

## Depression and HIV risk among men who have sex with men in Tanzania

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### ABSTRACT

Studies have shown high rates of depression among men who have sex with men (MSM) in developed countries. Studies have also shown association between depression and HIV risk among MSM. However, very little research has been done on depression among African MSM. We assessed depression and HIV risk among a sample of MSM in Tanzania. We reviewed data on 205 MSM who were recruited from two Tanzanian cities using the respondent driven sampling method. Demographic and behavioral data were collected using a structured questionnaire. HIV and sexually transmitted infections data were determined from biological tests. Depression scores were assessed using the Patient Health Questionnaire (PHQ-9). For the analysis, depression scores were dichotomized as depressed (PHQ > 4) and not depressed (PHQ ≤ 4). Bivariate and multivariable Poisson regression analyses were conducted to assess factors associated with depression. The prevalence of depression in the sample was 46.3%. The mean (±SD) age of the sample was 25 (±5) years. In bivariate analysis, depression was associated with self-identifying as gay ( $p = .001$ ), being HIV positive ( $p < .001$ : <8% of MSM knew they were HIV infected) and having a high number of sexual partners in the last 6 months ( $p = .001$ ). Depression was also associated with sexual ( $p = .007$ ), physical ( $p = .003$ ) and verbal ( $p < .001$ ) abuse. In the Poisson regression analysis, depression was associated with verbal abuse (APR = 1.91, CI = 1.30–2.81). Depression rates were high among MSM in Tanzania. It is also associated with abuse, HIV and HIV risk behaviors. Thus, reducing the risk of depression may be helpful in reducing the risk of HIV among MSM in Africa. We recommend the colocation of mental health and HIV preventive services as a cost-effective means of addressing both depression and HIV risk among MSM in Africa.

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## Introduction

Depression is a leading cause of morbidity and disability in the world (Moussavi et al., 2007; Murray, Lopez, Mathers, & Stein, 2001). The prevalence of depression in the general population ranges from 0.3% in Czech Republic to 10% in the USA (Andrade, Caraveo-Anduaga, Berglund, Bijl, & Dragomericka, 2003). Research, particularly in high income countries, has shown higher rates of depression and mental health disorders among men who have sex with men (MSM). In the Netherlands, MSM were three times more likely to be depressed compared to heterosexual men (Sandfort, de Graaf, Bijl, & Schnabel, 2001). In the USA, several studies report high rates of depression among MSM – 33% in Massachusetts (Reisner et al., 2009), 23.1% in Chicago (Fendrich, Avci,

Johnson, & Mackesy-Amiti, 2013) and 22.8% in Seattle (Perdue, Hagan, Thiede, & Valleroy, 2003). Reviews of other studies showed rates of depression that were three to five times higher among MSM compared to the general adult male population (Cochran & Mays, 2000; Lhomond & Saurel-Cubizolles, 2009; Pratt & Brody, 2008). Depression among MSM has further public health implications because of its association with risky sexual behavior and HIV infection. In one study, MSM who engage in unprotected anal intercourse were 10 times more likely to be depressed compared to those who do not engage in unprotected anal intercourse (Reisner et al., 2009). In another study, MSM with high depression scores were five times more likely to be depressed than those with low depression scores. In their study of MSM in Seattle,

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Perdue et al. (2003) reported a significant association between high depression scores and multiple sexual partners ( $\geq 3$ ) in the preceding six months. Given the high rates of depression among MSM, the association with risky sexual behavior is cause for concern (Fendrich et al., 2013; Perdue et al., 2003; Reisner et al., 2009).

While there has been considerable research on depression among MSM in high income countries, there is little research on depression among MSM in Africa. To our knowledge only two studies (both in South Africa) have researched depression among African MSM (Stoloff et al., 2013; Tucker et al., 2013). Furthermore, MSM in Africa face both cultural and civil hostility as a result of their sexual orientation and identity (Baral et al., 2009; Semugoma, Nemande, & Baral, 2012). Furthermore, over 30 countries in Africa, including Tanzania have civil or criminal laws against MSM behavior (Itaborahy, 2012). This situation may contribute to the risk of HIV infection, through a cycle of internalized hostility, depression and HIV risk behavior. Thus, there is need for more research to assess depression among MSM in Africa. The objectives of our study are: (1) to determine the prevalence of depression among a sample of MSM in Tanzania; (2) to determine the association between depression and HIV in the sample; (3) to determine other factors associated with depression in the sample. We hypothesize that depression will be higher among HIV-positive men than HIV-negative men.

