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# The Feasibility of Interventions to Reduce HIV Risk and Drug Use among Heterosexual Methamphetamine Users

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**Abstract**

This paper reports on a feasibility study that examined contingency management among out-of-treatment, heterosexual methamphetamine users and the reduction of drug use and HIV risk. Fifty-eight meth users were recruited through street outreach in Denver from November 2006 through March 2007. The low sample size reflects that this was a pilot study to see if CM is feasible in an out-of-treatment, street-recruited population of meth users. Secondary aims were to examine if reductions and drug use and risk behavior could be found. Subjects were randomly assigned to contingency management (CM) or CM plus strengths-based case management (CM/SBCM), with follow-up at 4 and 8 months. Participants were primarily White (90%), 52% male and averaged 38 years old. Eighty-three percent attended at least one CM session, with 29% attending at least fifteen. All participants reduced meth use significantly at follow-up. Those who attended more sessions submitted more stimulant-free urines than those who attended fewer sessions. Participants assigned to CM/SBCM attended more sessions and earned more vouchers than clients in CM. Similarly, participants reported reduced needle-sharing and sex risk. Findings demonstrate that CM and SBCM may help meth users reduce drug use and HIV risk.

**Keywords:** Methamphetamine; HIV risks; Sex; Contingency management; Strengths-based case management

## Introduction

Methamphetamine (meth) use is a nationwide issue that has far-reaching impacts on users and their communities. In Colorado, meth use is becoming a rapidly-expanding social problem, as evidenced by rising treatment admission rates and an increase in seizures of clandestine labs [1, 2]. Colorado's meth use problem stems from its many rural areas where meth use and production are prevalent, as well as a thriving tourist industry and a centrally-located capital city with two major Interstate highways that facilitate trafficking. Additionally, methamphetamine is increasingly coming into Colorado from Mexico which is close and has direct routes into the state [2]. Colorado ranks fourth highest in the nation in meth-related deaths, with a reported increase from 8 in 1999 to 47 in 2003 [3]. In addition to the ill health affects of drug use, meth users are also at risk for HIV through unsafe sex while high and through drug injection [4-8]. Many studies have shown that high-risk sex behaviors are common among meth-using men who have sex with men (MSM), which likely contributes to high HIV prevalence in this group. Fewer studies have examined sex risk behaviors in heterosexual meth users [9], a group with potential for HIV transmission as heterosexual meth users also engages in high risk sex behaviors, such as multiple partners and unprotected sex when under the influence [10-13]. Meth users also face risks for HIV transmission through unsafe injection practices, such as sharing needles and other injection equipment [14,15], though less attention has been given to heterosexual meth users and their high-risk sex behaviors. There is a need to identify and develop efficacious strategies to reduce the use of meth and of concomitant HIV risk behaviors in this population.

Heterosexual meth users experience heightened sex drives, report more sexual behaviors when under the influence [6,16], and engage in more sex-related risk behaviors than users of other drugs [11,17-19]. These risks include decreased condom use during vaginal and anal sex, exchanging sex for drugs or money, and sex with an injection drug user [10]. Female meth injectors in San Francisco report more sex-related risk than opiate injectors, including increased unprotected anal sex, sex with more than 5 partners, and sex work [20]. Women using meth also report in other studies multiple unprotected sex acts when under the influence [21]. Despite these and other studies, there is a need for more research on risk and behavior among heterosexual meth users [22].

One promising approach to intervening with meth users is contingency management [23,24]. In voucher-based CM programs, the behavior of drug users who submit urine samples that are negative for specified drugs is reinforced with vouchers, but reinforcement is withheld when compliance is not achieved [25]. Studies of CM efficacy in MSM meth users show that compared to cognitive behavior therapy, CM and CM combined with cognitive behavioral therapy produce superior outcomes while receiving the intervention in terms of treatment retention and length of consecutive negative urine samples [7]. Not all studies among MSM have shown efficacy of CM, such as a recent study by Menza and colleagues that showed little to no difference in intervention group on drug use and HIV risk [26]. Among heterosexual meth users, CM is superior to cognitive behavioral therapy for reducing meth use during treatment [27]. While long-term effects were not found in either of these studies, it is important to note, as McLellan does, that perhaps there is clinical significance in the fact that meth users do reduce their drug use and other negative behaviors while taking the treatment [28]. Studies such as the one presented here add to the literature examining if a long-term effect can be found with meth users and if so, in what population group? Meta-analyses of CM and other behavioral therapies for reduction of meth use have shown

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some promise but have yet to include conclusive evidence that CM can help reduce meth use long-term [29]. This research looks at feasibility of CM in a select population in addition to examining the possibility of reducing meth use and HIV risk which are in clear need of study in the field of addiction research.

