Prize-based versus Voucher-based Contingency Management protocols for Stimulant-Opioid Co-Use: A Network Meta-Analysis

Submission ID 3003934

Submission Type Paper

Topic Addiction- Substance Use Disorders: Identifying, Diagnosing, Treating, and/or Managing

Status Submitted

Submitter Henrique Oliva

Affiliation Yale University School of Medicine Department of Psychiatry

Participant(s) Henrique Oliva (Presenter), Srinivas Muvvala (Co-Author), Carla Rash (Co-Author), Oluwole Jegede (Co-Author)

SUBMISSION DETAILS

If your paper is not accepted, please elect if you would like your submission to be reviewed as a poster. Yes, I would like to be reviewed as a poster.

Summary Objective: To compare prize-based and voucher-based contingency management (CM) protocols for individuals with stimulant–opioid co-use using a network meta-analysis (PROSPERO CRD420251000204).

Methods: We searched Cochrane Library, Embase, PubMed, PsycINFO, and Web of Science through April 2026. Randomized controlled trials evaluating CM among individuals with past-year stimulant-opioid co-use were eligible. Outcomes included percent combined stimulant-opioid–negative urine toxicology samples, longest duration of continuous, simultaneous abstinence from stimulants and opioids during treatment, and treatment retention. Data were extracted following PRISMA guidelines, and random-effects meta-analyses were performed. Network meta-analysis was conducted to compare relative effects among categorized CM protocols (prize-based versusvoucher-based) and non-contingency control conditions.

Results: Twenty-six trials involving 2,356 participants were included. All studies evaluated cocaine as the stimulant and heroin as the opioid. In the network meta-analysis of combined stimulant-opioid–negative urine samples, prize-based CM ranked higherthan voucher-based CM. Relative to control, prize-based CM showed the larger estimated effect (OR = 3.33), whereas voucher-based CM also outperformed control (OR = 2.08). In the network meta-analysis of duration of continuous abstinence, prize-based CM again ranked higher and was associated with the larger estimated benefit versus control (MD = 1.68 weeks), compared to voucher-based CM (MD = 1.16 weeks). However, for treatment retention, both prize based and voucher based CM showed favorable estimated effects versus control, with voucher-based CM showing a slightly larger effect (MD = 1.11 weeks) compared to prize-based CM (MD = 0.93 weeks).

Conclusions: Contingency management improves abstinence outcomes among individuals with stimulant-opioid co-use across treatment settings. In this network meta-analysis, both prize-based and voucer based CM showed moderate to strong effect sizes for clinical outcomes in people with stimulant-opioid co-use compared to control conditions. However, prize based CM appeared more favorable for negative urine samples and duration of continuous abstinence while voucher based had a slightly more favorable for treatment retention. However, these comparative findings should be interpreted cautiously because they were driven largely by indirect evidence without direct head-to-head comparisons between active interventions.

These findings support the implementation of contingency management as an effective behavioral intervention for stimulant-opioid co-use, with both prize- and voucher-based approaches representing viable options. We note that the absence of fentanyl-specific data highlights the need for adequately powered CM trials addressing high potency synthetic opioid-stimulant co-use. Educational efforts should emphasize the evidence base and practical delivery of contingency management across treatment settings. At the policy level, these results support broader adoption and reimbursement of contingency management interventions to address polysubstance use in routine care.

The questions following the above will ask you to breakdown your summary.

Background Although drug overdose deaths have declined from a recent peak, mortality remains high and continues to impose a substantial burden on individuals, health systems, and communities.[1] The increase in overdose mortality over the past decade reflects multiple interacting factors, including socio-structural determinants and shifts in the illicit drug supply, particularly the opioid contamination of stimulants and increasing stimulant–opioid co-use.[2, 3] The synthetic opioid fentanyl has largely replaced illicit opioid supplies, resulting in mortality involving fentanyl increasing from only 0.6% in 2010 to 32.3% in 2021.[4] An emerging polysubstance pattern of drug use involving synthetic opioids and stimulants has continued to challenge traditional addiction treatments and public health interventions[5].
Contingency management (CM) is a behavioral intervention grounded in operant conditioning, in which tangible positive reinforcers (e.g., vouchers, cash, or prize draws) are provided contingent upon objective evidence of a target behavior, most commonly drug abstinence verified by toxicology screening.[6, 7] This approach has the strongest evidence base for stimulant use disorders[8, 9] and has been shown to improve clinical outcomes among individuals receiving medication for opioid use disorder (MOUD).[10-14] Despite this evidence, CM remains underutilized in clinical practice, in part due to implementation barriers and regulatory concerns.
Prior meta-analyses of contingency management in polysubstance use populations have reported heterogeneous effect sizes (d = 0.11–0.57)[10, 12-17] Although the two major modalities of CM delivery- voucher based and prize based CM have been shown to have comparative efficacy,[18, 19] available studies were not designed to compare or rank the relative effectiveness of these modalities in individuals with stimulant-opioid co-use, limiting their ability to inform intervention selection. in a population with particularly high morbidity and mortality risk. This represents a gap in clinical care. The present study addresses these gaps by explicitly defining concurrent

