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The fourth wave of the overdose crisis: Examining the prominent role of psychomotor stimulants with and without fentanyl

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ABSTRACT

The current overdose and broader public health crisis involving illicit drug use is often referred to as the “opioid” or “fentanyl” crisis. Clearly there is extensive data on the profound damage done by opioids over the past 20 years and specifically by fentanyl in the past 5 years. However, there is an extensive array of data that suggests there is more to the current crisis than opioids/fentanyl. Much recent evidence indicates that methamphetamine and cocaine are playing a substantial and increasing role in the illicit drug crisis in the US—the 4th wave. This paper reviews data that illustrate the role of psychomotor stimulants in fatal overdoses, nonfatal overdoses, and emergency department visits. Despite the major detrimental role that stimulants are having on the public health in the US in 2023, there is virtually no evidence-based treatment available in practice for people with stimulant use disorder (StimUD). Although there are no medications with FDA-approval for the treatment of StimUD, there is a behavioral treatment, contingency management (CM), with over 3 decades of robust research supporting its efficacy for individuals with StimUD. Despite the overwhelming evidence supporting CM, it is not being widely used in routine treatment outside the VA healthcare system. This paper reviews some of the (a) evidence for CM, (b) CM protocol design elements that require consideration, (c) current obstacles to the widespread implementation of CM, and (d) strategies for addressing these obstacles. Overcoming these obstacles is a priority to allow routine use of CM as a treatment for StimUD.

The “fourth wave” of the 21st century drug overdose death crisis in the United States refers to an escalation of cocaine- and methamphetamine-associated deaths, both with and without fentanyl (Ciccarone, 2021; Jenkins, 2021). Three earlier “waves,” were characterized by increases in overdose deaths associated with (a) prescription opioids, (b) heroin, and (c) fentanyl (Centers for Disease Control and Prevention [CDC], 2019; Ciccarone, 2019). The data we present in this article support the characterization of this fourth wave by Ciccarone (2021):

“A ‘fourth wave’ of high mortality involving methamphetamine and cocaine use has been gathering force in the USA. Availability and use of illicit fentanyls are still the major drivers of overdose deaths and the current rise in stimulant-related deaths appears entwined with the ongoing opioid epidemic.”

Even though the current overdose crisis in the US is almost universally referred to as the “opioid” or “fentanyl crisis” (Ince et al., 2023), the overdose death rate associated with psychomotor stimulants

including cocaine (Hedegaard et al., 2020) and methamphetamine (Hoopsick and Andrew Yockey, 2023) has also dramatically increased in recent years.

Using data from the CDC’s Wide-Ranging Online Database for Epidemiologic Research (WONDER) from 2010 through 2021, Hoopsick and Andrew Yockey (2023) recently documented a “50-fold increase in the methamphetamine mortality rate, which was accompanied by an increasing proportion of deaths that co-involved heroin or fentanyl.” Of the 32,353 total methamphetamine-associated deaths in 2021, 61.2% included fentanyl, meaning that that, 38.2%—or 12, 617 deaths—*did not* involve fentanyl. Thus, it would be a misrepresentation of the 2023 overdose crisis to be viewed as *exclusively* an opioid or fentanyl crisis (Ciccarone, 2021; Friedman and Shover, 2022).

Hedegaard et al. (2021) report on a parallel, albeit slightly less dramatic increase in cocaine-related overdose deaths. They report: “the age-adjusted rate of drug overdose deaths involving cocaine more than tripled from 1.6 per 100,000 in 2013 to 4.9 in 2019.” Of the cocaine-

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related deaths in 2019, 75.5% included fentanyl. These data on cocaine-related deaths further emphasize how stimulants are involved in a significant way in the current overdose death crisis.

1. Almost 50% of overdose deaths involve psychomotor stimulants

Friedman and Shover (2022) reported the annual percentage of overdose deaths that involved (a) fentanyl, (b) stimulants, (c) fentanyl and stimulants, and (d) neither fentanyl nor stimulants. In addition, they also measured the most commonly co-involved substance at the state level over the study period.

