Structural, interpersonal, psychosocial, and behavioral risk factors for HIV acquisition among female bar workers in Dar es Salaam, Tanzania

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In sub-Saharan Africa where sex work is often criminalized and highly stigmatized, female bar workers (FBWs) often serve as informal sex workers. However, little is known about the prevalence of HIV and HIV-related risk factors among FBWs in Dar es Salaam (DSM), Tanzania. Using an adapted Structural HIV Determinants Framework, we identified structural, interpersonal, psychosocial, and behavioral risk factors for HIV acquisition. We compared the prevalence of these risk factors and the prevalence of HIV among a random sample of 66 FBWs from DSM to an age-standardized, representative sample of female DSM-residents using data from the Tanzanian 2016 Demographic and Health and 2011-2012 AIDS Indicator Surveys. We found that, compared to other women in DSM, FBWs had elevated prevalence of all four groups of risk factors, often substantially so. Key risk factors included gender and economic inequalities (structural); sexual violence and challenges negotiating condom use (interpersonal); depression, post-traumatic stress disorder, and low social support (psychosocial); and history of unprotected sex, multiple sex partners, and frequent high alcohol consumption (behavioral). However, the HIV prevalence did not differ between FBWs (7.1%, 95% CI 3.7-13.3%) and survey respondents (7.7%, 95% CI: 5.3-11.1%), perhaps due to FBWs' higher – but still sub-optimal – engagement with HIV prevention strategies including condom use and HIV testing. FBWs' elevated exposure to structural, interpersonal, psychosocial, and behavioral risk factors for HIV acquisition but low HIV prevalence suggests that economic, psychosocial, and biomedical interventions to prevent HIV acquisition among FBWs in DSM are warranted.

Keywords: Tanzania, Female Bar Workers, Sex risk behaviors, HIV prevalence, HIV prevention

Introduction

Reducing HIV incidence in key populations, (e.g. men who have sex with men, transgender individuals, and female sex workers (FSW) is critical to controlling HIV

epidemics (Beyrer et al., 2014). Key populations' vulnerability to HIV stems from both structural and interpersonal risk factors that operate beyond individuals' control (e.g. poverty, stigma, and intimate partner violence) and individual-level psychosocial and behavioral risk factors (e.g. drug use and participation in high-risk sex) (Rhodes et al., 2012; Shannon, Goldenberg, Deering, & Strathdee, 2014). These structural, interpersonal, psychosocial, and behavioral risk factors generate specific HIV prevention and treatment needs among key populations. In Sub-Saharan African countries facing generalized HIV epidemics, these needs are often overlooked, leaving members of key populations vulnerable to HIV acquisition and undermining national efforts to reduce HIV incidence (Djomand, Quaye, & Sullivan, 2014; Mpondo, Gunda, & Kilonzo, 2017).

In Tanzania, one population likely facing elevated HIV risk is female bar workers (FBWs) (Hoffmann et al., 2004; Mgalla and Pool, 1997; Talle, 1995, 1998). . FBWs, also known as barmaids, sell or deliver drinks to customers in commercial bars and, in sub-Saharan Africa (SSA), where formal sex work is often criminalized and stigmatized, often serve as informal sex workers (Harcourt and Donovan, 2005). Although similar to formal FSW in many respects, FBWs typically do not self-identify as sex workers, have fewer sexual partners, necessarily encounter partners in environments with alcohol consumption, and exchange sex for material goods and other benefits, blurring the line between commercial sex work and non-commercial transactional sex (Dambach et al., 2018; Harcourt and Donovan, 2005; Stoebenau, Heise, Wamoyi, & Bobrova, 2016). Tanzanian policy is to prioritize HIV prevention and treatment among FSW and other key populations (Ministry of Health, Community Development, Gender, Elderly and Children [MoHCDGEC] and National AIDS Control Programme [NACP], 2017); however, criminalization of sex work limits the scope and

number of HIV prevention and treatment interventions targeted at FSW (Mpondo, et al., 2017). To our knowledge, no HIV programs are currently targeting FBWs. Understanding the specific HIV risk profiles faced by FBWs could inform the development of future HIV prevention and treatment programs that target these potentially vulnerable women.

