Patterns of inconsistent condom use and risky sexual behaviors among female sex workers in Mozambique

Rachid Muleia[1*], Auria Ribeiro Banze[1], Shelsea Luís Damião[2] and Cynthia Semá Baltazar[1]

Abstract

Background Female sex workers (FSWs) in Mozambique face significant health risks, including high HIV prevalence, combination of factors, including inconsistent condom use, engagement in risky sexual behaviors, and various socio-ecological determinants of health. Understanding the determinants of these practices is crucial for developing targeted interventions.

Methods This cross-sectional study analyzed data from the second round of Biobehavioral Survey (BBS) conducted from 2019 to 2020 in five urban areas to examine determinants of inconsistent condom use and risky sexual behaviors among FSWs. Modified Poisson regression models were used to assess the effect of various socio-demographic, economic, and behavioral factors on the outcomes, providing adjusted relative risk (aRR) with 95% confidence intervals (CI).

Results Among the 2,565 FSWs who reported inconsistent condom use, younger FSWs (15–24 years old, 29.1%), single (27.3%), with secondary or higher education (26.1%), nationals (25.9%), and residents of Tete City (30.5%) had a higher prevalence of inconsistent condom use. Initiating sex work < 18 years (31.0%), binge drinking (23.7%), and experiencing physical violence (29.0%) were significantly associated with this behavior. Among the 2,564 FSWs reporting risky sexual behaviors, a higher prevalence was observed in FSWs aged 15–24 (75.6%), those with secondary or higher education (75.8%), nationals (74.4%), and those residing in Quelimane (87.3%). Early sexual debut (< 15 years, 79.3%), initiating sex work before 18 years of age (77.7%), and illicit drug use (82.2%) were all associated with increased risky sexual practices. Inconsistent condom use among FSWs was significantly associated with residing in Tete (aRR = 2.4, 95% CI: 1.77–3.25), not being aware of female condom (aRR = 1.22, 95% CI: 1.03–1.45) and having experienced sexual a physical violence. Moreover, being married was significantly linked to risky sexual behavior among female sex workers (aRR = 1.27, 95% CI: 1.19–1.37), along with initiating sexual activity before age 15, having at least five years of sex work experience, engaging in binge drinking, and experiencing sexual and physical violence.

Conclusion The study highlights the complex set of factors as age, education, geographic location, years of sex work services, early sexual debut, and illicit drug use that influence sexual risks behavior among FSWs in Mozambique. Tailored interventions addressing not only sexual health education and services, but also economic empowerment and illicit drug use is imperative for mitigating these risks.

*Correspondence:
Rachid Muleia
rachid.muleia@ins.gov.mz

Full list of author information is available at the end of the article

Background

Globally, female sex workers (FSWs) face a disproportionately high burden of HIV infection. In 2022, the prevalence of HIV among FSWs was four times that of the general adult population (aged 15–49 years), highlighting a significant public health challenge among this key population [1]. This elevated risk among FSWs stems from several interrelated factors, including engagement with multiple sexual partners, inconsistent condom use, and limited access to HIV prevention services [2–5].

Effective HIV and other sexually transmitted infection (STI) prevention critically relies heavily on using condoms correctly and consistently during sexual activities. While there are multiple prevention methods available, such as pre-exposure prophylaxis (PrEP), condom use remains a key strategy for reducing HIV transmission, particularly among high-risk populations like FSWs. Condoms offer a dual protection advantage, reducing the risk of both HIV and other STIs. However, FSWs often struggle to negotiate condom use due to power imbalances with their male clients, who are their main source of income [4, 6]. This challenge is intensified by factors beyond financial dependence, such as social stigma, gender inequality, and laws that marginalize sex work. FSWs risk violence, coercion, or financial loss if they advocate for condom use, further increasing their vulnerability [7, 8]. Societal views on sex work further restrict their access to legal aid and support, isolating them and complicating their efforts to promote safer sex. Moreover, the criminalization of sex work in various places prevents them from seeking justice for abuses and accessing health services freely, perpetuating their risk and marginalization [7–9].

The global ambition to end the HIV epidemic by 2030, as outlined by the Joint United Nations Programme on HIV/AIDS (UNAIDS), underscores the vital role of comprehensive prevention strategies, including widespread condom use [10]. Achieving this ambitious target requires significant progress in reducing new HIV infections and enhancing access to prevention tools across all populations, particularly among high-risk groups such as FSWs [10, 11]. Condom use not only serves as a cornerstone for preventing HIV transmission but also represents a broader commitment to sexual health and rights by empowering individuals to take control of their sexual health, ensuring safer sex practices, and promoting gender equality and autonomy in sexual relationships [7, 11].