stimulant–opioid co-use as the primary population of interest and by leveraging a network meta-analytic framework to enable comparative effectiveness and ranking of CM strategies. This methodological shift enables more precise clinical inference by clarifying whether – and to what extent – specific CM approaches are associated with meaningful improvements in simultaneous abstinence from the stimulant–opioid dyad.
To our knowledge, this is the first network meta-analysis to explicitly focus on CM for individuals with documented active concurrent stimulant–opioid co-use and to directly compare the relative effectiveness of different contingency management strategies. Using targeted inclusion criteria, we identified randomized controlled trials (RCTs) that enrolled participants with stimulant–opioid co-use and reported objective stimulant- and opioid-specific outcomes. This created a dataset distinct from prior reviews through a more restrictive, outcome-level definition. The approach enables a focused synthesis of CM's effects on simultaneous during-treatment outcomes (simultaneous abstinence and combined opioid-/stimulant-negative urine samples) as well as the post-treatment outcome of treatment retention, rather than aggregated polysubstance outcomes. By clarifying the relative effectiveness of CM approaches, this study aims to enhance clinical decision-making, support evidence-based selection of behavioral interventions, and inform implementation strategies across treatment settings.

Educational Learning Objectives

Learning Objective 1 Describe the benefit of contingency management in improving abstinence outcomes among individuals with stimulant–opioid co-use.

Learning Objective 2 Compare the relative performance of different contingency management strategies using network meta-analytic evidence.

Learning Objective 3 Recognize current evidence gaps, including the lack of data on fentanyl-related polysubstance use, and their implications for future research and clinical practice.

Methods We conducted a systematic review and network meta-analysis in accordance with PRISMA guidelines, with protocol registration in PROSPERO (CRD420251000204). We searched Cochrane Library, Embase, PubMed, PsycINFO, and Web of Science from inception through April 2026. Randomized controlled trials enrolling individuals with active stimulant–opioid co-use were included if contingency management (CM) interventions provided tangible incentives contingent on biologically verified abstinence. Outcomes included simultaneous stimulant-opioid-negative urine samples, continuous abstinence duration, and treatment retention. Study selection and data extraction were performed independently by two reviewers. Random-effects pairwise and network meta-analyses were conducted. Mean differences (MDs) and odds ratios (ORs) were estimated using inverse variance and Mantel-Haenszel methods. Heterogeneity was assessed using I2, and treatment rankings were summarized using P-scores.

Results Twenty-six randomized controlled trials[18, 20-44] including 2,356 participants were analyzed. All studies evaluated cocaine as the stimulant and heroin as the opioid. In pairwise meta-analysis, CM increased the odds of combined stimulant-opioid-negative urine samples (OR = 2.46, 95% CI: 1.96–3.10; I^2 = 0%) and prolonged continuous abstinence (MD = 1.42 weeks, 95% CI:

0.77–2.08; I^2 = 50%) compared with control. In network meta-analysis, prize-based CM showed the largest estimated effects for negative urine samples (OR = 3.33) and abstinence duration (MD = 1.68 weeks), followed by voucher-based CM (OR = 2.08; MD = 1.16 weeks). Both interventions improved retention, with voucher-based CM showing a slightly larger effect (MD = 1.11 weeks) than prize-based CM (MD = 0.93 weeks). No direct head-to-head comparisons were available.

Conclusion This network meta-analysis demonstrates that contingency management improves combined stimulant-opioid-negative urine samples and longest duration of continuous simultaneous abstinence among individuals with stimulant-opioid co-use. Prize-based contingency management consistently ranked highest among the evaluated strategies, followed by voucher-based contingency management. Clinically, these findings support the integration of contingency management into routine care for polysubstance use, with both approaches representing effective options. From a research perspective, future studies should prioritize head-to-head comparisons and evaluate effectiveness in the context of fentanyl-contaminated stimulant markets. Educational efforts should focus on increasing clinician familiarity with contingency management delivery. At the policy level, these results support broader implementation and reimbursement of contingency management interventions.

