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When the Party is Over: A Systematic Review of Behavioral Interventions for Substance-Using Men who Have Sex with Men

Adam W. Carrico, PhD^{1,2}, Roland Zepf, MS, RN, ACRN¹, Steven Meanley, MPH³, Abigail Batchelder, Ph.D., MPH⁴, and Ronald Stall, Ph.D., MPH³

¹University of California, San Francisco School of Nursing

²University of California, San Francisco Center for AIDS Prevention Studies

³University of Pittsburgh Graduate School of Public Health

⁴Harvard Medical School, Department of Psychiatry, Massachusetts General Hospital

Abstract

Because problematic patterns of alcohol and other substance use are prevalent drivers of the HIV/AIDS epidemic, comprehensive interventions are needed for substance-using men who have sex with men (SUMSM). We conducted a systematic review of 12 randomized controlled trials (RCTs) of behavioral interventions for reducing condomless anal intercourse (CAI) in SUMSM. Three RCTs observed that cognitive-behavioral or motivational interviewing interventions achieved a 24% to 40% decrease in CAI. Interventions also tended to demonstrate greater efficacy for reducing CAI and substance use among those who had lower severity of substance use disorder symptoms. Although behavioral interventions for SUMSM are one potentially important component of bio-behavioral HIV/AIDS prevention, further research is needed to examine if integrative approaches that cultivate resilience and target co-occurring syndemic conditions demonstrate greater efficacy. Multi-level intervention approaches are also needed to optimize the effectiveness of pre-exposure prophylaxis and HIV treatment as prevention with SUMSM.

Introduction

Although men who have sex with men (MSM) represent less than five percent of the male population,¹ almost two-thirds of new HIV infections in the United States are among MSM.^{2,3} Recent reports also documented an alarming, 34% increase in HIV incidence among young MSM ages 13-29, which was most pronounced among young African American MSM.⁴ Currently, it is estimated that approximately one in four MSM in the United States are living with HIV/AIDS.³ Consistent with the revised National HIV/AIDS Strategy,⁵ expanded efforts are desperately needed to target sub-groups of MSM who are at highest risk for acquiring or transmitting HIV.

Corresponding Author: Adam W. Carrico, Ph.D., University of California, San Francisco, School of Nursing, 2 Koret Way, N511M, San Francisco, CA 94143, Tel: 1-415-502-0955, Fax: 1-415-476-6042, adam.carrico@ucsf.edu.

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Problematic patterns of alcohol and other substance use are prevalent drivers of the HIV/AIDS epidemic among MSM. National HIV Behavioral Surveillance prevalence estimates indicate that half of MSM report binge drinking in the past 30 days and half report using non-injection substances in the past year.⁶ Among MSM, the use of alcohol as well as other sex-enhancing substances such as stimulants, amyl nitrites, and erectile dysfunction medications is associated with greater odds of engaging in condomless anal intercourse (CAI).⁷⁻⁹ Consequently, alcohol and sex-drug use are estimated to account for 30-60% of HIV seroconversions in MSM.¹⁰⁻¹² Studies conducted with HIV-positive persons also highlight that unhealthy drinking and stimulant use are associated with elevated HIV viral load,¹³⁻¹⁵ greater risk of onward HIV transmission,¹⁶⁻¹⁸ and potentially faster HIV disease progression.¹⁹⁻²¹ The relevance of alcohol and other substance use for HIV/AIDS prevention underscores the need for comprehensive, bio-behavioral interventions targeting substance-using MSM (SUMSM).

Behavioral interventions for SUMSM are needed to explicitly address the role of alcohol and substance use as drivers of CAI as well as risk factors for non-adherence to biomedical prevention.²² There is substantial heterogeneity among SUMSM such that most men engage in episodic patterns of binge drinking or substance use,²³ often occurring at community events where polysubstance use is common.²⁴ However, even episodic patterns of use are associated with engaging in CAI.²⁵ At the same time, a minority of SUMSM develop alcohol or substance use disorders that require intensive treatment.²⁶ Regardless of the severity of substance use disorder symptoms, many SUMSM experience overlapping psychosocial health comorbidities such as childhood sexual abuse, depression, and sexual compulsivity that serve as triggers for unhealthy drinking and substance use.^{27,28} The experience of social adversity and trauma across the life course is theorized to potentiate the development of these syndemic conditions,^{29,30} which predict engagement in CAI and faster rates of HIV seroconversion in MSM.³¹⁻³⁴ Among HIV-positive persons, syndemic conditions such as depression and trauma are associated with engagement in serodiscordant CAI,³⁵⁻³⁸ elevated HIV viral load,^{15,39} and hastened HIV disease progression.⁴⁰⁻⁴² Behavioral interventions should be tailored to the severity of substance use disorder symptoms and address co-occurring syndemic conditions among SUMSM.

