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Factors Associated with Risky Sexual Behaviour among Women Engaged in Cross-border Trade in Lusaka, Zambia

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Abstract

Background

Women engaged in cross-border trader in Lusaka, Zambia, operate in highly mobile and economically vulnerable contexts that contribute to regional economies and household livelihoods. Women constitute approximately 70% of informal cross-border traders in Zambia. This study investigated the prevalence and determinants of risky sexual behaviour among these traders.

Methods

A cross-sectional survey was conducted among 499 women at COMESA Market. A sampling frame of 632 women-owned trading units was obtained from the CBTA register. Data on socio-demographic, migratory, sexual behaviour, health, and substance use characteristics were collected. Firth Penalised logistic, regression identified factors associated with risky sexual behaviour, reporting crude (cOR) and adjusted odds ratios (aOR) with 95% CIs).

Results

Eighty-three-point four percent (83.4%) of respondents were classified as high-risk sexual behaviour. Most respondents were married (39.4%), aged 35–44 years (35.1%), and had secondary education (57.1%). Majority of respondents (83.4%) reported high-risk sexual behaviour. In bivariate analysis, educational level ($p < 0.01$), ability to read ($p < 0.01$) and write ($p < 0.01$), religious affiliation ($p < 0.05$), days spent out for trading ($p < 0.01$), and frequency of condom use ($p < 0.01$) were significantly associated with risky sexual behaviour. In the adjusted Firth Penalised logistic regression model, respondents who spent less than 5 days out (aOR = 11.91, 95% CI: 4.12–34.45, p < 0.01) and 6 or more days out (aOR = 8.29, 95% CI: 3.16–21.74, p < 0.01) had significantly higher odds of risky sexual behaviour compared to those who spent no days out. Age and education showed a protective effect in the crude model but were not significant after adjustment. Marital status, residence, religion, paid sex, frequency of condom use, alcohol and drug use were not significantly associated with risky sexual behaviour in the adjusted model.

Conclusion

Mobility, specifically time spent away from home for trading, was the strongest predictor of risky sexual behaviour. The findings highlight the need to address mobile traders' sexual health risks associated with extended time away from home, alongside efforts to improve educational and literacy levels.

Introduction

Risky sexual behaviour remains a major public health concern globally and continues to drive the transmission of HIV and other sexually transmitted infections (STIs), particularly in sub-Saharan Africa. Despite substantial progress in HIV prevention and treatment, the region still accounts for the majority of global HIV infections, with women disproportionately affected due to structural, biological, and socioeconomic vulnerabilities [1, 2]. While individual behaviours such as unprotected sex, early sexual debut, multiple partnerships, and sex under the influence of alcohol or drugs are proximal risks, mobility itself acts as a structural determinant of HIV vulnerability. Mobility creates conditions for risk through separation from regular partners, exposure to transactional sexual networks, and limited access to health services while travelling [37,38].

Informal cross-border trade is a critical livelihood strategy in Zambia, contributing significantly to household income and regional integration. Women constitute approximately 70% of informal traders in Zambia and are central to this economy [37]. This trade is highly gendered. While mobility provides economic opportunity, research on HIV risk among mobile populations has focused predominantly on male groups such as truck drivers and migrant workers [3]. Limited research exists on women traders, despite evidence that power asymmetries at border points and economic pressure create environments conducive to transactional sex and increased HIV and STI risk [3, 4, 28]. Mobility has been consistently identified as a key structural driver of HIV risk, as it disrupts social networks and increases exposure to high-risk sexual networks [3].

Economic vulnerability further exacerbates the risk. Women face unstable incomes and may engage in transactional sex as a coping mechanism. Such relationships often involve power imbalances that limit condom negotiation. While many studies treat women as a homogenous group, women cross-border traders have unique mobility-related risks [5, 6]. Transactional sex, defined as non-marital sexual relationships motivated by material or financial exchange, has been widely documented as a significant contributor to HIV risk among women in sub-Saharan Africa [7]. Such relationships often involve power imbalances that limit women's ability to negotiate condom use, thereby increasing their susceptibility to HIV and STIs.

In addition to economic factors, social and structural determinants such as gender inequality, limited educational attainment, and restricted access to healthcare services contribute to heightened vulnerability. Gender power imbalances often reduce women's autonomy in sexual decision-making, increasing the likelihood of engaging in unsafe sexual practices [8]. Similarly, lower levels of education have been associated with reduced awareness of HIV prevention strategies and limited capacity to make informed health decisions [9]. Access to sexual and reproductive health services remains uneven, particularly among mobile populations, further compounding the risk of undiagnosed and untreated STIs [10].

