behind the components that make a CM protocol evidence based

Why should we be concerned about stimulant use (cocaine and methamphetamine)?

Growing Role of Stimulants in Overdose Deaths

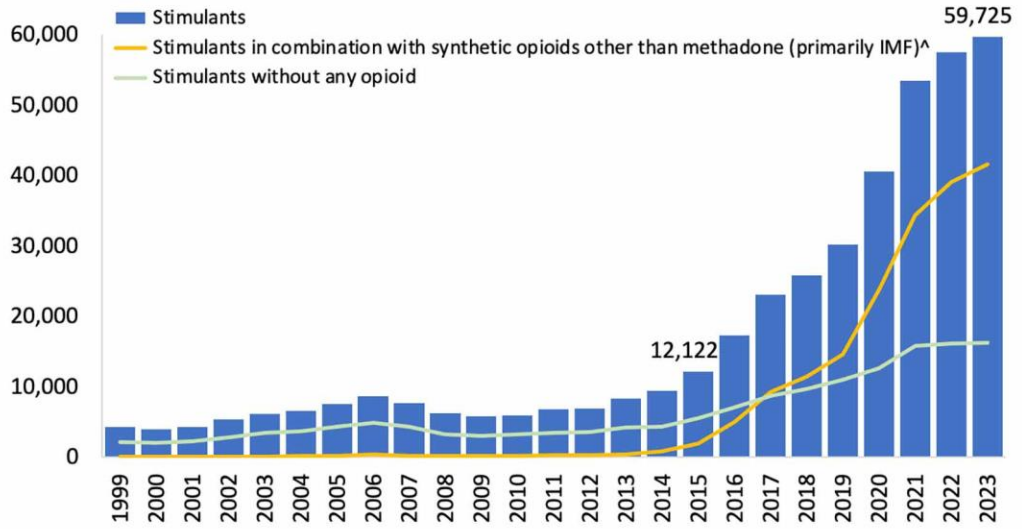
Figure 1. U.S. Overdose Deaths* by Sex, 1999-2023



*Includes deaths with underlying causes of unintentional drug poisoning (X40–X44), suicide drug poisoning (X60–X64), homicide drug poisoning (X85), or drug poisoning of undetermined intent (Y10–Y14), as coded in the International Classification of Diseases, 10th Revision.

Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Multiple Cause of Death 1999-2023 on CDC WONDER Online Database, released 1/2025.

Figure 6. U.S. Overdose Deaths Involving Stimulants (Cocaine or Psychostimulants with Abuse Potential), 1999-2023



*Among deaths with drug overdose as the underlying cause, the stimulants category included cocaine and psychostimulants with abuse potential (primarily methamphetamine) determined by the T40.5 and the T43.6 ICD-10 multiple cause-of-death codes, respectively. ^illicitly manufactured fentanyl. Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Multiple Cause of Death 1999-2023 on CDC WONDER Online Database, released 1/2025.

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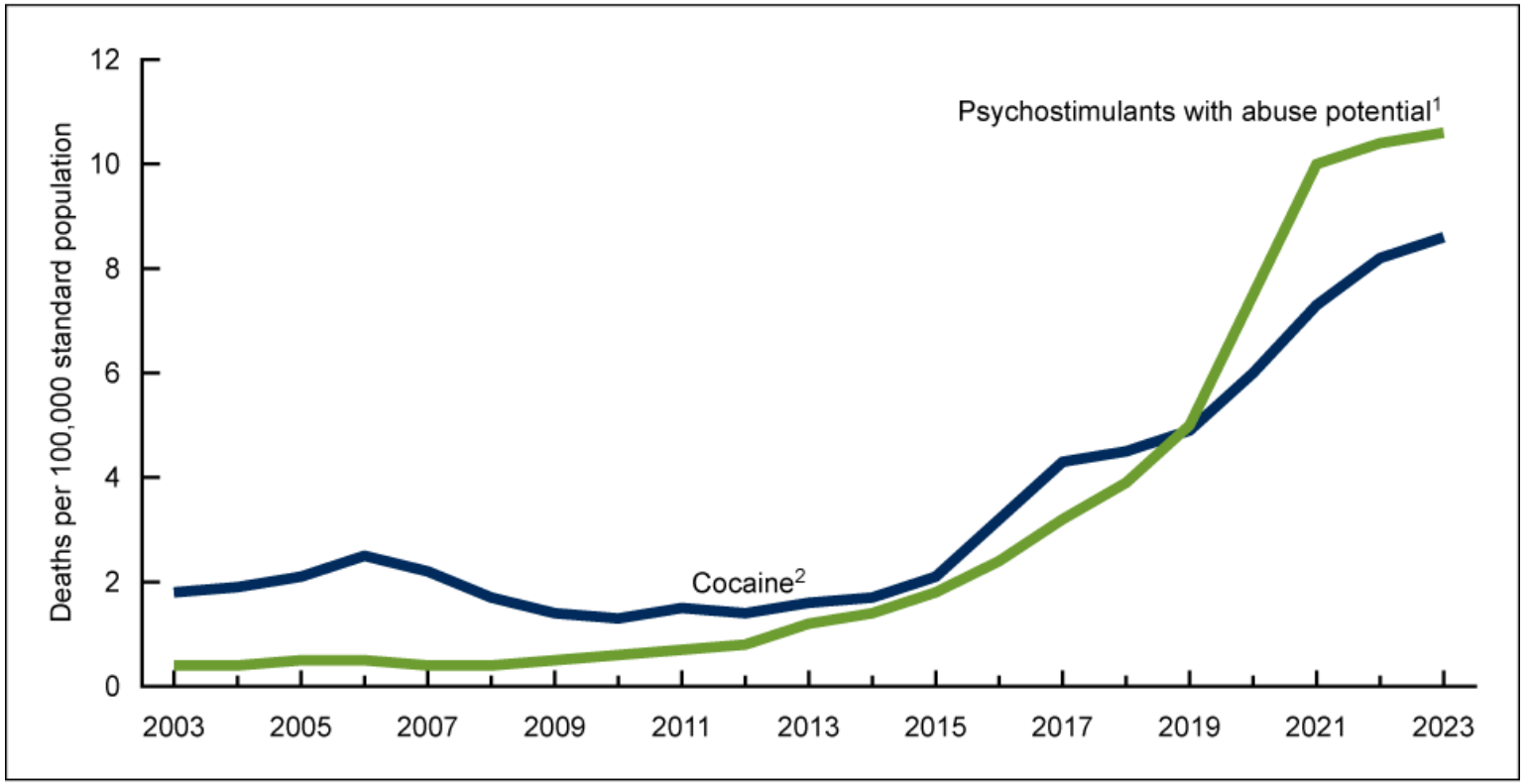
Centers for Disease Control and Prevention, National Center for Health Statistics, 2024

Growing Role of Stimulants in Overdose Deaths

Figure 5. Age-adjusted rate of drug overdose deaths involving stimulants, by type of stimulant: United States, 2003–2023



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Centers for Disease Control and Prevention, National Center for Health Statistics, 2024

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DATA INSIGHT

ADDICTION SSA

Charting the fourth wave: Geographic, temporal, race/ethnicity and demographic trends in polysubstance fentanyl overdose deaths in the United States, 2010–2021

Joseph Friedman[1] | Chelsea L. Shover[2]

Purpose: examine polysubstance use in overdose deaths from 2010-2021 by year, state and demographics.

Methods

Data were obtained from the CDC Wide-ranging Online Database for Epidemiological Research (WONDER) from 2010 through 2021.

All deaths with underlying cause of overdose were selected.

- Among those, deaths with multiple causes were then selected.

Annual percentage of overdose deaths were measured for those involving: (1) fentanyl, (2) stimulants, (3) fentanyl and stimulants, and (4) neither fentanyl or stimulants.