Previous research indicates that Tanzanian FBWs often engage in behaviors placing them at risk of HIV acquisition, including having multiple sexual partners (Ostermann et al., 2015), having unprotected sex (Ao, Sam, Masenga, Seage, & Kapiga, 2006; Riedner et al., 2003; Rosenheck, Ngilangwa, Manongi, & Kapiga, 2010; Tassiopoulos et al., 2006), and high alcohol consumption (Akarro, 2009; Ao, et al., 2006). FBWs are also exposed to structural and interpersonal risk factors including poverty, gender inequality, and interpersonal violence (Beckham, 2013; Talle, 1995, 1998). HIV prevalence among FBWs has been correspondingly high (19-68%) with precise estimates varying by geography, year, and the extent to which FBWs were distinguished from other high-risk groups (Ao, et al., 2006; Kapiga et al., 2002; Mhalu et al., 1987; Mhalu et al., 1991; Riedner, et al., 2003; Vallely et al., 2007). However, with few exceptions (Beckham, 2013; Ostermann, et al., 2015), research on Tanzanian FBWs has been based on data gathered before 2005. In Dar es Salaam (DSM), one of the largest cities in Africa, the most recent estimate of HIV prevalence among FBWs (52%), is from 1991 (Mhalu, et al.), so little is known about the HIV risks currently faced by this population.

In this paper, we use data from a random sample of FBWs working in DSM to describe the structural, interpersonal, psychosocial, and behavioral HIV-related risk factors faced by FBWs. We contextualize these results by comparing FBWs' HIV risk profile and HIV prevalence to an age-standardized, representative sample of women

from DSM. By better understanding FBWs' HIV risk profile, we hope to identify strategies to prevent HIV among FBWs.

Methods

Participants

Data on FBWs came from a two-stage cross-sectional study conducted in January 2017. We randomly selected eight bars from a book provided by the Kinondoni District Medical Officer, which listed over all licensed bars in DSM's Kinondoni district. Field workers scheduled interviews with each bar's licensee and explained the study to bar managers and FBWs. After arriving at the bar and obtaining approval from the bar manager, we created a list of all women who were 18 years or older and working as a FBW at the time of study visit. Between 6 and 12 FBWs – depending on the time available at the bar and the length of each interview – were chosen at random from that list to participate in an interview that collected data on socio-demographics and HIV-related risk factors followed by optional HIV counselling and testing (HCT). Each participant provided written informed consent. To ensure privacy, interviews were conducted in a nearby three-wheel taxi (*bajaji*) with closed sides. Ethics approval was granted by the Tanzanian National Institute for Medical Research and Harvard T.H. Chan School of Public Health. As the primary aim of the original study was to prove the feasibility of working with barmaids in Dar es Salaam, no formal power calculations were conducted for this study.

Data on our comparison group comes from the Tanzanian 2016 Demographic and Health Survey (TDHS) (MoHCDGEC, Ministry of Health [MoH], National Bureau of Statistics [NBS], Office of the Chief Government Statistician [OCGS], & ICF, 2016) and the Tanzanian 2011-12 AIDS Indicator Survey (TAIS) (Tanzania Commission for

AIDS [TACAIDS], Zanzibar AIDS Commission [ZAC], NBS, OCGS, & ICF International, 2013). These cross-sectional surveys were designed to calculate representative statistics for DSM. We compared FBWs to the subpopulation of survey respondents who were female, residing in urban DSM, and, to mirror the age distribution of the FBWs, aged 18-44 (Graubard and Korn, 1996).

Measures

HIV risk factors

Using a version of the Structural HIV Determinants Framework (Shannon, et al., 2014) we identified variables collected among the FBWs that reflected structural, interpersonal, psychosocial, and behavioral risk factors for HIV (Figure 1). Structural risk factors included socioeconomic characteristics, access to reproductive healthcare, and workplace environment. Interpersonal risk factors included exposure to violence and condom negotiation with clients. Psychosocial risk factors included depression, PTSD, social support, and stigmatizing attitudes about HIV/AIDS. Behavioral risk factors included sexual behaviors, HIV testing, and substance use. Whenever possible, we harmonized variables collected among FBWs to those collected in the TDHS, or, if comparable data was unavailable from the TDHS, the TAIS (details in Supplemental Table 1). We defined unmet need for modern contraception, a marker for access to reproductive healthcare, as the proportion of women not using barrier methods, hormonal contraception, Long-Acting Reversible Contraception (LARCs), or sterilization among those who reported sexual activity in the past 12 months and were not pregnant or seeking to become pregnant. Psychosocial risk factors were assessed using the PHQ-9 depression scale with moderate to severe depressive symptoms defined using a cut-off of ≥10 (Kroenke, Spitzer, & Williams, 2001); the primary care PTSD