Questions have been raised regarding the acceptability of CM to policymakers in publicly funded substance abuse programs. At least two publicly funded CM projects are underway: in San Francisco [30] and Los Angeles for meth-using MSM. While CM has demonstrated efficacy in several populations of meth users, including MSM and those already engaged in treatment, we know of no other research examining CM with out-of-treatment meth users who are recruited through street outreach and who are difficult to reach due to paranoia and mistrust.

A contrasting approach to intervening with out-of-treatment drug users is strengths-based case management (SBCM). Case management has a long history in the United States [31] and has been used successfully with drug users [32-35]. Studies of IDUs seeking treatment or in treatment found that case management is associated with reduced time to admission [33,36], increased retention [37], less relapse [34], and improved family and social relationships [38]. Case management also produces higher rates of treatment entry than other interventions, as well as improved linkage to substance abuse treatment [39]. Using case management for HIV prevention stems from the premise that an individual's ability to effectively respond to the threat of HIV is compromised when other problems are perceived as having greater immediacy and salience than AIDS [40-42]. Our interest in testing this approach with meth users who are not in treatment stems from the observation that they have multiple chronic needs that impact their motivation to reduce their HIV risks and to reduce their drug use.

This report describes a study that first examined the feasibility of implementing contingency management (CM) and strengths-based case management (SBCM) with out-of-treatment meth users, and next compared these participants who were randomly assigned to receive 17 weeks of CM or CM combined with SBCM on the following outcomes: reduced methamphetamine use, reduced HIV-related needle and sex risk behaviors.

## Materials and Methods

### Participants

From November 2006 through March 2007, out-of-treatment heterosexual meth users were recruited through street outreach in Denver, Colorado. The street outreach conducted in this study adapts the central features of the community outreach model [43,44] to engage IDUs in various interventions. For this study, two teams of two outreach workers each were trained in outreach recruitment. Success in recruiting drug users required that outreach workers relate to target group members on their terms, were committed to helping, and saw themselves as advocates. Street outreach workers reflected the ethnic diversity of the meth users that were being targeted for intervention. Outreach workers sought out locations frequented by drug users (e.g., bars, liquor stores, motels, truck stops) to recruit them. Eligibility criteria were: 1) methamphetamine use (reported drug of choice) in the previous 30 days (verified through observed urinalysis (UA) and self-report of meth use); 2) reported sex with an opposite-sex partner in last 30 days; 3) negative urinalysis for opiates and methadone during baseline screening period; 4) ability to provide reliable contact information; 5) not in drug treatment in the 30 days prior to the baseline interview; 6) willing to be tested for HIV at baseline and follow-up; and; 7) not transient and committed to being available for follow-up interviews. Participants were compensated up to $85 total for their time as research subjects for the three interviews (baseline, 4-month and 8-month). After the baseline interview (which included the RBQ and BSI described below), participants were randomized to one of two conditions: Contingency Management alone (CM), or Contingency Management plus Strengths-Based Case Management (CM/SBCM). Randomization procedures were as follows: prior to the start of the study, a random number generator was used to assign anonymous code numbers, equally, to each condition. Code numbers were then printed on envelopes containing information about the assigned intervention and its various components, a standardized description of the study, and the timetable for additional interviews. Thirty envelopes, 15 in each condition, were placed in a box that the client drew from following their initial interview. When there are 5 envelopes left, the other thirty envelopes were placed in the box for random drawing by the next participants. The professional research assistant who conducted this process was blind to the randomization. Study procedures were approved by the Institutional Review Board of the University Of Colorado Denver School Of Medicine.

### Interventions

**Contingency management (CM):** The CM intervention provided vouchers in escalating value for successive meth-free urine samples with reset [45]. Vouchers could be exchanged at any time for goods such as toiletries, athletic equipment or gear, school or office supplies, baby clothes, or other pro-social items purchased at a local Target store. Vouchers were not exchanged for cash.

The CM protocol involved two phases. In the first phase (weeks 1 to 4), vouchers that decreased in value were provided to participants (from $10 down to $2) contingent on providing urine samples, independent of results. Participants also received a bonus voucher for each urine sample that was stimulant-free. This bonus started at $2.50 and increased by $1.25 for each subsequent sample that was stimulant-free up to a maximum of $10. Excused absences were not permitted in the first four weeks and participants who missed a urine sample or provided a stimulant-positive sample received no bonus voucher for that visit. A positive sample reset the voucher value for the next negative sample at $2.50. Phase 1 was constructed to ensure that participants understood the study and that they were set up to succeed, since we were testing the feasibility of the study.