Mozambique, in particular, faces one of the world's most severe HIV epidemics. The Mozambique Population-based HIV Impact Assessment (PHIA), INSIDA 2021, reports an HIV prevalence of 12.5%, rising to 15.4% among women of reproductive age [12]. The epidemic is generalized, affecting a wide cross-section of the population, but certain groups, such as FSWs, are disproportionately impacted. Results from the most recent Biobehavioral Survey (BBS) conducted among FSW in Mozambique during 2019/20, highlight the vulnerability of this group to HIV, with significant regional variations in prevalence: 46.5% in Maputo, 16.3% in Beira, 36.3% in Tete, 24.8% in Quelimane, and 10.2% in Nampula [13]. Recognizing the acute vulnerability of FSWs to HIV, Mozambique's National HIV Strategic Plan (PEN) has prioritized them as a key population for intervention [14].

The country has been implementing a variety of intervention programs aimed at curbing HIV transmission among FSWs. These include promoting HIV counseling and testing, as well as enhancing condom use, and providing targeted education on safer sex practices [14, 15]. While progress has been noted in Mozambique evidenced by increased condom use during the last sexual encounter with clients, challenges remain, particularly regarding consistent condom use with both casual partners (non-client partners) and commercial partners. Data from the first BBS (2011–2012) indicate that condom use during the last encounter with the most recent client was reported by 85.8% of FSWs in Maputo, 73.4% in Beira, and 62.8% in Nampula, however, condom use with non-client partners was significantly lower, suggesting gaps in prevention efforts [5].

Previous studies conducted in Mozambique among this population have found that inconsistent condom use is prevalent among FSWs, influenced by clients' refusal to use condoms and the higher payments offered for unprotected sex [5]. Additionally, younger FSWs, those with lower levels of education, and those who had experienced violence were more likely to engage in risky sexual behaviors [5, 16, 17]. In addition to inconsistent condom use, having multiple non-commercial sexual partners and engaging in anal sex have been identified as significant contributors to the transmission of HIV and other STIs among FSWs. Non-commercial partners are often viewed as "trusted" partners, leading to lower rates of condom negotiation and use, which can increase vulnerability to HIV infection. Anal sex, another component of risky sexual behavior, carries a significantly higher risk for HIV transmission compared to vaginal sex due to the fragility of rectal tissue, which can lead to tearing and facilitate the entry of the virus. Among FSWs, anal sex is often practiced in exchange for higher payments, further complicating the dynamics of risk negotiation and creating a multifaceted challenge for intervention efforts [18–20].

In Southern Africa, particularly Mozambique, sex work walks a tightrope. The legal system doesn't explicitly criminalize it, but related activities pose constant risk of arrest. This ambiguity creates fear, pushing FSWs to operate in the shadows [17, 21]. As a result, essential healthcare services, including STI testing, treatment, and access to condoms, can become out of reach due to fear of legal repercussions.

Condom negotiation with male clients is crucial for the safety of FSWs and plays a significant role in their overall ability to prevent HIV transmission. The current study aims to assess the associations of FSWs' characteristics with inconsistent condom use and risky sexual behaviors during the second round of the BBS conducted in Mozambique from 2019 to 2020. Understanding these associations is vital to improve preventive interventions, informing policy formulation and program design that could significantly enhance the health outcomes of FSWs and their communities.

Methods

Study design

To investigate the factors associated with inconsistent condom use and risky sexual practice among FSW in Mozambique, we utilized data from the second round of the BBS conducted in 2019–2020, collected through a standardized structured questionnaire that was based on the WHO 2017 bio-behavioral survey guidelines for populations at risk of HIV [22], adapted to the Mozambican context and is available as supplementary material accompanying this manuscript. The BBS covered five urban cities: Maputo, Beira, Tete, Quelimane, and Nampula.

This cross-sectional survey was designed to gather a wide range of information on socio-demographic characteristics, behavioral factors related to HIV (e.g., sexual history, condom use, alcohol and other illicit drug use), other STI, and access to health services and healthcare-seeking behavior. FSWs participating in the study were recruited using respondent-driven sampling (RDS), a peer recruitment methodology that is particularly effective for reaching high-risk and hidden populations [22]. In this approach, initial participants (seeds) are selected based on their network size, and are given coupons to invite peers from their network to join the study.

Data collection was carried out by trained interviewers who administered face-to-face interviews using a structured questionnaire in a private and confidential setting. The interviews were conducted at designated study sites, chosen based on accessibility and convenience for the participants. Prior to the interview, informed consent was obtained from all participants. The structured questionnaire was designed to minimize recall bias and social desirability bias by asking clear, specific questions. The data collected were then entered into a secure database, ensuring the confidentiality and integrity of the data. Further details regarding the survey methodology, including sample size calculation and the application of the RDS methodology, are provided elsewhere [5, 14].

The study recruited 419 FSW in Maputo, 521 in Beira, 519 in Tete, 514 in Quelimane, and 519 in Nampula. The sample size calculation for each city followed the WHO 2017 bio-behavioral survey guidelines for key populations [22]. Participation in the study was subject to the following eligibility criteria: being 15 years or older (18 were considered emancipated minors and were therefore allowed to provide written informed consent to participate in the survey); report receiving money or goods in exchange for sex from someone other than a steady partner in the six months preceding the survey; live, work or socialize in the survey area; and, have a valid referral coupon.

