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Mindfulness, mental health and HIV outcomes among female sex workers in the Dominican Republic and Tanzania

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Abstract

We examined the relationship between mindfulness, mental health and HIV outcomes among female sex workers (FSW) from the Dominican Republic (DR) (n=201) and Tanzania (n=208) using cross-sectional survey and biologic data. We employed stratified multivariate linear and logistic regression. Depression was associated with lower odds of ART adherence in the DR (AOR

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• Authors' contributions

DK led the conceptualization and implementation of the overall study and manuscript; TK implemented the statistical analysis; YD, MP, HG, JM, SL led in country field work and reviewed and edited the paper; CB, WD, SWB, AM reviewed and edited the paper; NG was the lead statistician; and ES helped to conceptualize the analysis and wrote portions of the paper.

• Conflicts of interest/Competing interests

The authors have no conflicts of interest to declare.

• Ethics approval

The study was approved by the Institutional Review Boards of the Johns Hopkins Bloomberg School of Public Health in the United States, the IDCP in the DR, and MUHAS and the National Institute for Medical Research (NIMR) in Tanzania.

• Consent to participate

Not applicable

• Consent for publication

Not applicable

• Availability of data and material

Not applicable

• Code availability

Not applicable

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0.25, 95% CI: 0.08-0.78) and of viral suppression in Tanzania (AOR 0.49, 95% CI: 0.24-0.97). In both countries, mindfulness was associated with lower odds of moderate to severe depression (AOR 0.82, 95% CI: 0.76-0.88 for the DR; AOR 0.85, 95% CI: 0.77-0.95 for Tanzania). In the DR, mindfulness was associated with lower odds of anxiety (AOR 0.83, 95% CI: 0.77-0.89), lower HIV stigma (β=−0.28 per unit change, 95% CI: −0.37- −0.19) and greater odds of viral suppression (AOR 1.09, 95% CI: 1.02-1.15). Findings demonstrate the potential of tailored mindfulness interventions to improve mental health and HIV outcomes among FSW.

Resumen

Examinamosla relación entre la atención plena, la salud mental y los resultados del VIH entre las trabajadoras sexuales (TRSX) de la República Dominicana (RD) (n=201) y Tanzania (n=208) utilizando una encuesta transversal y datos biológicos. Empleamos regresión lineal multivariada estratificada y regresión logística. La depresión se asoció con menores probabilidades de adherencia al terapia antiretroviral (TAR) en la República Dominicana (AOR 0.25, IC del 95%: 0.08-0.78) y de supresión viral en Tanzania (AOR 0.49, IC del 95%: 0.24-0.97). En ambos países, la atención plena se asoció con menores probabilidades de depresión moderada a grave (AOR 0.82, IC del 95%: 0.76-0.88 para la República Dominicana; AOR 0.85, IC del 95%: 0.77-0.95 para Tanzania). En la República Dominicana, la atención plena se asoció con menores probabilidades de ansiedad (AOR 0.83, IC del 95%: 0.77-0.89), menor estigma del VIH (β=−0.28 por unidad de cambio, IC del 95%: −0.37- −0.19) y mayores probabilidades de supresión viral (AOR 1.09, 95% CI: 1.02-1.15). Los hallazgos demuestran el potencial de las intervenciones de atención plena para mejorar la salud mental y los resultados del VIH entre las TRSX.

Introduction

The global prevalence of HIV among female sex workers (FSW) is estimated to be 10.4% and FSW have a significantly heightened risk of being infected with HIV compared to women overall (1). While the global prevalence of HIV has declined significantly in the general population in recent years, prevalence trends among key populations such as female sex workers, have not declined at the same pace (1–3). Additionally, among FSW living with HIV, significant gaps exist along the HIV care continuum. Prior systematic reviews have revealed that less than half of FSW are estimated to have access to antiretroviral therapy (ART) and among those on ART, there are significant gaps in viral suppression (4). For example, baseline studies conducted among FSW in the Dominican Republic and Tanzania prior to their engagement in comprehensive community-driven interventions found that only 50% and 40%, respectively, of FSW were virally surpressed in those settings (5, 6).

