Associations between Major Depressive Episode, Methamphetamine Use Disorder Severity, and Engagement in Sexual Risk-Taking among Methamphetamine-using Men Who Have Sex with Men

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Abstract

Depression and methamphetamine use have been associated with increased sexual risk-taking among men who have sex with men (MSM). This study estimated associations between current major depressive episode and/or methamphetamine use disorder and engagement in condomless anal intercourse (CAI). From March 2014 thru January 2016, 286 methamphetamine-using MSM were enrolled into a RCT to reduce methamphetamine use and sexual risk-taking. Analyses revealed that current major depressive episode was associated with a 92% increase in the rate of engagement in CAI with casual male partners (IRR=1.92; 95% CI=1.12–3.31) and a 76% increase in the rate of engagement in CAI with anonymous male partners (IRR=1.76; 95% CI=1.00–3.09). Additionally, for each unit increase in diagnostic methamphetamine use disorder severity, rates of engagement in CAI with anonymous male partners increased by 44% (IRR=1.44; 95% CI=1.11–1.87) and rates of engagement in CAI with exchange male partners increased by 140% (IRR=2.40; 95% CI=1.39–4.13). Neither diagnosis was associated with CAI with main male partners. Depression and methamphetamine use influence sexual risk-taking in unique ways, and interventions working with MSM should assess participants for both depression and methamphetamine use, and may tailor intervention content based on diagnostic outcomes.

Keywords

men who have sex with men; condomless anal intercourse; depression; methamphetamine; DSM-5

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INTRODUCTION

Evidence from the STD Surveillance Network demonstrates elevated rates of sexually transmitted disease prevalence among men who have sex with men (MSM) in the United States (U.S.). In 2015, gonorrhea (19%) and Chlamydia (16%) (27) both demonstrated rates an order of magnitude greater among MSM than those observed in the general U.S. population (0.2% & 0.5%, respectively) (28). The persistence of such elevated STD prevalence (1–4) are noted to be predominantly the result of high rates of engagement in condomless anal intercourse (CAI) with male sexual partners (3,5,6). Major depressive disorder (7) and methamphetamine use/abuse (8) are both more prevalent among MSM than among heterosexual males, have themselves demonstrated significant covariation among MSM (9, 10) and as a pair have been both independently (11–13) and jointly (14) associated with engagement in sexual risk-taking among MSM. Prior studies with MSM employing assessments of diagnostic depression and/or methamphetamine use disorder (MUD) severity have not yet distinguished between sexual risks taken with different types of male sexual partners.

Distinguishing between sexual partner types (e.g., main, casual, anonymous, or exchange partners) may be critical among samples of MSM, as some evidence has suggested that between 52% and 74% of all new HIV infections among MSM in the U.S. have occurred solely between main/primary male sexual partners (15). Other studies have provided contradictory evidence, suggesting that sexual risk-taking can increase with non-primary sexual partners (29, 30). Evidence has also suggested that MSM engaged in sex work demonstrate elevated rates of HIV infection, though meta-analytic evidence revealed such associations may vary significantly by region (32). Additionally, patterns of sexual risk-taking with primary vs. non-primary partners has been shown to fluctuate among HIV-positive MSM in the calendar year immediately following their initial diagnosis (31), especially among methamphetamine-using MSM, further indicating a need to parse sexual behavior by the characteristics of the sexual partner(s). In summary, evidence from studies of MSM have indicated that sexual behaviors may not be consistent across partner types.

This analysis of baseline data from a randomized controlled trial to reduce methamphetamine use and sexual risk-taking among methamphetamine-using MSM tested the simultaneous associations between a) DSM-5 verified major depressive episode (current; MDE); b) DSM-5 verified MUD severity (current); and, c) engagement in CAI with main, casual, anonymous, and/or exchange male partners.