In the second phase (weeks 5 to17), vouchers were contingent solely on provision of stimulant-free urine samples. The initial voucher value was based on the level achieved for stimulant-free samples during the first phase. If the participant provided no stimulant-free urine samples in the first phase, the voucher value started at $2.50 and increased by $1.25 for each subsequent stimulant-free UA. The voucher value increased to a maximum of $10. Participants in this period could also earn a bonus voucher worth $10 for every third consecutive stimulant-free urine sample. Participants who missed a urine sample did not receive a voucher for that visit and the value for the next stimulant-free sample was set to the initial $2.50. Positive urine samples were handled in a non-judgmental manner, with the interventionist encouraging the participant to continue pursuing the goal of abstinence. The maximum amount a participant could earn by providing all stimulant-free urine samples was $685.75.

**CM plus strengths-based case management (SBCM) intervention (CM/SBCM):** Participants assigned to CM/SBCM participated in all elements of CM and also received 17 weeks of weekly SBCM which,

like other case management, includes five processes: 1) Assessment - identifying strengths and needs; 2) Planning - prioritizing goals and objectives and having a specific plan to achieve them; 3) Linking - identifying, referring and facilitating intakes at appropriate agencies; 4) Monitoring - assessing client progress and satisfaction; and 5) Advocacy - working on the participant's behalf to achieve goals and objectives. SCBM includes: helping participants identify strengths; encouraging participants to set their own goals according to their needs (assisting in setting specific goals, identifying resources, conducting a needs assessment); organizing needed resources/services (listing resources according to identified needs and following up on referrals); and helping identify personal resources (family and friends). Case managers met with participants to address the breadth of their problems and to focus on employing and increasing strengths. Substance abuse treatment was addressed if the participant was ready; typically after other basic needs, such as housing, were met. This follows the basic premise of SBCM that the client's "basic needs" will be met first, as determined by the client.

## Procedures

Following provision of informed consent, participants completed the Addiction Severity Index (ASI) and provided a urine sample for analysis. Participants were asked to return a week later for a baseline interview/assessment and urine sample to evaluate the capacity of the participant to meet the requirement for frequent clinic visits for the CM intervention. The Risk Behavior Questionnaire (RBQ, adapted from the Risk Behavior Assessment used in NIDA's Cooperative Agreement) and the Brief Symptom Inventory [46] were completed during the second baseline interview. Participants were re-interviewed with this battery at 4 and 8 months after this second interview, which was considered the true baseline interview. The populations that returned one week after the initial interview that included the ASI and UA were admitted as study participants. The "timeline" for intervention then began at that point after this true baseline interview.

## Analysis

The primary analysis for this paper tested whether adding SBCM to CM improved performance on outcome variables over CM alone. Initial descriptive analyses report means and standard deviations for continuous variables and percentages for dichotomous variables at baseline, for all participants, by intervention, and by CM session attendance. Attendance at sessions, urine results, total vouchers earned, satisfaction with the intervention and reported barriers to attendance are also described. Attendance was coded into three levels (none, 1-8 sessions attended, 15-50 sessions attended). Drug use, needle risk, and sex risk outcomes measured at 4 and 8 months after baseline were compared to baseline rates. We compared changes in rates among the three attendance-level groups and between the two intervention groups.

When comparisons were made among groups (e.g., no vs. low vs. high attendees; CM only vs. CM/SBCM), chi-square tests for categorical variables and t-tests (or F-tests for more than two groups) for continuous variables were used. Other than systematic skips (e.g., non-injection drug users did not answer questions on needle risk),