The authors summarize the results of their analysis as follows:

“As overdose deaths rose in the United States from 38,643 in 2010 to 106,719 in 2021, the percent involving both fentanyl and stimulants concurrently rose nearly 60-fold, from a 0.6% (n = 235) to 32.3% (n = 34,424) (Fig. 1). The proportion of deaths involving fentanyl without stimulants also rose from 7.2% in 2010 to a peak of 35.7% in 2020, before declining slightly to 33.9% in 2021. The proportion with stimulants and no fentanyl remained relatively more stable, from 14.8% in 2010 to 17.9% in 2021. The proportion containing neither fentanyl nor stimulants fell from 77.3% in 2010 to only 16.0% in 2021.”

Stimulants alone or in combination with fentanyl were detected in 47.1% of deaths in 2021. Meanwhile, stimulants alone were detected in 17.9% of deaths, representing 19,103 individuals who died without evidence of fentanyl/opioid involvement. The analysis by Friedman and Shover (2022) also suggests some regional differences in the specific type of stimulant being used in the overdose death data. In brief, methamphetamine was the most prevalent stimulant in overdose deaths West of the Mississippi, most Midwest states, and in Southern states in 2021. However, in Northeastern and Great Lake states, cocaine was the most common stimulant associated with overdose deaths.

The rates of stimulant-related overdose deaths were substantially different according to race/ethnicity. Friedman et al. (2022) reported that increases in methamphetamine-related overdose deaths among American Indian/Alaska Native (AI/AN) increased over eightfold between 2010 and 2019. Among Black individuals, overdose death rates associated with methamphetamine alone and in combination with opioids were found to have increased tenfold (compared to 3-fold among Whites) between 2015 and 2019 (Han et al., 2021). In addition to geographic and racial/ethnic differences, Friedman and Shover (2022) found gender difference in the drug type by overdose death totals in the 2021 data. While 72% of fentanyl-related deaths were males vs 28% females, rates of stimulant-involved deaths were much closer to equal—48.3% male and 50.1% female.

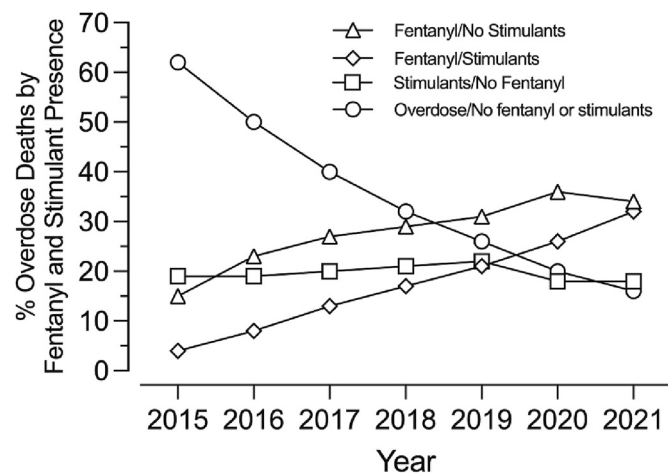


Fig. 1. Percent of overdose-involved deaths by fentanyl and stimulant presence by year.

2. Other evidence reflecting the substantial public health impact of stimulant use

Korthuis et al. (2022) report data on non-fatal overdose from a cross-sectional survey of people who use drugs (any injection drug use or non-injection opioid use) in past 30 days) in rural communities of 10 states. Among their sample of 2970 participants with complete data, 13% reported methamphetamine use only, 23.3% reported opioid use only, and 63.2% reported use of both methamphetamine and opioids. Of those who used methamphetamine only (n = 390), 31% reported ever overdosing with 6% reporting an overdose in the past 180 days. For opioids only (n = 702), 44% reported ever overdosing with 14% reporting an overdose in the past 180 days. For methamphetamine plus opioids (n = 1878), 55% reported ever overdosing with 22% reporting an overdose in the past 180 days. Clearly, use of methamphetamine was an important factor in the vulnerability to overdose among this rural sample. As concluded by the authors:

“Our results document pervasive co-use of methamphetamine and opioids associated with nonfatal overdose among people who use drugs in rural communities, with profound implications for harm reduction and treatment services. Study findings highlight the urgent need for interventions that address both opioids and methamphetamine and are tailored to the needs of rural communities.”

Finally, there are several other datasets that reinforce the role that stimulants are playing in the drug crisis being experienced in the US in recent years. For example, data from the Drug Abuse Warning Network (DAWN) on emergency room drug mentions in 2021 indicated that mentions of stimulant use (i.e., cocaine and methamphetamine) were exceeded only by mentions of alcohol, exceeding the number of mentions of opioids (see Fig. 2).