## Methods

### Study design and sampling

Using a cross-sectional epidemiologic design, data were collected between 2012 and 2013 from two cities in Tanzania: a large metropolitan city (Dar es Salaam) and a small provincial city (Tanga). Dar es Salaam (DES) is the capital city of Tanzania and is a large metropolitan city with over four million inhabitants. Tanga is a smaller city in the northeastern part of the country with a population of about 275,000 people. Two hundred MSM and 100 MSM were recruited from DES and Tanga, respectively. Before recruitment we mapped several MSM sites in each city including hotels, parks, clubs and bars (Ross, Nyoni, Bowen, Williams, & Kashiha, 2012). Starting with initial “seeds” of five people in each city, the respondent driven sampling (RDS) method was used to recruit subjects into the study (Heckathorn, 1997, 2002). RDS is a chain-referral sampling method that starts with initial seeds of recruiters who recruit subjects into a study. These newly recruited subjects then recruits a limited number of other MSM into the study. This process continues in recruitment “waves” until the desired

sample size is reached. MSM behavior is both illegal and a social stigma in Tanzania (Itaborahy, 2012). The RDS method allows us to reach such a closed community with less difficulty. Subjects were eligible for the study if they were male, 18 years or older, could provide informed consent for the study and indicated they have had sex with another male within six months preceding data collection. Seeds were chosen from three different regions of each city, and covering three decades of age (20s–40s). A more detailed account of the recruitment process is referenced elsewhere (Ross et al., 2014).

### Data collection and procedure and study approval

All research activities were managed by research supervisors and assistants with experience and training in MSM field research. The participant self-administered the questionnaire using a pencil and paper form. If the participant had any difficulty with any question or item, the research assistant explained the item/question in a manner consistent with the item’s meaning. After the participant was done, the research assistant checked the questionnaire for completeness and consistency of the data while the participant was still present. Any inconsistencies and missing data were clarified with the respondents. Meetings with each participant were conducted in private store fronts/offices rented for the project.

Our study is a secondary study of data collected on a primary study to assess HIV, risk behavior and stigma among MSM in Tanzania (Ross et al., 2014). The study was approved by the Institutional Review Boards of the University of Texas Health Science Center at Houston and the Tanzanian National Institute for Medical Research.

### Dependent (outcome) variable

Depression, our main outcome variable, was measured using the Patient Health Questionnaire – 9 scale (PHQ-9). The PHQ-9 is a validated nine-item instrument that scores each of the nine DSM-IV depressive symptoms between 0 (not present at all) and 3 (present nearly every day) (Adewuya, Ola, & Afolabi, 2006; Kroenke, Spitzer, & Williams, 2001; Monahan et al., 2009; Ola et al., 2006). Thus, scores ranges between 0 and 27. For our study, depression was dichotomized into: No depression (0–4) and depression ( $>4$ ) (Monahan et al., 2009). A cut of point of four was used because this is the threshold for at least mild depression (Kroenke et al., 2001; Kroenke & Spitzer, 2009). Additionally, since this is a population-based study, using a cut-off point of four increases the sensitivity of the tool to capture all respondents with any level of

depression irrespective of the severity. The PHQ-9 has been validated in East African populations (Monahan et al., 2009).

### Independent variables

The independent variables for this study fall into five main domains: (1) Demographics; (2) Sexual behavior;

(3) MSM network size; (4) Violence/abuse and Internalized homonegativity (IH); (5) Sexual Diseases (HIV status, diagnosis of sexually transmitted infection (STI), ever been tested for HIV). See Table 1 for variables in each domain.

IH is the acceptance and internalization of negative attitudes toward one's own sexual orientation (Shidlo, 1994).