Both their heightened risk for HIV infection as well as their suboptimal HIV care continuum outcomes have been linked to the multiple, intersecting forms of stigma, discrimination and violence faced by sex workers (7), and the broader structures and environments surrounding sex work, including policy and physicial environments (8). Similarly, socio-structural dynamics have also been linked to increased mental health challenges among FSW (9). For example, previous studies have demonstrated greater mental health conditions among FSW who have experience violence (10), work in street work environments (11, 12), identify as

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sexual or gender minority (13) and experience internalized stigma and have a lack of family support (14).

Several studies have shown that the prevalence of depression is greater than 50% among FSW (15–17), including in the Caribbean where studies in the Dominican Republic (DR) and Puerto Rico found that approximately 70% of FSW surveyed had elevated depressive symptoms (18, 19). Depression has been found to be associated with increased sexual risk behavior among FSW in several studies (9, 19). In addition to its link to HIV risk, a recent meta-analyses examining mental health among FSW in low- and middle-income countries found significant associations between depression and violence and substance use, respectively (20).While depression is also an established predictor of lower ART adherence among people living with HIV (PLHIV) overall (21), this relationship has not been well explored among FSW who are living with HIV.

There is growing evidence regarding the positive mental health effects of mindfulness or the process of "paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally" (22). A prior systematic review and meta-analysis found that mindfulness meditation interventions among adults with a clinical condition were associated with statistically significant reductions in both anxiety and depression, with an effect size of 0.38 [95% CI: 0.12-0.64] for anxiety and an effect size of 0.30 [95% CI: 0.00-0.59] for depression at eight weeks (23). Recent systematic reviews and meta-analyses examining the role of mindfulness among PLHIV have documented significant associations between mindfulness and mindfulness instruction interventions and better mental health, lower internalized HIV stigma, greater adherence to ART and improved HIV-related clinical outcomes such as higher CD4 count (24–28). The majority of these studies were conducted in higher-resource settings and few were conducted among marginalized groups which may experience intersectional stigma associated with multiple social categories reflecting interlocking systems of privilege and oppression (29).

We sought here to examine the association between mindfulness and mental health, as well as mindfulness and HIV outcomes among FSW to gain insights into the potential of mindfulness interventions to improve health and well-being in this population. We leveraged existing cohorts of FSW living with HIV in the DR and Tanzania to explore these relationships between contexts.

Methods

Study design and data collection procedures

The longitudinal observational study, "Stigma, cohesion and HIV outcomes among vulnerable women across epidemic settings" (R01MH110158), is being conducted with FSW living with HIV in the Dominican Republic and Tanzania. The study integrates biologic, survey and qualitative data to obtain a holistic understanding of the social determinants of HIV outcomes among FSW living with HIV between these countries. In both settings, women were eligible if they were 18 years or older, had a confirmed HIV-positive diagnosis and reported exchanging sex for money in the last month prior to their enrollment in the study. All participants were surveyed and had blood draws at 0-,

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12- and 24-month intervals. The current analysis draws on one round of cross-sectional quantitative survey data collected from 2017-2018.

In the DR, cohort recruitment occurred using a hybrid form of snowball sampling predominantly by FSW peer navigators, complemented by recruitment by other key informants such as clinicians and study participants (30). In Tanzania, FSW were recruited into the cohort using time location sampling to recruit venue-based FSW from two communities in the Iringa region (31).

Data collection occurred in private offices at the Instituto Dermatológico y Cirugía de la Piel (IDCP) in Santo Domingo, DR and Muhimbili University of Health and Allied Sciences (MUHAS) offices in Iringa, Tanzania. Surveys were interviewer-administered and conducted face-to-face using a pre-programmed tablet. Blood draws for viral load were conducted by trained study staff at the time of the survey in IDCP clinical offices in the DR and in field sites near venues or at the local MUHAS office in Iringa, Tanzania.

Measures

Primary outcome variables for the current analysis include ART adherence and viral suppression. Independent variables included mindfulness, depression and anxiety, as well as key sociodemographic and behavioral variables that may confound the potential associations between mindfulness and mental health, as well as mindfulness on HIV-related outcomes.

ART adherence and viral load: We measured self-reported adherence to ART using AIDS Clinical Trials Group (ACTG) measures including doses taken or missed over the last 4 days (32). ART adherence was dichotomized as perfect (took all doses each day) or less than perfect. We assessed HIV viral load in each setting using polymerase chain reaction (PCR) technology with the Roche Amplicor HIV-1 Monitor Test. Viral suppression was defined as <400 copies/mL.