Prior randomized controlled trials (RCTs) support the potential benefits of behavioral interventions for HIV prevention in the broader population of MSM. EXPLORE was a multi-site RCT of a 10-session, individually delivered intervention for HIV-negative MSM that achieved significant reductions in CAI and serodiscordant CAI.⁴³ Although men randomized to the sexual risk reduction intervention also displayed an 18% decrease in HIV incidence at two years,⁴⁴ behavioral interventions targeting pre-exposure prophylaxis (PrEP) uptake and adherence are needed to achieve greater reductions HIV incidence among MSM.^{45,46} The NIMH Healthy Living Project was a multi-site RCT of a 15-session, individually delivered intervention for HIV-positive persons to reduce serodiscordant, condomless sexual intercourse and optimize HIV disease management.^{47,48} Among HIV-positive MSM enrolled, intervention-related reductions in serodiscordant CAI were partially attributable to increases in serosorting (i.e., having anal sex with other HIV-positive men).⁴⁹ In the era of HIV treatment as prevention (TasP),^{50,51} behavioral interventions are needed to

assist HIV-positive MSM with achieving sustained virologic suppression and reducing serodiscordant CAI when viral load is detectable.

There are numerous behavioral intervention approaches to reduce alcohol and other substance use that could optimize HIV/AIDS prevention efforts with SUMSM. For example, contingency management (CM) provides tangible incentives as positive reinforcement for biologically confirmed abstinence from substance use and it is currently being implemented with SUMSM.^{52,53} Cognitive-behavioral interventions focusing on modifying cognitive distortions and building self-efficacy for managing triggers have also been adapted for SUMSM and are currently being implemented.^{54,55} Motivational interviewing (MI) is a client-centered, directive intervention targeting intrinsic motivation and self-efficacy for behavior change that has been shown to be effective for reducing alcohol and substance use.^{56,57} Recent clinical research with SUMSM has also examined evidence-based approaches to address co-occurring syndemic conditions such as depression,⁵⁸ and there is increasing interest in behavioral interventions to cultivate resilience in this population.⁵⁹ The overarching goal of this systematic review was to examine RCTs testing the efficacy of behavioral interventions to reduce CAI and substance use among SUMSM. Informed by these results, we provide recommendations for interventions to meet the complex, overlapping psychosocial health needs of SUMSM in the era bio-behavioral HIV/AIDS prevention.

Methods

A PubMed, PsycINFO, Web of Science, and CINAHL database search was conducted in August of 2015 to identify published RCTs of behavioral interventions that focused on enrolling SUMSM, defined MSM who engage in problematic patterns of alcohol or other substance use. Behavioral interventions were defined as those that utilized psychological or behavioral principles to modify engagement in CAI or substance use. Only RCTs that enrolled SUMSM and examined CAI outcomes were selected. Indices of CAI encompassed insertive and receptive CAI, engagement in CAI with a serodiscordant partner, CAI while feeling the effects of alcohol or other substances, and serosorting among HIV-negative men only. RCTs that were not published in English or those that tested biomedical approaches to HIV/AIDS prevention such as PrEP were excluded. No formal review protocol was published prior to conducting this systematic review.