**Table 1.** Results of bivariate analysis between depression and variables in each domain.

	Not depressed		Depressed		Total		PR <sup>a</sup>	95% CI <sup>b</sup>	P-value
	N	%	N	%	N	%			
<b>Demographics</b>									
City	110		95		205		1.23	0.86–1.73	0.215
Dar es Salaam (DES)	71	50.7%	69	49.3%	140	68.3%			
Tanga <sup>c</sup>	39	60.0%	26	40.0%	65	31.7%			
Currently employed	110		95		205		1.01	0.69–1.49	0.957
Yes	90	53.6%	78	46.4%	168	82.0%			
No <sup>c</sup>	20	54.1%	17	45.9%	37	18.0%			
Self-identified sexual orientation	106		94		200		1.90	1.24–2.91	0.001
Gay/homosexual	64	45.4%	77	54.6%	141	70.5%			
Bisexual <sup>c</sup>	42	71.2%	17	28.8%	59	29.5%			
Education	110		95		205		0.82	0.59–1.15	0.239
Primary school or less	41	59.4%	28	40.6%	69	33.7%			
Sec school or more <sup>c</sup>	69	50.7%	67	49.3%	136	66.3%			
Ever had a meaningful sexual relationship with a female	110		95		205		0.73	0.55–0.97	0.038
Yes	81	58.7%	57	41.3%	138	67.3%			
No <sup>c</sup>	29	43.3%	38	56.7%	67	32.7%			
Age	23.99 <sup>d</sup>	5.27 <sup>e</sup>	24.74 <sup>d</sup>	5.3 <sup>e</sup>	24.71 <sup>d</sup>	5.21 <sup>e</sup>		24.00–25.42	0.314
<b>Abuse and stigma</b>									
Ever been a victim of sexual abuse	110		95		205		1.53	1.16–2.04	0.007
Yes	19	37.3%	32	62.7%	51	24.9%			
No <sup>c</sup>	91	59.1%	63	40.9%	154	75.1%			
Ever been a victim of physical abuse	110		95		205		1.58	1.20–2.10	0.003
Yes	21	36.8%	36	63.2%	57	27.8%			
No <sup>c</sup>	89	60.1%	59	39.9%	148	72.2%			
Ever been a victim of verbal abuse	110		95		205		1.95	1.44–2.63	<0.001
Yes	31	35.6%	56	64.4%	87	42.4%			
No <sup>c</sup>	79	66.9%	39	33.1%	118	57.6%			
IH	23.25 <sup>d</sup>	8.19 <sup>e</sup>	21.77 <sup>d</sup>	7.52 <sup>e</sup>	23.03 <sup>d</sup>	7.87 <sup>e</sup>		21.95–24.12	0.184
<b>Sexual behavior</b>									
Used condom with most recent transactional sex	97		89		186		1.35	0.95–1.93	0.069
Did not use condom	59	47.6%	65	52.4%	124	66.7%			
Used condom <sup>c</sup>	38	61.3%	24	38.7%	62	33.3%			
Condom use in receptive anal sex with last three partners	110		95		205	100.0%	2.31	1.68–3.18	<0.001
Did not use condom	30	32.6%	62	67.4%	92	44.9%			
Used condom <sup>c</sup>	80	70.8%	33	29.2%	113	55.1%			
Condom use in insertive anal sex with last three partners	110		95		205	100.0%	0.61	0.39–0.98	0.02
Did not use condom	31	68.9%	14	31.1%	45	22.0%			
Used condom <sup>c</sup>	79	49.4%	81	50.6%	160	78.0%			
Number of people you have had sex with in past 6 months	4.97 <sup>d</sup>	5.18 <sup>e</sup>	10.68 <sup>d</sup>	16.27 <sup>e</sup>	7.86 <sup>d</sup>	11.02 <sup>e</sup>		6.59–9.13	0.001
<b>Sexual diseases</b>									
HIV status	97		79		176		1.84	1.36–2.48	<0.001
Positive	14	31.8%	30	68.2%	44	25.0%			
Negative <sup>c</sup>	83	62.9%	49	37.1%	132	75.0%			
Current diagnosis of STI	104		86		190		1.26	0.88–1.79	0.235
Positive	16	45.7%	19	54.3%	35	18.4%			
Negative <sup>c</sup>	88	56.8%	67	43.2%	155	81.6%			
Ever been tested for HIV	108		93		201		0.93	0.66–1.33	0.703
Yes	86	54.4%	72	45.6%	158	78.6%			
No <sup>c</sup>	22	51.2%	21	48.8%	43	21.4%			
<b>MSM network size</b>	Mean	SD	Mean	SD	Mean	SD		95% CI <sup>b</sup>	P-value
How many gay men over 15 years whom you know by name	13.66	15.99	19.33	21.31	15.45	17.73		13.02–17.88	0.039
How many of these have you seen in the past one month	7.53	9.81	14.38	17.47	10.54	13.63		8.67–12.41	0.001
How many gays do you consider as close friends	3.41	3.62	4.36	7.00	3.68	4.86		3.01–4.35	0.236

<sup>a</sup>PR, prevalence ratio.