screen, which uses a cut off of ≥3 (PC-PTSD) (Prins et al., 2003); a version of the Duke-UNC Functional Social Support Questionnaire adapted for Tanzanian women, which uses a cut-off of <3 (Antelman et al., 2001); and an 8-item version of the AIDS-related stigma scale with scores ranging from 1 (low stigma) to 5 (high stigma) (Kalichman et al., 2005). Questions about unintended pregnancies and, because Tanzania criminalizes induced abortion, pregnancies ending in either a termination or a miscarriage were used as a marker for a history of unprotected sex. We defined binge drinking as consuming ≥6 drinks on a single occasion (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998). Statistics on monthly income were converted into 2016 international dollars.

Data analysis

We generated descriptive statistics on employment and workplace environment for all FBWs, and calculated additional statistics among FBWs reporting ever participating in bar-based sex work. We calculated proportions for categorical variables and means and standard errors for continuous variables, with standard errors accounting for bar-level clustering using Taylor series linearization (Wolter, 2007).

When comparing FBWs to TDHS or TAIS respondents, we adjusted for the survey design of the TDHS or TAIS and accounted for clustering within either sampling clusters (among TDHS or TAIS respondents) or bars (among FBWs). We used sampling weights provided by the TDHS or TAIS to create a representative comparison group of women in DSM. All FBWs received a weight of one since they were randomly selected from the Kinondoni FBW population. To control for confounding, we directly standardized statistics to the age distribution of the FBWs. We compared FBWs to TDHS or TAIS respondents using Rao-Scott corrected F-statistics for categorical variables and Wald tests for continuous variables. For HIV prevalence, we conducted

sensitivity analyses where all and none of the women who declined HCT were HIV-positive. All analyses were conducted in STATA 14.2 (StataCorp. 2015, College Station, TX, USA).

Results

All 66 FBWs approached to participate in the study agreed. Our comparison groups of non-FBWs consisted of 679 female respondents to the TDHS and 497 female respondents to the TAIS (Figure 2).

Structural risk factors

FBWs had similar educational attainment and food security to non-FBWs (Table 1). FBWs were more likely to have been born outside of DSM (91% vs. 69%) but not outside of Tanzania. While both groups were equally likely to have living children, FBWs were usually unmarried and four times more likely to be single mothers. Access to reproductive health care was limited in both groups and, although unmet need for modern contraception was greater among non-FBWs (54%) than among FBWs (42%), fewer FBWs had heard of cervical cancer (70% vs. 95%).

Most FBWs had worked as a FBW for less than two years and only 5% planned to continue for over a year (Table 2). FBWs' mean monthly income was $320. Thirty-two percent had no previous employment, but others had worked as a street food vendor (*mamalishe*), petty vendor, housemaid, or in other food service positions. Most FBWs believed that at least some FBWs, both within DSM (97%) and within their bar (84%), engaged in bar-based sex work. Half of FBW reported engaging in commercial sex work themselves, and 35% reported engaging in bar-based sex work.

Interpersonal Risk Factors

FBWs reported experiencing physical abuse as both children (35%) and adults (39%). However, non-FBWs were equally likely to have been physically abused as an adult (Table 3). All FBWs reporting physical abuse at work were abused by clients, rather than managers or other FBWs. FBWs were seven times more likely to have experienced sexual violence than non-FBWs as children (14% vs. 2%), and almost three times more likely as adults (32% vs. 12%).

Among FBWs engaging in bar-based sex work, we observed high concordance between the average number of nightly clients and the average number of nightly clients with whom condoms were used (91%). However, FBWs did not consistently negotiate condom use with their clients. Only 13% always requested that clients use condoms, and 65% of FBWs would agree to forgo condoms in at least some circumstances (Table 4).

Psychosocial risk factors

Using the PHQ-9, 20% of FBWs screened positive for depressive symptoms and 21% screened positive on the Primary Care PTSD screening tool. Additionally, 58% of FBWs reported low social support on the adapted Duke-UNC Functional Social Support Questionnaire. FBWs reported low levels of stigmatizing attitudes on the AIDS-related stigma scale with an average score of 1.5 (SE=0.05).