Mental health: We assessed *depression* using the 9-item Patient Health Questionnaire (PHQ-9) (33), which characterizes the level of depression over the last two weeks. We assessed *anxiety* using the HADS-A, the anxiety component of the Hospital Anxiety and Depression Scale (HADS) (34), which contains 7 items related to anxiety over the last week. Both measures were found to be reliable, with a Cronbach's alpha (α) of 0.79 in DR and 0.82 in Tanzania for the HADS-A, and 0.87 in DR and 0.85 in Tanzania for the PHQ-9. These measures were dichotomized for the purposes of regression analyses with depression (PHQ-9) dichotomized as "minimal or no depression" (0-4) versus "mild/moderate/severe" (5 and above). Anxiety (HADS-A) was dichotomized as "normal" (0-7) versus "borderline abnormal/abnormal anxiety level" (8 and above). All cut-off categories were based on validated PHQ-9 and HADS-A measures (33, 34).

Mindfulness: We used the Cognitive and Affective Mindfulness Scale Revised (CAMS-R) (35) which is a 10-item measure designed to capture a broad conceptualization of mindfulness and assesses the individual's ability to be present and pay attention without judgment, using a 4-point Likert scale. The measure had good reliability with an α of 0.85

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for the DR and 0.78 for Tanzania. The CAMS-R was previously utilized in a number of geographic settings with good reliability (36–38).

Internalized HIV stigma: We utilized the Berger HIV Stigma Scale (39) to assess internalized HIV stigma. This measure included 8-items assessed on a 4-point Likert scale (30). Questions addressed whether participants felt bad or unworthy due to their HIV status (α=0.91 for DR and 0.88 for Tanzania).

Sexual partner violence: We used an adapted measure of the Conflict Tactics Scale (40) with expanded questions on perpetrator types. We assessed physical and sexual violence from intimate partners (e.g. boyfriends, husbands) as well as sex work related partners (e.g. new and regular clients) (41).

Substance use: We screened for historic (ever) and recent (last 6 months) substance use across a range of illicit drugs including cocaine, crack, heroin, marijuana, club drugs and methamphetamines. We assessed ever and current alcohol use including the frequency and quantity of drinking alcohol.

Statistical Data Analysis

Final multivariate models were developed in relation to the role of mindfulness on multiple outcomes including: depression, anxiety, HIV stigma, ART adherence and viral suppression. In building these models, we first explored the survey data descriptively, examining the frequency distribution of sociodemographic and behavioral characteristics and HIV outcomes for participating FSW between the settings, and the distribution of mental health, mindfulness and HIV stigma aggregate measures. We compared these characteristics, behaviors and aggregate measures as appropriate between the two countries using chi-square (categorial), t-tests (continuous, normally distributed) or Wilcoxon rank sum tests (continuous, not normally distributed). We conducted bivariate analyses followed by multivariate backward stepwise logistic regression for binary outcomes to identify factors associated with mental health (depression and anxiety) and HIV care continuum (ART adherence and viral suppression) outcomes. In the case of depression, we explored the potential role of mindfulness on varying levels of severity of depression (e.g. on moderate versus severe depression). For HIV stigma, we employed multivariate linear regression using the same steps above. Variables significant at the $p<=0.10$ level in bivariate analysis were included in multivariate modeling (42). Results from logistic regression are expressed as odds ratio (OR) and 95% confidence intervals (CI). Findings from linear regression are expressed as unstandardized beta coefficients (β) and 95% CI.

Ethical considerations

The study was approved by the Institutional Review Boards of the Johns Hopkins Bloomberg School of Public Health in the United States, the IDCP in the DR, and MUHAS and the National Institute for Medical Research (NIMR) in Tanzania. All participants provided oral informed consent prior to being enrolled and were compensated based on local standards in past studies with FSW at the end of each study visit.

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Results

Characteristics of the samples

Among our samples of FSW living with HIV in the DR and Tanzania, many socio-demographic and behavioral characteristics were significantly different ($p<0.001$) between the two settings, including: age, marital status, number of children and substance use (Table I). Whereas, for example, the median age was significantly older in the DR (40 years) versus Tanzania (31 years) ($p<0.001$). In both settings the minority of women were married or cohabitating (32.5% in DR and 23.1% in Tanzania) ($p<0.001$). The median number of children was 3 in the DR and 2 in Tanzania ($p<0.001$). While prior drug use was more prevalent in the DR (36.5%) compared to Tanzania (6.3%) ($p<0.001$), alcohol use frequency was higher in Tanzania, with 34.6% using alcohol 4 or more times per week compared to 9.0% in the DR ($p<0.001$). Sexual partner violence in the last 6 months was experienced by a greater percentage of FSW in Tanzania (33.2%) as compared to the DR (20.2%) ($p=0.004$).