3. A disparity in the treatment and harm reduction response

We reviewed the data above to highlight that although fentanyl and opioids are clearly a major factor in the current overdose crisis, cocaine and methamphetamine use, alone and in combination with fentanyl is also a significant contributing element to this public health crisis. Despite the substantial role that stimulants play in this crisis, efforts to address the treatment needs of people with StimUD have been almost negligible. This is in sharp contrast to the very robust and successful efforts over the past 20 years in providing treatment for people with opioid use disorder (OUD).

In the 4th wave, fentanyl remains a central element in the still increasing rate of overdose deaths and all the efforts to expand treatment and harm reduction activities for individuals who use opioids need to be continued and expanded (Office of National Drug Control Policy, 2022). However, as noted by the Executive Office of the President in the

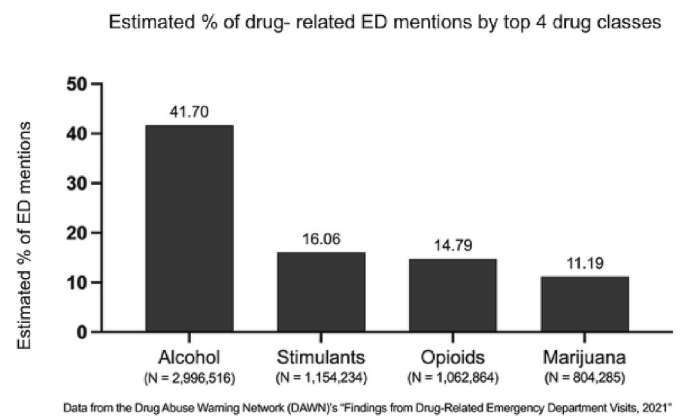


Fig. 2. Estimated percent of drug-related emergency department visits by the top four drug classes.

2022 National Drug Control plan, there is a need to expand evidence-based treatment for stimulant use disorder. At present, there are no FDA approved medications for the treatment of StimUD. Thus, although there are some classes of candidate pharmacotherapies with potential benefit (Brandt et al., 2021) and some specific promising candidates with some initial evidence of efficacy (Coffin et al., 2020; Trivedi et al., 2021), there are no medications considered effective as treatments for StimUD (Buchholz and Saxon, 2019; Chan et al., 2020).

4. Contingency management for StimUD: An essential treatment for the 4th Wave

There is one treatment with robust evidence of efficacy for the treatment of individuals with cocaine and methamphetamine use disorder—contingency management (CM), a behavioral approach based on basic principles of positive reinforcement. The evidence of CM for the treatment of StimUD is supported by over three decades of rigorously conducted research studies. Remarkably, however, this approach is used minimally outside of the US Veterans Administration healthcare system despite its demonstrated efficacy. The purpose of this article is to explain what CM is, the empirical support for its use, some key parameters for protocol design, and current obstacles to its implementation.

5. Contingency management: a highly effective behavioral approach

Contingency management (CM) is a behavior change technique based upon the principles of operant conditioning where reinforcement is provided contingent on the occurrence of a target behavior consistent with reduced cocaine and/or methamphetamine use (Higgins et al., 2007; Petry, 2011; Stitzer and Petry, 2006). As a protocol-driven intervention, CM includes three fundamental components: (a) an observable and measurable target behavior, (b) delivery of a reinforcing consequence for the occurrence of the target behavior, and (c) withholding a reinforcing consequence for the nonoccurrence of the target behavior.

The empirical support for CM in the treatment of substance use disorders is well established, with decades of support across a myriad of behaviors (Prendergast et al., 2006). In the past 5 years, there have been at least 7 meta-analyses or systematic reviews which unanimously support the conclusion that CM has robust evidence as a treatment for StimUD. Meta-analyses examining CM are highly efficacious for reducing cocaine use (Bentzley et al., 2021) and methamphetamine use (Brown and DeFulio, 2020), as well as increasing treatment attendance (Ginley et al., 2021). Bolivar and colleagues (2021) found that CM produces an extensive array of behavior change benefits in treating individuals on MOUD who are also using stimulants. When compared to other behavioral therapies (e.g., cognitive behavioral therapy [CBT]), CM has been shown to be the most effective intervention (De Crescenzo et al., 2018). Moreover, CM has been shown to produce a greater effect in the long term—that is, in the time that extends beyond the acute intervention period—when compared to other evidence-based interventions like CBT and standard care (Ginley et al., 2021). CM for the treatment of StimUD has been used in the Veterans Administration Healthcare system for almost a decade with very positive impact (DePhilippis et al., 2018). In addition, there is documentation that CM has clear support as a cost-effective intervention (Washington State Policy Institute, 2021). This robust evidence base, when coupled with the current paucity of effective pharmacotherapies for stimulant use, suggests that CM is the most effective intervention to date to promote reduced stimulant use/stimulant abstinence.