Behavioral risk factors

FBWs had the same age of sexual debut, were equally likely to have been pregnant, and had the same age at first pregnancy as non-FBWs. However, they were substantially more likely to have had an unintended pregnancy (52% vs. 34%), significantly more likely to have had a pregnancy end in a termination or miscarriage (46% vs. 22%), and

had over twice as many non-commercial sex partners in the last 12 months (Table 5). FBWs consumed alcohol more frequently than non-FBWs, and 32% of FBWs who drank reported binge drinking at least once per month. Only one FBW used drugs other than alcohol in the past 12 months. Despite elevated behavioral risk factors, FBWs reported greater engagement in HIV prevention activities than non-FBWs, including using barrier methods for contraception (59% vs. 33%, Table 1), having ever received an HIV test (97% vs. 85%, Table 5), and having received an HIV test in the past 12 months (72% vs. 48%).

HIV prevalence

Among the 56 FBWs participating in HCT, HIV prevalence was 7.1% (95% CI: 3.7-13.3%), which was not significantly different from the age-standardized HIV prevalence of the general population, 7.7% (95% CI: 5.3-11.1%). We would have observed an HIV prevalence of 6.1% if all the FBWs who declined testing were HIV-negative and 21% if all FBWs who declined testing were HIV-positive.

Discussion

FBWs in DSM tend to be unmarried migrants to DSM. Similar findings have been reported elsewhere in Tanzania (Ao, et al., 2006; Hoffmann, et al., 2004; Kapiga, et al., 2002; Vallely, et al., 2007), suggesting that bar work can provide economic independence to unmarried women living away from their families (Mgalla and Pool, 1997; Talle, 1995). However, the FBWs' in this study reported a short duration of employment and were disinterested in working as a FBW for over a year. Their entry into bar work may reflect the fact that many alternative jobs listed in their employment histories have also been associated with low wages, informal sex work, and elevated HIV risk (Vallely, et al., 2007). Although the FBWs' mean monthly income ($320) is

similar to that of other self-employed female workers in DSM ($322), it is lower than that of paid female employees in DSM ($435) and much lower than the mean monthly incomes of self-employed or paid male employees in DSM ($641 and $692, respectively) (NBS, 2014). These results suggest unmarried women in DSM lack viable employment opportunities and that economic and gender inequality are important structural risk factors for HIV acquisition among FBWs.

Relative to other women in DSM, FBWs were also exposed to more interpersonal, behavioral, and psychosocial risk factors for HIV acquisition. These risk factors include sexual violence, participation in commercial sex work, a history of unprotected sex, multiple non-commercial sex partners, and frequent heavy alcohol consumption. Although data on psychosocial risk factors was not available from the TAIS or TDHS, the prevalence of depressive symptoms (20%) and PTSD (21%) among FBW is higher than the prevalence of common mental disorders among women living in a nearby DSM demographic surveillance site (3.1%) (Jenkins, Mbatia, Singleton, & White, 2010). However, FBWs are more also engaged with HIV prevention interventions, including condom use and HIV testing, than the general DSM population. Their engagement is underscored by low levels of stigmatizing attitudes about HIV and high participation (85%) in the HCT services offered as part of the study. Engagement with HIV prevention services may explain why, despite facing many risk factors for HIV acquisition, FBWs did not have a higher HIV prevalence than the general population. This engagement with preventative services may also indicate that FBWs are aware of their elevated risk for HIV acquisition, willing to engage in additional preventative strategies to compensate for this risk, and poised to benefit from additional HIV preventative services.