When examining differences in aggregate measures for mental health conditions, internalized HIV stigma and mindfulness, we also observed significant differences between the two countries among FSW living with HIV. For depression, the mean score on the PHQ-9 was 8.05 (sd=5.91) in the DR compared to a score of 4.25 (sd=4.02) in Tanzania ($p<0.001$). For anxiety, the mean score on the HADS-A measure was 6.75 (sd=4.45) in the DR versus 5.05 (sd=4.11) in Tanzania ($p<0.001$). HIV stigma was also significantly higher among FSW living with HIV in the DR versus those in Tanzania (22.57 vs. 19.18; $p<0.001$). Additionally, the mean score on the CAMS-R measure for mindfulness was 29.53 (sd=5.63) among FSW in the DR compared to 24.77 (sd=5.83) those from Tanzania ($p<0.001$).

In terms of HIV characteristics and outcomes, we also observed significant differences between settings. Women in the DR (9.10 years) were aware of their HIV-positive status for a longer mean number of years than those in Tanzania (3.47 years; $p<0.001$). Self-reported ART adherence was similar among those on ART across settings at 83.2% in the DR and 83.8% in Tanzania ($p=0.89$). However, in the DR, 72.6% of FSW were found to be virally suppressed versus 48.5% in Tanzania ($p<0.001$). The greater level of viral suppression among FSW in the DR, despite similar levels of adherence, reflects the fact that a significantly greater percentage of women in that setting reported being on ART (90.0%) versus in Tanzania (76.3%; $p<0.001$).

Factors associated with mental health outcomes

Depression—In both the DR and Tanzania, we observed statistically significant associations between experiencing sexual partner violence as well as internalized HIV stigma and greater levels of depression among FSW living with HIV (Table II). FSW living with HIV in the DR had a greater odds of depression if they experienced sexual partner violence in the last 6 months (4.81; 95% CI: 1.33, 17.48) and a greater odds of depression for every unit increase of internalized HIV stigma (1.18; 95% CI: 1.06, 1.32). Similarly, FSW in Tanzania had a greater odds of depression (AOR 3.71; 95% CI: 1.83, 7.52) if they experienced sexual partner violence in the last 6 months and greater odds of depression per unit increase in internalized HIV stigma (AOR 1.06; 95% CI: 1.02, 1.10). Substance use,

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including alcohol use in the DR (AOR: 0.38; 95%CI: 0.13-1.10) and both alcohol use (AOR: 3.41; 95% CI: 0.92-12.67) and drug use (AOR: 4.95; 95% CI: 0.84-29.23) in Tanzania, were marginally associated with depression in the multivariate model.

In the DR, we found that greater mindfulness was associated with a lower odds of being depressed using the cut-off of minimal depression or greater (AOR 0.80; 95% CI: 0.73, 0.88). However, when we looked at the relationship between the level of mindfulness among participating FSW living with HIV and the odds of depression using the cut-off of moderate to severe depression or greater, we found significant statistical associations in both countries (AOR 0.82; 95% CI: 0.76, 0.88 for the DR; AOR 0.85; 95% CI: 0.77, 0.95 for Tanzania).

Anxiety—As seen in Table III, we observed the negative effects of internalized HIV stigma in relation to anxiety among FSW living with HIV in both the DR and Tanzania. In the DR, the odds of anxiety were 1.15 times greater (95% CI: 1.03, 1.28) and in Tanzania the odds of anxiety were 1.06 times greater (95% CI: 1.02, 1.10) per each unit increase in internalized HIV stigma. Sexual partner violence remained significantly associated with a greater odds of anxiety in multivariate logistic regression analyses only among FSW in Tanzania (AOR 2.64; 95% CI: 1.29, 5.37). In the DR only, we found mindfulness was significantly associated with a lower odds of anxiety (AOR 0.83; 95% CI: 0.77, 0.89).