| | Total (N=58) | CM (N=29) | CM/SBCM (N=29) | $\chi^2_1$ | p |
|---|---|---|---|---|---|
| Demographics and Background | | | | | |
| Age (years) | 38.00 ± 8.64 | 36.72 ± 8.11 | 39.28 ± 9.11 | 1.13[1] | 0.26 |
| Male | 51.7% | 41.4% | 62.1% | 2.49 | 0.11 |
| Hispanic | 20.7% | 31.0% | 10.3% | 3.78 | 0.052 |
| White | 89.7% | 82.8% | 96.6% | 2.97 | 0.08 |
| Some College | 43.1% | 44.8% | 41.4% | 0.07 | 0.79 |
| Live in own place | 46.6% | 37.9% | 55.2% | 1.73 | 0.19 |
| Support group in last 30 days[2] | 10.3% | 10.0% | 10.5% | 0.003 | 0.96 |
| Have valid driver's license | 34.5% | 24.1% | 44.8% | 2.75 | 0.10 |
| Have car available | 22.4% | 6.9% | 37.9% | **8.03** | **0.005** |
| Worked 9 days or more last 30 days | 41.4% | 51.7% | 31.0% | 2.56 | 0.11 |
| Any current legal involvement | 24.1% | 24.1% | 24.1% | 0.00 | 1.00 |
| Alcohol and Drug Use | | | | | |
| Drank alcohol 10 or more days last 30 days | 32.8% | 44.8% | 20.7% | 3.84 | 0.0502 |
| Any alcohol problems last 30 days | 17.2% | 24.1% | 10.3% | 1.93 | 0.16 |
| Cocaine positive | 22.4% | 31.0% | 13.8% | 2.48 | 0.12 |
| Amphetamine positive | 84.5% | 75.9% | 93.1% | 3.29 | 0.07 |
| Ever inject | 74.1% | 79.3% | 69.0% | 0.81 | 0.37 |
| Ever inject meth | 72.4% | 75.9% | 69.0% | 0.65 | 0.56 |
| Times inject meth last 30 days | 17.34 ± 25.61 | 16.31 ± 23.64 | 18.38 ± 27.83 | 0.31[1] | 0.76 |
| Times use meth (non-inj) last 30 days | 45.14 ± 96.07 | 51.10 ± 122.58 | 38.96 ± 59.01 | 0.48[3] | 0.63 |
| Mental Health | | | | | |
| Any psych outpatient | 45.6% | 46.4% | 44.8% | 0.01 | 0.90 |
| Symptoms last 30 days | | | | | |
| Depression | 36.2% | 41.4% | 31.0% | 0.67 | 0.41 |
| Anxiety | 56.9% | 62.1% | 51.7% | 0.63 | 0.43 |
| Trouble concentrating | 48.3% | 58.6% | 37.9% | 2.49 | 0.11 |
| Trouble controlling violent thoughts | 31.0% | 34.5% | 27.6% | 0.32 | 0.57 |
| Thoughts of suicide | 19.0% | 17.2% | 20.7% | 0.11 | 0.74 |

Chi-square tests for categorical variables and t-tests for continuous variables were used to compare between groups. Statistics and p-values are bolded when $p < 0.05$. [1] $t_{56}$ [2] N=39 [3] $t_{40.63}$ with unequal variances

**Table 1A:** Client Characteristics at Baseline by Intervention (% or mean ± S.D.)

| | None (N=10) | 1-8 (N=31) | 15-50 (N=17) | $\chi^2_2$ | p |
|---|---|---|---|---|---|
| Demographics and Background | | | | | |
| Age (years) | 37.40 ± 7.57 | 38.48 ± 8.77 | 37.47 ± 9.41 | 0.10[1] | 0.90 |
| Male | 50.0% | 45.2% | 64.7% | 1.69 | 0.43 |
| Hispanic | 10.0% | 22.6% | 23.5% | 0.85 | 0.66 |
| White | 90.0% | 90.3% | 88.2% | 0.05 | 0.97 |
| Some College | 40.0% | 51.6% | 29.4% | 2.25 | 0.32 |
| Live in own place | 50.0% | 54.8% | 29.4% | 2.91 | 0.23 |
| Support group in last 30 days[2] | 0.0% | 0.0% | 33.3% | **10.03** | **0.007** |
| Have valid driver's license | 30.0% | 32.3% | 41.2% | 0.49 | 0.78 |
| Have car available | 30.0% | 19.4% | 23.5% | 0.51 | 0.78 |
| Worked 9 days or more last 30 days | 40.0% | 35.5% | 52.9% | 1.39 | 0.50 |
| Any current legal involvement | 30.0% | 25.8% | 17.6% | 0.63 | 0.73 |
| Alcohol and Drug Use | | | | | |
| Drank alcohol 10 or more days last 30 days | 50.0% | 35.5% | 17.6% | 3.22 | 0.20 |
| Any alcohol problems last 30 days | 30.0% | 19.4% | 5.9% | 2.78 | 0.25 |
| Cocaine positive | 20.0% | 29.0% | 11.8% | 1.92 | 0.38 |
| Amphetamine positive | 100.0% | 87.1% | 70.6% | 4.50 | 0.11 |
| Ever inject | 70.0% | 71.0% | 82.4% | 0.85 | 0.65 |
| Ever inject meth | 70.0% | 67.7% | 82.4% | 1.21 | 0.55 |
| Times inject meth last 30 days | 11.50 ± 15.64 | 16.48 ± 21.81 | 22.35 ± 35.48 | 0.59[1] | 0.56 |
| Times use meth (non-inj) last 30 days | 47.80 ± 39.40 | 51.86 ± 122.38 | 31.71 ± 63.27 | 0.24[3] | 0.79 |
| Mental Health | | | | | |
| Any psych outpatient | 50.0% | 48.4% | 37.5% | 0.60 | 0.74 |
| Symptoms last 30 days | | | | | |
| Depression | 20.0% | 32.3% | 52.9% | 3.41 | 0.18 |
| Anxiety | 40.0% | 58.1% | 64.7% | 1.60 | 0.45 |
| Trouble concentrating | 70.0% | 45.2% | 41.2% | 2.35 | 0.31 |
| Trouble controlling violent thoughts | 20.0% | 32.3% | 35.3% | 0.73 | 0.69 |
| Thoughts of suicide | 10.0% | 19.4% | 23.5% | 0.76 | 0.69 |