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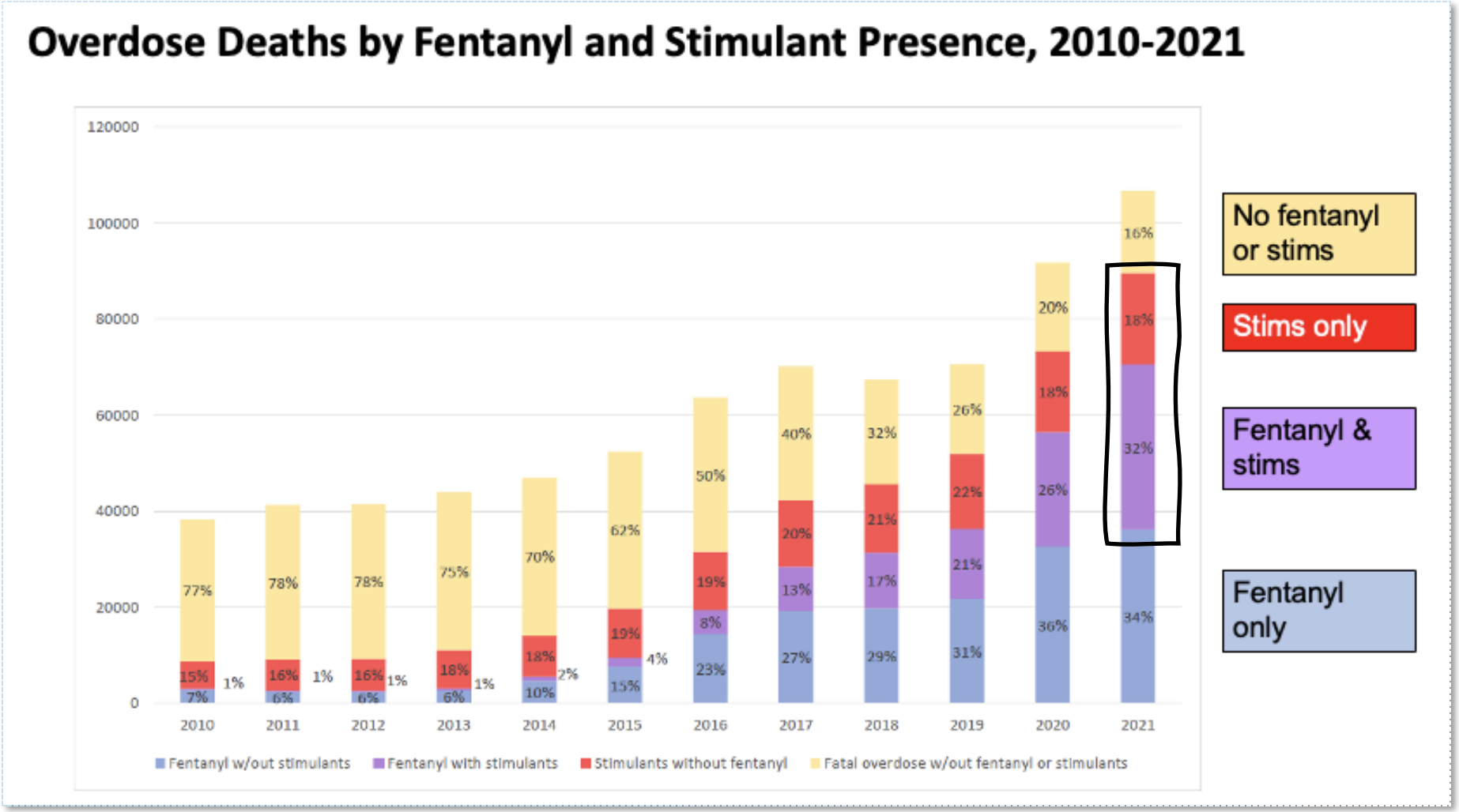
Results



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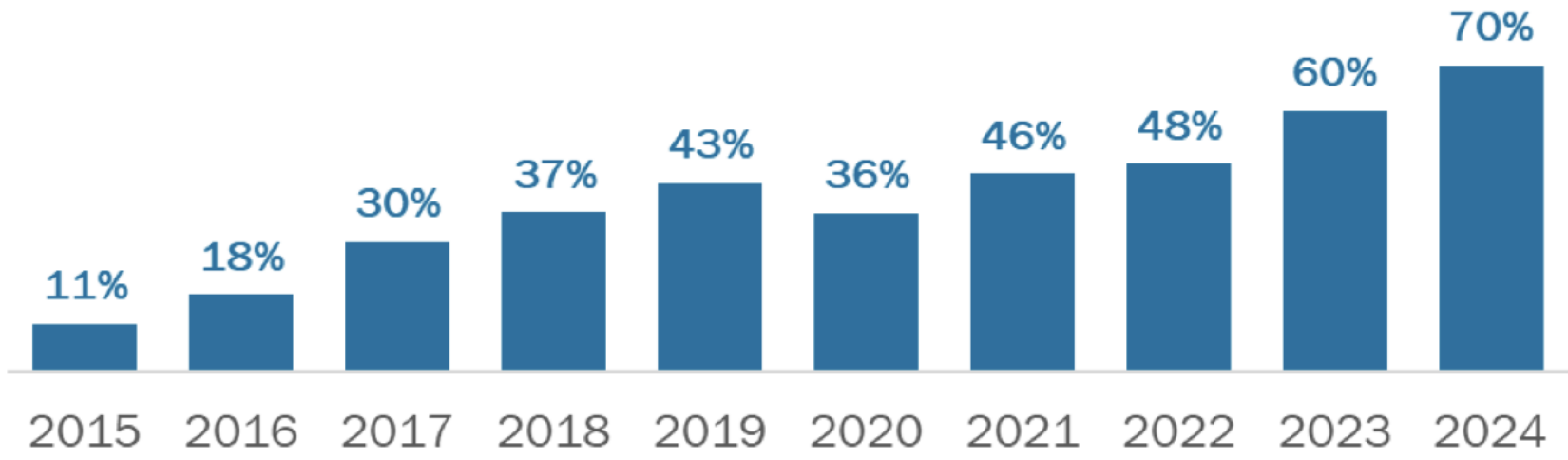
Fatal Opioid Overdoses Among Vermonters

Annual 2024 Data Brief
May 2025

Cocaine was involved in 7 out of 10 accidental or undetermined opioid-related fatal overdoses in 2024.



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Cocaine involvement in opioid-related fatal overdoses

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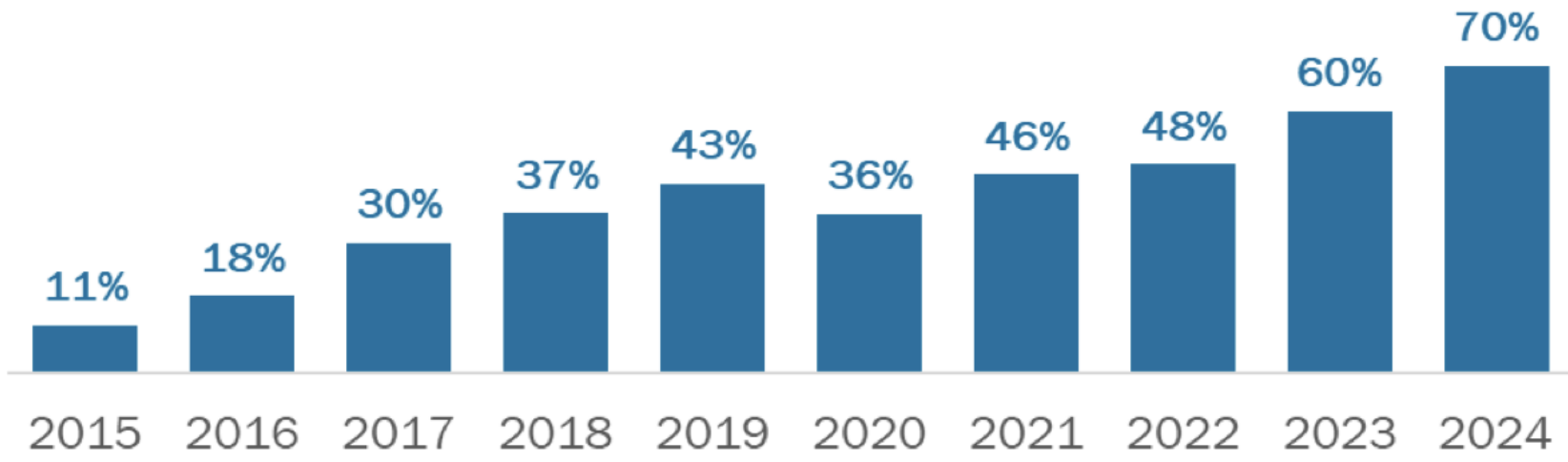