Separate literature searches were conducted by two members of the team (RZ & SM). These literature searches generated a total of 548 citations in English (see Table 1). Thirty-nine duplicate citations were excluded. After reviewing abstracts for the 509 remaining citations, 450 were excluded because they did not focus on SUMSM, did not examine CAI, or RCTs were not conducted. A total of 46 citations were excluded because they examined biomedical interventions without a randomized comparison of a behavioral intervention. Identified RCTs were examined by two other members of the team (AWC and RS) to confirm that all selected RCTs met the inclusion and exclusion criteria for the review. In total, 13 published articles from 12 RCTs were selected for this qualitative systematic review of behavioral interventions to reduce CAI among SUMSM. Articles were rated by three members of the team (AWC, RZ, and SM) to better characterize the population enrolled,

intervention and control conditions, and outcomes (PICO).⁶⁰ Because our team observed substantial heterogeneity in each of the PICO domains, we concluded that a meta-analysis would not be appropriate.⁶¹ At the same time, we calculated and transformed intent-to-treat effect sizes into an odds ratio (OR) or risk ratio (RR) as appropriate for behavioral interventions tested in these RCTs.

Results

There was substantial heterogeneity in the 12 identified RCTs with respect to the population enrolled. Three RCTs enrolled SUMSM who were actively seeking formal substance abuse treatment,^{54,62,63} and nine enrolled SUMSM who were not.⁶⁴⁻⁷³ As shown in Table 2, two RCTs enrolled HIV-negative participants only, three enrolled HIV-positive participants only, and seven enrolled both HIV-positive and HIV-negative participants. Five RCTs specifically targeted methamphetamine-using MSM, four enrolled those using alcohol and other substances, and three enrolled those who engaged in episodic patterns of alcohol and other substance use.

There was also substantial variability in the modality, theoretical orientation, and dose of the behavioral interventions tested in these RCTs. Nine RCTs tested individually delivered interventions, and three incorporated some form of group counseling. Cognitive and behavioral intervention approaches such as cognitive behavioral therapy (CBT) and CM were tested in six RCTs. Three RCTs tested 4-session MI interventions, either alone or combined with a transtheoretical model (TTM) intervention. Two RCTs examined resilience interventions, either alone or combined with CM. One RCT tested an expressive writing intervention targeting traumatic stress symptoms. Although the majority of interventions were fewer than 10 sessions, dose ranged from a single individually delivered session to an intensive, 16-week outpatient treatment program.

Cognitive and Behavioral Interventions

Two of the six RCTs of cognitive and behavioral interventions observed intent-to-treat effects on CAI with methamphetamine-using MSM. In one RCT with HIV-negative and HIV-positive, methamphetamine-using MSM, those receiving gay-specific CBT (GCBT) reported the greatest reductions in receptive CAI at one month compared to other active behavioral treatments.⁵⁴ However, these initial benefits of GCBT were not sustained such that all participants receiving active behavioral treatments displayed substantial reductions over the 12-month follow-up. A second RCT of a behavioral intervention that targeted CAI without attempting to decrease substance use in HIV-positive, methamphetamine-using MSM observed sustained reductions in CAI over a 12-month follow-up compared to a diet and exercise control condition (OR = 0.60; 95% CI = 0.42-0.85).⁶⁹ There were no significant intent-to-treat effects of a single session personalized cognitive counseling (PCC) intervention with HIV-negative, episodic SUMSM on CAI over a 6-month follow-up compared to HIV counseling and testing alone (RR Range = 0.57-1.34). However, significant PCC-related reductions in CAI events with the three most recent non-primary partners were observed in a secondary analysis among those who did not meet criteria for dependence.⁶⁶

Four of the six RCTs observed intent-to-treat effects on substance use, but not always in the expected direction. Compared to HIV counseling and testing alone, a single session PCC intervention with HIV-negative, episodic SUMSM significantly decreased alcohol, marijuana, erectile dysfunction medication use (RR Range = 0.51-0.93) over a 6-month follow-up.⁷² PCC also decreased the frequency of drinking to intoxication (OR = 0.58; 95% CI = 0.36-0.90) and reduced the number of CAI partners while feeling the effects of methamphetamine (RR = 0.26; 95% CI = 0.08-0.84). Similarly, GCBT with HIV-negative and HIV-positive SUMSM achieved greater reductions in methamphetamine (OR = 0.44; 95% CI = 0.24-0.78) and marijuana (OR = 0.54; 95% CI = 0.30-0.96) use over a 12-month follow-up compared to gay-specific social support therapy.⁶²