Scientific Significance Contingency management improves clinically meaningful abstinence outcomes in individuals with stimulant-opioid-co-use. Across trials, contingency management increased the likelihood of submitting urine samples negative for both substances and increased the duration of continuous simultaneous abstinence during treatment. Using a network meta-analytic framework, prize-based contingency management ranked highest for both outcomes, followed by voucher-based contingency management, providing an initial comparative effectiveness hierarchy. Although these rankings should be interpreted cautiously because the evidence base was dominated by indirect comparisons, they offer a structured basis for hypothesis generation regarding reinforcement strategies and treatment response. These findings support contingency management as one of the few interventions with reproducible benefit in this population, while highlighting the absence of fentanyl-specific data and the need for contemporary trials in synthetic opioid contexts.

Will your paper cite external research? Yes

Please cite all references here in AMA format.
1. Dowell D, Nataraj N, Rikard M, Park J, Zhang K, Baldwin G. Why have overdose deaths decreased? Widespread fentanyl saturation and decreased drug use among key drivers. Lancet Reg Health Am. Nov 2025;51:101226. doi:10.1016/j.lana.2025.101226
2. Friedman JR, Nguemeni Tiako MJ, Hansen H. Understanding and addressing widening racial inequalities in drug overdose. American Journal of Psychiatry. 2024;181(5):381-390.
3. Ciccarone D. The rise of illicit fentanyls, stimulants and the fourth wave of the opioid overdose crisis. Current Opinion in Psychiatry. 2021;34(4)
4. Friedman J, Shover CL. Charting the fourth wave: Geographic, temporal, race/ethnicity and demographic trends in polysubstance fentanyl overdose deaths in the United States, 2010–2021. Addiction. 2023;118(12):2477-2485.
5. Mills R, Jegede O, Muvvala SB. Urgent response is needed to address the stimulant-fentanyl

related overdose crisis. Opinion. Frontiers in Psychiatry. 2026-March-17 2026;Volume 17 - 2026doi:10.3389/fpsyt.2026.1769408
6. Bigelow GE, Stitzer ML, Griffiths RR, Liebson IA. Contingency management approaches to drug self-administration and drug abuse: efficacy and limitations. Addict Behav. 1981;6(3):241-52. doi:10.1016/0306-4603(81)90022-8
7. Rash CJ, McDonell M, Erath T, Parent S, Rawson R, Wattenberg S. A Call to Action: Evidence-Based Contingency Management. Am J Psychiatry. Mar 26 2025:appiajp20240261. doi:10.1176/appi.ajp.20240261
8. Rash CJ. Implementing an evidence-based prize contingency management protocol for stimulant use. J Subst Use Addict Treat. Aug 2023;151:209079. doi:10.1016/j.josat.2023.209079
9. Rash CJ, Alessi SM, Petry NM. Contingency management is efficacious for cocaine abusers with prior treatment attempts. Exp Clin Psychopharmacol. Dec 2008;16(6):547-54. doi:10.1037/a0014042
10. Bolívar HA, Klemperer EM, Coleman SRM, DeSarno M, Skelly JM, Higgins ST. Contingency Management for Patients Receiving Medication for Opioid Use Disorder: A Systematic Review and Meta-analysis. JAMA Psychiatry. Oct 1 2021;78(10):1092-1102. doi:10.1001/jamapsychiatry.2021.1969
11. De Crescenzo F, Ciabattini M, D'Alò GL, et al. Comparative efficacy and acceptability of psychosocial interventions for individuals with cocaine and amphetamine addiction: A systematic review and network meta-analysis. PLoS Med. Dec 2018;15(12):e1002715. doi:10.1371/journal.pmed.1002715
12. Ainscough TS, McNeill A, Strang J, Calder R, Brose LS. Contingency Management interventions for non-prescribed drug use during treatment for opiate addiction: A systematic review and meta-analysis. Drug Alcohol Depend. Sep 1 2017;178:318-339. doi:10.1016/j.drugalcdep.2017.05.028
13. Griffith JD, Rowan-Szal GA, Roark RR, Simpson DD. Contingency management in outpatient methadone treatment: a meta-analysis. Drug Alcohol Depend. Feb 1 2000;58(1-2):55-66. doi:10.1016/s0376-8716(99)00068-x
14. Lussier JP, Heil SH, Mongeon JA, Badger GJ, Higgins ST. A meta-analysis of voucher-based reinforcement therapy for substance use disorders. Addiction. Feb 2006;101(2):192-203. doi:10.1111/j.1360-0443.2006.01311.x
15. Prendergast M, Podus D, Finney J, Greenwell L, Roll J. Contingency management for treatment of substance use disorders: a meta-analysis. Addiction. Nov 2006;101(11):1546-60. doi:10.1111/j.1360-0443.2006.01581.x
16. Benishek LA, Dugosh KL, Kirby KC, et al. Prize-based contingency management for the treatment of substance abusers: a meta-analysis. Addiction. Sep 2014;109(9):1426-36. doi:10.1111/add.12589
17. Ginley MK, Pfund RA, Rash CJ, Zajac K. 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. Jan 2021;89(1):58-71. doi:10.1037/ccp0000552
18. Petry NM, Alessi SM, Marx J, Austin M, Tardif M. Vouchers versus prizes: contingency management treatment of substance abusers in community settings. J Consult Clin Psychol. Dec