<sup>b</sup>95% confidence interval.

<sup>c</sup>The reference category for computing the prevalence ratio. The prevalence ratio is computed by dividing the prevalence of depression in the main group by the reference group. For example, for the city variable prevalence ratio is 49.3%/40.0% = 1.23.

<sup>d</sup>Mean.

<sup>e</sup>Standard deviation; SD, standard deviation; N, sample.

IH was measured using an 8-item short version of the 28-item Reactions to Homosexuality Scale (Ross & Rosser, 1996; Smolenski, Diamond, Ross, & Simon Rosser, 2010). The 8-item short version is formatted for a 6-point Likert type response from 0 (strongly disagree) to 5 (strongly agree). Thus, the scores ranged between 0 and 40.

HIV status was based on result of tests carried out on blood samples provided by the subjects. HIV status was assessed using two methods: Determine, Abbot Laboratories, USA for initial testing; and Unigold, Trinity Biotech PLC, Ireland for confirmation of the initial test. These tests require minimal infrastructure and allows for quick turnaround time for results. Tests were initially done using the Abbot Determine test and confirmed with the Unigold test. In the event of any discordant results, the result of the Unigold test was adopted. Validation studies done in five African countries showed greater than 98% sensitivity and specificity for these tests (Piwowar-Manning et al., 2010). Voluntary counseling and testing for HIV was offered to all participants (12% of the participants declined being tested) and all HIV-positive men were referred to the HIV center in Dar es Salaam or the Bombo regional Hospital in Tanga.

STI was diagnosed as positive if the participant tested positive for syphilis, Chlamydia or gonorrhea. The respondents provided blood samples for the syphilis test and urine and anal swab samples for the Chlamydia and gonorrhea tests. Syphilis antibody was tested using DetermineTP Rapid Syphilis Assay (Inverness Medical Innovations, MA, USA). Chlamydia and gonorrhea were tested using APTIMA Combo2 (Hologic Gen-Probe, CA, USA).

### Power and sample size estimation

Based on past research studies, a priori estimates of depression prevalence were: 36% among HIV-positive MSM and 16% among HIV-negative MSM (Kelly et al., 1998; Rosenberger et al., 1993; Stoloff et al., 2013; Tucker et al., 2013). Thus, assuming an 80% power and a two-sided significance level of .05, we needed a minimum of 150 people to detect a difference of 20% points in depression rates between HIV-positive and HIV-negative participants. However, considering the RDS method, we factored in a design effect of 1.5 for our study (Johnston et al., 2010; Salganik, 2006). Thus, the final minimum sample size for this study was 225 subjects. However, due to missing data, we only had 205 subjects with complete data for depression. With this number of subjects, we had 80% power to detect a 21% point difference in depression prevalence between HIV-positive and HIV-negative subjects.

### Data analysis

Simple descriptive statistics were conducted for each variable. Bivariate analysis (chi-square tests and *t*-tests) were performed to assess relationship between depression and each independent variable. Variables with *p*-values  $\leq .200$  were subsequently used for a Poisson multivariable regression analysis.

A Poisson regression model with robust variance estimation was used to assess association between depression and the independent variables (Barros & Hirakata, 2003). Poisson regression is commonly used to assess discrete outcomes in longitudinal studies (Singer & Willett, 2003). To adapt this regression method to our cross-sectional data, we assigned a follow-up time of one year to every participant. Thus, the offset variable was set at  $\log(1)$  which is zero. The effect sizes from this Poisson model will thus yield prevalence ratios which appropriately reflect the cross-sectional design of our study. Using a robust estimation method will yield confidence intervals that are more precise than using standard variance estimation methods (Barros & Hirakata, 2003).

All analyses were done using SPSS 21 and were based on two-sided significance level of .05.