Study measures

The present study aims to analyze two primary outcomes: inconsistent condom uses with clients and risky sexual behavior. The classification of sexual behavior as "risky" can vary depending on cultural, gender, age differences, and defined thresholds [23]. Inconsistent use of condoms with clients was measured considering two survey questions: "*the last time you had sex with the last client did you use condom? and the last time you had sex with your second to last client, did you use a condom?*" FSW were considered to have multiple partners if they had more than one fixed sexual partner in the month before the survey, while regarding anal sex, they were asked whether they have ever had anal sex. Fixed partners are defined as non-commercial, steady partners with whom the FSW has an ongoing sexual relationship.

The risky sexual behavior outcome was built upon the combination of different aspects related to FSWs' HIV risk behaviors and vulnerability. FSWs were considered to *have engaged in risky sexual behavior if they reported inconsistent condom use with any sexual partner, engaging with multiple fixed non-commercial sexual partners and anal sex practice* [23–25]. The risky sexual behavior outcome is a binary variable, assigned a value of 1 if the FSW has engaged in any of these behaviors and 0 otherwise.

Exploratory variables considered in this study were chosen based on previous empirical studies and their availability in the dataset [26–29]. They included socio-demographic, behavioral and sexual history factors. Socio-demographic variables included age, education level, religion, marital status, monthly income, additional income other than sex work, years of sex work service, and where the FSW get their clients. Additionally, we consider, abusive alcohol consumption (AUDIT-C)

[30] and illicit drug consumption. These variables were included because substance abuse has been consistently linked to impaired judgment and increased likelihood of engaging in unprotected sex, which elevates the risk of HIV and other STIs [31–34]. For sexual history, we considered factors such as age at sexual debut, age at first sexual intercourse in exchange for money and number of clients in the last month before the survey. We also considered comprehensive knowledge of HIV, STI self-report, HIV testing in the last 12 months, experience of physical and sexual violence in the last 12 months.

Statistical analysis

For this study, we employed bivariate and multivariate analysis. The bivariate analysis was used to present the prevalence of the outcome variables with respect to socio-demographics and other sex work related variables and to identify potential candidate variables for the multivariate analysis. Moreover, we used Pearson's Chi-square test to assess the association between the outcome variables and the explanatory variables. Multivariate analysis was performed using Poisson regression with robust standard errors, also termed modified Poisson regression, to identify socio-demographic and sex work related characteristic that influence the outcome variables. Though the outcome variables are binary, modified Poisson regression was applied as this approach has been proved to be suitable for common outcomes [35–37]. Additionally, logistic regression, when applied to frequent outcome, tends to overestimate the magnitude of the association between the outcome variable and exposure [38]. Furthermore, the modified Poisson regression allows for the estimation of risk ratio while accounting for covariates without substantially altering the size of the effect, whereas logistic regression suffers from non-collapsibility [39, 40]. Prior to multivariate analysis, we ran a bivariate modified Poisson regression to identify potential candidate variables to be included in the multiple modified Poisson regression. Variables that were significant at 25% in the bivariate modified Poisson regression were selected for the multivariate analysis. Although the data used in this study was collected through RDS, all the analyses were unweighted. Additionally, several studies show that unweighted regression outperforms the weighted regression [41, 42]. Furthermore, the modified Poisson regression was assessed for multicollinearity, and variable with higher variance inflation factor (VIF>5) were excluded from the model. In addition, variables that had a significant amount of missing data were excluded from the multivariate analysis. The final model was assessed for Goodness-of-fit using the Pearson's Chi-square statistic.

Herein, the results are presented in the form of percentages and adjusted risk ratio accompanied with their respective 95% confidence intervals (CI). All the analyses were conducted using the R statistical software version 4.2.2 [43]. Statistical significance was assessed at 5% significance level. The presented P-values in the tables are associated with the bivariate analysis. For the multivariate regression, all significant results are reported in bold.

Results

Inconsistent condom use

In our study, we analyzed data from 2,565 FSWs participants who reported inconsistent condom use (Table 1). The results show that 25.6% of FSWs reported inconsistent condom use. Younger FSWs aged 15–24 have a higher prevalence of inconsistent condom use at 29.1% compared to older FSWs, as well as single FSWs at 27.3%. Those with secondary education or higher have a prevalence of 26.1%, while Mozambican nationals have a 25.9% rate.

FSWs participants from Tete City showed the highest rate of inconsistent condom use (30.5%, $p<0.001$), while Maputo had the lowest (13.4%, $p<0.001$). FSWs participants who reported their first sexual experience before age 15 (28.5%, $p<0.001$) and those who started sex work before age 18 (31.0%) had significantly higher rates of inconsistent condom use compared to their counterparts who had their first sexual experience at 15 year or older (24.0%) and those who began sex work at 18 or older (21.1%, $p<0.001$).