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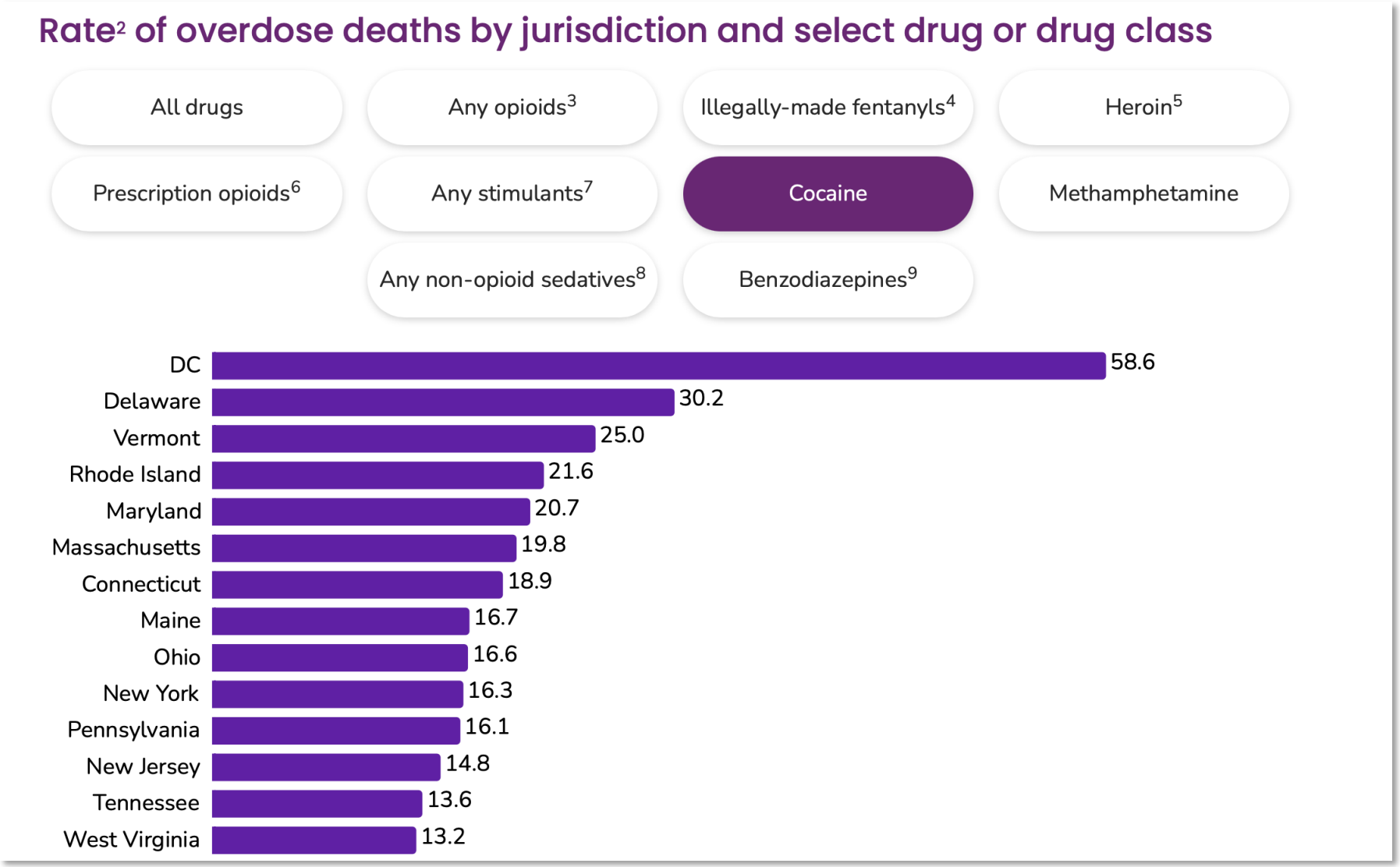
Cocaine involvement in opioid-related fatal overdoses

State Unintentional Drug Overdose Reporting System



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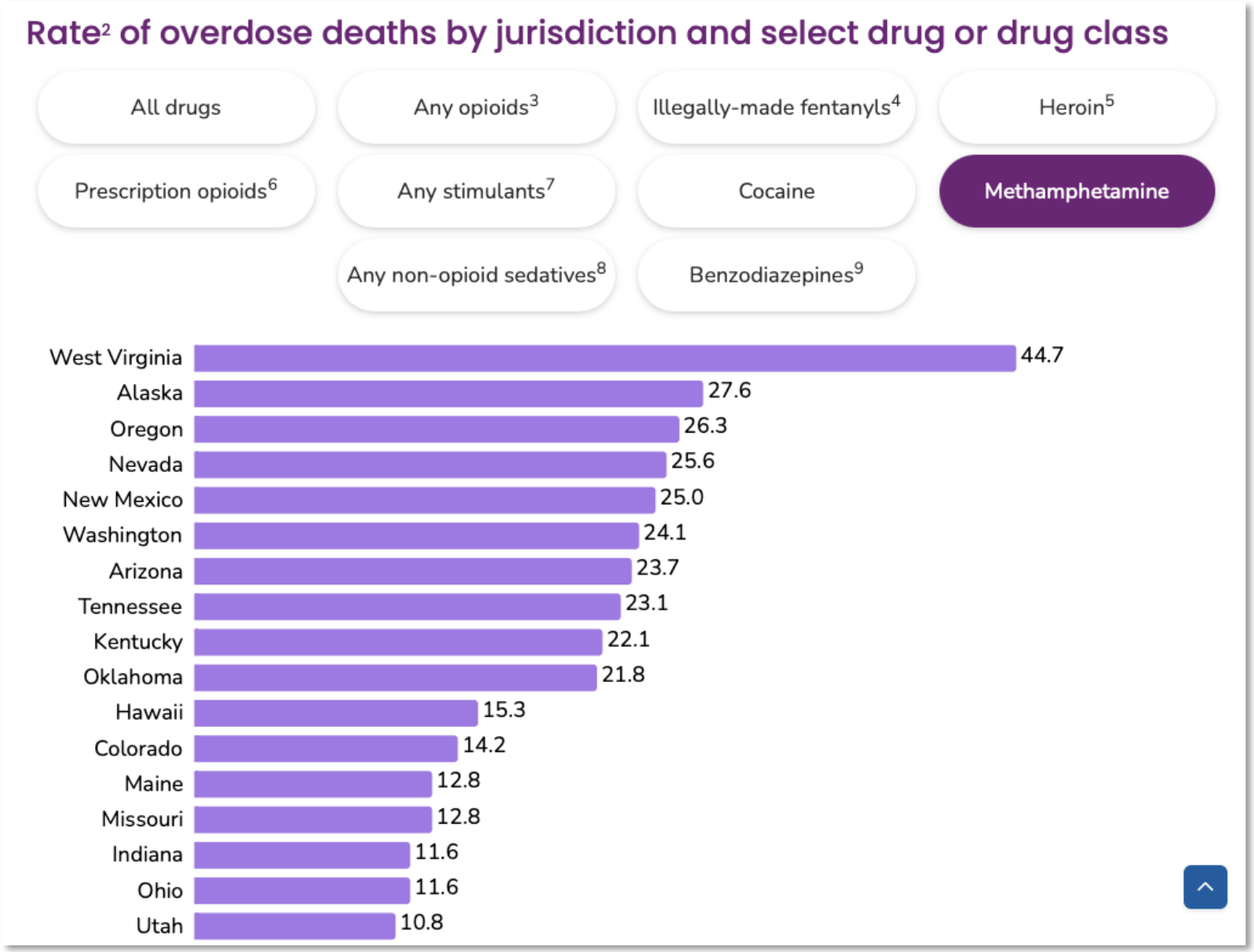