Urban poverty and informal settlement conditions also play a critical role in shaping sexual risk behaviours. Many women informal cross-border traders reside in high-density, low-income areas characterised by overcrowding, unemployment, and limited social services [4, 20]. These environments

have been linked to increased engagement in risky sexual behaviours due to economic stress, social instability, and limited access to health information and services [11, 19]. Furthermore, food insecurity and financial hardship have been shown to increase reliance on risky coping strategies, including transactional sex and multiple partnerships [16]. Behavioural factors, including alcohol and substance use, have also been associated with increased sexual risk-taking. Alcohol consumption can impair judgment and reduce inhibitions, leading to inconsistent condom use and engagement in multiple sexual partnerships [12, 28]. However, the relationship between substance use and risky sexual behaviour is complex and often mediated by contextual factors such as social environment and economic conditions.

In Zambia, HIV prevalence remains a significant public health concern, with women disproportionately affected. National reports indicate that structural inequalities, economic vulnerability, and limited access to health services continue to drive new infections [13]. The Zambia Demographic Health Survey 2024 reported that HIV prevalence among women aged 15 and older was 13.9%, compared to 7.5% for men [22]. In 2025, there were about 30,000 new infections, with 38% among youth aged 15–24, and young women were three times more likely to acquire HIV than their male peers. Urban provinces, such as Lusaka (15.1%) and Copperbelt (15.4%), had the highest prevalence rates [22, 23]. Risky sexual behaviour plays a key role in transmitting HIV and STIs in Zambia, but specific STI prevalence data for women are lacking.

While considerable research has examined HIV risk among the general population, there is limited empirical evidence focusing specifically on women informal cross-border traders, a group that may face unique and heightened risks due to their mobility and economic activities. Given these gaps, this study aims to examine the factors associated with risky sexual behaviour among women informal cross-border traders operating at the Common Market for Eastern and Southern Africa (COMESA) Market in Lusaka, Zambia. By analysing demographic, socioeconomic, and behavioural determinants, the study seeks to contribute to a better understanding of the drivers of sexual risk in this population and to inform targeted interventions aimed at reducing HIV and STI vulnerability.

This study examines risky sexual behaviour among women engaged in informal cross-border trade in Lusaka, Zambia, contributing to Sustainable Development Goal 3, particularly Target 3.3, which aims to end the AIDS epidemic by 2030. Identifying key predictors of risky behaviour is crucial for developing targeted HIV prevention interventions that address the vulnerabilities associated with mobility, a significant transmission driver in sub-Saharan Africa, particularly affecting women. Furthermore, the study supports Target 3.7, emphasising the need for universal access to sexual and reproductive health services, which are often unmet due to barriers faced by this population. With approximately 30,000 new HIV infections reported in Zambia in 2025 and adolescent girls and young women at a threefold higher risk, focused research on high-risk women is vital for achieving national and global HIV reduction goals. By shedding light on an often-overlooked demographic, this study underscores the importance of equity and the commitment to “leave no one behind” in Zambia’s HIV response.

In the era of regional integration allowing goods and people to move freely under COMESA, there is need to examine how such trade influences sexual decision-making among female traders. No known study in Zambia has examined how informal trade environment across the border influences sexual decision-making among female traders. This study aims to fill this gap. We examine not cross-border movement as the problem per se, but rather how the context of cross-border trade influences women's behaviours. To our knowledge, no study in Zambia has examined how the informal cross-border trade environment influences sexual decision-making among female traders. Furthermore, much of the existing literature on risky sexual behaviour treats women as a homogeneous group, masking the unique vulnerabilities of mobile traders.

Methods and Data

Data Source

Data for this study were collected in 2019 from 499 women engaged in informal cross-border trade at COMESA Market in Lusaka, Zambia. Structured questionnaires were used to collect information on socio-demographic characteristics, including marital status, age, education level, literacy, religious affiliation, and place of residence, as well as self-reported sexual behaviours. Respondents were selected using a probability sampling technique, with eligibility criteria requiring that participants be at least 18 years old, members of the Cross-Border Traders Association (CBTA), actively engaged in cross-border trading, and owning or renting a shop or container at the COMESA Market. This approach was adopted to focus on women whose demographic characteristics could influence higher levels of risky sexual behaviour.

Study Context

The study was conducted at the COMESA Market, a major centre for informal cross-border trade in Lusaka. Established in 1998 by informal traders who founded the CBTA, the market had a membership of approximately 42,350 cross-border traders by 2015, of which 70% were women [14, 15].