Factors associated with HIV stigma

In the DR, greater scores on the mindfulness scale were significantly associated with less internalized HIV stigma (β=−0.28; 95% CI: −0.37, −0.19) (Table IV). Also in the DR, having more children (β=0.34; 95% CI: 0.03, 0.66) was associated with more HIV stigma and being aware of one's HIV status for more years was associated with less HIV stigma (β=−0.18; 95% CI −0.25, −0.11). No variables were found to be statistically significant with greater internalized HIV stigma in multivariate regression among FSW living with HIV in Tanzania at the $p<0.05$ level. Older age and prior drug use were found to be marginally significantly associated with internalized HIV stigma among FSW in Tanzania.

Factors associated with HIV care continuum outcomes

ART adherence and viral suppression—In multivariate analysis we observed the deleterious effects of depression on HIV care continuum outcomes among FSW living with HIV, with some variation between settings (Table V). We found that being depressed was significantly associated with a lower odds of self-reported ART adherence among FSW in the DR (AOR 0.25; 95% CI: 0.08, 0.78) and with a lower odds of viral suppression among FSW in Tanzania (AOR 0.49; 95% CI: 0.24, 0.97). Anxiety was borderline associated with a lower odds of self-reported ART adherence in Tanzania (AOR 0.39; 95% CI: 0.15, 1.02).

In both settings, each additional year of age was associated with viral suppression (AOR 1.05; 95% CI: 1.01, 1.09 in the DR and AOR 1.09; 95% CI: 1.04, 1.15 in Tanzania). Age was also associated with ART adherence in Tanzania only. Years living with HIV was significantly associated with a greater odds of adherence to ART in the DR (AOR 1.06; 95% CI: 1.01, 1.13). In the DR, we observed a significant association between mindfulness and viral suppression. Whereas for each unit increase in the mindfulness score, we observed

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a 1.09 times greater odds of participating FSW living with HIV being virally suppressed (AOR 1.09; 95% CI: 1.02, 1.15).

Discussion

Findings from this analysis of the role of mindfulness on depression and anxiety and HIV outcomes among FSW living with HIV in the DR and Tanzania highlight the burden of mental health challenges across these contexts. In line with the broader literature on mental health and HIV outcomes among PLHIV overall (21), moderate to severe depression was associated with suboptimal HIV outcomes among FSW living with HIV from both countries, including suboptimal ART adherence in both the DR and Tanzania, and lower levels of viral suppression in Tanzania. We also observed the critical role of socio-structural factors that underlie the increased likelihood of anxiety and depression among FSW living with HIV, including internalized HIV stigma and sexual partner violence. These factors were significantly correlated with poor mental health among current study participants and are known predictors of poor HIV prevention and treatment outcomes among FSW across geographic settings (6, 43–45).

Reinforcing the growing literature that mindfulness can act as a form of resilience to challenge or resist socio-structural constraints and to buffer or reduce related experiences of poor mental health (46–51), we found here that mindfulness was significantly associated with a lower odds of depression among FSW living with HIV in both the DR and Tanzania. Mindfulness was also associated with less anxiety and HIV stigma in the DR. These findings are particularly important given the high prevalence of depression and HIV stigma among FSW and their connection to suboptimal HIV outcomes among FSW and PLHIV overall. Longitudinal mixed methods research is needed to establish causal inferences related to the ways in which greater levels of mindfulness may work to improve mental health and HIV outcomes over time, as well as to better understand the dynamic and nuanced role that mindfulness may play in these pathways.

Though our results did not show strong association between substance use and depression in either setting, the literature indicates that some FSWs may engage in substance use to cope with stigma, discrimination and violence related to sex work (52). Further research is needed to unpack the relationship between mental health and substance use among this population and to explore the potential for mindfulness to reduce harmful levels of substance use among FSW.

The finding that mindfulness was significantly associated with increased viral suppression among FSW living with HIV in the DR is of particular interest given the importance of this outcome for individual health outcomes and population-level HIV transmission dynamics (53). The literature has documented the role of mindfulness on CD4 count among PLHIV (54–57). However, less attention has been paid to viral suppression. Previous mindfulness intervention research has demonstrated that HIV-infected youth who participated in a mindfulness-based stress reduction (MBSR) program in the United States were more likely to be virally suppressed than those in a health education control condition (25). Additionally, qualitative work in a subsequent randomized controlled trial of MBSR suggested improved

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ART adherence due to increased acceptance and reduced HIV stigma (26). While some studies show that mindfulness interventions can lead to enhanced immune function (58), further research is needed to understand if increased viral suppression associated with mindfulness is related to greater ART adherence, through improved mental health for example, and/or via immune function itself.