### Results

A total of 300 MSM participated in the study. However, we only had depression data on 205 participants. Thus, results presented here are based on the 205 participants with depression data. The prevalence of depression among our sample was 46.3% (95/205).

The mean age and standard deviation of the sample was 24.7 years and 5.2 years, respectively. Most of the participants indicated they were gay/homosexual (71%) and had at least a secondary school education (66%). Those who identified as gay/homosexual were twice as likely to be depressed compared to bisexuals (PR = 1.9, CI = 1.24–2.91). However, those who have had a meaningful sexual relationship with a female were significantly less likely to be depressed than those who have never had a meaningful sexual relationship with a female (PR = 0.73, CI = 0.54–0.97). Most respondents reported not experiencing any form of sexual abuse (75%), physical abuse (72%) or verbal abuse (58%). Depression was significantly more prevalent in those who have experienced sexual abuse (PR = 1.53, CI = 1.16–2.04), physical abuse (PR = 1.58, CI = 1.20–2.10) and verbal abuse (PR = 1.95, CI = 1.44–2.63) compared to those who have not experienced each of these, respectively. Depression was significantly more prevalent among those who did not use a condom in receptive anal sex with all of their last

**Table 2.** Multiple poisson regression showing factors associated with depression as the dependent variable.

Poisson regression with robust estimators	APR <sup>a</sup>	LCL <sup>b</sup>	UCL <sup>c</sup>	P-value
How many gay men that you know have you seen in the past one month	1.01	1.00	1.02	0.06
No of different men you have had sex with in the past 6 months	1.01	1.00	1.01	0.141
IH	1.01	1.00	1.04	0.32
Ever had a meaningful sexual relationship with a woman (Yes vs. No <sup>d</sup> )	1.00	0.67	1.25	0.579
<b>Ever been a victim of verbal abuse (Yes vs. No<sup>d</sup>)</b>	<b>1.91</b>	<b>1.30</b>	<b>2.81</b>	<b>0.001</b>
Ever been a victim of sexual abuse (Yes vs. No <sup>d</sup> )	1.11	0.82	1.52	0.501
HIV status (Positive vs. Negative <sup>d</sup> )	1.33	1.00	1.86	0.102
Self-identified sexual relationship (Homosexual vs. bisexual <sup>d</sup> )	1.15	0.67	1.97	0.623
Used condom with most recent transactional partner (Did not use condom vs. Used condom <sup>d</sup> )	1.34	0.91	1.96	0.134
Used condom in receptive anal sex with last three partners (Did not use condom vs. Used condom <sup>d</sup> )	1.33	0.88	2.01	0.177
Used condom in insertive anal sex with last three partners (Did not use condom vs. Used condom <sup>d</sup> )	1.05	0.61	1.81	0.86

<sup>a</sup>APR = adjusted Prevalence Ratio. Each variable was adjusted for all the other variables in the table.

<sup>b</sup>LCL = 95% lower confidence level.

<sup>c</sup>UCL = 95% upper confidence level.

<sup>d</sup>Reference category for each variable. For example, those who have ever experienced verbal abuse were 1.9 times more likely to be depressed than those who have never experienced verbal abuse.

three partners (PR = 2.31, CI = 1.68–3.18) compared to those who used. The mean number of sexual partners within the last 6 months was significantly higher for the depressed participants than non-depressed participants (10.68 vs. 4.97,  $p = .001$ ). With regard to MSM network size, those who were depressed had higher indices of network size than those who were not depressed. Those who were depressed were significantly more likely to have seen more gay people who they know within the last one month (14.38 vs. 7.53,  $p = .001$ ).

Further analysis on MSM network size (not shown in table) reveal that gay/homosexual men had significantly larger network size compared to bisexual men (13 vs. 7,  $p < .001$ ). Furthermore, those who did not use condom in receptive anal sex with their last three partners had significantly larger network size (15 vs. 7,  $p < .001$ ) than those who used condom. Network size was significantly associated with number of sexual partners in the last six months ( $\rho = 0.260$ ,  $p < .001$ ).

Depression was significantly more prevalent among HIV-positive MSM compared to HIV-negative MSM (PR = 1.84, CI = 1.36–2.48).