Study Design and Sample Size

The sampling frame was the CBTA register of 1,299 trading units at COMESA Market as of January 2019. Of these, 632 were women-owned or rented units. Three-stage stratified random sampling was used. First stage: Stratification of women traders by 14 business sections. Second stage: Proportional selection of trading units from each section. Third stage: Simple random sampling of individual respondents using random number generator. Sample size was calculated using Yamane formula (1967) for N = 29,645 women traders in Zambia: n = N/(1 + N(e)2) = 395 at ± 5% precision. Plus 20% non-response = 500. Final N = 499, response 99.8%. As sampling was within a single site without clustering

across markets, design effect was set at 1.0. No complex survey weighting was required Non-response was accounted for by oversampling.

Study Measurements

Outcome Variable

A respondent was classified as engaging in risky sexual behaviour if she reported the following three indicators: (i) having multiple current sexual partners, (ii) having 2 + partners in last 12 months, (iii) had contracted STI in last 12 months. For Firth Penalised logistic regression, the scale as shown in Table 1 below was dichotomised: 0 = Low risk : $sc\ \text{or}\ es0, 1, 2(norisk \rightarrow lowrisk)\ \text{and}\ 1\ =\ Highrisk$: scores 3, 4, 5, 6 (moderate to extreme risk). This composite approach was adopted to capture the multidimensional nature of sexual risk-taking, as reliance on a single indicator may underestimate exposure to HIV risk. The selected indicators represent well-established measures that exhibit the highest risky sexual behaviour in epidemiological and public health research, particularly in studies examining HIV vulnerability among mobile and economically active populations [26, 27, 28]. After recoding, distribution was highly skewed: 416 (83.4%) high-risk vs 83 (16.6%) low-risk, N = 499. Given the common outcome, we conducted sensitivity analyses using Firth Penalised logistic regression and exact logistic regression to assess robustness to potential MLE bias and separation [39,40]. For analytical purposes, models with 10–15 events per predictor were run, with crude odds ratios (cORs) and adjusted odds ratios (aORs) and corresponding confidence intervals (CIs) reported.

Table 1
Recoding of the dependent variable

Variable measurement	Survey Results, 2019 (N = 499)	
	Number	**Percent**
RISK_LEVEL		
0 – no risk	1	0.20
1 – very low risk	23	4.61
2 – low risk	59	11.82
3 – moderate risk	301	60.32
4 – high risk	99	19.84
5 – very high risk	15	3.01
6 – extreme risk	1	0.20
RISK_STATUS		
Low risk	83	16.63
High risk	416	83.37

The binary outcome variable enabled the estimation of the likelihood of engaging in risky sexual behaviour among women informal cross-border traders. This allowed for the identification of key demographic, socioeconomic, and behavioural predictors, including age, marital status, education, literacy, residence, economic status, and substance use. Overall, the outcome variable provides a clear, theoretically grounded, and methodologically robust measure of risky sexual behaviour, suitable for multivariable logistic regression analysis and consistent with best practices in public health research.

Independent Variables

The independent variables included in this study were selected based on their theoretical and empirical relevance to risky sexual behaviour and HIV vulnerability, as supported by previous literature. These variables were categorised into demographic, socioeconomic, and behavioural factors and included in the multivariable logistic regression model following bivariate screening and assessment for multicollinearity.

Demographic characteristics

All variables were measured using the survey questionnaire as follows: Marital status: “What is your current marital status?” Marital status was categorised as married, single (never married), widowed, divorced, or separated. Age: “What was your age at your last birthday?” Age was measured in completed

years and grouped into five categories: below 25 years, 25–34 years, 35–44 years, 45–54 years, and 55 years and above. Education: “What is your highest education qualification?” Response options were none, primary (Grade 1–7), secondary (Grade 8–12), and tertiary (college, university). Education level was classified into four categories: no formal education, primary, secondary, and tertiary education. However, due to potential multicollinearity between education and literacy, literacy (ability to read and write) was excluded from the final model to improve model stability and avoid redundancy. Religion: “What is your religion?” Response options were 11 Christian denominations, Islam, Hinduism, other (specify). Religious affiliation was initially included and categorised as Catholic, Muslim, Jehovah’s Witness (JW), Masonic, Pentecostal, Protestant, and Seventh-day Adventist (SDA). Religion was further recoded into Trinitarian Christianity (Catholic, Protestant, and Pentecostal), Non-Trinitarian Christianity (JW and SDA), and Non-Christian (Muslim and Masonic) [30, 31].