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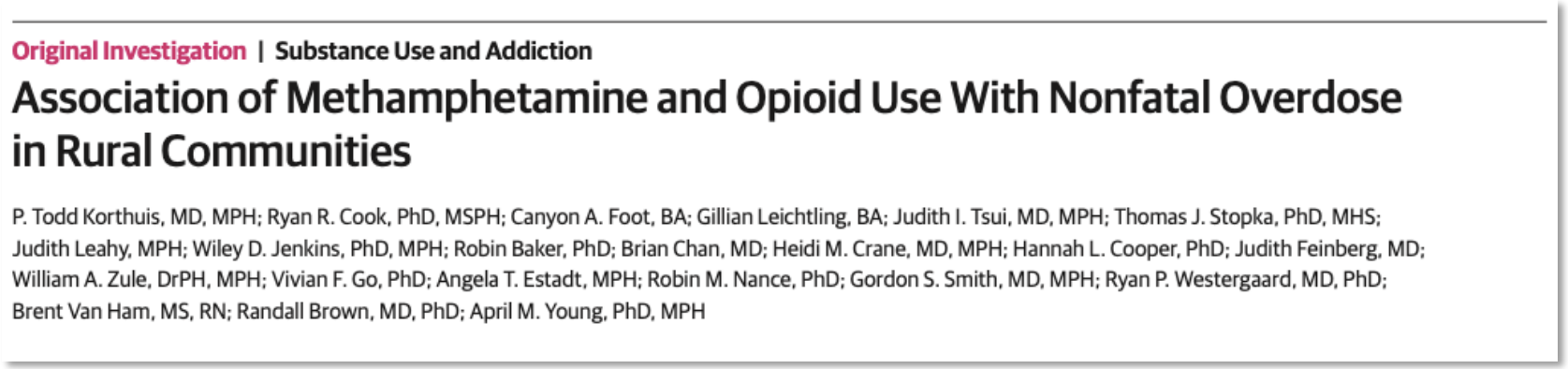


Original Investigation | Substance Use and Addiction

Association of Methamphetamine and Opioid Use With Nonfatal Overdose in Rural Communities

P. Todd Korthuis, MD, MPH; Ryan R. Cook, PhD, MSPH; Canyon A. Foot, BA; Gillian Leichtling, BA; Judith I. Tsui, MD, MPH; Thomas J. Stopka, PhD, MHS; Judith Leahy, MPH; Wiley D. Jenkins, PhD, MPH; Robin Baker, PhD; Brian Chan, MD; Heidi M. Crane, MD, MPH; Hannah L. Cooper, PhD; Judith Feinberg, MD; William A. Zule, DrPH, MPH; Vivian F. Go, PhD; Angela T. Estadt, MPH; Robin M. Nance, PhD; Gordon S. Smith, MD, MPH; Ryan P. Westergaard, MD, PhD; Brent Van Ham, MS, RN; Randall Brown, MD, PhD; April M. Young, PhD, MPH

Key Findings

- Nonfatal overdose was highest among people using both methamphetamine and opioids (22%) vs opioids alone (14%) or methamphetamine alone (6%).
- Individuals using both methamphetamine and opioids reported the least access to treatment
- Past 30-day cocaine use was commonly reported for all three groups
- *Only 17% of individuals using methamphetamine alone had naloxone

Substance use disorder is a brain disease

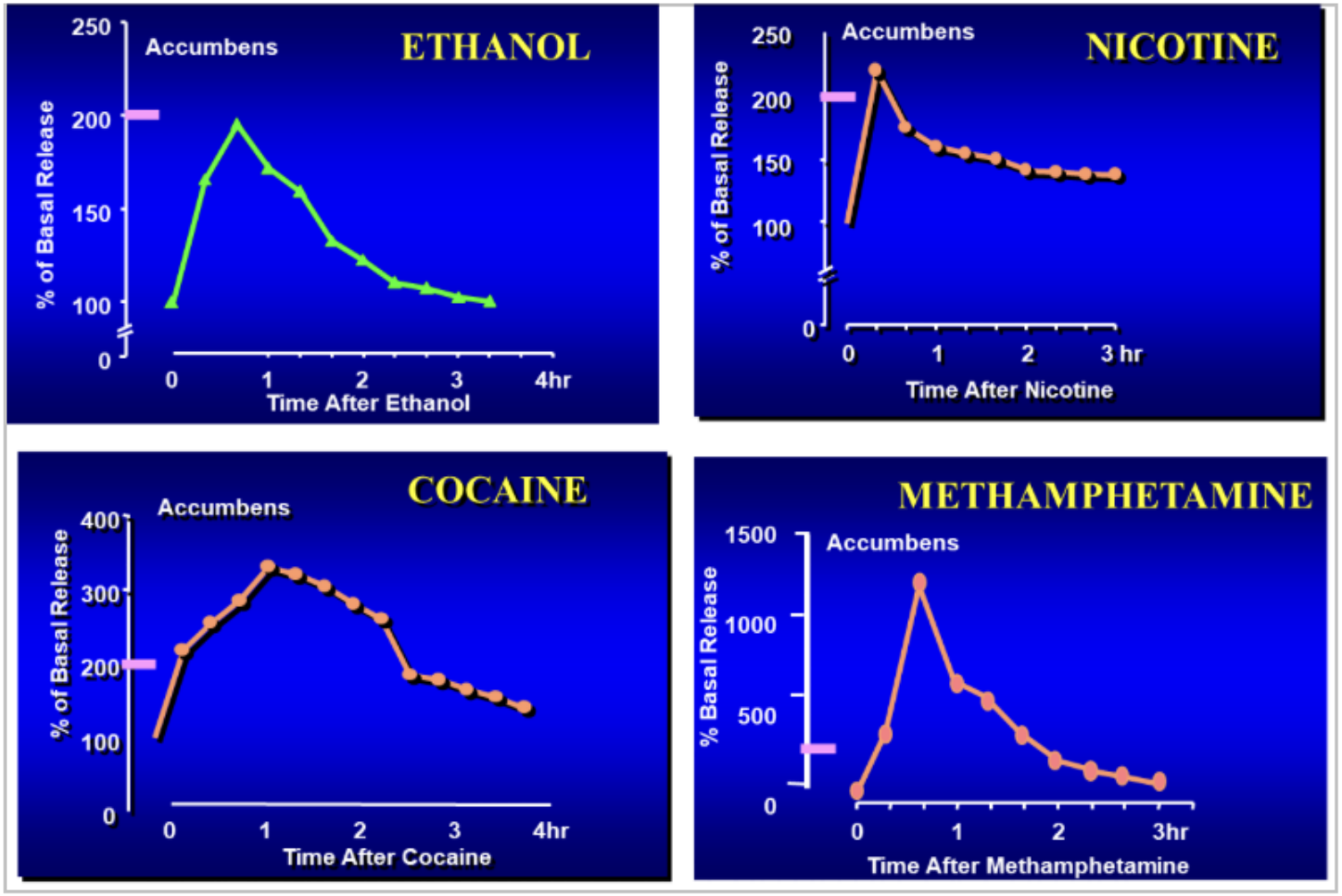
- "Addiction is a brain disease"

  Alan Leshner, Ph.D.