Research focused on adapting mindfulness instruction models to the needs of FSW living with HIV and evaluating their effects on mental health and HIV outcomes is warranted given study findings. This may include adapting and refining content to address the multiple forms of stigma and discrimination faced by FSW through mindfulness instruction curriculum and exercises. Specifically, future research should examine the role of mindfulness on sex work-related stigma and its potential role in depression and anxiety. Adaptation may also need to address the potential for tailored intervention delivery modalities taking into account the daily lives and work patterns of FSW given the implications that these dynamics may have for the feasibility and acceptability of individual versus group sessions or in-person versus electronic platforms. Additionally, longitudinal analyses on the relationships documented here cross-sectionally will be critical to further strengthen potentially causal relationships and their pathways over time.

This study has several limitations including the cross-sectional nature of the analysis, given that depression and anxiety can change over time, and the reliance on self-reported measures of variables such as adherence to ART, which introduces the potential for response bias. Differences in the two study populations and their social-cultural contexts may impact experiences related to mindfulness and mental health and thus, implicit bias may also have been a factor in relation to these measures and their associations with HIV-related outcomes. Variations in cultural understandings of key constructs such as depression and/or mindfulness in the DR and Tanzania may have influenced participants' reported responses and outcomes. However, findings document a strong relationship between mindfulness, mental health and HIV outcomes among FSW living with HIV in both of these settings, indicating the validity of the measures. There were also some variables that might be directly related to anxiety and depression that were not captured in the current analysis that will be important to address in future research (e.g social support). Finally, there is also bias introduced by the non-random sampling techniques utilized in these studies, and lack of matching used when comparing the two study populations.

Conclusions

Taken together, study findings underscore the need for further descriptive and intervention research on the role of mindfulness and mindfulness instruction interventions to improve the mental health and HIV outcomes of FSW and other groups of PLHIV across settings, particularly those with heightened vulnerability to depression and intersectional stigma.

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Table I.

Demographic, psychosocial and HIV-related characteristics among FSW living with HIV

Characteristics	Dominican Republic N = 200 Mean [SD] or n (%)	Tanzania N= 208 Mean [SD] or n (%)	Test Statistic*, p-value
Socio-demographics:			
Age in years	39.11 [9.02]	31.69 [7.44]	9.0375, <0.001
Marital Status			
Single, never married	48 (24.0%)	104 (50.0%)	
Currently married or cohabitating	65 (32.5%)	48 (23.1%)	29.7640, <0.001
Separated, Divorced or Widowed	87 (43.5%)	56 (26.9%)	
Number of children	2.78 [1.65]	2.03 [1.31]	4.9717, <0.001
Substance use:			
Drug use (ever)			
Yes	73 (36.5%)	13 (6.3%)	56.0854, <0.001
No	127 (63.5%)	195 (93.8%)	
Alcohol use			
Never	39 (19.5%)	62 (29.8%)	
Once a month or less	45 (22.5%)	14 (6.7%)	
2-4 times per month	40 (20.0%)	13 (6.3%)	68.7024, <0.001
2-3 times per week	58 (29.0%)	47 (22.6%)	
4 or more times per week	18 (9.0%)	72 (34.6%)	
Sexual partner violence (last 6 months):			
Yes	40[a] (20.2%)	59[b] (33.2%)	8.0965, 0.004
No	158[a] (79.8%)	119[b] (66.9%)	
Mental health:			
Depression (PHQ-9)	8.05 [5.91]	4.25 [4.02]	7.5618, <0.001
Minimal or none (0-4)	61 (30.5%)	131 (63.0%)	
Mild (5-9)	63 (31.5%)	54 (26.0%)	
Moderate (10-14)	45 (22.5%)	19 (9.1%)	58.0115, <0.001
Moderately severe (15-19)	23 (11.5%)	4 (1.9%)	
Severe (20-27)	8 (4.0%)	0 (0.0%)	
Anxiety (HADS-A)	6.75 [4.45]	5.05 [4.11]	3.9934, <0.001
Normal (0-7)	122[c] (64.9%)	153[d] (75.0%)	
Borderline (8-10)	32[c] (17.0%)	27[d] (13.2%)	4.9977, 0.082
Abnormal (11-21)	34[c] (18.1%)	24[d] (11.8%)	
Mindfulness (CAMS-R)	29.53 [5.63]	24.77 [5.83]	8.3679, <0.001
HIV characteristics, stigma and care continuum outcomes:			
Years living with HIV	9.10 [6.25]	3.47 [3.69]	10.9122, <0.001
Internalized HIV Stigma	22.57 [3.83]	19.18 [7.97]	5.3561, <0.001
Currently on ART	179[e] (90.0%)	148[h] (76.3%)	13.1198, <0.001