METHODS

Participants and Procedure

Participants (N=286) enrolled from March 2014 through January 2016 and recruited from a community-wide effort that included street- and venue-based outreach (e.g., bars, clubs, bathhouses, sex clubs, drug and sex stroll streets); print media (e.g., magazines that targeted MSM); online social media site advertisement and geolocation-based dating apps; flyers and posters distribution; and, participant referrals. Eligibility criterion was self-identified MSM who have used methamphetamine within the previous three months, reported CAI (insertive

or receptive) with a non-primary male partner in the previous 6 months, were not currently in treatment or seeking methamphetamine abuse treatment, between the ages of 18 and 65 years, were able and willing to provide informed consent and comply with study requirements. Individuals were excluded if they did not meet all criteria, were unable to understand the Informed Consent Form (unable to pass a consent quiz), or were determined to have a more serious psychiatric condition (SCID verified) that was beyond the safe enrollment of the study procedures. Participants were administered the OraQuick rapid HIV-antibody blood test. If the OraQuick test was reactive, the participant was retested with a second rapid blood test, Clearview Complete. If the second Clearview Complete test was reactive the participant was presumed positive and referred for additional evaluation and treatment. Participants who showed documentation of a HIV-positive serostatus (e.g., a prescription bottle or laboratory results in their name) were not given a HIV-antibody test. Following screening, informed consent, and HIV testing (if necessary), participants completed a baseline Audio Computer Assisted Self Interview (ACASI) assessment comprised of the Behavioral Questionnaire – Amphetamine and Behavioral Risk Assessment-Lite (below). All study procedures were approved by the Friends Research Institute, Inc.'s and University of California, Los Angeles Institutional Review Boards.

Assessments

Behavioral Questionnaire – Amphetamine (BQA)—The BQA was developed by investigators at the University of California at San Francisco, Center for AIDS Prevention Studies (16), and was modified, in consultation with the developers, for behavioral studies with methamphetamine-using MSM (17). The BQA gathers information on HIV-related drug and sexual risk behaviors (e.g., needle sharing, drug use during sex), needle sharing, drug use during sex), and collects detailed data on discrete sexual behaviors (with primary or non-primary partners and whether or not the behavior occurred under the influence of methamphetamine), as well as data about participants' sexual encounters with main, casual, anonymous, and exchange male partners. A main partner was defined as a person with whom the participant had a relationship where they felt committed to above anyone else and with whom they have had sex. It was specifically stated at the conclusion of the definition for main partners that commitment did not have to mean monogamy. A casual partner was then defined as a person that the participant knew, with whom they had sex, but did not consider their main partners. An anonymous partner was then defined as someone the participant had sex with, but who they did not know before the sexual encounter and might not know their name. For each of these partner types (i.e., main, casual, anonymous), participants were explicitly asked to exclude any individuals they had sex with in exchange for money, drugs, shelter, or food. Exchange partners were queried last, and were defined as someone the participant had sex with in exchange for something the participant needed such as money, drugs, shelter, or food.

Behavioral Risk Assessment-Lite (BRA-Lite)—The BRA-Lite is a reduced version of the Behavioral Risk Assessment developed by the senior author (CJR); it assessed participant sociodemographics (e.g., sexual identity, race/ethnicity, age) and sexual risk behaviors (including the types of partners that were present and substances taken immediately before/during sex) during their three most recent sexual encounters.

Structured Clinical Interview for the Diagnostic Statistical Manual of Mental Disorders—Fifth Edition (SCID)—The SCID (26), a structured interview to determine current substance use severity and/or mental health disorder diagnoses, was administered by a trained research assistant at the conclusion of the baseline ACASI assessment. The current analyses include only two diagnostic outcomes: major depressive episode (current; 0 = no MDE [fewer than five criteria endorsed], 1 = diagnosed with MDE [five or more criteria endorsed]), and methamphetamine use disorder severity (current; 0 = no MUD [0 or 1 criteria endorsed], 1 = mild MUD [2 or 3 criteria endorsed], 2 = moderate MUD [4 or 5 criteria endorsed], 3 = severe MUD [6 or more criteria endorsed]).