  Former Director, National Institute on Drug Abuse

- This statement in the late 1990's began to change the way drug abuse/dependence were viewed, at least by the medical and scientific communities
- Unfortunately, much stigma remains among general public as well as among healthcare providers

Effects of drugs on dopamine release



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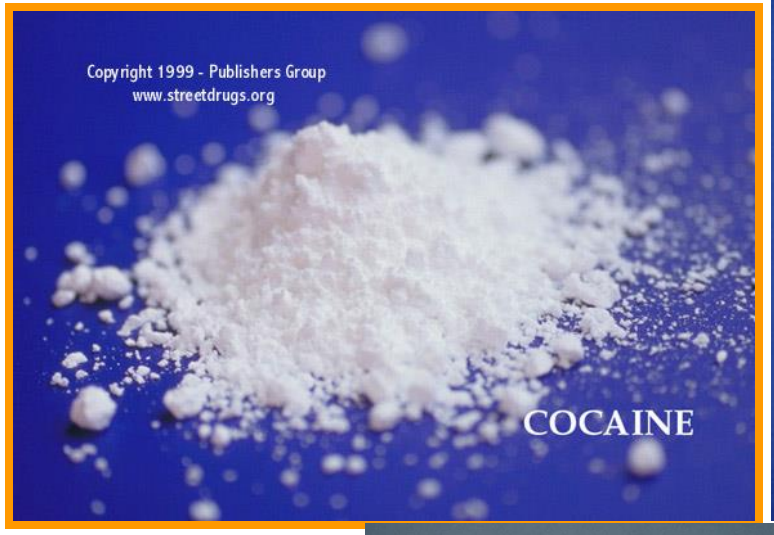
Stimulants



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Stimulants

- Description: A group of synthetic and plant-derived drugs that increase alertness and arousal by stimulating the central nervous system.
- Although MDMA (ecstasy) has some hallucinogenic properties, it is often classified as a stimulant
- Medical Uses: Short-term treatment of obesity, narcolepsy, and hyperactivity (e.g., ADHD)
- Method of Use: Intravenous, intranasal, oral, smoking

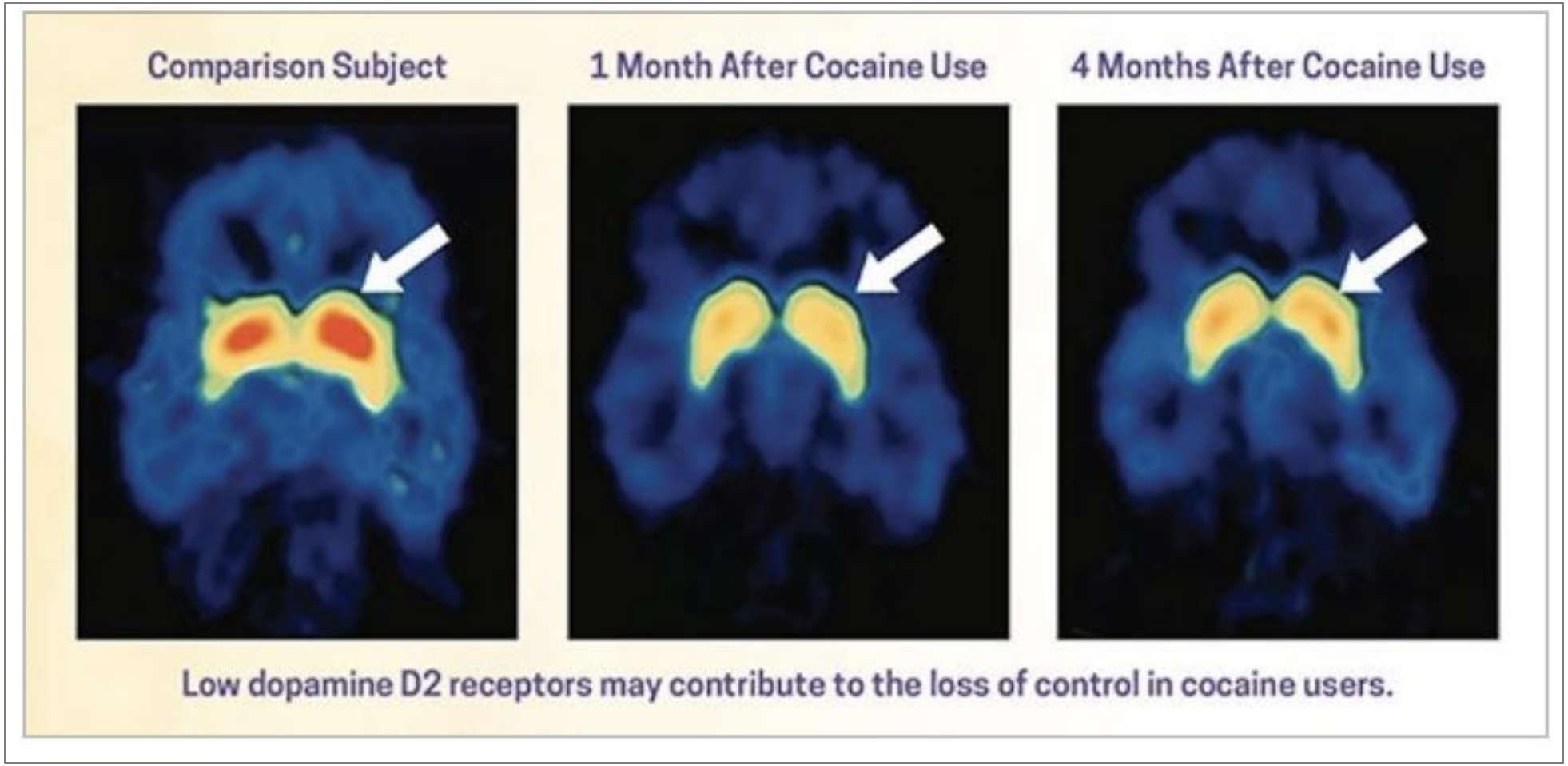
Cocaine vs. Methamphetamine

- Cocaine half-life: 2 hours
- Methamphetamine half-life: 10 hours
- Cocaine paranoia: 4 - 8 hours following drug cessation
- Methamphetamine paranoia: 7-14 days
- Methamphetamine psychosis - May require medication / hospitalization and may not be reversible
- Neurotoxicity: Appears to be more profound with amphetamine-like substances

Acute effects of crack/cocaine

- Euphoria or affective blunting
- Changes in sociability
- Hypervigilance
- Interpersonal sensitivity
- Anxiety, tension, or anger
- Impaired judgment
- Impaired social or occupational functioning