Chi-square tests for categorical variables and ANOVAs for continuous variables were used to compare across groups. Statistics and p-values are bolded when $p < 0.05$.
[1] $F_{2,55}$ [2] N=39 [3] $F_{2,54}$

**Table 1B:** Client Characteristics at Baseline by Session Attendance (% or mean ± S.D.)

there were few missing data. Analyses at the two follow-up periods (4-months and 8- months) were each based on 45 cases that completed the baseline and the respective follow-up interview. Analyses using needle risk indicators were based only on those who injected drugs at least once in the last 30 days prior to the interview. McNemar's tests for dichotomous outcomes and paired t-tests for continuous outcomes were used to compare paired measurements between baseline and follow-up.

## Results

### Sample and retention

A total of 71 participants completed the ASI during the first baseline interview and 58 (82%) returned a week later to complete the RBQ and BSI. Of these 58 (the intent-to-treat sample), 45 participants (78%) completed the 4-month follow-up interview and 45 (78%) completed the 8-month follow-up interview (42 of the 45 participants (93%) who completed the 4-month interview also completed the 8-month interview).

Of the 58 participants who completed the full baseline interview, 52% were male, 90% were White, 21% were Hispanic, and the mean age was 38 years old. Overall, 88% had a least a high school education (or GED) and 42% had some education beyond high school. Almost half (47%) lived in their own place and 45% described themselves as living with a friend.

All participants tested positive for meth at baseline; 84.5% were positive for amphetamines, and 22.4% for cocaine. There were no samples positive for opiates at baseline. Over 70% of the sample injected meth in their lifetime; and those who had injected meth in the last 30 days injected an average of 17 times. In terms of risky injection practices in the last 30 days, 28% of injectors had used a syringe after someone else had used it, 33% had shared cotton, cooker, or water, and 47% had split a drug solution with someone else.

Tables 1A and 1B describe selected baseline participant characteristics. The two intervention groups were mostly balanced, except significantly more in the CM/SBCM group had a car available. There were several variables on which the two groups trended towards being different, such as living in one's own place and not being Hispanic, both of which were marginally higher in the CM/SBCM group. Also, there were non-significant trends towards differences between intervention groups on alcohol use and problems in past 30 days and cocaine positivity, with the CM group reporting higher on those variables. To broadly identify relationships between session attendance and client characteristics, trends will be discussed as differences between attendance groups did not reach statistical significance, with

| | Total (N=58) | CM (N=29) | CM/SBCM (N=29) | $\chi^2_1$ | p |
|---|---|---|---|---|---|
| # Sessions | 11.19 ± 15.02 | 9.66 ± 13.10 | 12.72 ± 16.81 | 0.78[1] | 0.44 |
| # weeks | 5.34 ± 5.98 | 4.76 ± 5.37 | 5.93 ± 6.58 | 0.74[1] | 0.46 |
| Reward earned | $87.62 ± 153.36 | $72.00 ± 135.60 | $103.24 ± 170.26 | 0.77[1] | 0.44 |
| Reward redeemed | $75.85 ± 155.57 | $60.46 ± 136.92 | $91.23 ± 173.29 | 0.75[1] | 0.46 |
| | Total (N=45) | CM (N=22) | CM/SBCM (N=23) | $\chi^2_1$ | p |
| Ratings of CM (1-10, low to high) | | | | | |
| Rules easy to understand | 9.16 ± 2.04 | 9.14 ± 2.12 | 9.17 ± 2.01 | 0.06[2] | 0.95 |
| Facility convenient | 7.84 ± 3.07 | 6.95 ± 3.23 | 8.70 ± 2.70 | 1.96[2] | 0.06 |
| Incentives motivating | 8.09 ± 2.87 | 7.73 ± 3.10 | 8.43 ± 2.64 | 0.82[2] | 0.41 |
| UA days/times good | 7.69 ± 2.65 | 6.77 ± 3.13 | 8.57 ± 1.75 | **2.36**[3] | **0.03** |
| Staff helpful | 9.82 ± 0.58 | 9.91 ± 0.43 | 9.74 ± 0.69 | 1.00[4] | 0.32 |
| Barriers to participation | | | | | |
| Location | 22.2% | 36.4% | 8.7% | **4.98** | **0.03** |
| Schedule | 31.1% | 36.4% | 26.1% | 0.55 | 0.46 |
| Incentives not motivating | 6.7% | 4.5% | 8.7% | 0.31 | 0.58 |
| Not ready to quit | 15.6% | 22.7% | 8.7% | 1.69 | 0.19 |
| No barriers | 33.3% | 18.2% | 47.8% | **4.45** | **0.04** |
| Incentives enough to be motivating | 82.2% | 68.2% | 95.7% | **5.81** | **0.02** |