Socioeconomic and contextual factors

Residence: “Which area do you exactly live in?” Respondents had to indicate the exact location where they resided in Lusaka such as Kabulonga and Matero. Place of residence was further classified based on the socioeconomic characteristics of residential areas within and outside Lusaka. These included high-density, low-income areas (e.g., Chawama, Kanyama), medium-density, middle-income areas (e.g., Kabwata, Mandevu, Matero), and low-density, higher-income areas (e.g., Lusaka Central, Munali), as well as areas outside Lusaka following the Zambia Statistics Agency categorisation [21]. For analytical purposes, categories with small frequencies were merged to ensure statistical reliability. Residence was therefore recoded as high-density areas (combined Chawama and Kanyama), medium-density areas (combined Kabwata, Mandevu and Matero), and low-density areas (combined Lusaka Central and Munali).

Days spent away: “In the last 12 months, how many days did you spend outside Lusaka for trading purposes? Response options were none or indication of number of days spent out. Accommodation arrangement: “When you go out to buy goods across borders, what type of accommodation do you use?” Response options were hostel, hotel, lodge, other (specify). Economic status: “How would you describe your economic position as a cross-border trader at the moment?” Economic status was assessed based on respondents’ perception, categorised into Very Good, Good, Reasonable, Bad, and Very Bad. Respondents were asked to choose the option that best reflects their economic status. Due to fewer cases reported on “bad” and “very bad” economic statuses, the two response categories were combined.

Behavioural factors

Behavioural variables were condom use; engagement in transactional sex within the past 12 months, alcohol and drug use, which were treated as independent predictors. Frequency of condom use: “How often did you and your partner(s) use a condom over the last 12 months? Response options were every time, almost every time, sometimes, never, don’t know, no response, no partner. Transactional sex: “Has any of the border-post officials (ZRA Officer, ZP Officer, ZABS Officer) asked you for sex in exchange for

any kind of favours?" Yes/No. Consumption of alcohol and drugs: "Have you ever taken an alcoholic drink of any kind, for example, beer, wine, or whiskey? Yes/No. "Have you ever taken drugs such as cannabis, cocaine, heroine, or sniffed petrol? Yes/No. Those who had indicated Yes were further asked if they were currently taking alcohol or dugs. For analysis, the four variables were combined into alcohol and drug use. These variables were included because they are recognised as important facilitators of risky sexual practices, influencing decision-making and increasing the likelihood of engaging in unsafe sexual behaviours [23, 24]. Importantly, condom use and transactional sex were not included in the outcome to avoid tautology, but were modeled as independent predictors and also tested in sensitivity analysis.

Model Selection and Diagnostics

Due to high prevalence of outcome and evidence of quasi-complete separation, Firth Penalised logistic regression was used with weakly informative priors. Multicollinearity was assessed using Variance Inflation Factor (VIF); confounders retained variables VIF < 2.5. Two models: Model I crude Firth Penalised estimates, Model II adjusted Firth Penalised estimates controlling for marital status, age, education, religion, residence. Sensitivity analysis excluding paid sex and condom use was conducted to test for masking of structural drivers.

Statistical Analysis

Analysis was at three levels. Bivariate: chi-square. Multivariate: Firth Penalised logistic regression with 11 independent variables. Univariate analysis employed descriptive statistics to summarise respondents' demographic characteristics, sexual behaviours, and risk levels. Bivariate analysis used chi-square tests to assess associations between independent variables and risky sexual behaviour. For multivariate analysis, revised binary logistic regression models were applied to identify significant predictors of risky sexual behaviour. Two Firth Penalised logistic regression models were fitted. Model I estimated crude odds ratios for the association between each independent demographic variable and risky sexual behaviour. Model II estimated adjusted odds ratios using a multivariable Firth Penalised logistic regression model that included behavioural, socioeconomic and contextual variables, adjusting for age, marital status, education level, and place of residence as potential confounders. Variables for Model II were selected based on theoretical relevance, with multicollinearity assessed using variance inflation factors. The specification of Model I and Model II in this study was justified by the need to examine both crude relationships and the influence of behavioural factors while controlling for confounding variables. Model I assesses unadjusted associations to reveal natural relationships in the data, while Model II evaluates the significance of behavioural factors after accounting for sociodemographic confounders. This method not only prevents the risk of over-adjustment in exploratory analyses but also provides more reliable estimates for key policy variables, enhancing the study's rigour and informing better policy decisions [25]. Adjusted odds ratios with 95% Firth Penalised logistic profile CIs reported, with significance set at $p < 0.05$.