Two RCTs found conflicting results for the efficacy of CM with methamphetamine-using MSM. Shoptaw and colleagues observed that HIV-negative and HIV-positive, methamphetamine-using MSM receiving CM alone (OR = 3.71; 95% CI = 1.77-7.80) or CBT+CM (OR = 7.79; 95% CI = 3.53-17.17) achieved greater abstinence during treatment compared to CBT alone.⁵⁴ A second RCT with HIV-negative and HIV-positive, methamphetamine-using MSM administered CM urine screening twice weekly instead of thrice weekly, which subverts contingent reinforcement of abstinence by opening a window for stimulant use to go undetected.⁷⁰ Compared to an assessment-only control condition, men randomized to receive twice weekly CM reported *increased* frequency (RR = 1.76; 95% CI = 1.13-2.73) and quantity (RR = 3.02; 95% CI = 1.47-6.23) of methamphetamine use over a 6-month follow-up.

Project MIX was a multi-site RCT of a six-session, group-based cognitive-behavioral intervention for HIV-negative and HIV-positive SUMSM.⁶⁸ The largest RCT of a behavioral intervention for SUMSM conducted to date, Project MIX did not observe any intent-to-treat effects on CAI (OR Range = 0.85-1.15) or substance use during CAI (OR Range = 1.04-1.25) over the 12-month follow-up compared to an attention-control group.⁶⁸ Irrespective of intervention assignment, men reported substantial reductions in these risk behaviors over 12 months, a pattern observed consistently across other RCTs.

MI Interventions

One of the three RCTs examining 4-session MI interventions with SUMSM observed intent-to-treat effects on CAI and substance use. In this RCT with young, HIV-negative SUMSM, those receiving a 4-session MI intervention were less likely to engage in CAI (OR = 0.76; 95% CI = 0.68-0.85) and report any substance use (OR = 0.72; 95% CI = 0.75-0.89) over a 12-month follow-up compared to participants receiving education.⁷¹ The remaining two RCTs observed some beneficial effects of MI interventions in secondary analyses only. Compared to an education condition, a 4-session MI intervention reduced club drug use over a 12-month follow-up among HIV-positive and HIV-negative men with lower severity of dependence at baseline.⁷³ A RCT with HIV-positive, alcohol-using MSM observed that participants randomized to MI+TTM reported greater reductions in the co-occurrence of alcohol use and CAI over the 12-month follow-up compared to those receiving resource referrals.⁶³ However, this effect was only among participants reporting both heavy drinking and CAI at baseline.

Resilience and Syndemics Interventions

Resilience encompasses social and psychological resources that promote successful adaptation, particularly in the midst of stressful life circumstances.^{59,74} Two RCTs examining resilience interventions for SUMSM have not observed significant intervention-related changes in CAI (OR Range = 0.83-1.07) or substance use (OR Range = 0.80-3.81).^{64,67} In one large RCT with 515 HIV-negative and HIV-positive SUMSM, men reported moderate to large reductions in CAI and substance use over the 12-month follow-up regardless of whether they were randomized to receive the empowerment intervention or a single session of risk reduction counseling.⁶⁷ One small RCT of a 5-session positive affect regulation intervention delivered with CM observed increases in positive affect (e.g., happiness, gratitude) immediately following the intervention compared to CM alone with HIV-negative and HIV-positive, methamphetamine-using MSM.⁶⁴ However, no significant intent-to-treat effects were reported for methamphetamine use and CAI over the 6-month follow-up compared to CM alone.

One small RCT with HIV-positive, methamphetamine-using MSM examined a behavioral intervention targeting traumatic stress symptoms as a syndemic condition that can trigger substance use and CAI. This individually delivered intervention included seven sessions of expressive writing targeting HIV-related traumatic stress followed by meditation and relaxation exercises. There were no intent-to-treat effects of the expressive writing intervention on serodiscordant CAI (OR = 2.10; 95% CI = 0.52-8.54) over a 3-month follow-up compared to an attention-matched control condition that completed neutral writing exercises. Although those receiving the expressive writing intervention reported significant decreases in methamphetamine use at the 1-month follow-up (OR = 0.28; 95% CI = 0.66-1.17), this was not sustained at three months.