Chi-square tests for categorical variables and t-tests for continuous variables were used to compare between groups. Statistics and p-values are bolded when $p < 0.05$. [1] $t_{56}$ [2] $t_{43}$ [3] $t_{32.68}$ with unequal variances [4] $t_{36.95}$ with unequal variances

**Table 2:** CM Attendance, Rewards Earned, and Process Measures by Intervention (% or mean ± S.D.).

| | Baseline (N=48) | 4-month Follow-up (N=45) | $CMH_1$[1] | p | 8-month Follow-up (N=45) | $CMH_1$[1] | p |
|---|---|---|---|---|---|---|---|
| Drug Use | | | | | | | |
| UA Results | | | | | | | |
| Opiates | 0.0% | 4.4% | na | na | 11.1% | na | na |
| Cocaine | 20.8% | 20.0% | 0.14 | 0.71 | 13.3% | 1.29 | 0.26 |
| Amphetamine | 81.3% | 40.0% | **11.57** | **<.001** | 44.4% | **11.64** | **<.001** |
| Meth | 100.0% | 53.3% | na | na | 53.3% | na | na |
| Times injected last 30 days | 17.29 ± 25.86 | 11.33 ± 21.27 | 1.90[2] | 0.06 | 10.07 ± 21.63 | 1.45[3] | 0.15 |
| Times injected meth last 30 days | 16.23 ± 24.92 | 9.16 ± 19.49 | **2.30**[4] | **0.03** | 6.61 ± 11.49 | **2.04**[5] | **0.048** |
| Times used meth (non-inj) last 30 days | 41.13 ± 83.16 | 10.76 ± 18.85 | **2.16**[6] | **0.04** | 10.25 ± 25.65 | **2.32**[7] | **0.03** |
| | | | | | | | |
| Needle Risk[8] | | | | | | | |
| Use dirty syringe | 27.0% | 4.0% | **7.00** | **0.008** | 26.1% | 0.00 | 1.00 |
| Use dirty cooker, cotton, water | 29.7% | 24.0% | 1.80 | 0.18 | 34.8% | 0.00 | 1.00 |
| Split drug solution with others | 43.2% | 32.0% | 1.60 | 0.21 | 52.2% | 0.50 | 0.48 |
| Sex Risk | | | | | | | |
| Any sex last 30 days | 85.4% | 71.1% | 3.60 | 0.06 | 71.1% | 2.57 | 0.11 |
| Sex with multiple partners | 16.7% | 15.6% | 0.08 | 0.78 | 15.6% | 0.00 | 1.00 |
| Sex under the influence | 77.1% | 57.8% | 3.56 | 0.06 | 55.6% | **3.86** | **0.049** |
| Unprotected sex | 56.3% | 57.8% | 0.08 | 0.78 | 60.0% | 0.06 | 0.81 |

McNemar's tests for dichotomous variables and paired t-tests for continuous variables were used to compare between baseline and follow-up. Statistics and p-values are bolded when $p < 0.05$. [1] Cochran-Mantel-Haenszel statistic, distributed as $\chi^2_1$ [2] $t_{44}$ [3] $t_{44}$ [4] $t_{42}$ [5] $t_{43}$ [6] $t_{36}$ [7] $t_{42}$ [8] Defined for injectors only: N=37, 25, and 23 at baseline, 4 months and 8 months, respectively

**Table 3:** Drug Use and Needle Risk at Baseline and Follow-up for those with a Follow-up Measurement (% or mean ± S.D.).

the exception of attending a support group in the last 30 days. Session attendance was related to attendance at a support group within the past 30 days. Also, the percentage of males appeared highest in the group that attended most frequently. Those who reported more employment and had a driver's license also attended sessions more frequently than those who did not.

## CM Session Attendance, vouchers earned and process measures

Results showing CM session attendance, voucher amounts earned, and process measures are shown in Table 2.

Participants assigned to CM/SBCM attended more sessions than did participants in the CM only condition (12.7 vs. 9.7), and earned more in reward vouchers ($103.24 vs. $72.00), although these differences were not statistically significant. In addition, the urine samples collected for the CM/SBCM group had a slightly but not significantly higher percent of stimulant-free urines (70.2% vs. 65.7%). Somewhat surprisingly, post-intervention ratings of satisfaction were higher in several areas for clients receiving the CM/SBCM intervention compared to CM only clients.