Results

Table 2
Background characteristics of respondents

Background characteristics	Survey Results, 2019 (N = 499)	
	Number	Percent
Marital status		
Married	196	39.4
Single (never married)	135	27.1
Widowed	81	16.3
Divorced	58	11.7
Separated	28	5.6
Age (years)		
Below 25	25	5.0
25–34	168	33.7
35–44	175	35.1
45–54	90	18.2
Above 55	40	6.0
Educational level		
None	31	6.3
Primary (Grade 1–7)	139	28.4
Secondary (Grade 8–12)	280	57.1
Tertiary (college, university)	40	8.2
Ability to write		
Yes	406	82.5
No	86	17.5
Ability to read		
Yes	386	78.5
No	102	21.5
Religious affiliation		

Background characteristics	Survey Results, 2019 (N = 499)	
	Number	Percent
Marital status		
Trinitarian Christians (Catholic, Pentecostal, Protestant)	380	76.2
Trinitarian Christians (JW, SDA)	73	14.6
Non-Christians (Muslim, Masonic)	46	9,2
Residence		
High-density areas (Kanyama, Chawama)	194	39.1
Medium-density areas (Kabwata, Mandevu, Matero)	234	47.2
Low-density areas (Lusaka Central, Munali)	68	13.7

Table 2 presents the background characteristics of the 499 women informal cross-border traders who participated in the survey. The marital status distribution showed that the majority of respondents were married (39.4%), followed by unmarried (27.1%), widowed (16.3%), divorced (11.7%), and separated (5.6%) women. The age distribution indicated that most of the respondents were in their prime working age, with 35.1% aged 35–44 years and 33.7% aged 25–34 years. In terms of education, 57.1% of respondents had secondary education, 28.4% primary, 8.2% tertiary, and 6.3% had no formal education. The majority of respondents could write (82.5%) and read (78.5%). In terms of religious affiliation, the majority of respondents were Trinitarian Christians (Catholic, Pentecostal, Protestant) (76.2%), followed by Non-Trinitarian Christians (JW, SDA) (14.6%). Nearly half of the respondents lived in medium-density areas (47.2%), followed by high-density areas (39.1%), and low-density areas (13.7%).

Table 3
Migratory, behavioural and social lifestyle characteristics of respondents

Respondent characteristics	Survey Results, 2019 (N = 499)	
	Number	Percent
Days spent out		
None	39	7.9
Less than 5 days	152	30.7
6 + days	304	61.4
Type of accommodation		
Hostel	124	25.2
Hotel	69	14.0
Lodge	300	60.8
Economic status		
Very good	112	22.4
Good	121	24.3
Reasonable	211	42.3
Bad	55.	11.0
Paid sex		
Yes	93	18.6
No	406	81.4
Frequency of condom use		
Every time	14	2.8
Almost every time	42	8.4
Sometimes	166	33.3
Never	277	55.5
Alcohol and drug use		
Yes	9	1.8
No	490	98.2

Table 3 presents migratory, behavioural, and social lifestyle characteristics of the respondents. The majority of respondents (61.4%) spent 6 or more days out, indicating a relatively high level of mobility, while 30.7% spent less than 5 days out, and 7.9% did not spend any days out. In terms of accommodation, most respondents stayed in lodges (60.8%), followed by hostels (25.2%), and hotels (14.0%). The respondents' economic status was varied, with 42.3% reporting a reasonable status, 24.3% good, 22.4% very good, and 11.0% as bad. A relatively small proportion of respondents (18.6%) reported engaging in paid sex, and among them, condom use was not consistent, with 55.5% never using condoms, 33.3% using them sometimes, and only 2.8% using them every time. The majority of respondents (98.2%) reported not using alcohol and drugs.

Table 4
Percent distribution of risky sexual behaviour by background characteristics

Background characteristics	Survey Results 2019 (N = 499)		
	Low risk	High risk	
	N (%)	N (%)	p-value
Marital status			**0.824**
Married	29(14.7)	169(85.4)	
Singer, unmarried	18(13.3)	117(86.6)	
Widowed	9(11.1)	72(88.9)	
Divorced	6(10.5)	51(89.5)	
Separated	5(17.9)	23(82.1)	
Age (years)			**0.118**
Below 25	7(28.0)	18(72.0)	
25–34	21(12.5)	147(87.5)	
35–44	27(15.3)	149(84.7)	
45–54	9(10.0)	81(90.0)	
Above 55	3(7.5)	37(92.5)	
Educational level			**0.000****
None	2(5.0)	38(95.0)	
Primary	14(10.1)	125(89.9)	
Secondary	35(12.5)	245(87.5)	
Tertiary	16(40.0)	24(60.0)	
Ability to write			**0.001****
Yes	63(16.0)	330(84.0)	
No	4(3.8)	102(96.2)	
Ability to read			**0.009****
Yes	63(15.3)	350(84.7)	
No	4(4.7)	82(95.3)	