Statistical Analyses

Descriptive statistics were calculated for all variables, with the specific metric based on the level of measurement used (e.g., count and percentages for nominal variables, mean and standard deviation for counted/continuous variables). Multivariable analyses employed generalized structural equation modeling (GSEM) given the non-continuous nature (i.e., counts) of the outcome variables. Outcomes for this study were self-reported episodes of CAI with main, casual, anonymous, and exchange male partners. These outcomes were regressed on SCID diagnoses for current MDE and MUD using the negative binomial family and log link function. Results were reported in their exponentiated form (i.e., adjusted incidence rate ratios [AIRRs]), which indicate the expected factor change in the rate of CAI with a specific partner type for every one unit increase in the predictor variable. Both MDE and MUD were included simultaneously in all analyses, and coefficient estimates thus represented the unique influence of each while controlling for the other. Joint or interactive effects were parceled out of the individual coefficient estimates, but were included in measures of the overall model fit. All analyses employed robust estimation of the variance-covariance matrices, implying limited risk of results being disproportionately influenced by outliers in the CAI data. All analyses were carried out using Stata v13SE, all significance tests are two-tailed, and results were flagged as significant beginning at α 0.05.

RESULTS

As demonstrated in Table I, approximately two-thirds of participants self-identified as gay (67%), most identified as African American/Black (44%) or non-white Hispanic Latino (25%), and ages ranged from 18 to 65 years (interquartile range = 33–50 years). Biomarker-confirmed HIV prevalence was 41% (n = 118/286).

Table II provides bivariate associations between current MDE, current MUD severity, and self-reported engagement in CAI with main, casual, anonymous, and exchange male partners in the past 30 days. More than a third of the sample (35.8%) were diagnosed with current MDE at baseline; participants diagnosed with current MDE on average engaged in more episodes of CAI with main (4.0 vs. 2.5; *ns*), casual (7.2 vs. 3.7; *p*   0.05), anonymous (4.5 vs. 2.8; *ns*), and exchange (2.0 vs. 1.8; *ns*) male partners than participants without current MDE, though only results with casual male partners reached statistical significance.

Most participants (64.2%) were diagnosed with a current severe MUD at baseline assessment. Associations between sexual risk-taking and current MUD demonstrated that

episodes of CAI across main (M_{None} = 2.1, M_{Mild} = 1.5, $M_{Moderate}$ = 3.2, M_{Severe} = 3.5; *ns*), casual (M_{None} = 3.3, M_{Mild} = 4.4, $M_{Moderate}$ = 5.9, M_{Severe} = 5.1; *ns*), anonymous (M_{None} = 2.7, M_{Mild} = 0.3, $M_{Moderate}$ = 2.4, M_{Severe} = 4.3; p 0.05), and exchange (M_{None} = 0.4, M_{Mild} = 0.2, $M_{Moderate}$ = 0.1, M_{Severe} = 2.7; *ns*) male partners tended to increase with MUD severity; only differences across anonymous male partners reached statistical significance.

Table III provides multivariable estimates of the associations between diagnosis with MDE and/or MUD and engagement in CAI with male partners (n = 285). When controlling for severity of MUD, diagnosis of MDE was associated with a 92% increase in the rate of engagement in CAI with casual male partners (AIRR = 1.92; 95% CI = 1.12 – 3.31), as well as a 76% increase in the rate of engagement in CAI with anonymous male partners (AIRR = 1.76; 95% CI = 1.00 – 3.09). Diagnosis with MDE was unassociated with engagement in CAI with main or exchange male partners. When controlling for MDE, increasingly severe MUD was associated with an iterative 44% increase in the rate of CAI with anonymous male partners (AIRR = 1.44; 95% CI = 1.11 – 1.87) as well as an iterative 140% increase in the rate of CAI with exchange male partners (AIRR = 2.40; 95% CI = 1.40 – 4.13); severity of MUD was unassociated with engagement in CAI with main or casual male partners.

DISCUSSION

In this sample of predominantly gay-identified racial/ethnic minority MSM, diagnostic depression and/or methamphetamine use disorder were both prevalent and each independently associated with increased CAI with male partners, even after controlling for the other's influence. Importantly, estimated effects on rates of engagement in CAI differed across partner types, demonstrating that depression and methamphetamine use influenced sexual risk-taking among MSM in unique ways.