Dopamine (D2) Receptor Availability



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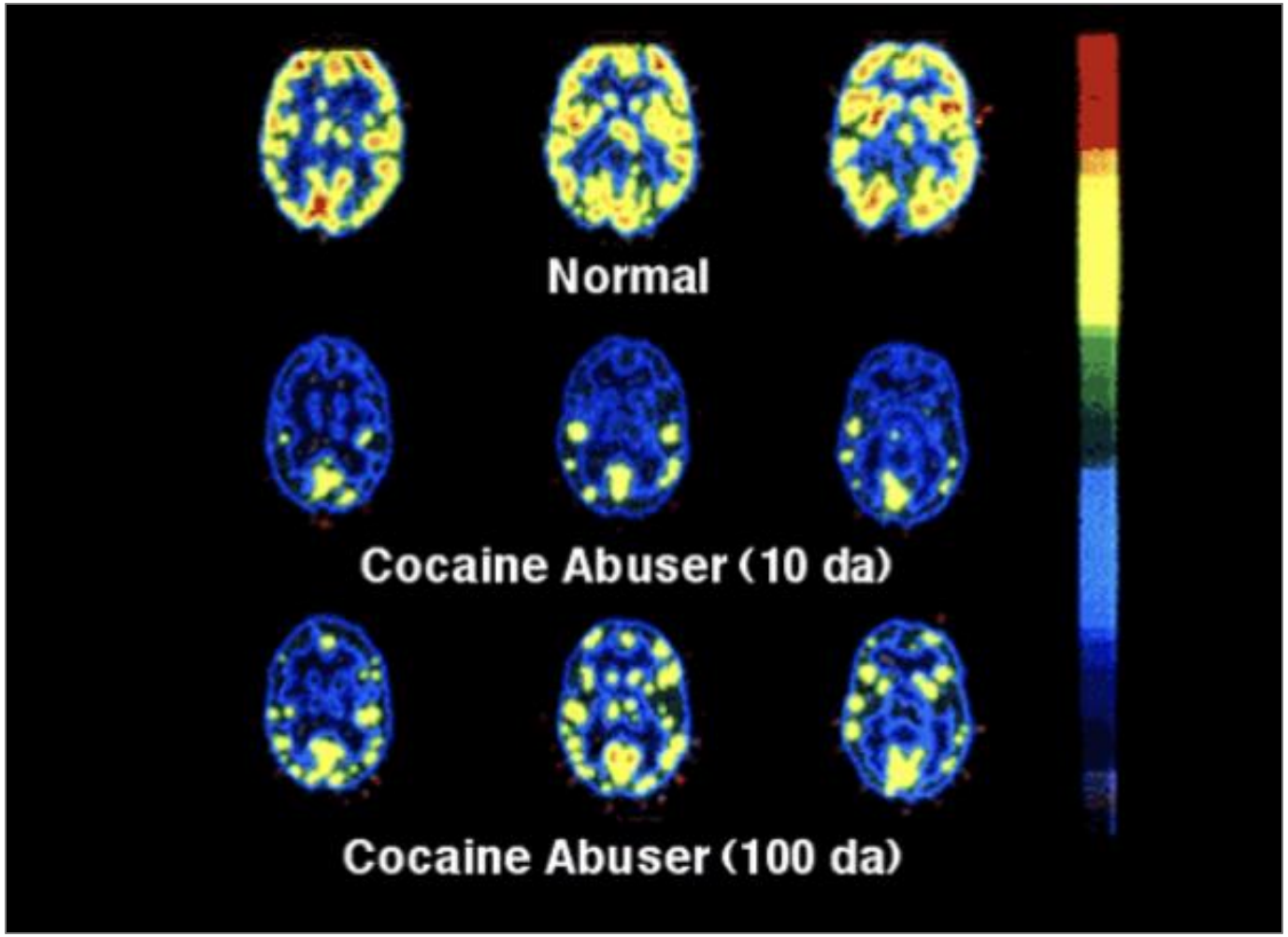
NIDA, 2020

Longer-term impact of cocaine use



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NIDA, 2016;
Volkow et al., 1993

Medical effects of crack/cocaine

- Cardiovascular effects
  - Disturbances in heart rhythm; heart attacks
- Respiratory effects
  - Chest pain; respiratory failure
- Neurological effects
  - Strokes; seizures; headaches
- Gastrointestinal complications
  - Abdominal pain; nausea
- Paranoia

NIDA, 2016

Methamphetamine

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Clinical challengers: Treating stimulant use disorders

- Overdose death/Lethality of currently available stimulants
- Limited understanding of stimulant addiction
- Ambivalence about need to stop use
- Impulsivity/Poor judgement
- Cognitive impairment and poor memory
- Anhedonia

Clinical challengers: Treating stimulant use disorders

- Hypersexuality/Hyposexuality
- Violence and psychosis
- Powerful Pavlovian trigger-craving response
- Elevated rates of psychiatric co-morbidity
- Very difficult to engage in treatment
- Very poor retention in outpatient treatment

Special treatment considerations

- People who inject.
- People who use stimulants daily or in very high doses.
- Women (high rates of physical/sexual abuse).
- Homeless, chronically mentally ill and/or individuals with high levels of psychiatric symptoms at admission.
- Men who have sex with men (MSM).
- People who use stimulants who are under the age of 21.
- Individuals in medication treatment for OUD.

Association Between Stimulant Use and Retention Among Patients With Opioid Use Disorders Treated With Buprenorphine. (Tsui et al., 2020)

The study utilized data on adult patients receiving buprenorphine from Washington State Medication Assisted Treatment-Prescription Drug and Opioid Addiction program clinics between November 1, 2015, and April 31, 2018 (N=799). Past 30-day substance use data were collected at baseline, 6-months, and date of program discharge.

30% (n=237) of individuals reported meth use at admission. Baseline methamphetamine use was associated with more than twice the relative hazards for discharge in adjusted models (aHR=2.39; 95% CI: 1.94–2.93).

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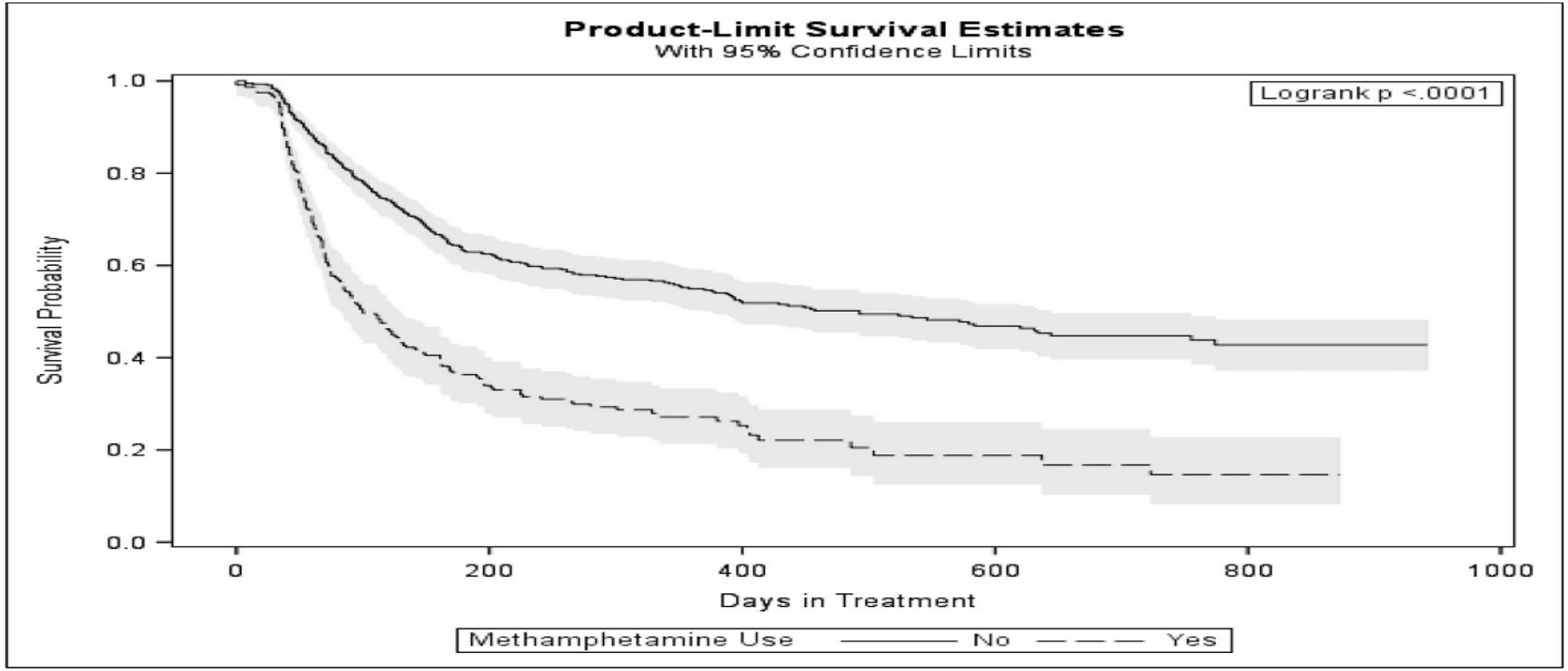