*$p < 0.05$, ** $p < 0.01$

Religious affiliation			**0.038***
Trinitarian Christians (Catholic, Pentecostal, Protestant)	58(15.3)	322(84.7)	
Trinitarian Christians (JW, SDA)	3(4.1)	70(95.9)	
Non-Christians (Muslim, Masonic)	6(13.4)	432(86.6)	
Residence			**0.720**
High-density areas (Kanyama, Chawama)	23(11.9)	171(88.1)	
Medium-density areas (Kabwata, Mandevu, Matero)	34(14.5)	200(85.5)	
Low-density areas (Lusaka Central, Munali)	9(13.2)	59(86.8)	
*$p < 0.05$, ** $p < 0.01$			

Table 4 presents the distribution of risky sexual behaviour among women informal cross-border traders according to selected background characteristics. Although marital status did not show a statistically significant association with risky sexual behaviour ($p = 0.824$), notable patterns were observed. Widowed women (88.9%) and those who were divorced (89.5%) exhibited a high prevalence of risky behaviour, comparable to married women (85.4%). Unmarried women also reported a high proportion (86.6%), while separated women had a relatively lower prevalence (82.1%). Age was also not significantly associated with risky sexual behaviour ($p = 0.118$). Younger women (below 25 years) had the lowest proportion of high-risk behaviour (72.0%), while the prevalence increased substantially among older age groups. Women aged 25–34 and 35–44 reported similarly high levels of risky behaviour (87.5% and 84.7%, respectively). The highest prevalence was observed among women aged 45–54 (90.0%) and those above 55 years (at 92.5%).

Educational attainment showed a statistically significant association with risky sexual behaviour ($p = 0.000$). Women with no formal education exhibited a high prevalence of risky behaviour (95.0%), while those with primary (89.9%) and secondary education (87.5%) also reported similarly high levels. In contrast, women with tertiary education had a notably lower prevalence (60.0%). Literacy showed a similar pattern. The ability to write showed a statistically significant association with risky sexual behaviour ($p = 0.001$). Women who could not write had a higher prevalence of risky sexual behaviour (96.2%) compared to those who could write (84.0%). These findings suggest that literacy influenced

women's engagement in risky behaviours, potentially through its effect on access to health information and communication skills. Similarly, the ability to read was significantly associated with risky sexual behaviour (p = 0.009). Notably, women who could not read (95.3%) still exhibited a higher prevalence of risky behaviour compared to those who could read (84.7%).

Religious affiliation was significantly associated with risky sexual behaviour (p = 0.038). Among Catholics, Pentecostals, or Protestants, 15.3% reported low-risk behaviour while 84.7% were classified as high risk. In contrast, JW or SDA had the lowest proportion of low-risk behaviour at 4.1%, with 95.9% in the high-risk category. Muslims and Masonic affiliates, reported 13.4% low risk and 86.6% high risk. Overall, the Catholic/Pentecostal/Protestant group had the highest rate of low-risk behaviour, while the JW /SDA group had the highest rate of high-risk behaviour. However, the small sample sizes for the JW/SDA and Non-Christian groups should be interpreted with caution. Residence was not significantly associated with risky sexual behaviour (p = 0.720). Low-risk rates were similar across residential densities: 11.9% in high-density areas such as Kanyama and Chawama, 14.5% in medium-density areas including Kabwata, Mandevu, and Matero, and 13.2% in low-density areas such as Lusaka Central and Munali. The corresponding high-risk proportions were 88.1%, 85.5%, and 86.8% respectively.

Table 5
Percent distribution of risky sexual behaviour by migratory, sexual and social lifestyle characteristics of respondents

Migratory, behavioural and social lifestyle characteristics	Survey Results 2019 (N = 499)		
	Low risk	High risk	
	N (%)	N (%)	p-value
Days spent out			**0.000****
None	24(61.5)	15(38.5)	
Less than 5 days	13(8.6)	139(91.4)	
6 + days	29(9.5)	275(90.5)	
Type of accommodation			**0.809**
Hostel	19(15.3)	105(84.7)	
Hotel	9(13.0)	60(87.0)	
Lodge	39(13.0)	261(87.0)	
Economic status			**0.565**
Very good	19(17.0)	93(83.0)	
Good	17(14.1)	104(85.9)	
Reasonable	24(11.4)	187(88.6)	
Bad	4(8.0)	46(92.0)	
Paid sex			**0.236**
Yes	16(17.2)	77(82.8)	
No	67(12.6)	355(87.4)	
Frequency of condom use			**0.000****
Every time	1(7.1)	13(92.9)	
Almost every time	2(4.8)	40(95.2)	
Sometimes	8(4.8)	158(95.2)	
Never	56(20.2)	221(79.8)	
Alcohol and drug use			**0.077**
Yes	3(33.3)	6(66.7)	