The HIV prevalence among the FBWs (7.1%) was much lower than that reported among FBWs working in DSM in 1991 (52%) (Mhalu, et al., 1991) or among FBWs working in transportation corridors and border towns in the early-to-mid 2000s (19-68%) (Ao, et al., 2006; Kapiga, et al., 2002; Riedner, et al., 2003; Vallely, et al., 2007). Even if all the FBWs in this study who declined HCT had been HIV-positive, the prevalence (21%) would have been lower than most previous estimates. This decline in HIV prevalence likely reflects several factors. First, overall HIV prevalence in DSM declined between 2003 (10.9%) and 2017 (4.7%) (MoHCDGEC, MoH, NBS, OCGS, & ICAP, 2017; TACAIDS, NBS, & ORC Macro, 2005). Second, FBWs in DSM may be at lower risk of HIV acquisition than FBWs working in transportation corridors and border towns, who engage with a transient client population and may consequently belong to a broader sexual network with more HIV-positive partners. Third, FBWs and their clients appear to have adopted risk-reduction strategies: while studies from the mid-2000s found that approximately half of FBWs were never using condoms (Ao, et al., 2006; Kapiga, et al., 2002), we found a high concordance between the average number of nightly clients and the average number of nightly clients with whom condoms were used.

The prevalence of HIV among FBWs (7.1%) was also lower than a recent estimate of HIV prevalence among FSWs in DSM (32%) (Vu and Misra, 2018) . Relative to Tanzanian FSWs, the FBWs in our study reported fewer commercial partners, less drug and alcohol use, less exposure to physical or sexual violence, and increased HIV testing (Ministry of Health and Social Welfare & NACP, 2014), . Although bar work is sometimes viewed as synonymous with (Talle, 1995) or a gateway to (Ingabire et al., 2012; Mbonye et al., 2012) commercial sex work, these results and the results of others (Hoffmann, et al., 2004; Messersmith et al., 2014)

support the idea that FSWs and FBWs are not homogenous groups and may have different HIV prevention and treatment needs.

Although HIV prevalence was lower than expected, FBWs are still a key population for HIV prevention. First, FBWs' short employment duration could obscure high HIV incidence in this population. Second, FBWs have multiple commercial and non-commercial sex partners, so a large portion of new HIV infections may occur among sexual partners of HIV-positive FBWs. Third, despite FBWs' engagement in HIV prevention services, condom use remains imperfect and appears to depend on the preferences of male clients.

Our findings suggest several opportunities for HIV prevention among FBWs. Structural risk factors of economic and gender inequality could be addressed through political advocacy, economic empowerment, and occupational training. Because many FBWs are single mothers, economic interventions could also include support for childcare and education fees. The high prevalences of binge drinking, depression, PTSD, sexual and physical abuse, and low social support suggest FBWs may also benefit from access to mental health care and other social support. In addition to preventing HIV, these interventions could promote general well-being. Finally, as has been noted elsewhere (Lees et al., 2009), FBWs struggle to negotiate condom use with clients and are strong candidates for HIV prevention strategies over which they can exercise direct control, such as pre-exposure prophylaxis (PrEP). Fifty-four percent of FBWs in this study expressed interest in oral PrEP, suggesting that FBWs may be an ideal population for conducting PrEP demonstration projects (Harling et al., in press). While interventions that simultaneously address multiple levels of risk may be most effective at HIV prevention (Shannon, et al., 2014), the broad scope of possible interventions suggests that government agencies, healthcare workers, non-governmental

groups, and FBWs themselves could all contribute to the reduction of risk among FBWs.

Our study also has some limitations. Although the FBWs reflect a random sample drawn from a full enumeration of licensed bars in DSM's Kinondoni district and can be assumed to be representative of FBWs in this region, our small sample size limits our study's power. Additionally, data was self-reported and may suffer from social desirability bias. We sought to minimize this bias by conducting interviews in private and would not expect differential bias across the surveys; however, some findings could be explained if FBWs were more willing to discuss stigmatizing behaviors than survey respondents. Finally, some variables collected among FBWs could not be perfectly harmonized to the TDHS or TAIS. While imperfect, we did manage to make meaningful comparisons for all variables presented and have clearly described possible discrepancies in the supplemental material.

Despite facing many structural, interpersonal, psychological, and behavioral risk factors for HIV acquisition, FBWs working in DSM did not have a significantly higher HIV prevalence than other women in the city. We observed a substantially lower HIV prevalence than seen in previous FBW studies, which may be explained by FBWs' high engagement in HIV prevention as well as the general decline in HIV prevalence in DSM. Despite this encouraging finding, targeted HIV prevention strategies among FBWs, including economic and psychosocial interventions and the provision of PrEP, are still warranted.