6. Design of CM protocols for real world use: parameters for consideration

Different dimensions of reinforcement have been shown to impact

the efficacy of CM. In general, CM is more effective when the reinforcer is: (a) provided at higher rather than lower values, (b) provided more immediately than delayed, and (c) highly probable of being delivered. There are numerous parameters that states, treatment providers, and other parties interested in implementing CM will need to consider on their CM protocol design.

- **CM Protocol Model: Voucher-based or Prize-based.** A first question might be what type of CM protocol will be used. The two most common types of CM protocols are voucher-based (Higgins et al., 1993, 1994) and prize-based (Petry et al., 2000), both of which are evidence-based with strong empirical support. There are no studies which suggest that one type of CM approach is superior to the other. Although the prize-based CM is being used in the VA and is quite popular in training efforts, the simplicity of the voucher-based approach may lend itself better to fraud prevention efforts.
- **Target Behavior.** A key parameter to protocol design is deciding on an observable, measurable target behavior. Examples of common target behaviors include stimulant-negative urine samples, attendance, or some combination thereof. With respect to urinalysis testing for substance use, another key parameter is whether testing is for one class of substances (e.g., stimulant use) or more than one class. This decision will impact other parameters such as incentive magnitude, among others.
- **Magnitude of the Incentive Program.** The overall cost of the CM intervention includes another important decision, selecting the incentive magnitude. At the time of the writing of this article, SAMHSA/HRSA funds limit the amount of money that can be used for CM incentives to \$75 per patient per year. A \$75 limit is well below the amounts used in the research studies that have established the efficacy of CM for StimUD. Research on the optimal incentive amount for effective treatment for StimUD has not been conducted. However, a review by the authors of the research using voucher-based CM protocols shows that many of the published studies have used a “maximum potential earning of \$200-\$300 per 30-day period”. The amounts used in prize-based protocols have tended to be somewhat less, but typically in the \$150–\$200 per month range. We strongly recommend that incentive magnitudes adhere to best-practice—both for voucher and prize CM.
- **Frequency of visits.** To promote substantial behavior change, incentives should be delivered frequently. In many of the early CM studies for cocaine use (Higgins et al., 1993), three visits per week were required. However, in more recent prize-based protocols, one CM opportunity per week was required (Becker et al., 2021). While there are no systematic comparisons of different frequencies, if urine test results are the primary target behavior, a twice-weekly schedule provides good assessment of stimulant use if the testing opportunities are properly spaced in the week, with one screening early in the week and the other in the latter half (e.g., Monday and Thursday; Tuesday and Friday).
- **Treatment duration.** Many of the research studies establishing the efficacy of CM have used twelve weeks as the length of randomized control trials evaluating CM; however, research indicates longer intervention durations lead to more robust outcomes (e.g., methamphetamine abstinence and treatment attendance increased as the CM intervention increased; Roll et al., 2013).

This list is by no means exhaustive. In fact, it is a small selection of parameters on which protocol decisions must be made. Other parameters to determine in the CM protocol will also include: Will an escalation, reset, recovery feature be used in the protocol? What should the initial value be in the protocol? How will the specific incentives (e.g., gift cards) be selected and delivered? Will CM be used as the sole intervention or in combination with other interventions (e.g., CBT, community reinforcement approach)? Will CM be delivered in person or via an app? And numerous other considerations.

7. Challenges to the implementation of CM

Large scale efforts to adopt CM for the treatment of StimUD have, to date, been limited to the VA (Petry et al., 2014). Currently there are several challenges that have impeded the adoption of CM outside the VA (Rawson et al., 2023). These include (a) resistance to the concept of CM (i.e., using tangible reinforcers such as incentives to directly reward reduction in cocaine and methamphetamine use), (b) regulatory obstacles, (c) difficulty in financing CM, and (d) the absence of established guidelines for “evidence-based” CM protocols and training and implementation plans.