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Treatment for Stimulant Use Disorders

There are currently no FDA-approved medications for treating individuals with stimulant use disorder (Brandt et al., 2021)

Effective treatment for individuals with stimulant use disorders is **Contingency Management**

Contingency Management Defined

A behavioral technique employing the systematic delivery of positive reinforcement for predetermined goal behaviors.

In the treatment of stimulant use disorder, most commonly tangible items (e.g. gift cards) can be earned for the submission of stimulant-negative urine drug specimens or for completion of other goal behaviors (e.g., therapy attendance).

Treatment for Stimulant Use Disorders

- Contingency management unanimously (> 7 systematic reviews and meta-analyses) found to have the most robust evidence of effectiveness.
- Other approaches with lesser but evidence of support: Cognitive Behavioral Therapy (CBT) and Community Reinforcement Approach (CRA)
- Approach with evidence for treatment of a broad variety of SUD: Motivational Interviewing (MI).
- Approach with recent studies showing benefit to individuals with methamphetamine use disorder: Physical Exercise (PE). (e.g. Rawson et al, 2015)

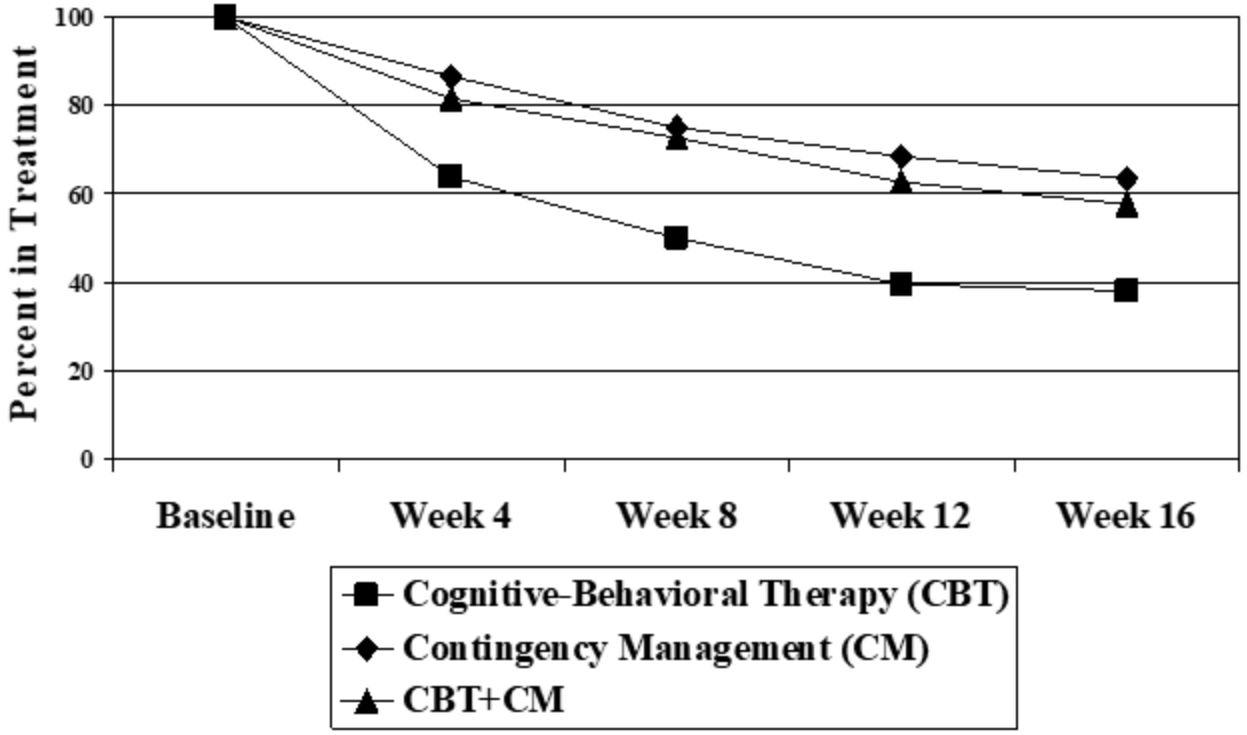
CM vs CBT

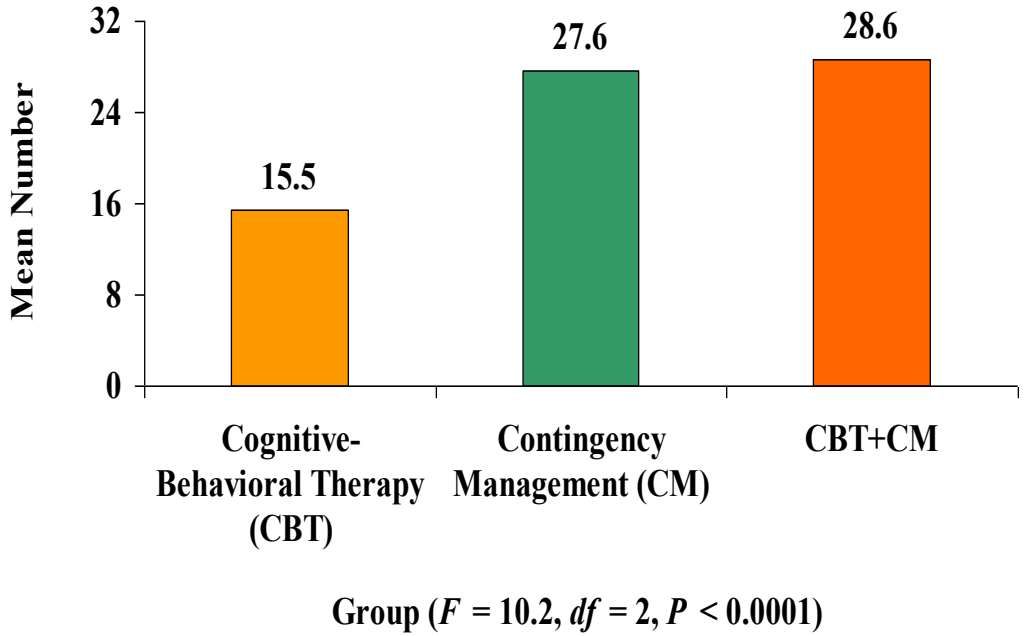
Study Design

- The study sought to directly compare the effectiveness of (CM) and (CBT) alone and in combination in reducing stimulant use.
- CM, CBT or combined CM and CBT, 16-week treatment conditions.
- CM condition participants received vouchers for stimulant-free urine samples.
- CBT condition participants attended three 90-minute group sessions each week

Rawson et al., (2006)

CM vs CBT





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Rawson et al., (2006)

CM vs CBT

Results

- CM procedures produced better retention and lower rates of stimulant use during the study period.
- There was no evidence of an additive effect when the two treatments were combined.