Rates of MDE observed in this study were significantly higher than rates of depressive disorder observed among males in the U.S. general population (18). In this sample, diagnosis with MDE was associated with increased rates of CAI with both casual and anonymous male sexual partners. These findings were consistent with prior examinations showing that depressed MSM reported greater engagement in sexual risk-taking than MSM who were not depressed(13, 19, 20). Sexual encounters can establish or reaffirm intimacy between partners, can be pleasurable, and can be affirming to one's feelings of attractiveness and self-worth, all potential self-initiated responses to the detrimental effects of depression. It is interesting to note that MDE was not associated with changes in sexual risk-taking with main male partners or exchange partners, implying perhaps a greater focus on pleasure, stress relief, or affirming self-worth as motivating factors, rather than fundamental changes in established relationships or the tendency to use sex to acquire valued resources.

Diagnosis with a MUD, particularly a severe MUD, was common in the sample, and increasingly severe MUD was associated with significant corresponding increases in the rates of CAI with both anonymous and exchange male partners, with particularly strong effects among exchange partners. This coincides cleanly with prior evidence with MSM samples that demonstrated stimulant use, particularly methamphetamine use, has been associated with significant increases in condomless sexual behaviors and risk for infectious

disease transmission (21). This implies that the sexual risks accompanying MUD were taking place specifically with sexual partners who were not part of the immediate social networks of MSM. By definition, anonymous and exchange male sexual partners exist outside of the immediate social circle of friends and significant others that comprise an individual's group of main and/or casual sexual partners. This is an important finding, and though preliminary may add further nuance to explanations of why methamphetamine use is consistently associated with increased risk for HIV/STI infection among MSM: methamphetamine use among MSM appears to promote condomless sexual encounters primarily with individuals who are not members of the individual's existing social network (i.e., anonymous partners, and some proportion of exchange partners), thereby increasing potential risk for the introduction of new pathogens across otherwise unconnected networks of sexually active MSM.

It is important to note that prior evidence suggested most risk for HIV transmission among MSM occurred with main male partners (15); yet, in this study, neither depression nor methamphetamine use were predictive of CAI with main male partners. As such, the bulk of sexual risk-taking among MSM remains unexplained by the risk factors discussed here; sexual behaviors with main male partners may more accurately be understood as the result of a broad number of interpersonal factors germane to both partners in the relationship, and thus are likely not reducible to psychosocial characteristics (e.g., depression, methamphetamine use) of just one member of the pair.

There are several limitations to the current analyses. First, some participants diagnosed with current MDE may have been experiencing depressive symptoms related to their HIV status (especially if the participant enrolled soon after their initial diagnosis) and/or specific events which prompted them to enroll in the intervention; as such, rates of current MDE may be inflated beyond rates observed in other samples of MSM. Relatedly, the current study enrolled methamphetamine-using MSM interested and willing to enroll in an intervention to reduce their methamphetamine use and sexual risk-taking; results are likely not generalizable to MSM who do not use methamphetamine or other MSM in general. The high rate of MUD observed in this sample were elevated due to the eligibility criteria of the intervention from which the data were derived, as well as from the study location in the Western U.S.; rates of methamphetamine use are demonstrably higher in the West relative to other regions of the U.S. (22, 23) and thus prevalence rates may not be reflective of MUD rates among MSM in the U.S. more broadly. All rates reported here were self-reported and may suffer from recall bias. In the few cases where results presented here failed to replicate findings from prior studies there is a risk of Type-II error due to small cell sizes; though the overall sample was of sufficient size for inferential statistical analysis, contrasts made across multiple diagnostic outcomes and/or partner types may test the limits of available power. Last, several prior examinations of the relationship between depression and sexual risk among MSM have revealed non-linear relationships (24, 25); this was untestable in the current data given the dichotomous nature of the diagnostic depression variable used and represents a significant limitation of the current analysis.