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Disclosure statement

The authors declare that they have no conflict of interest

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Table 1: Age distribution and structural risk factors for HIV acquisition among Female Bar Workers (FBWs) compared to respondents of the Tanzanian Demographic Health Survey (TDHS) or AIDS Indicator Survey (TAIS). All variables except age are standardized to the age distribution of the FBWs.

	FBWs (N=66)	TDHS (N=679) or TAIS (N=497) Respondents	p-value
AGE[1]			0.11
15-19	3%	12%	
20-24	35%	23%	
25-29	35%	20%	
30-34	17%	18%	
35-39	5%	17%	
40-44	6%	10%	
SOCIOECONOMIC CHARACTERISTICS			
Educational Attainment			0.13
No education	2%	3%	
Incomplete primary	6%	5%	
Complete primary	42%	46%	
Incomplete secondary	23%	7%	
Complete secondary	27%	33%	
Higher Education	0%	6%	
Migrant to DSM[2]	91%	69%	0.001
Migrant to Tanzania[2]	2%	2%	0.96
Difficulty meeting household food needs			
Never	62%	70%	0.14
Seldom	24%	16%	
Sometimes	12%	7%	
Often	2%	6%	
Always	0%	1%	
HOUSEHOLD STRUCTURE			
Marital Status			<0.001
Never married	68%	27%	
Currently Married/cohabitating	12%	60%	
Separated/Divorced/Widowed	20%	13%	
Have any children	70%	72%	0.71
Single mother	64%	17%	<0.001
ACCESS TO REPRODUCTIVE HEALTH CARE			
Unmet need for modern contraception[3]	42%	54%	0.04
Barrier Method[4]	59%	33%	0.01
Combined hormonal contraception[4]	9%	16%	0.43
LARC Method[4]	47%	43%	0.66
Heard of cervical cancer[2, 5]	70%	95%	<0.001

[1]Not age-standardized; [2]See appendix for details on harmonization; [3]Proportion not using barrier, combined hormonal contraception, or LARC methods among those reporting sexual activity in the past 12mo. & not pregnant or seeking to become pregnant. [4]Among those whose need for contraception was met; [5]Data from TAIS 2012

Table 2. Workplace environment among Female Bar Workers (FBWs) (N=66).

	% or mean (SE)
Length of employment as FBW	
<1 year	35%
1-2 years	26%
3-5 years	20%
≥5 years	20%
Number of bars worked at	
1	39%
2	32%
≥3	29%
Plan to work as FBW for >1 year	5%
Previous employment	
None	32%
Street food vendor	11%
Other food service	17%
Petty vendor	18%
Housemaid	8%
Other	15%
Monthly income (2016 International Dollars)	320 (31)
Believe FBWs in DSM have sex with patrons	97%
Believe FBWs at this bar have sex with patrons	84%
Ever engaged in commercial sex work	50%
Ever engaged in bar-based sex work	35%

Table 3. Exposure to violence among Female Bar Workers (FBWs) compared to respondents of the Tanzanian Demographic Health Survey (TDHS). All variables are standardized to the age distribution of the FBWs and are reported as % or mean (SE).

	FBWs (N=66)	**TDHS Respondents (N=679)**	**p-value**
Physically abused age <15	35%	---	
Physically abused age ≥15	39%	32%	0.59
Identity of physical abuser[1]			
Non-client Partner	38%	74%	0.0003
Parent	31%	16%	0.10
Sibling	8%	6%	0.70
Other relative	8%	1%	0.01
Someone at work	12%	0%	<0.001
Other	27%	6%	0.07
Sexually abused age <15	14%	2%	<0.001
Sexually abused, ever	32%	12%	<0.001
Identity of sexual abuser[2, 3]			
Non-client partner	25%	40%	0.46
Relative	13%	1%	0.02
Male Friend/Acquaintance	44%	31%	0.35
Someone at work	5%	1%	0.29
Other	0%	11%	0.25

[1]Among those reporting physical abuse after age 15; [2]See appendix for details on harmonization; [3]Among those reporting sexual abuse;

Table 4. Condom negotiations with bar-based clients among FBWs reporting bar-based sex work (N=23).