2005;73(6):1005-14. doi:10.1037/0022-006x.73.6.1005
19. Petry NM, Alessi SM, Hanson T, Sierra S. Randomized trial of contingent prizes versus vouchers in cocaine-using methadone patients. J Consult Clin Psychol. Dec 2007;75(6):983-91. doi:10.1037/0022-006x.75.6.983
20. Bickel WK, Marsch LA, Buchhalter AR, Badger GJ. Computerized behavior therapy for opioid-dependent outpatients: a randomized controlled trial. Exp Clin Psychopharmacol. Apr 2008;16(2):132-43. doi:10.1037/1064-1297.16.2.132
21. Brooner RK, Kidorf MS, King VL, Stoller KB, Neufeld KJ, Kolodner K. Comparing adaptive stepped care and monetary-based voucher interventions for opioid dependence. Drug Alcohol Depend. May 2007;88 Suppl 2(Suppl 2):S14-23. doi:10.1016/j.drugalcdep.2006.12.006
22. Carroll KM, Sinha R, Nich C, Babuscio T, Rounsaville BJ. Contingency management to enhance naltrexone treatment of opioid dependence: a randomized clinical trial of reinforcement magnitude. Exp Clin Psychopharmacol. Feb 2002;10(1):54-63. doi:10.1037//1064-1297.10.1.54
23. Chopra MP, Landes RD, Gatchalian KM, et al. Buprenorphine medication versus voucher contingencies in promoting abstinence from opioids and cocaine. Exp Clin Psychopharmacol. Aug 2009;17(4):226-36. doi:10.1037/a0016597
24. Chutuape MA, Silverman K, Stitzer ML. Effects of urine testing frequency on outcome in a methadone take-home contingency program. Drug Alcohol Depend. Mar 1 2001;62(1):69-76. doi:10.1016/s0376-8716(00)00160-5
25. Downey KK, Helmus TC, Schuster CR. Treatment of heroin-dependent poly-drug abusers with contingency management and buprenorphine maintenance. Exp Clin Psychopharmacol. May 2000;8(2):176-84. doi:10.1037//1064-1297.8.2.176
26. Dunn KE, Fingerhood M, Wong CJ, Svikis DS, Nuzzo P, Silverman K. Employment-based abstinence reinforcement following inpatient detoxification in HIV-positive opioid and/or cocaine-dependent patients. Exp Clin Psychopharmacol. Feb 2014;22(1):75-85. doi:10.1037/a0034863
27. Epstein DH, Schmittner J, Umbricht A, Schroeder JR, Moolchan ET, Preston KL. Promoting abstinence from cocaine and heroin with a methadone dose increase and a novel contingency. Drug Alcohol Depend. Apr 1 2009;101(1-2):92-100. doi:10.1016/j.drugalcdep.2008.11.006
28. Everly JJ, DeFulio A, Koffarnus MN, et al. Employment-based reinforcement of adherence to depot naltrexone in unemployed opioid-dependent adults: a randomized controlled trial. Addiction. Jul 2011;106(7):1309-18. doi:10.1111/j.1360-0443.2011.03400.x
29. Ghitza UE, Epstein DH, Schmittner J, Vahabzadeh M, Lin JL, Preston KL. Randomized trial of prize-based reinforcement density for simultaneous abstinence from cocaine and heroin. J Consult Clin Psychol. Oct 2007;75(5):765-74. doi:10.1037/0022-006x.75.5.765
30. Gross A, Marsch LA, Badger GJ, Bickel WK. A comparison between low-magnitude voucher and buprenorphine medication contingencies in promoting abstinence from opioids and cocaine. Exp Clin Psychopharmacol. May 2006;14(2):148-56. doi:10.1037/1064-1297.14.2.148
31. Holtyn AF, Toegel F, Subramaniam S, et al. Abstinence-contingent wage supplements to promote drug abstinence and employment: a randomised controlled trial. J Epidemiol Community Health. May 2020;74(5):445-452. doi:10.1136/jech-2020-213761
32. Iguchi MY, Belding MA, Morral AR, Lamb RJ, Husband SD. Reinforcing operants other than abstinence in drug abuse treatment: an effective alternative for reducing drug use. J Consult Clin