CONCLUSIONS

In spite of limitations, this study makes two important contributions to the current understanding of how depression, methamphetamine use, and sexual risk-taking are related among methamphetamine-using MSM. First, MDE and MUD severity were both unassociated with sexual risk-taking with main male partners. This is critical, as the majority of sexual risk-taking among MSM in the U.S. may occur with main male partners (15), demonstrating there is still important work to be done to establish predictors of sexual risk-taking with these most crucial of partner types. Second, MDE and MUD were predictive of CAI with partners of different types. Though both were related to increased rates of CAI with anonymous male partners, only MDE was associated with CAI with casual partners, and only MUD was related to CAI during exchange sex. This perhaps not only reveals differing motivations behind the increased sexual risk-taking associated with MDE versus MUD, but also reveals that increased risk of HIV/STI infection due to methamphetamine use may be related in part to increased exposure to anonymous (or in some cases exchange) sexual partners outside an individual's existing social circle. These results indicate that screening for mental health disorder, particularly screening for depression, should be a routine part of methamphetamine abuse treatment for MSM. Results further provide evidence that diagnosis with a depressive disorder may warrant the application of additional programming to guard against increased engagement in sexual risk behavior with casual and anonymous male partners.

Acknowledgments

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Table I

Participant Sociodemographic Characteristics (N = 286)

	Mean or N	SD or %
Age		
	42 years	11 years
Racial/Ethnic Identity		
White	56	20%
Black	125	44%
Hispanic/Latino	72	25%
Other Racial/Ethnic Identity	33	12%
Sexual Orientation		
Gay Identified	192	67%
Non Gay Identified	94	33%
HIV Status		
HIV Positive	118	41%
HIV Negative	168	59%

Table II

Bivariate Associations between Major Depressive Episode (current), Methamphetamine Use Disorder Severity (current), and Episodes of Condomless Anal Intercourse with Male Partners in the Past 30 Days (n = 285)

Episodes of Condomless Anal Intercourse with Male Partners

Partner Type	Major Depressive Episode			Methamphetamine Use Disorder Severity				
	No MDE (n = 183)	MDE (n = 102)	Sig.	None (n = 31)	Mild (n = 36)	Moderate (n = 35)	Severe (n = 183)	Sig.
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Main	2.51 (7.5)	3.99 (9.1)	$F_{(1,283)} = 2.15$; *ns*	2.13 (6.3)	1.50 (4.6)	3.23 (10.0)	3.46 (8.6)	$F_{(281,3)} = 0.73$; *ns*
Casual	3.68 (8.6)	7.22 (15.2)	$F_{(1,283)} = 6.29$; *p* = 0.013	3.29 (7.1)	4.44 (11.3)	5.94 (19.4)	5.14 (10.1)	$F_{(281,3)} = 0.34$; *ns*
Anonymous	2.80 (7.6)	4.50 (9.9)	$F_{(1,283)} = 2.63$; *ns*	2.65 (6.7)	0.31 (0.8)	2.4 (6.2)	4.34 (9.7)	$F_{(281,3)} = 2.64$; *p* = 0.050
Exchange	1.75 (11.9)	1.96 (6.1)	$F_{(1,283)} = 0.03$; *ns*	0.36 (1.4)	0.22 (0.7)	0.06 (0.3)	2.73 (12.6)	$F_{(281,3)} = 1.35$; *ns*

Pearson Correlation between MDE and MUD Severity: $\chi^2 (3) = 15.41$; *p* = 0.002; all sig. tests two-tailed

Table III

Episodes of CAI with Male Partners in the Past 30 Days Regressed on Current Diagnoses with Major Depressive Episode and Methamphetamine Use Disorder Severity (N = 285)

Partner Type	Main		Casual		Anonymous		Exchange	
Exogenous Covariate	AIRR[a]	95% CI[b]	AIRR[a]	95% CI[b]	AIRR[a]	95% CI[b]	AIRR[a]	95% CI[b]
Major Depressive Episode (*1 = current MDE*)	1.46	0.74 – 2.87	1.92*	1.12 – 3.31	1.76*	1.00 – 3.09	0.78	0.25 – 2.38
Methamphetamine Use Disorder Severity (*0–3; 3 = Severe*)	1.20	0.87 – 1.65	1.08	0.84 – 1.39	1.44**	1.11 – 1.87	2.40**	1.39 – 4.13

[a] AIRR = Adjusted Incidence Rate Ratio

[b] 95% CI = 95% Confidence Interval

*
p 0.05;

**
0.01; all sig. tests two-tailed