	% or mean (SE)
Number of clients per night	2.3 (.2)
Number of clients used condom with per night	2.1 (.1)
FBW requests condom use	
Always	13%
Often	61%
Sometimes	4%
Seldom	13%
Never	9%
Client requests to forgo condom	
Never	13%
Seldom	35%
Sometimes	35%
Often	17%
FBW agrees to forgo condom	
Never	35%
Seldom	35%
Sometimes	22%
Often	4%
Always	4%

Table 5. Exposure to behavioral risk factors for HIV acquisition and HIV prevalence among Female Bar Workers (FBWs) compared to respondents of the Tanzanian Demographic Health Survey (TDHS) or AIDS Indicator Survey (TAIS). All variables are standardized to the age distribution of the FBWs and are reported as % or mean (SE).

	FBWs (N=66)	TDHS (N=679) or TAIS (N=497) Respondents	p-value
SEXUAL & REPRODUCTIVE BEHAVIORS			
Age at first sex	18 (.3)	18 (.2)	0.23
Ever pregnant	85%	78%	0.27
Age at first pregnancy[1, 2]	20 (.6)	20 (.2)	0.51
Ever unintended pregnancy[1, 2]	52%	34%	0.06
Ever terminated/miscarried pregnancy[1, 2]	46%	22%	<0.001
Non-commercial sex partners in last 12 mo[1, 3]	2.2 (0.3)	0.9 (0.04)	<0.001
SUBSTANCE USE			
Alcohol consumption			<0.001
No alcohol	42%	82%	
Less than weekly	41%	13%	
More than weekly	17%	5%	
Binge drinking ≥1 per month[4]	32%	---	
Number of drinks in the past 14 days[4]	8.6 (2.8)	---	
Any drug use in past 12mo.	2%	---	
HIV TESTING			
Ever received HIV test[3]	97%	85%	0.02
Months Since Last HIV test[3, 5]			0.02
0-<6mo	45%	25%	
6-<12mo	27%	22%	
12-<24mo	9%	17%	
≥24mo	19%	35%	
Received results of last HIV test[3, 5]	98%	96%	0.37
HIV Prevalence[6]	7.1%	7.7%	0.98

[1]See appendix for details on harmonization; [2] Calculated among ever pregnant women; [3]Data comes from TAIS 2012; [4]Among those who consume alcohol; [5]Among those ever receiving an HIV test; [6]Among those consenting to HIV testing

Supplemental Table 1: Comments on variable harmonization

Variable	*Construction in the TDHS/TAIS*	*Construction among FBWs*
Migrant to DSM	DHS respondents were considered migrants to DSM unless the respondent reported having always lived in the same city.	FBW were considered migrants to DSM if they reported being born elsewhere.
Migrant to Tanzania	DHS respondents were considered migrants to TZ if they reported having lived outside of TZ before moving to DSM.	FBW were considered migrants to TZ if they reported being born elsewhere.
Ever pregnant	DHS respondents were considered "ever pregnant" if they report at least one living child, termination, or miscarriage, or current pregnancy.	FBWs directly reported if they had ever been pregnant
Age at first pregnancy	DHS respondents reported age of first birth.	FBWs reported age of first pregnancy
Ever undesired pregnancy	Asked only among TDHS respondents who were currently pregnant or had been pregnant since 2010.	Asked of all women reporting a pregnancy
Non-commercial sex partners in last 12mo	The TAIS does not distinguish between commercial and non-commercial partners. However, as no TAIS respondents in the sample reported more than 4 sexual partners in the past 12 months, we assumed that all reported partners were non-commercial	FBWs reported number of partners excluding those who paid to have sex.
Heard of cervical cancer	Respondents to the TDHS were provided with a description of cervical cancer	Respondents to the TDHS were not provided with a description of cervical cancer
Identity of sexual abuser	DHS respondents were asked to report the identity of their first sexual abuser	FBWs were asked to report the identity of any sexual abusers

Figure 1. Structural HIV Determinants Framework adapted from Shannon et al. (2014)