7.1. Resistance to the concept of CM (aka “Paying individuals not to use drugs”)

In early CM training efforts, it was common to have feedback from clinicians and others that “paying individuals not to use drugs” or “bribing patients to not use drugs” was not seen as an acceptable approach. Promoting behavior change with external reinforcement was viewed as less desirable than behavior change based on “internal motivation”. This attitude was often accompanied by the opinion that tangible reinforcement might promote behavior change, but it didn’t get to the “root causes” of the substance use disorder. However, as a result of the dramatic escalation of stimulant involvement in the current overdose crisis and the fact that CM is the only treatment strategy with robust evidence of efficacy, there appears to be growing acceptance to the concept of CM and growing interest in using CM.

7.2. Regulatory challenges: The Office of the Inspector General (OIG)

Prior to 2020, there was a widespread belief that the use of tangible reinforcers violated Medicaid antikickback and beneficiary inducement regulations. In December 2020, the HHS Office of the Inspector General (OIG) released a “final rule” that comprehensively addressed the issue of incentive use within federal healthcare programs, including Medicaid (Federal Register Vo1 85, No. 232, December 2, 2020 at 77684). In brief, this document articulates the OIG opinion that there is no “OIG ban” on the use of CM, but that if incentives are to be used, there are some required actions (“guardrails”) to ensure against kickbacks and to prevent waste, fraud, and abuse (Rawson et al., 2023).

7.3. Difficulty in financing CM

At present, where there is interest in using CM, a universal question is, “Where does the money come from to pay for incentives?”. As of 2023, SAMHSA and HRSA program announcements have included language that allows for use of these funds for CM programs, but they restrict the incentive amounts to \$75 per patient per year (FY 2022 State Opioid Response Grants (TI-22-005) ([samhsa.gov](https://www.samhsa.gov))). The restriction to limit incentives to \$75 has created a situation where the incentive amounts are well below what has been shown to be empirically effective. With the \$75 limit on CM incentive per patient totals, it is impossible to have “evidence-based” CM. Another financial consideration for using CM is that the IRS currently considers the money “earned” in a CM protocol to be taxable income. Classification of the money as “taxable income” creates numerous reporting requirements and impact on eligibility of other government benefit programs which are serious deterrents for participation in CM.

7.4. Absence of established guidelines for training and implementation plans

There are currently no guidelines about how clinical staff should be trained to effectively deliver CM, with fidelity to the protocol and fraud prevention guardrails. At present the only model that has been used to systematically guide CM training and implementation efforts has been

described by Becker et al. (2018). Within this model, staff being trained to deliver CM need to (a) be guided to the development of a sound CM protocol; (b) have a preliminary “readiness” assessment discussion to prepare the site; (c) have intensive training (with role playing) of how to conduct CM interactions with patients, how to dispense and record incentives and how to ensure fraud prevention guardrails; and (d) attend, at a minimum, monthly “implementation” sessions in which progress is monitored via structured data reviewed in the session and problem solving is done with expert consultation. To effectively impart the knowledge and skills needed to deliver CM with fidelity to the CM protocol and guardrails, much more is needed beyond a one-time training for an effective training and implementation plan.

8. Summary

Use of methamphetamine and cocaine are major elements to the public health crisis caused by illicit drug use in 2023. While there is extensive evidence that fentanyl is a primary driver of overdose and overdose deaths, psychostimulants are also involved in many of these deaths (and non-fatal overdoses) in ways that we may not fully understand. One thing is clear, efforts to effectively address the current illicit drug crisis need to go beyond simply addressing the risk of opioid/fentanyl use.

Effective treatment for individuals who use stimulants is currently not available outside the VA health system. Contingency management is an effective, but severely underused treatment for assisting people with StimUD to reduce/discontinue their methamphetamine and/or cocaine use and reduce their risk of overdose death. It is a priority to expand the use of CM. Empirical research should guide the protocols used for CM as well as the training and implementation methods used. Fraud prevention guardrails to promote compliance with anti-kickback regulations will be essential. A top priority is the removal of limits on federal funding for CM incentives to allow the use of this effective treatment approach at evidence-based magnitudes.