Discussion

RCTs conducted to date provide some limited support for the efficacy of behavioral interventions for achieving modest reductions in CAI and substance use with SUMSM. Three RCTs reported intent-to-treat effects of cognitive-behavioral or MI interventions on decreases in CAI. Although findings do not provide evidence for the long-term differential efficacy of behavioral interventions,^{54,67} two RCTs with attention-matched control conditions provided support for the modest, long-term efficacy of cognitive-behavioral and MI interventions for achieving a 24% to 40% reduction in CAI among SUMSM.^{69,71} Intervention-related reductions in alcohol and other substance use are one hypothesized mechanism whereby behavioral interventions may decrease CAI in this population, but intent-to-treat analyses indicated that only one intervention reduced both CAI and substance use.⁷¹ This highlights that behavioral interventions may achieve decreases in CAI even in the context of active substance use.^{55,69}

There was some evidence that behavioral interventions demonstrated greater efficacy with those who had lower severity of substance use disorder symptoms.^{66,71-73} The brief behavioral intervention approaches tested in many of these RCTs may be more effective with those who engage in episodic patterns of use and young SUMSM because these subgroups may be less likely to have developed alcohol or substance use disorders that require

ongoing treatment.²⁶ HIV infection rates have increased among young MSM and young Black MSM in particular,⁴ but only one RCT has examined the efficacy of a behavioral intervention specifically targeting young SUMSM.⁷¹ Although many RCTs enrolled ethnically diverse samples of SUMSM, further research is needed to examine the efficacy of culturally tailored, behavioral interventions to optimize HIV testing and treatment among young Black SUMSM.

Behavioral interventions for SUMSM are one potentially important component of combination HIV/AIDS prevention, and further research is needed to identify novel approaches targeting syndemic burden and resilience. Co-occurring psychosocial health problems fuel the HIV/AIDS epidemic, but behavioral interventions with SUMSM have often not addressed syndemic conditions that serve as triggers for alcohol and substance use as well as independently contribute to engagement in CAI.^{27,28,31-34} Although some behavioral interventions addressing depression and trauma have been pilot tested with methamphetamine-using MSM,^{58,65} more definitive clinical research is needed to examine if more comprehensive, syndemic approaches demonstrate greater efficacy. Behavioral interventions targeting modifiable psychological processes such as sexual minority stress could alleviate syndemic burden and optimize HIV/AIDS prevention with SUMSM.⁷⁵⁻⁷⁸ Syndemic interventions are also needed to target substance-using male couples because couple-level processes may increase risk for substance use, intimate partner violence, engagement in CAI, and poorer HIV disease management.⁷⁹⁻⁸² On the other hand, behavioral interventions to cultivate resilience could mitigate syndemic burden and directly improve HIV-related health behaviors.⁸³⁻⁸⁶ Relatively few RCTs have examined resilience interventions and this is a promising direction for further clinical research.^{64,67}

Findings from RCTs of behavioral interventions for SUMSM should be interpreted in context of some important limitations. Substantial heterogeneity in the PICO domains make it difficult to draw definitive conclusions regarding the efficacy of behavioral interventions for reducing CAI among SUMSM. Furthermore, despite the fact that all RCTs conducted intent-to-treat analyses, this does not rule out the possibility of other methodological biases including publication bias. It is also noteworthy that all published RCTs were conducted in the United States, which calls into question the generalizability of results to other industrialized nations as well as lower and middle income countries.

Other methodological limitations of this literature have implications for the design of future RCTs of bio-behavioral interventions with SUMSM. A consistent pattern of regression to the mean across RCTs highlights that SUMSM experience substantial reductions in CAI and substance use irrespective of experimental condition. Because many SUMSM may report substantial behavior change in response to study assessments or brief interventions, promising avenues for further research would be a run-in period prior to randomization or testing adaptive treatment strategies that augment brief interventions with more intensive approaches for non-responders. It is also noteworthy that no RCT published to date with SUMSM has examined key biological outcomes such as sexually transmitted infections, HIV seroconversion, or HIV viral load. Finally, because biomedical approaches substantially mitigate risk of HIV acquisition or onward transmission even in the presence of CAI,

behavioral interventions for SUMSM are needed to optimize the unprecedented benefits of PrEP and TasP.²²

Since the discovery of HIV/AIDS in the early 1980's, three themes have emerged that are relevant to delivering comprehensive healthcare to SUMSM. First, MSM as a group report far higher rates of substance use and substance-related problems than heterosexual men. Second, SUMSM often use substances in social or sexual contexts, which increases risk for engagement in CAI. Third, HIV-positive SUMSM experience disparities along the entire HIV care cascade that lead to poorer health outcomes as well as greater risk of onward transmission. Bearing these themes in mind, providers should routinely screen MSM for alcohol and substance use disorders, provide evidence-based pharmacologic and behavioral treatments targeting alcohol or other substance use to SUMSM, and deliver biomedical HIV/AIDS prevention to SUMSM.