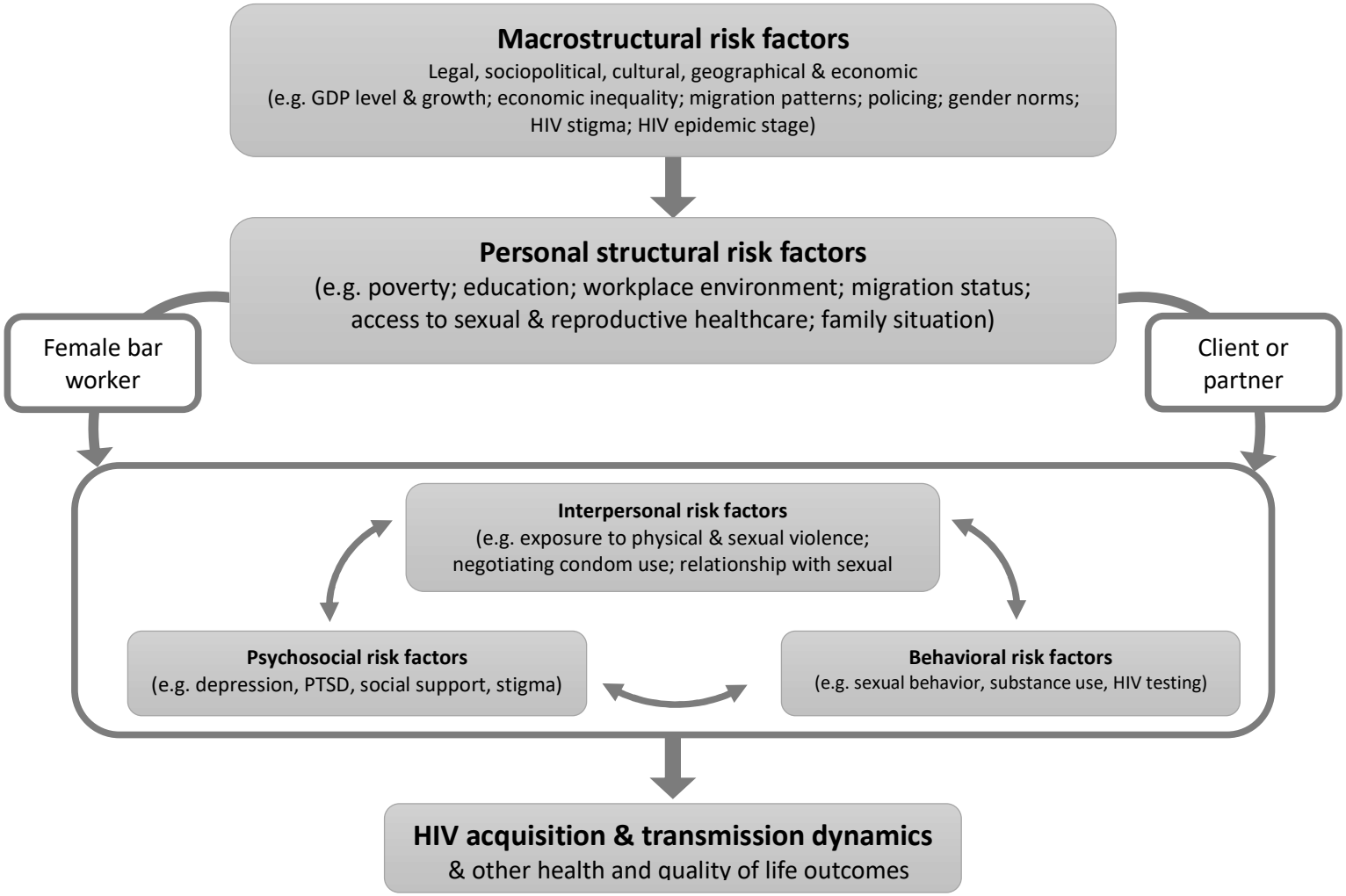
Macrostructural risk factors
Legal, sociopolitical, cultural, geographical & economic
(e.g. GDP level & growth; economic inequality; migration patterns; policing; gender norms; HIV stigma; HIV epidemic stage)
Personal structural risk factors
(e.g. poverty; education; workplace environment; migration status; access to sexual & reproductive healthcare; family situation)
Female bar worker
Client or partner
Interpersonal risk factors
(e.g. exposure to physical & sexual violence; negotiating condom use; relationship with sexual
Psychosocial risk factors
(e.g. depression, PTSD, social support, stigma)
Behavioral risk factors
(e.g. sexual behavior, substance use, HIV testing)
HIV acquisition & transmission dynamics
& other health and quality of life outcomes

Figure 2. Flow chart describing analytic subpopulations of Female Bar Workers (FBWs), Tanzania Demographic and Health Survey (TDHS) respondents, and Tanzania AIDS Indicator Survey (TAIS) respondents