### Drug use outcomes at 4-month and 8-month follow-up

Table 3 shows that amphetamine and meth use was reduced significantly from baseline to each of the follow-up periods ($\chi^2 = 11.6$, $p < 0.001$ at both 4-month and 8-month for amphetamine use; meth use reduced from 100% at baseline to 53% at 4-month and 8-month, McNemar's test not applicable due to 100% use at baseline). The number of times injected meth and times used meth without injecting in the last 30 days also decreased significantly from baseline to the 4-month follow-up ($t = 2.30$, $p = 0.03$ for injecting and $t = 2.16$, $p = 0.04$ for use without injecting) and those decreases were sustained at the 8-month follow-up ($t = 2.04$, $p = 0.048$ and $t = 2.32$, $p = 0.03$ for injecting and non-injecting, respectively). Needle risk behaviors during the last 30 days were also reduced from baseline to the 4-month follow-up although these reductions were not sustained at the 8-month follow-up. Although participants reported reductions in some sex risk behaviors at 4-month, none was statistically significant.

We also compared participant's "dose" of attendance (no attendance, low attendance, and high attendance) on drug use, needle risk and sex risk outcomes. Associations observed were in the predicted direction. High attendee participants showed greater improvement in the number of times they injected drugs at follow-up (average reduction of 14 times per month) and the number of times they injected meth at follow-up (average reduction of 14 times per month) than did low attendees (average reductions of 2 times and 5 times per month for times injected and times injected meth) and no attendees (average reductions of 4 and 3 times per month). High attendee participants also reduced the likelihood of having sex in the last 30 days (average reduction of 25 percentage points (pp), ignoring concordance/discordance) and having sex under the influence (average reduction of 31 pp) at greater rates at the 4-month follow-up than did other participants (5 pp and 9 pp for low attendees for any sex and sex under the influence; 14 pp for any sex and sex under the influence for no attendees). By the 8-month follow up evaluation, differences from baseline in sex risk behaviors were unremarkable.

Outcome comparisons between the CM only and CM/SBCM groups were also made. We looked at the amount of pre/post change within each of the intervention groups and computed effect sizes (E.S.) for the change within each group. The effect sizes for change were larger for the CM/SBCM than for the CM-only groups on several important variables. The CM/SBCM group had an E.S. for change at 4 months of 2.57 for amphetamine use compared to 0.10 for the CM-only group. Meth positive UAs were reduced from 100% at baseline to 39% at 4-month follow-up for CM/SBCM and to 68% for CM-only (E.S. could not be calculated). The CM/SBCM group had an effect size of 1.85 for amphetamine use compared to 0.37 for CM-only; meth use was reduced to 41% at 8-months in CM/SBCM compared to 65% in CM-only (from a baseline of 100% for both groups, E.S. could not be calculated). CM/SBCM had effect sizes of 0.46 for times injected meth and 0.64 for times used meth without injecting compared to E.S. of 0.26 and 0.24 for CM-only, respectively.

Needle risk behaviors generally remained unchanged in both intervention groups. However, several sex risk behaviors showed greater reductions at the 4-month follow-up for the CM/SBCM compared to the CM-only groups, such as any sex in the last 30 days (E.S. of 0.62 for CM/SBCM vs. 0.00 for CM-only), unprotected sex (E.S. of 0.17 for CM/SBCM vs. -0.29 for CM-only, which showed an increase in unprotected sex), having sex under the influence (E.S. of 0.87 for CM/SBCM vs. -0.11 for CM-only), and sex for drugs or money (E.S. of 0.26 for CM/SBCM vs. 0.00 for CM-only). At the 8-month follow-up, reductions for sex under the influence and sex for drugs or money were greater for the CM/SBCM group (E.S. of 0.60 and 0.26, respectively, than for the CM-only group (E.S. of 0.31 and 0.00, respectively).

Significance of reduction in outcome within each group for intervention or attendance-level was further tested at 8-month. Significance or trends were noted on times injected in the last 30 days ($p = 0.08$) for high attendees, and on amphetamine use ($p = 0.007$) and on times used meth without injecting ($p = 0.09$) for low attendees while no trends were observed for no attendees. Significance or trends were noted on amphetamine use ($p = 0.0005$), on times used meth with and without injecting ($p = 0.07$ and 0.008, respectively), and on sex under the influence ($p = 0.08$) for the CM/SBCM group while no trends were observed for the CM group.

## Discussion

Findings presented here show statistically significant reductions in meth use from baseline to follow-up for individuals who are not in treatment. In contrast to other studies finding associations between reductions in HIV-related transmission behaviors with reductions in meth use consequent to drug abuse treatment [7,47], no consistent reductions in meth-associated sex risk behaviors were noted. As with treatment studies in general, findings from this study showed strongly significant associations between extent of session attendance and reduction in meth use for both conditions. Findings also are concordant with the original work with contingency management [25] indicating that incorporating a psychosocial therapy (SBCM) with a behavioral therapy (CM) improves the feasibility of drug intervention to some degree. This work is significant in that findings are overall consistent with published data on contingency management and that the findings provide strong direction in applying this efficacious drug therapy to out-of-treatment meth users, an understudied group.