Additionally, FSWs who do not engage in other forms of work besides sex work, and those with a large volume of sexual clients (3–4 clients) reported higher rates of inconsistent condom use at 26.9% and 28.3%. The analysis also identified that illicit drug use, and experiences of violence as critical factors related to condom use among FSWs. Binge drinking was significantly associated with inconsistent condom use, with a prevalence of 23.7% ($p=0.007$). HIV testing in the last 12 months was significantly associated with inconsistent condom use, where individuals who reported not testing had a prevalence of inconsistent condom use of 30.2% ($p<0.001$). The impact of violence was profound, as the results also revealed a statistically significant association between physical violence experience and inconsistent condom use (29.0%, $p<0.001$) as well as sexual violence and inconsistent condom use (34.2%, $p<0.001$), underscoring the intertwined relationship between violence, illicit drug use, and sexual health risks.

Risky sexual behavior

We also analyzed 2,564 FSWs participants for risky sexual behavior (Table 1). The results reveal that 74.1% of FSWs have once engaged in risky sexual behavior. Furthermore, the findings indicate a notably higher prevalence of risky sexual behavior among younger FSWs aged 15–24 years

Table 1 Association between socio-demographic and sex work-related characteristics with inconsistent condom use and risky sexual behavior among FSWs, Mozambique 2019-20

Characteristics	Inconsistent condom use (N = 2565)			Risky Sexual Behavior (N = 2564)		
	No	Yes	P-value	No	Yes	P-value
Age						
Median (min-max)	22 (15–59)			22 (15–59)		
15–24	1050 (70.9)	431 (29.1)	<0.001	362 (24.4)	1119 (75.6)	0.068
25+	849 (79.2)	223 (20.8)		297 (27.7)	774 (72.3)	
Marital status						
Single	1107 (72.7)	415 (27.3)	0.04	393 (25.8)	1129 (74.2)	<0.001
Married	134 (73.6)	48 (26.4)		19 (10.4)	163 (89.6)	
Divorced/Separated/Widowed	666 (77.4)	194 (22.6)		250 (29.1)	609 (70.9)	
Educational level						
Primary	581 (75.4)	190 (24.6)	0.463	227 (29.5)	543 (70.5)	0.006
Secondary/High	1321 (73.9)	467 (26.1)		433 (24.2)	1355 (75.8)	
Religion						
No religion/other	299 (73.6)	107 (26.4)	0.938	93 (22.9)	313 (77.1)	0.001
Catholic	565 (74.0)	199 (26.0)		175 (22.9)	588 (77.1)	
Muslim	268 (75.1)	89 (24.9)		84 (23.5)	273 (76.5)	
Protestant	775 (74.9)	260 (25.1)		311 (30)	724 (70.0)	
Mozambican nationality	1735 (74.1)	607 (25.9)	0.288	600 (25.6)	1741 (74.4)	0.439
City						
Maputo	425 (86.6)	66 (13.4)	<0.001	172 (35.1)	318 (64.9)	<0.001
Beira	377 (72.5)	143 (27.5)		155 (29.8)	365 (70.2)	
Tete	360 (69.5)	158 (30.5)		107 (20.7)	411 (79.3)	
Quelimane	373 (72.1)	144 (27.9)		102 (19.7)	415 (80.3)	
Nampula	373 (71.9)	146 (28.1)		127 (24.5)	392 (75.5)	
Age at first intercourse						
<15	617 (71.5)	246 (28.5)	0.016	179 (20.7)	684 (79.3)	<0.001
>=15	1281 (76.0)	405 (24.0)		480 (28.5)	1205 (71.5)	
Age at first commercial sex						
<18	795 (69.0)	358 (31.0)	<0.001	257 (22.3)	896 (77.7)	<0.001
>18+	1106 (78.9)	296 (21.1)		405 (28.9)	996 (71.1)	
Location of commercial sex						
Street/other	158 (70.2)	67 (29.8)	0.303	55 (24.4)	170 (75.6)	0.816
Bar/Disco/Restaurant	652 (74.3)	225 (25.7)		224 (25.5)	653 (74.5)	
Hotel/Motel/Guesthouse	1098 (75.1)	365 (24.9)		384 (26.3)	1078 (73.7)	
Sex work monthly income						
<3500	625 (71.0)	255 (29.0)	0.024	224 (25.5)	656 (74.5)	0.905
3500–6500	586 (74.6)	200 (25.4)		196 (24.9)	590 (75.1)	
>6500	634 (76.8)	192 (23.2)		214 (25.9)	612 (74.1)	
Years of sex work service						
<3	656 (73.7)	234 (26.3)	0.139	258 (29.0)	632 (71.0)	0.036
3–4	606 (72.7)	228 (27.3)		203 (24.3)	631 (75.7)	
5+	637 (76.7)	193 (23.3)		201 (24.2)	628 (75.8)	
Condom cost						
Free	797 (77.2)	235 (22.8)	0.100	283 (27.4)	748 (72.6)	0.013
Cheap	928 (73.4)	336 (26.6)		302 (23.9)	962 (76.1)	
Expensive	172 (73.8)	61 (26.2)		75 (32.2)	158 (67.8)	
Number of sexual clients in the last month						
0–2	563 (73.0)	208 (27.0)	0.398	181 (23.5)	590 (76.5)	0.124
3–4	327 (71.7)	129 (28.3)		131 (28.7)	325 (71.3)	
5+	703 (74.9)	235 (25.1)		238 (25.4)	700 (74.6)	
Most recent HIV result						