Conclusions

- This study suggests that CM is an efficacious treatment for reducing stimulant use and is superior during treatment to a CBT approach.
- CM is useful in engaging substance abusers, retaining them in treatment and helping them achieve abstinence from stimulant use.

Rawson et al., (2006)

JAMA Network | Open

Original Investigation | Substance Use and Addiction

Comparison of Treatments for Cocaine Use Disorder Among Adults
A Systematic Review and Meta-analysis

Brandon S. Bentzley, MD, PhD; Summer S. Han, PhD; Sophie Neuner, BS; Keith Humphreys, PhD; Kyle M. Kampman, MD; Casey H. Halpern, MD

- Results: A total of **157** studies comprising 402 treatment groups and 15,842 participants were included
- Only contingency management was significantly associated with an increased likelihood of having a negative test result for the presence of cocaine (OR, 2.13)
- Conclusions: In this meta-analysis, **contingency management** programs were associated with the highest reductions in cocaine use among adults.

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JAMA Psychiatry | Original Investigation

Contingency Management for Patients Receiving Medication for Opioid Use Disorder

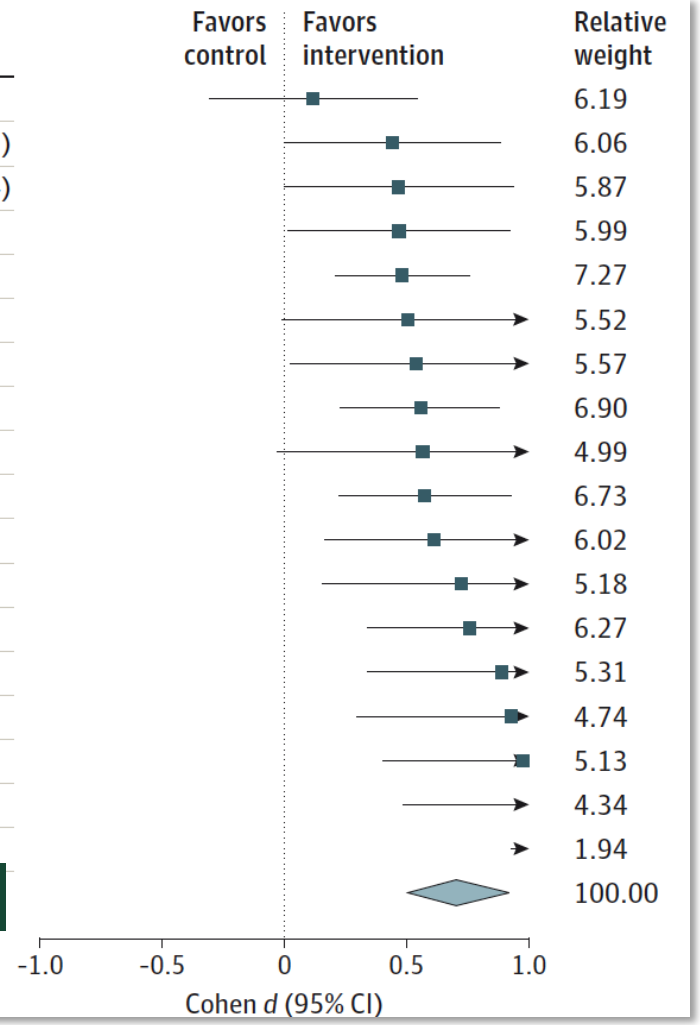
A Systematic Review and Meta-analysis

Hypatia A. Bolívar, PhD; Elias M. Klemperer, PhD; Sulamunn R. M. Coleman, PhD; Michael DeSarno, MS; Joan M. Skelly, MS; Stephen T. Higgins, PhD

- Systematic search of published reports through May 05, 2020
- Prospective experimental studies of monetary-based CM among patients undergoing medication treatment for OUD (MOUD)
- 74 studies (n=10,444) met inclusion criteria for systematic review; 60 studies (n=7,000) met inclusion criteria for meta-analysis (Cohen's d)
- Primary outcome: effect of CM at end-of-treatment on psychomotor stimulant use

Results: Stimulant Use

Study	Cohen *d* (95% CI)
Umbricht et al,[24] 2014	0.12 (-0.31 to 0.54)
Preston et al,[25] 2001	0.44 (-0.002 to 0.89)
Winstanley et al,[26] 2011	0.47 (-0.005 to 0.94)
Petry et al,[27] 2005	0.47 (0.02 to 0.92)
Blanken et al,[28] 2016	0.48 (0.21 to 0.76)
Rawson et al,[29] 2002	0.51 (-0.01 to 1.02)
Rowan-Szal et al,[30] 2005	0.54 (0.03 to 1.05)
Festinger et al,[31] 2014	0.56 (0.23 to 0.88)
Petry et al,[32] 2007	0.57 (-0.03 to 1.16)
Kirby et al,[33] 2013	0.58 (0.22 to 0.93)
Katz et al,[34] 2002	0.61 (0.17 to 1.06)
DeFulio et al,[35] 2009	0.73 (0.16 to 1.29)
Epstein et al,[36] 2003	0.76 (0.34 to 1.17)
Silverman et al,[37] 2007	0.89 (0.34 to 1.44)
Silverman et al,[38] 1999	0.93 (0.29 to 1.56)
Silverman et al,[39] 2004	0.98 (0.40 to 1.55)
Silverman et al,[40] 1996	1.19 (0.49 to 1.89)
Silverman et al,[41] 1998	5.21 (3.88 to 6.54)
Total (95% CI)	0.70 (0.49 to 0.92)



"These results provide evidence supporting the use of contingency management in addressing key clinical problems among patients receiving MOUD, including the ongoing epidemic of comorbid psychomotor stimulant misuse."

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Characteristics of the VT CM program: the science that drives protocol development

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Characteristics of the VT CM Program

- Clearly defined and achievable goal behavior
- Providing desirable and tangible incentives
- Timely pairing of behavior and incentive
- Contingent (incentives provided only when the behavior is demonstrated)
- Consistent (behavior is frequently observed and incentivized)

Clearly Defined Goal Behavior

Focused: nonuse from only stimulants

Objective: relies on urine drug specimen collected (not self report)

Immediate results: quickly provide positive reinforcement with point-of-care test results

Feasible: cost effective for frequent use, does not take specialized training

Achievable: a 2 to 4-day stimulant metabolite detection window means rewards can be earned within first few days of nonuse

Suggested Goal Behavior: Stimulant nonuse measured by a point-of-care urine drug test

Frequent Measurement of Behavior

- Collect urine drug test and provide incentives
  - At least 2x per week (recommended minimum)
- Attendance requirements
  - Positive reinforcement focus
  - Missed visit = missed opportunity for reward
- Scheduled equally throughout week
  - Mondays and Thursdays
  - Tuesdays and Fridays

Provide Desirable and Immediate Rewards

Desirable:

- Provide a desirable array of incentive options
- Incentive values of an appropriate amount (i.e., magnitude) for the first and each subsequent stimulant-negative UDT

Immediate:

- Incentives delivered electronically (e.g., gift cards; reloadable)
- Also have the option to print gift cards (e.g., if there is unreliable access to technology)

VT CM Protocol: Key Parameter Ingredients

- Type of CM model used (*voucher CM*)
- Duration of the CM treatment (*24 weeks*)
- Goal behavior (*e.g., objectively verified nonuse of stimulants*)
- Urine Drug Test goal behavior (*stimulants nonuse only*)
- Frequency of CM visits
    - *Weeks 1-12: 2x per week; weeks 13-24: 1x per week*
- Incentive magnitude (*earn up to $720*)
- Use of CM in combination with other behavioral treatments (*e.g., IOP, group therapy*)

Questions?

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Richard.Rawson@uvm.edu