With recent, groundbreaking advances in biomedical HIV/AIDS prevention, there is increasing optimism that we have the tools to achieve an AIDS free generation.⁵¹ However, this goal cannot be achieved without evidence-based approaches to optimize HIV prevention and care with MSM, a population that suffers approximately two-thirds of new HIV infections in the United States where substance use is arguably one of the most potent drivers. Maximizing the public health benefits of TasP and PrEP will require a renewed focus on addressing the structural, social, and psychological drivers of HIV-related health disparities among SUMSM. Multi-level interventions are needed to target community-level norms relevant to problematic patterns of alcohol and substance use, support providers in delivering PrEP and TasP to SUMSM, address the complex psychosocial health needs of SUMSM, and more fully integrate substance abuse treatment and biomedical HIV/AIDS prevention in community settings.

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Table 1

Search terms for the present systematic review.

MeSH terms

((((MSM[tiab] OR SUMSM[tiab] OR Homosexuality, Male[mh]) OR (HIV Infections[majr] OR HIV Seronegativity[majr] OR Homosexuality[majr:noexp] AND (Male[MeSH Terms]))) AND (Amphetamine-related disorders[majr] OR Cocaine[majr] OR Drug users[majr] OR Methamphetamine[majr] OR Psychoses, Substance-induced[majr] OR Street drugs[majr] OR Substance abuse treatment centers[majr] OR Substance-related disorders[majr]) AND (Risk factors[mh] OR Risk reduction behavior[mh] OR Risk taking[mh] OR Sexual Behavior[mh] OR Sexually transmitted diseases[mh] OR Unsafe sex[mh]) AND English[la] AND (Randomized Controlled Trial[ptyp]

Keyword search terms

((MSM[tiab] OR SUMSM[tiab] OR “gay men” OR “men who have sex with men” OR (homosexual*[tiab] OR HIV OR HIV-1 NOT (female OR females OR women*))) AND (amphetamine* OR cocaine* OR drug user* OR drug abus* OR methamphetamine OR substance abus* OR substance dependen* OR substance us* OR “street drug” OR “street drugs” OR substance disorder*) NOT (alcohol*) AND (risk OR risks OR sexual behavior* OR sexually transmitted disease* OR STD OR STDS OR “unprotected sex” OR unprotected intercourse OR “unsafe sex”) AND English[la] AND random*

Table 2

Randomized controlled trials of behavioral interventions for substance-using men who have sex with men that examined condomless anal intercourse (N = 12)

Authors	Sample	Conditions	Number of Sessions and Modality	Condomless Anal Intercourse	Alcohol and Substance Use
<i>Cognitive and Behavioral Interventions</i>					
Coffin et al. ⁶⁶ Santos et al. ⁷²	326 episodic SUMSM HIV- Only African American (10%) Caucasian (47%) Hispanic/Latino (26%) Other (17%)	PCC+HIV testing (n = 162) HIV testing (n = 164)	One 30-50 minute individual session	No intent-to-treat effects on primary CAI outcomes PCC reduced CAI events among non-dependent men PCC reduced number of CAI partners on meth	PCC decreased alcohol, marijuana, and erectile dysfunction medication use
Mansegh et al. ⁶⁸	1,206 SUMSM HIV+ and HIV- African American (33%) Caucasian (39%) Hispanic/Latino (18%) Other (10%)	CBT (n = 599) attention-control (n = 607)	6 weekly, 2-hour group sessions	No intent-to-treat effects	No intent-to-treat effects on substance use during sex
Mausbach et al. ⁶⁹	341 meth-using MSM HIV + Only African American (21%) Caucasian (57%) Hispanic/Latino (13%) Other (9%)	EDGE safer sex (n = 170) diet and exercise (n = 171)	5 weekly and 3 monthly individual sessions	Intervention-related reductions in CAI acts	N/A
Shoptaw et al. ⁵⁴	162 meth-using MSM HIV + and HIV- African American (13%) Caucasian (80%) Hispanic/Latino (3%) Other (4%)	CBT (n = 40) CM (n = 42) CBT+CM (n = 40) GCBT (n = 40)	CBT & GCBT - 16 weeks of outpatient treatment CM - 16 weeks thrice weekly urine visits	GCBT reduced receptive CAI at 1 month, but no group differences at 12 months	CM and CBT+CM had more negative urine samples for meth during treatment than CBT