Psychol. Jun 1997;65(3):421-8. doi:10.1037//0022-006x.65.3.421
33. Jones HE, Wong CJ, Tuten M, Stitzer ML. Reinforcement-based therapy: 12-month evaluation of an outpatient drug-free treatment for heroin abusers. Drug Alcohol Depend. Aug 1 2005;79(2):119-28. doi:10.1016/j.drugalcdep.2005.01.006
34. Katz EC, Chutuape MA, Jones HE, Stitzer ML. Voucher reinforcement for heroin and cocaine abstinence in an outpatient drug-free program. Exp Clin Psychopharmacol. May 2002;10(2):136-43. doi:10.1037//1064-1297.10.2.136
35. Katz EC, Chutuape MA, Jones H, Jasinski D, Fingerhood M, Stitzer M. Abstinence incentive effects in a short-term outpatient detoxification program. Exp Clin Psychopharmacol. Nov 2004;12(4):262-8. doi:10.1037/1064-1297.12.4.262
36. Kennedy AP, Phillips KA, Epstein DH, Reamer DA, Schmittner J, Preston KL. A randomized investigation of methadone doses at or over 100 mg/day, combined with contingency management. Drug Alcohol Depend. Jun 1 2013;130(1-3):77-84. doi:10.1016/j.drugalcdep.2012.10.025
37. Kosten T, Oliveto A, Feingold A, et al. Desipramine and contingency management for cocaine and opiate dependence in buprenorphine maintained patients. Drug Alcohol Depend. Jun 5 2003;70(3):315-25. doi:10.1016/s0376-8716(03)00032-2
38. Kosten T, Poling J, Oliveto A. Effects of reducing contingency management values on heroin and cocaine use for buprenorphine- and desipramine-treated patients. Addiction. May 2003;98(5):665-71. doi:10.1046/j.1360-0443.2003.00380.x
39. Ledgerwood DM, Petry NM. Does contingency management affect motivation to change substance use? Drug Alcohol Depend. Jun 9 2006;83(1):65-72. doi:10.1016/j.drugalcdep.2005.10.012
40. Novak MD, Holtyn AF, Toegel F, Leoutsakos JM, Silverman K. Abstinence-contingent wage supplements to promote drug abstinence and employment: Post-intervention outcomes. Drug Alcohol Depend. Mar 1 2022;232:109322. doi:10.1016/j.drugalcdep.2022.109322
41. Petry NM, Martin B. Low-cost contingency management for treating cocaine- and opioid-abusing methadone patients. J Consult Clin Psychol. Apr 2002;70(2):398-405. doi:10.1037//0022-006x.70.2.398
42. Schottenfeld RS, Chawarski MC, Pakes JR, Pantalon MV, Carroll KM, Kosten TR. Methadone versus buprenorphine with contingency management or performance feedback for cocaine and opioid dependence. Am J Psychiatry. Feb 2005;162(2):340-9. doi:10.1176/appi.ajp.162.2.340
43. Tuten M, Svikis DS, Keyser-Marcus L, O'Grady KE, Jones HE. Lessons learned from a randomized trial of fixed and escalating contingency management schedules in opioid-dependent pregnant women. Am J Drug Alcohol Abuse. Jul 2012;38(4):286-92. doi:10.3109/00952990.2011.643977
44. Oliveto A, Poling J, Sevarino KA, et al. Efficacy of dose and contingency management procedures in LAAM-maintained cocaine-dependent patients. Drug Alcohol Depend. Aug 1 2005;79(2):157-65. doi:10.1016/j.drugalcdep.2005.01.007