Of all the variables in our Poisson regression model (Table 2), only one variable was significantly associated with depression. Those who have ever experienced verbal abuse had about twice the prevalence of depression compared to those that have never had verbal abuse (APR = 1.91, CI: 1.29–2.81).

## Discussion

Our study is one of very few studies that have assessed depression among MSM in Africa. We found a 46.3% prevalence of depression among our study sample. Our result is similar to the 44% and 56% prevalence reported in two other studies in South Africa (Stoloff et al., 2013; Tucker et al., 2013). We note that these three studies report depression prevalence that are higher than those

reported for MSM in high income countries. Studies among MSM in the USA and Australia report prevalence of depression ranging from 22.8% to 33% (Fendrich et al., 2013; Mao et al., 2009; Perdue et al., 2003; Reisner et al., 2009). We also note that some of the non-African studies used instruments that were different from our study. It is unlikely that the large difference in depression prevalence could have been entirely due to differences in instruments used. In fact, one of the South African studies used instruments similar to the studies in the USA and reported prevalence that were higher than those from the USA.

So what could be responsible for the high prevalence of depression among African MSM? Anti-gay laws, cultural stigma and human right abuses toward MSM may be contributory factors here (Itaborahy, 2012; Mayer et al. 2013). In the multivariate analysis, those who have ever experienced verbal abuse had significantly higher prevalence of depression compared to those who have never experienced verbal abuse (see Table 2). Additionally, 25%, 28% and 42% of the participants reported ever experiencing sexual, physical and verbal abuse, respectively. These abuses are likely related to their sexual orientation (Anderson, Ross, Nyoni, & McCurdy, 2015). Other African studies have reported similarly high prevalence of human right abuses ranging from 26% in Botswana to 60% in Lesotho (Baral et al., 2009, 2011, 2013).

Depression among African MSM presents a major concern for two reasons. One, MSM represents a high risk population for HIV. Two, Africa carries a greater burden of HIV compared to other regions of the world. In the bivariate analysis, being HIV positive, having a high number of sexual partners and engaging in unprotected receptive anal intercourse with the last three partners were associated with depression (see Table 1). Our data support findings from other studies that have found associations between depression and risky sexual behavior or

HIV infection (Fendrich et al., 2013; Perdue et al., 2003; Reisner et al., 2009; Tucker et al., 2013, 2014). Knowledge of HIV status cannot entirely explain the association between HIV and depression in our data since only five of the 64 HIV-positive men (7.8%) were aware of their status. The association may be mediated by risky sexual behavior. Further exploration of risky sexual behavior as a mediating factor between depression and HIV may be needed.

In regard to MSM Network size, bivariate analysis showed that network size was associated with self-identifying as homosexual (as opposed to bisexual), non-use of condom in receptive anal sex and having a large number of sexual partners in the last six months. These results suggest that a large network size may be fostering an environment for more casual relationships among MSM and engaging in risky sexual behavior which is associated with depression (see discussion above). Thus, those MSM with larger networks may be viable targets for public health interventions aimed at delivering HIV prevention and mental health services.

### Limitations

Our study has a few limitations including large number of MSM with no depression data (although further analysis did not show any significant difference between those with depression data and those missing depression data with respect to age, education, HIV status or city of residence), inability to make causal inferences on depression (because of the cross-sectional design) and reporting and recall bias. We also note that our findings may not be generalizable to older “closeted” MSM who were outside the primary network and cannot be reached by the recruitment process (RDS). Additionally, information bias could have resulted from research assistants influencing response of the research participants in their bid to clarify questions on the questionnaire. However, we do not envisage these limitations would have any significant impact our conclusions since we used structured and well validated instruments for our study (Adewuya et al., 2006; Monahan et al., 2009; Ross et al., 2010). Moreover, the research assistants received training on research techniques on preventing undue influence on participants’ responses.

### Conclusion

In summary, the study showed a high prevalence of depression and its association with abuse, sexual risk behaviors and HIV infection. The high prevalence of depression as well as its positive association with HIV risk behaviors among our study sample demonstrates

the need for assessing and addressing mental health needs among MSM. Researchers have acknowledged this complex interaction between HIV infection, high risk sexual behavior, stigma/abuse and depression and have suggested the co-location of mental health services with HIV services as a cost-effective means of addressing mental health among MSM (Fendrich et al., 2013; Stoloff et al., 2013).

### Disclosure statement

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