Because this was a feasibility study, results on whether participants attended sessions at all and returned for follow-up were important outcomes. The data showed that out-of-treatment meth users were able to be recruited through street outreach, and they would come in for baseline and follow-up interviews (78% returned for 4- and 8-month interviews). Additionally, 83% came back for one or more CM session, with almost a third of the overall sample (29%) attending 15 more sessions (up to 50). While this indicates that CM is feasible for this typically transient and frequently paranoid group, findings underscore the need to improve the proportion of participants who engage in more of the intervention. While not statistically significant, those in the combined CM/SBCM condition attended on average more sessions and for a longer period of time, which may suggest that using personalized case management to aid meth users in making it to their appointments, as well as attending treatment may be effective. Participants in the combined CM/SBCM also earned, on average, more vouchers than those in CM alone, again suggesting the value of incorporating SBCM with the contingency management to improve attendance and outcomes.

In examining feasibility, we were interested in how people rated the CM intervention. Overall, ratings were positive, with participants indicating that the rules were easy to understand, the staff was helpful and the facility was conveniently located. Ratings also indicated that the incentives motivated them to come in and the schedule (UA days/times) was appropriate. Additionally, those in CM/SBCM reported significantly higher ratings of acceptability of UA schedule and reported significantly lower ratings of barriers to clinic attendance and barriers to participation in the CM intervention than those in the CM only condition. It is possible that SBCM may facilitate treatment entry and UA delivery through its hands-on approach.

It was important also to consider who participated in the pilot, in order to target people for involvement in future studies. We found that those that got the biggest "dose" of sessions tended to be male, less educated, not have their own place, and significantly more likely to have attended a support group in the last 30 days. The support group may have acted as a "booster" to assist the participant in remaining organized sufficiently to comply with the CM regimen. Future studies might develop methods that target methods to increase the number of participants who engage the CM vouchers using alternate target behaviors [48] and methods to better engage out-of-treatment women and homeless meth users in treatment. Participants with comorbid alcohol and mental health problems demonstrated similar levels of participation to those who did not have these conditions, which is somewhat surprising. It may be that comorbidities are less disruptive to the behaviors of out-of-treatment meth users than those in treatment, thereby facilitating ability to adhere to treatment.

Finally, in examining the frequently correlated outcomes of drug use and HIV risk behaviors, findings showed there was significantly reduced meth use (as shown by urine drug screen results at 4- and 8-month follow-up) among all participants who returned for those interviews. Also, participants reported significantly less injection and non-injection meth use in the 30 days prior to the follow up at both 4- and 8-months, which was confirmed by UA results. Somewhat significant reduction in meth use was noted for in the CM/SBCM group at 8 months. Needle risk behaviors, for example using a dirty syringe, were reduced significantly from baseline to 4- month follow up, although those reduced risk behaviors were not sustained over time and should be examined in future studies. This mimics what other studies of CM have found in the inability to note long-term effects. Sex risk, in the form of having sex under the influence of drugs, was reduced significantly from baseline to 8-month follow-up.

Although this study is low-powered, there may be differences between treatment conditions that didn't show up. Future research will test this. However, contingency management worked with this population, and decreased meth use and some HIV risk behaviors. Because this appears in such a small sample, then we find this effect to be strong. While the effects of SBCM may be unclear in this small sample, the results have demonstrated that meth use will decrease in an out-of-treatment heterosexual population, which has been previously understudied on these outcomes. The public health significance however, is clear. Meth use is a growing problem and treatments for active meth users have not been tested. Moreover, there are few, if any, evidence-based treatments that might guide intervention with such high-risk groups of active meth users, even in areas like Denver, where meth is rampant. Contingency management, an evidence-based practice known to work for some meth users, shows promise for further testing with this group. Findings show that it is possible to recruit and retain heterosexual meth users who are not currently engaged in treatment. Furthermore, the results here indicate that the addition of another intervention such as a client-based case management model that targets the strengths of the individual may induce further gains in the areas of both reduced drug and HIV risk behaviors. We are currently studying a larger sample (N=350) of this same population in a 5-year randomized controlled trial examining these same interventions over time. For that study, we have included a "control" condition which is an HIV testing and counseling (HIV T/C) condition that all participants will receive, with the other 2 intervention arms being HIV T/C plus CM and HIV T/C plus CM/SBCM. Follow-up times are increased to 12 months for this larger trial and we are hopeful that results will address the research gaps surrounding behavioral treatment of meth use and reduction of HIV risk among this population.

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