Table 1 (continued)

Characteristics	Inconsistent condom use (N = 2565)			Risky Sexual Behavior (N = 2564)		
	No	Yes	*P*-value	No	Yes	*P*-value
Never tested	235 (62.2)	143 (37.8)	< 0.001	103 (27.2)	275 (72.8)	< 0.001
Positive	412 (77.2)	122 (22.8)		174 (32.6)	359 (67.4)	
Negative	1255 (76.2)	391 (23.8)		383 (23.3)	1263 (76.7)	
Knowledge of female condom	536 (79.2)	141 (20.8)	0.001	168 (24.9)	508 (75.1)	0.514
Have another source of income	586 (77.3)	172 (22.7)	0.031	191 (25.2)	567 (74.8)	0.666
Ever used drugs	244 (71.3)	98 (28.7)	0.188	61 (17.8)	281 (82.2)	< 0.001
Binging drinking (AUDIT-C)	1164 (76.3)	361 (23.7)	0.007	372 (24.4)	1152 (75.6)	0.047
STI self-report, last six months	556 (71.6)	220 (28.4)	0.04	177 (22.8)	599 (77.2)	0.023
HIV testing, last 12 months	1188 (77.4)	347 (22.6)	< 0.001	385 (25.1)	1150 (74.9)	0.318
Have comprehensive HIV knowledge	950 (76.6)	290 (23.4)	0.014	306 (24.7)	933 (75.3)	0.21
Ever experienced sexual violence	513 (65.8)	267 (34.2)	< 0.001	152 (19.5)	628 (80.5)	< 0.001
Ever experienced physical violence	952 (71.0)	388 (29.0)	< 0.001	312 (23.3)	1028 (76.7)	0.002
Overall	1908 (74.4)	657 (25.6)		663 (25.9)	1901 (74.1%)	

(75.6%). Additionally, FSWs with secondary or higher education levels exhibited increased rates of risky sexual behavior (75.8%, *p*=0.006), as did FSWs residing in Quelimane city (87.3%, *p*<0.001). Moreover, the results show a statistically significant association between religion and risky sexual behavior, with FSWs professing the Catholic religion and those with no religion showing a higher prevalence (77.1%, *p*=0.001).

FSWs participants who reported their first sexual encounter before the age of 15 (79.3%, *p*<0.001) and those who initiated sex work before reaching the age of 18 (77.7%, *p*<0.001) were found to have higher rates of risky sexual behavior. Furthermore, FSWs who reported illicit drug use exhibited higher rates of engaging in risky sexual practices (82.2%, p=<0.001), highlighting the influence of illicit drug use on sexual health behaviors. It is also noted that FSWs who tested negative in their last HIV test had a higher prevalence of risky sexual behavior (76.7%, *p*<0.001).

Determinants of condom use and risky sexual behavior among FSW

Modified Poisson regression shows that inconsistent use of condom is significantly related to site of study, knowledge of female condom, experience of sexual and physical (Table 2).

Geographic differences were pronounced; FSWs participants from Beira, Tete, Quelimane, and Nampula exhibited a significantly higher risk of inconsistent condom use than those from Maputo, with Tete showing the most substantial risk (aRR=2.40, 95% CI:1.77–3.25). Furthermore, the results reveal that FSWs who were not aware of female condom were more likely to report inconsistent condom use (aRR=1.22, 95% CI: 1.03–1.45). The results further revealed that FSWs who reported ever experiencing sexual violence were 38% more likely to

report inconsistent condom use when compared to those who never experienced sexual violence (aRR=1.38, 95% CI: 1.19–1.61). Similarly, FSWs who reported ever experiencing physical violence had a higher risk of engaging in inconsistent condom use as compared to FSWs who never had an event of physical violence (aRR=1.22, 95% CI: 1.05–1.42). From the results, it is also observed that, although not significant, FSWs who use illicit drugs are more likely to report inconsistent condom use. Likewise, FSWs who do not have a comprehensive knowledge of HIV have a higher risk of reporting inconsistent condom use.

With regards to risky sexual behavior, the results show that married FSWs have a higher likelihood of engaging in risky sexual behavior when compared to non-married FSWs (aRR=1.22, 95% CI: 1.05–1.42). The results also show that the risk of engaging in risky sexual practices is higher among FSWs from the city of Tete, Quelimane and Nampula as compared to FSWs from Maputo city. Moreover, the results show that FSWs who initiated sexual activity after the age of 15 were less likely to engage in risky sexual behavior (aRR=0.94, 95% CI: 0.89–0.99). The results further show that FSWs with five or more years of sex work are more likely to engage in risky sexual behavior when compared to those with less than three years of sex work service (aRR=1.11, 95% CI: 1.03–1.19). FSWs who use illicit drugs also have a higher likelihood of engaging in risky sexual behaviors (aRR=1.07, 95% CI: 1.00-1.14). On the other hand, the results show that FSWs who do not consume alcohol abusively have a lower risk of engaging in risky sexual behavior (aRR=0.92, 95% CI: 0.87–0.97). Moreover, we note that FSWs who experienced sexual violence have an increased likelihood of engaging in risky sexual behavior (aRR=1.06, 95% CI: 1.00-1.12).