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Declaration of Competing Interest

The authors have no conflicts of interest to disclose.

Data availability

No data was used for the research described in the article.

References

- Becker, S.J., Murphy, C.M., Hartzler, B., Rash, C.J., Janssen, T., Roosa, M., Garner, B.R., 2021. Project MIMIC (Maximizing Implementation of Motivational Incentives in Clinics): A cluster-randomized type 3 hybrid effectiveness-implementation trial. *Addiction Science & Clinical Practice* 16 (1), 1–16.
- Bentzley, B.S., Han, S.S., Neuner, S., Humphreys, K., Kampman, K.M., Halpern, C.H., 2021. Comparison of treatments for cocaine use disorder among adults: a systematic review and meta-analysis. *JAMA Netw Open* 4 (5), e218049.

- Brandt, L., Chao, T., Comer, S.D., Levin, F.R., 2021. Pharmacotherapeutic strategies for treating cocaine use disorder—what do we have to offer? *Addiction* 116 (4), 694–710.
- Brown, H.D., DeFulio, A., 2020. Contingency management for the treatment of methamphetamine use disorder: a systematic review. *Drug Alcohol Depend* 216, 108307.
- Buchholz, J., Saxon, A.J., 2019. Medications to treat cocaine use disorders: current options. *Curr Opin Psychiatry* 32 (4), 275–281.
- Centers for Disease Control and Prevention, 2019. 2019 Annual surveillance report of drug related risks and outcomes — United States surveillance special report. Accessed March, 20, 2023, from. <https://www.cdc.gov/drugoverdose/pdf/pubs/2019-cdc-drug-surveillance-report.pdf>.
- Chan, B., Freeman, M., Ayers, C., Korhuis, P.T., Paynter, R., Kondo, K., Kansagara, D., 2020. A systematic review and meta-analysis of medications for stimulant use disorders in patients with co-occurring opioid use disorders. *Drug Alcohol Depend* 216, 108193.
- Ciccarone, D., 2019. The triple wave epidemic: supply and demand drivers of the US opioid overdose crisis. *Int J Drug Pol* 71, 183.
- Ciccarone, D., 2021. The rise of illicit fentanyl, stimulants and the fourth wave of the opioid overdose crisis. *Curr Opin Psychiatry* 34 (4), 344.
- Coffin, P.O., Santos, G.M., Hern, J., Vittinghoff, E., Walker, J.E., Matheson, T., Batki, S.L., 2020. Effects of mirtazapine for methamphetamine use disorder among cisgender men and transgender women who have sex with men: a placebo-controlled randomized clinical trial. *JAMA Psychiatry* 77 (3), 246–255.
- De Crescenzo, F., Ciabattini, M., D'Alò, G.L., De Giorgi, R., Del Giovane, C., Cassar, C., Cipriani, A., 2018. Comparative efficacy and acceptability of psychosocial interventions for individuals with cocaine and amphetamine addiction: a systematic review and network meta-analysis. *PLoS Med* 15 (12), e1002715.
- DePhilippis, D., Petry, N.M., Bonn-Miller, M.O., Rosenbach, S.B., McKay, J.R., 2018. The national implementation of contingency management (CM) in the Department of Veterans Affairs: attendance at CM sessions and substance use outcomes. *Drug Alcohol Depend* 185, 367–373.
- Friedman, J., Shover, C., 2022. Charting the fourth wave: geographic, temporal, race/ethnicity, and demographic trends in polysubstance fentanyl overdose deaths in the United States, 2010–2021. *medRxiv*. <https://doi.org/10.1101/2022.11.04.22281945>, 2022–11.
- Friedman, J., Beletsky, L., Jordan, A., 2022. Surging racial disparities in the US overdose crisis. *Am J Psychiatr* 179 (2), 166–169.
- Ginley, M.K., Pfund, R.A., Rash, C.J., Zajac, K., 2021. Long-term efficacy of contingency management treatment based on objective indicators of abstinence from illicit substance use up to 1 year following treatment: a meta-analysis. *J Consult Clin Psychol* 89 (1), 58.