Authors	Sample	Conditions	Number of Sessions and Modality	Condomless Anal Intercourse	Alcohol and Substance Use
Shoptaw et al. ⁶²	128 SUMSM HIV+ and HIV- African American (0%) Caucasian 83 (65%) Hispanic 28 (22%) Other (13%)	GCBT (n = 64) GSST (n = 64)	48 group sessions	No intent-to-treat effects	GCBT reduced meth and marijuana use
Menza et al. ⁷⁰	127 meth-using MSM HIV+ and HIV- African American (8%) Caucasian (60%) Hispanic/Latino (13%) Other (19%)	CM (n = 70) assessment-only (n = 57)	12 weeks of twice weekly urine visits	No intent-to-treat effects	CM had <i>increased</i> meth use
Motivational Interviewing Interventions					
Morgenstern et al. ⁷³	150 SUMSM HIV+ and HIV- African American (34%) Caucasian (36%) Hispanic/Latino (14%) Other (16%)	MI (n = 70) education (n = 80)	4 individual sessions	No intent-to-treat effects	No intent-to-treat effects MI reduced club drug use among those with lower dependence
Parsons et al. ⁷¹	143 young SUMSM HIV- Only African American (21%) Caucasian (37%) Hispanic/Latino (29%) Other (13%)	MI (n = 73) Education (n = 70)	4 individual sessions	MI decreased CAI	MI decreased substance use
Velasquez et al. ⁶³	253 alcohol-using MSM HIV+ Only African American (54%) Caucasian (17%) Hispanic/Latino (20%)	MI+TTM (n = 118) resource referrals (n = 135)	4 individual sessions and 4 peer-led groups	No intent-to-treat effects on CAI Higher risk men in MI+TTM reported reduced drinking with CAI	No intent-to-treat effects on alcohol use

Authors	Sample	Conditions	Number of Sessions and Modality	Condomless Anal Intercourse	Alcohol and Substance Use
<i>Resilience and Syndemics Interventions</i>					
Kurtz et al. ⁶⁷	515 SUMSM HIV+ and HIV- African American (21%) Caucasian (49%) Hispanic/Latino (26%) Other (5%)	empowerment (n = 252) risk reduction (n = 263)	4 small group sessions and 1 individual session focused on empowerment single session targeting sexual and substance use	No intent-to-treat effects	No intent-to-treat effects on substance use during sex or substance dependence symptoms
Carrico et al. ⁶⁴	21 meth-using MSM HIV+ and HIV- African American (24%) Caucasian (48%) Hispanic/Latino (24%) Other (5%)	ARTEMIS+CM (n = 12) CM (n = 9)	ARTEMIS - 5 individual sessions targeting positive affect regulation CM - 12 weeks of thrice weekly urine visits	No intent-to-treat effects	No intent-to-treat effects on meth use
Carrico et al. ⁶⁵	23 meth-using MSM HIV+ Only African American (21%) Caucasian (37%) Hispanic/Latino (21%) Other (21%)	expressive writing (n = 12) neutral writing (n = 11)	7 individual sessions	No intent-to-treat effects	Expressive writing reduced meth use at 1 month, but not 3 months

ARTEMIS=Affect Regulation Treatment to Enhance Methamphetamine Intervention Success; CBT=Cognitive Behavioral Therapy; CAI=Condomless Anal Intercourse; CM=Contingency Management; GCBT=Gay-specific Cognitive Behavior Therapy; GSST=Gay-specific Social Support Therapy; Meth = Methamphetamine; MI=Motivational Interviewing; MSM=Men who Have Sex with Men; PCC=Personalized Cognitive Counseling; SUMSM=Substance-Using Men who Have Sex with Men; TTM=Transtheoretical Mode