Table 2 Multiple modified Poisson regression model for inconsistent condom uses and risky sexual behavior

	Inconsistent Condom Use			Risky sexual behavior		
	Bivariate		Multivariate	Bivariate		Multivariate
	RR (95% CI)	*P*-value	aRR (95% CI)	RR (95% CI)	*P*-value	aRR (95% CI)
Age						
15–24	Ref					
25+	0.71 (0.62–0.82)	<0.001	0.89 (0.71–1.11)	0.96 (0.91-1)	0.064	0.98 (0.91–1.05)
Marital status						
Single	Ref					
Married	0.97 (0.75–1.25)	0.797	1.25 (0.95–1.64)	1.21 (1.14–1.28)	<0.001	**1.27 (1.19–1.37)**
Divorced/Separated/Widowed	0.83 (0.71–0.96)	0.010	1 (0.83–1.20)	0.96 (0.91–1.01)	0.089	0.97 (0.90–1.03)
Educational level						
Primary	Ref					
Secondary/High	1.06 (0.92–1.23)	0.431		1.07 (1.02–1.13)	0.007	1.06 (0.99–1.12)
Religion						
Catholic	Ref					
Muslim	0.99 (0.81–1.21)	0.909	-	1.00 (0.94–1.07)	0.991	0.99 (0.91–1.07)
Protestant	0.95 (0.74–1.21)	0.653	-	0.99 (0.92–1.07)	0.839	0.98 (0.88–1.08)
Other	0.95 (0.79–1.16)	0.630	-	0.91 (0.85–0.97)	0.064	0.95 (0.88–1.02)
Nationality						
National	Ref					
Immigrant	0.87 (0.67–1.11)	0.239	0.82 (0.61–1.10)	0.96 (0.89–1.05)	0.412	-
City of residence						
Maputo	Ref					
Beira	2.05 (1.57–2.66)	<0.001	**1.80 (1.30–2.49)**	1.08 (0.99–1.18)	0.074	1.06 (0.96–1.17)
Tete	2.27 (1.75–2.94)	<0.001	**2.25 (1.68–3.01)**	1.22 (1.13–1.32)	<0.001	**1.32 (1.20–1.45)**
Quelimane	2.07 (1.59–2.70)	<0.001	**1.86 (1.36–2.53)**	1.24 (1.14–1.34)	<0.001	**1.22 (1.10–1.35)**
Nampula	2.09 (1.61–2.72)	<0.001	**2.26 (1.64–3.12)**	1.16 (1.07–1.26)	<0.001	**1.19 (1.06–1.33)**
Age at first intercourse						
<15	Ref					
15+	0.84 (0.74–0.97)	0.013	1.01 (0.88–1.17)	0.90 (0.82–0.99)	<0.001	**0.94 (0.89–0.99)**
Age sex work						
<18	Ref					
18+	0.68 (0.6–0.78)	<0.001	0.84 (0.71-1)	0.91 (0.87–0.96)	<0.001	0.98 (0.92–1.04)
Location of commercial sex						
Street	Ref					
Bar/Disco/Restaurant	0.86 (0.68–1.08)	0.204	0.83 (0.63–1.09)	0.99 (0.83–1.17)	0.732	-
Hotel/Motel/Guesthouse	0.84 (0.67–1.04)	0.114	0.96 (0.76–1.23)	0.98 (0.83–1.15)	0.552	-
Monthly income						
<3500	Ref					
3500–6500	0.88 (0.75–1.03)	0.105	0.88 (0.75–1.04)	1.01 (0.95–1.06)	0,808	-
6500+	0.8 (0.68–0.94)	0.007	**0.81 (0.68–0.97)**	0.99 (0.94–1.05)	0,830	-
Years of sex work service						
<3 years	Ref					
3–5 years	1.04 (0.89–1.22)	0.624	1.08 (0.92–1.27)	1.07 (1.01–1.13)	0.029	1.06 (1.00-1.13)
5+years	0.88 (0.75–1.04)	0.144	1.12 (0.9–1.38)	1.07 (1.01–1.13)	0.026	**1.11 (1.03–1.19)**
Have another income aside of sex work						
Yes	Ref					
No	1.18 (1.02–1.38)	0.029	1.08 (0.92–1.27)	0.99 (0.94–1.04)	0.628	-
Illicit drug use						
No	Ref					
Yes	1.14 (0.95–1.37)	0.159	1.19 (0.98–1.44)	1.13 (1.07–1.19)	<0.001	**1.07 (1-1.14)**
Binging drinking (AUDIT-C)						
Abusive	Ref					
Non abusive	1.2 (1.05–1.37)	0.006	0.97 (0.83–1.13)	0.95 (0.91-1)	0.045	**0.92 (0.87–0.97)**

Table 2 (continued)