- Han, B., Cotto, J., Etz, K., Einstein, E.B., Compton, W.M., Volkow, N.D., 2021. Methamphetamine overdose deaths in the US by sex and race and ethnicity. *JAMA Psychiatry* 78 (5), 564–567.
- Hedegaard, H., Spencer, M.R., Garnett, M.F., 2020. Increase in drug overdose deaths involving cocaine: United States, 2009–2018. *NCHS Data Brief* 384.
- Hedegaard, H., Miniño, A.M., Spencer, M.R., Warner, M., 2021. Drug overdose deaths in the United States, 1999–2020. *Jan*, 356, pp. 1–8. PMID: 32487285.
- Higgins, S.T., Budney, A.J., Bickel, W.K., Hughes, J.R., Foerg, F., Badger, G., 1993. Achieving cocaine abstinence with a behavioral approach. *Am J Psychiatry* 150(5), 763–769.
- Higgins, S.T., Budney, A.J., Bickel, W.K., Foerg, F.E., Donham, R., Badger, G.J., 1994. Incentives improve outcome in outpatient behavioral treatment of cocaine dependence. *Arch Gen Psychiatry* 51 (7), 568–576.
- Higgins, S.T., Silverman, K., Heil, S.H., 2007. *Contingency Management in Substance Abuse Treatment*. Guilford Press.
- Hoopsick, R.A., Andrew Yockey, R., 2023. Methamphetamine-related mortality in the United States: co-involvement of heroin and fentanyl, 1999–2021. *Am J Public Health* 113 (4), 416–419. <https://doi.org/10.2105/AJPH.2022.307212>.
- Ince, M.A., Kelley, A.T., Singer, P.M., 2023. Implementing the white House's strategic plan to save lives amid the opioid crisis: reaching for the “north star”. *JAMA* 329 (9), 705–706.
- Jenkins, R.A., 2021. The fourth wave of the US opioid epidemic and its implications for the rural US: a federal perspective. *Prev Med* 152, 106541.
- Korhuis, P.T., Cook, R.R., Foot, C.A., Leichtling, G., Tsui, J.I., Stopka, T.J., Young, A.M., 2022. Association of methamphetamine and opioid use with nonfatal overdose in rural communities. *JAMA Netw Open* 5 (8), e2226544.
- Office of National Drug Control Policy, 2022. *National Drug Control Strategy*. Retrieved March 22, 2023, from. <https://www.whitehouse.gov/wp-content/uploads/2022/04/National-Drug-Control-2022Strategy.pdf>.
- Petry, N.M., 2011. Contingency management: what it is and why psychiatrists should want to use it. *Psychiatrist* 35 (5), 161–163.
- Petry, N.M., Martin, B., Cooney, J.L., Kranzler, H.R., 2000. Give them prizes and they will come: contingency management for treatment of alcohol dependence. *J Consult Clin Psychol* 68 (2), 250.
- Petry, N.M., DePhilippis, D., Rash, C.J., Drapkin, M., McKay, J.R., 2014. Nationwide dissemination of contingency management: the veterans administration initiative. *Am J Addict* 23 (3), 205–210.
- Prendergast, M., Podus, D., Finney, J., Greenwell, L., Roll, J., 2006. Contingency management for treatment of substance use disorders: a meta-analysis. *Addiction* 101 (11), 1546–1560.
- Rawson, R.A., Erath, T.G., Chalk, M., Clark, H.W., McDaid, C., Wattenberg, S.A., Freese, T.E., 2023. Contingency Management for Stimulant Use Disorder: Progress, challenges, and recommendations. *J Ambulat Care Manag* 46 (2), 152–159.
- Roll, J.M., Chudzynski, J., Cameron, J.M., Howell, D.N., McPherson, S., 2013. Duration effects in contingency management treatment of methamphetamine disorders. *Addict Behav* 38 (9), 2455–2462.
- Stitzer, M., Petry, N., 2006. Contingency management for treatment of substance abuse. *Annu Rev Clin Psychol* 2, 411–434.
- Trivedi, M.H., Walker, R., Ling, W., Dela Cruz, A., Sharma, G., Carmody, T., Shoptaw, S., 2021. Bupropion and naltrexone in methamphetamine use disorder. *N Engl J Med* 384 (2), 140–153.
- Washington State Policy Institute, 2021. *Contingency Management for Substance Use Disorders*. Retrieved July 20, 2023 from. <https://www.wsipp.wa.gov/BenefitCost/Program/297>. Retrieved July 20, 2023 from.