**$p < 0.05$, *** $p < 0.01$

No	84(13.1)	426(86.9)
$^{**}p < 0.05$, $^{***}p < 0.01$		

Table 5 presents the distribution of risky sexual behaviour among women informal cross-border traders according to migratory, behavioural, and social lifestyle characteristics. The findings reveal that risky sexual behaviour is highly prevalent across most categories, with several variables showing statistically significant associations. Specifically, days spent away from home ($p < 0.001$), economic status ($p = 0.010$), and frequency of condom use ($p < 0.000$) were significantly associated with risky sexual behaviour. Other variables, including type of accommodation, paid sex, STI history, alcohol use, and drug use, were not statistically significant at the bivariate level. In addition, days spent away from home were strongly associated with risky sexual behaviour ($p < 0.000$). Women who did not spend time away from home had a substantially lower prevalence of risky behaviour (38.5%) and a higher proportion classified as low risk (61.5%). In contrast, those who spent less than five days away reported a very high prevalence of risky behaviour (91.4%), similar to those who spent six or more days away (90.5%).

The type of accommodation was not significantly associated with risky sexual behaviour ($p = 0.809$). However, variations were observed, with women staying in lodges (87.0%) and hotels (87.0%) reporting the highest prevalence of risky behaviour, followed by those in hostels (84.7%). Economic status was not significantly associated with risky sexual behaviour ($p = 0.565$). The proportion reporting low-risk behaviour declined slightly as economic status worsened: 17.0% among those reporting “Very good” economic status, 14.1% with “Good” status, 11.4% with “Reasonable” status, and 8.0% with “Bad” status. The corresponding high-risk proportions were 83.0%, 85.9%, 88.6%, and 92.0%. Although there was a downward trend in low-risk behaviour from “Very good” to “Bad,” the differences were not statistically significant.

In addition, engagement in paid sex was not significantly associated with risky sexual behaviour ($p = 0.236$). Both women who reported paid sex (82.8%) and those who did not (87.4%) exhibited similarly high levels of risky behaviour. Frequency of condom use was strongly associated with risky sexual behaviour ($p < 0.000$). Women who reported inconsistent condom use (“sometimes”) (95.2%) and those who used condoms “almost every time” (95.2%) had a very high prevalence of risky behaviour. Even among those reporting condom use “every time,” risky behaviour remained high (92.9%), as it reflects the composite nature of the risky sexual behaviour measure, which includes multiple risk indicators.

Alcohol and drug use also did not reach statistical significance in relation to risky sexual behaviour ($p = 0.077$). However, a notable pattern was observed: 33.3% of respondents who reported alcohol and/or drug use were classified as low risk compared to 66.7% high risk. Among those who reported no alcohol or drug use, 13.1% were low risk and 86.9% were high risk. While the “Yes” group had a higher percentage of low-risk behaviour, the very small sample size [n = 9] limited interpretation and the overall association was not significant at $p < 0.05$.

Table 6
Firth Penalised logistic regression of factors associated with risky sexual behaviour among women engaged in cross-border trade (N = 499)

Background characteristic	Model I (N = 496)		Model II (N = 486)	
	cOR	CI	aOR	CI
Marital status				
Married	Ref.		Ref.	
Single (never married)	1.17	(0.55–2.50)	0.96	(0.41–2.26)
Widowed	1.28	(0.51–3.20)	1.59	(0.56–4.51)
Divorced	1.08	0.38–3.01)	1.20	(0.37–3.86)
Separated	0.73	(0.24–2.18)	0.68	(0.21–2.15)
Age (years)				
Below 25	Ref.		Ref.	
25–34	3.86**	(1.33–11.13)	1.13	(0.29–4.40)
35–44	2.70	(0.91–8.03)	0.82	(0.20–3.38)
45–54	4.08*	(1.13–14.78)	1.37	(0.28–6.71)
Above 55	9.73*	(1.38–68.67)	1.58	(0.18–13.78)
Educational level				
None	Ref.		Ref.	
Primary (Grade 1–7)	0.61	(0.15–2.49)	0.68	(0.16–2.94)
Secondary (Grade 8–12)	0.63	(0.16–2.47)	0.84	(0.20–3.49)
Tertiary (college, university)	0.14**	(0.03–0.63)	0.31	(0.07–1.45)
Religious affiliation				
Trinitarian Christians	Ref.		Ref.	
Non-Trinitarian Christians	2.88	(0.99–11.62)	3.23	(0.89–11.74)
Non-Christians	0.88	(0.34–2.49)	0.86	(0.31–2.41)
Residence				

Note. *cOR* = crude odds ratio. *aOR* = adjusted odds ratio. CI = confidence interval. Ref. = reference category. Models adjusted for marital status, age, education level, religion and residence. *$p < 0.05$, ** $p < 0.01$.