	Inconsistent Condom Use			Risky sexual behavior		
	Bivariate		Multivariate	Bivariate		Multivariate
	RR (95% CI)	*P*-value	aRR (95% CI)	RR (95% CI)	*P*-value	aRR (95% CI)
Condom cost						
Free	Ref					
Cheap	1.17 (1.01–1.35)	0.035	1.06 (0.91–1.23)	1.05 (1.00-1.10)	0.054	1.03 (0.97–1.08)
Expensive	1.15 (0.9–1.47)	0.261	0.92 (0.71–1.19)	0.93 (0.85–1.03)	0.168	0.93 (0.84–1.02)
Knowledge of female condom						
Yes	Ref					
No	1.31 (1.11–1.54)	0.001	**1.24 (1.04–1.47)**	0.98 (0.93–1.03)	0.476	-
STI self-report, **last six months**						
Yes	Ref					
No	0.86 (0.75–0.99)	0.034	0.91 (0.78–1.05)	0.94 (0.9.00.99)	0.017	0.95 (0.90-1.00)
HIV testing, **last 12 months**						
No	Ref					
Yes	0.75 (0.66–0.85)	< 0.001	0.90 (0.76–1.06)	1.03 (0.98–1.07)	0.299	-
Most recent HIV test result						
Never tested	Ref					
Positive	0.60 (0.49–0.74)	< 0.001	0.92 (0.70–1.21)	0.93 (0.85–1.01)	0.077	0.93 (0.83–1.03)
Negative	0.63 (0.54–0.73)	< 0.001	0.85 (0.69–1.06)	1.05 (0.99–1.13)	0.120	1.05 (0.97–1.14)
Number of clients in the last month						
0–2	Ref					
3–4	1.05 (0.87–1.26)	0.620	-	0.93 (0.87-1.00)	0.047	0.94 (0.88–1.01)
5+	0.93 (0.79–1.09)	0.367	-	0.98 (0.92–1.03)	0.363	0.98 (0.93–1.03)
Have comprehensive HIV knowledge						
Yes	Ref					
No	1.18 (1.04–1.35)	0.012	1.13 (0.98–1.3)	0.97 (0.93–1.02)	0.194	0.99 (0.94–1.04)
Ever experienced sexual violence						
No	Ref					
Yes	1.56 (1.37–1.78)	< 0.001	**1.39 (1.19–1.61)**	1.13 (1.08–1.18)	< 0.001	**1.06 (1.00-1.12)**
Ever experienced physical violence						
No	Ref					
Yes	1.32 (1.15–1.51)	< 0.001	**1.22 (1.05–1.42)**	1.08 (1.03–1.13)	0.002	1.03 (0.98–1.09)

Discussion

Our study has identified several significant determinants that influence inconsistent condom use and risky sexual behavior among FSWs, highlighting the complexity of factors that contribute to sexual health risks in this population. These factors include the interplay of individual-level characteristics, social and environmental factors, and negotiation dynamics that contribute to unsafe sexual practices in this population. In the first BBS conducted in the country, a condom was used during the last sexual encounter with the most recent client by 85.8% of FSW in Maputo, 73.4% in Beira, and 62.8% in Nampula, while approximately half of FSW used a condom with their most recent non-client partner [5]. These findings emphasize the importance of addressing the multifaceted challenges FSWs face in practicing safer sex, not only with clients but also within their personal relationships. The variance in condom use across different contexts underscores the need for targeted interventions

that address both the environmental and individual-level determinants of risky sexual behaviors.

Our findings indicate a significant association between age and both inconsistent condom use and risky sexual behavior among FSWs, with younger FSWs (15–24 years old) exhibiting higher rates of both outcomes, which may reflect a combination of factors, including lower negotiation power, limited experience in managing client interactions, and greater economic vulnerability. These findings are consistent with previous studies that have shown younger FSWs are at higher risk for inconsistent condom use and sexual health risks due to similar socioeconomic and behavioral factors [44, 45]. Younger FSWs might also lack comprehensive sexual health knowledge or feel pressured to accept higher payments for unprotected sex, exacerbating their risk for HIV and STIs [33, 44, 46]. In contrast, older FSWs demonstrated lower, although not statistically significant, rates of inconsistent condom use and risky sexual behavior, suggesting that with age, FSWs may develop greater agency and negotiation skills

in managing their sexual health. However, the cumulative impact of long-term economic pressures and exposure to violence may still pose significant challenges for older FSWs, as reported in earlier research highlighting the ongoing vulnerability of older FSWs despite increased experience [47, 48]. These results underscore the need for age-specific interventions that address the unique risks and circumstances of both younger and older FSWs.

The study further identified the geographic location as a significant factor, with FSW in cities such as Beira, Tete, Quelimane, and Nampula being more likely to report inconsistent condom use than those in Maputo City. This geographic disparity may mirror the regional differences in the availability and accessibility of condoms and sexual health services, as well as variations in commercial sex practices prevalent in these areas, such as street-based sex work versus brothel-based sex work, which can affect access to condoms [21]. Additionally, regions with a higher influx of transient clients, such as border towns or major urban centers, may see different patterns in condom negotiation and use due to the transient nature of client relationships and the urgency to secure income quickly. It underscores the importance of geographically tailored public health strategies that address the unique challenges faced by FSW in different cities and regions of Mozambique.