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Characteristics	Dominican Republic N = 200 Mean [SD] or n (%)	Tanzania N= 208 Mean [SD] or n (%)	Test Statistic*, p-value
ART adherence last 4 days	149[f] (83.2%)	124[i] (83.8%)	0.0174, 0.895
Virally suppressed	146[g] (72.6%)	99[d] (48.5%)	24.6205, <0.001

[a] *N=198,*

[b] *N=178,*

[c] *N=188,*

[d] *N=204,*

[e] *N=199,*

[f] *N=179,*

[g] *N=201,*

[h] *N=194,*

[i] *N=148*

* Chi-square tests for categoral variables and Welch's t-tests for continuous variables

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Table II.

Multivariate logistic regression models for experiencing depression among FSW living with HIV

	Dominican Republic (n=197)				Tanzania (n=165)			
	Mild to Severe Depression		Moderate to Severe Depression		Mild to Severe Depression		Moderate to Severe Depression	
	AOR	95% C.I.	AOR	95% C.I.	AOR	95% C.I.	AOR	95% C.I.
Age					1.05**	1.00, 1.11		
Never drinking alcohol			0.38*	0.13, 1.10			3.41*	0.92, 12.67
Ever used drugs							4.95*	0.84, 29.23
Sexual partner violence	4.81**	1.33, 17.48			3.71***	1.83, 7.52	5.58***	1.65, 18.87
Internalized HIV stigma	1.18***	1.06, 1.32	1.22***	1.09, 1.37	1.06***	1.02, 1.10	1.08***	1.02, 1.13
Mindfulness	0.80***	0.73, 0.88	0.82***	0.76, 0.88			0.85***	0.77, 0.95

*** p<0.01,

** p<0.05,

* p<0.10

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Table III.

Multivariate logistic regression models for experiencing anxiety among FSW living with HIV

	Dominican Republic (n=197)		Tanzania (n=165)	
	AOR	**95% C.I.**	**AOR**	**95% C.I.**
Years living with HIV	1.06*	0.99, 1.13		
Sexual partner violence			2 64***	1.29, 5.37
Internalized HIV stigma	1.15**	1.03, 1.28	1.06***	1.02, 1.10
Mindfulness	0.83***	0.77, 0.89		

*** p<0.01,

** p<0.05,

* p<0.10

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Table IV.

Multivariate linear regression models for experiencing internalized HIV stigma among FSW living with HIV

	Dominican Republic (n=197)		Tanzania (n=165)	
	Beta Coefficient	**95% C.I.**	**Beta Coefficient**	**95% C.I.**
Age			−0.17 *	−0.35, 0.00
Years living with HIV	−0.18 ***	−0.25, −0.11		
Number of children	0.34 **	0.03, 0.66		
Ever used drugs			−3.02 *	−6.22, 0.17
Mindfulness	−0.28 ***	−0.37, −0.19		

*** p<0.01,

** p<0.05,

* p<0.10

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Table V.

Multivariate logistic regression models for ART adherence and viral suppression among FSW living with HIV

	Dominican Republic				Tanzania			
	Adherence (n=177)		Viral Suppression (n=197)		Adherence (n=120)		Viral Suppression (n=161)	
	AOR	95% C.I.	AOR	95% C.I.	AOR	95% C.I.	AOR	95% C.I.
Age			1.05**	1.01, 1.09	1.09**	1.00, 1.18	1.09***	1.04, 1.15
Years living with HIV	1.06**	1.01, 1.13						
Anxiety (Borderline to abnormal) Normal (Ref)					0.39*	0.15, 1.02		
Depression (Mild to severe) Minimal or no depression (Ref)	0.25**	0.08, 0.78					0.49**	0.24, 0.97
Mindfulness			1.09***	1.02, 1.15				

*** p<0.01,

** p<0.05,

* p<0.10