Our analysis reveals a significant association between the age of sexual initiation and both inconsistent condom uses and risky sexual behaviors among FSWs. Specifically, FSWs who initiated sexual activity at a younger age demonstrated higher likelihood of inconsistent condom use and engagement in risky sexual behaviors. Early sexual initiation may lead to entrenched behavior patterns that persist into adulthood, making it difficult to adopt protective practices later in life. This prolonged exposure to environments where risky behaviors are normalized can result in a lower likelihood of engaging in protective behaviors due to limited sexual health knowledge and reduced capacity to negotiate condom use. Additionally, younger initiators may experience more coercive or exploitative sexual relationships, which further hinders their ability to insist on condom use. These findings emphasize the critical need for interventions targeting young individuals to provide comprehensive sexuality education, aiming to delay sexual debut and promote safer sexual practices from an early age [47, 49, 50]. Moreover, in our analysis FSWs with five or more years of sex work were more likely to engage in risky sexual behavior compared to those with less than three years of sex work. This suggests that prolonged exposure to the sex work environment further entrenches risky behaviors [16, 46, 48]. Addressing the cumulative impact of years in sex work alongside early initiation can

be crucial in promoting safer sexual practices within the FSW community.

Illicit drug consumption was found to be associated with both inconsistent condom uses and higher engagement in risky sexual behavior. Illicit drug use can impair judgment and decision-making, leading to increased vulnerability and risk of STIs, including HIV among FSW. This correlation has been well-documented in previous research, where illicit drug use among FSWs has been identified as a key factor contributing to heightened sexual and health risks [32, 51, 52]. Additionally, our study found that binge drinking was significantly associated with risky sexual behaviors. Binge drinking, defined as consuming a large amount of alcohol in a short period, can severely impair judgment and decision-making capacities, similar to the effects of illicit drug consumption [30]. This impairment can lead to increased vulnerability and risk-taking behaviors among FSW, including the failure to use condoms with both regular and casual partners [53, 54].

Our findings demonstrate a significant association between experiences of violence and both inconsistent condom use and risky sexual behavior among FSWs. FSWs who had experienced physical violence were more likely to engage in inconsistent condom use, while those who had experienced sexual violence were more likely to engage in risky sexual behavior. These results align with previous research, which highlights that violence, particularly physical and sexual, compromises the ability of FSWs to negotiate safer sexual practices, leading to increased vulnerability to sexually transmitted infections, including HIV [45, 46]. Violence often exacerbates power imbalances, limiting FSWs' autonomy in sexual decision-making and creating environments where condom use is less likely. Moreover, frequent exposure to violence can normalize risky sexual behavior, contributing to a diminished sense of control over personal health [47]. Prioritizing interventions that address both the physical safety and mental health needs of female sex workers is essential for preventing negative sexual health outcomes [8, 45, 47].

Our study, while providing valuable insights into the factors influencing inconsistence condom use and risky sexual behavior among FSWs, is not without limitations. Our study uses a pooled sample and RDS methodology, which, while effective for reaching hidden populations like FSWs, may introduce biases related to network size and the homophily within participant networks and also may mask variations and specificities within subgroups of the FSW population. The cross-sectional design restricts our ability to infer causality between identified determinants and sexual health outcomes. Additionally, reliance on self-reported data may introduce bias, as participants might underreport behaviors perceived

as socially undesirable or stigmatized or may suffer from recall bias. Despite these constraints, the findings offer a critical foundation for future research and the development of targeted interventions aimed at improving the sexual health and well-being of FSWs. Priority areas for future research should include age-specific interventions, addressing substance use and sexual behavior, improving healthcare accessibility, and understanding the economic and cultural factors that influence condom use and sexual health practices among FSWs. By focusing on these areas, future research can better address the multifaceted challenges faced by FSWs and contribute to more effective public health strategies and interventions.

Conclusion

This study highlights the complex factors influencing inconsistent condom use and risky sexual behavior among FSWs in Mozambique, underscoring the significant roles of geographic location, age at sexual debut, years in sex work, illicit drug use, and experiences of violence. These findings underscore the pressing need for a comprehensive public health approach that addresses the unique challenges faced by this high-risk population. Tailored interventions should include sexual health education, improved access to prevention resources, substance use treatment, and socio-economic support. By tackling the interconnected socio-demographic, behavioral, and economic factors contributing to vulnerability, we can reduce the sexual health risks among FSWs and support broader public health and social equity goals. Collaborative efforts between policymakers, community-based organizations, healthcare providers, and FSWs themselves are crucial to designing and implementing strategies that meaningfully improve sexual health outcomes for this population.

Supplementary Information

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Supplementary Material 1

Declarations

Author details
[1]Instituto Nacional de Saúde, P.O. Box 264, Maputo, Mozambique
[2]Universidade Eduardo Mondlane, Maputo, Mozambique

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