Background characteristic	Model I (N = 496)		Model II (N = 486)	
	cOR	CI	aOR	CI
Marital status				
High-density areas	Ref.		Ref.	
Medium-density areas	0.85	(0.45–1.60)	0.72	(0.35–1.47)
Low-density areas	0.83	(0.35–1.96)	0.47	(0.18–1.27)
Days spent out				
None	Ref.		Ref.	
Less than 5 days	12.15**	(4.66–31.70)	11.91**	(4.12–34.45)
6 + days	9.55**	(4.08–22.35)	8.29**	(3.16–21.74)
Type of accommodation				
Hostel	Ref.		Ref.	
Hotel	1.06	(0.36–3.09)	1.02	(0.34–3.06)
Lodge	1.06	(0.46–2.48)	1.05	(0.44–2.54)
Economic status				
Very good	Ref.		Ref.	
Good	0.72	(0.27–1.91)	0.83	(0.29–2.35)
Reasonable	0.71	(0.29–1.76)	0.75	(0.28–2.01)
Bad	1.05	(0.29–3.89)	0.83	(0.21–3.21)
Paid sex				
Yes	Ref.		Ref.	
No	1.35	(0.61–2.96)	1.40	(0.64– 3.08)
Frequency of condom use				
Every time	Ref.		Ref.	
Almost every time	1.34	(0.10-17.26)	1.71	(0.14–20.28)
Sometimes	2.76	(0.26–29.43)	3.10	(0.33 – 29.52)

Note. *cOR* = crude odds ratio. *aOR* = adjusted odds ratio. CI = confidence interval. Ref. = reference category. Models adjusted for marital status, age, education level, religion and residence. *$p < 0.05$, ** $p < 0.01$.

Background characteristic	Model I (N = 496)		Model II (N = 486)	
	cOR	CI	aOR	CI
Marital status				
Never	0.45	(0.05–4.05)	0.60	(0.08–4.77)
Alcohol and drug use				
Yes	Ref.		Ref.	
No	2.23	(0.38–12.93)	1.88	(0.28 − 12.51)

Note. *cOR* = crude odds ratio. *aOR* = adjusted odds ratio. CI = confidence interval. Ref. = reference category. Models adjusted for marital status, age, education level, religion and residence. *$p < 0.05$, ** $p < 0.01$.

Table 6 presents results from multivariable logistic regression examining associations between demographic, migratory, behavioural, and social lifestyle factors and risky sexual behaviour among women informal cross-border traders. Model I reports crude odds ratios, and Model II presents adjusted odds ratios controlling for marital status, age, education level, religious affiliation and residence.

Sociodemographic characteristics

In the analysis, marital status was not significantly associated with risky sexual behaviour in both crude and adjusted models. Compared to married women, unmarried, widowed, divorced, and separated women showed no statistically significant differences in odds of risky sexual behaviour in Model I. Similarly, these associations remained non-significant after adjustment in Model II.

Age also showed no significant association in the adjusted model. In the crude analysis, women aged 25–34 years had higher odds of risky sexual behaviour compared to those below 25 years (cOR = 3.86, 95% CI:1.33–11.13, $p < 0.01$), but this association was diminished and non-significant after adjustment (aOR = 1.13, 95% CI:0.29–4.40). Similarly, in the crude model, women aged 45–54 (cOR = 4.08, 95% CI:1.13–14.78, $p < 0.05$) and those above 55 years (cOR = 9.73, 95% CI:1.38–68.67, $p < 0.05$) had significantly higher odds in Model I, but not in Model II (aOR = 1.37, 95% CI:0.28–6.71 and aOR = 1.58, 95% CI:0.18–13.78, respectively). Women aged 35–44 did not differ significantly from those below 25 years in either model.

Educational level showed a protective effect in the crude model. Women with tertiary education (college, university) had significantly lower odds of risky sexual behaviour compared to those with no education (cOR = 0.14, 95% CI:0.03–0.63, $p < 0.01$). After adjustment, the association was reduced and no longer statistically significant (aOR = 0.31, 95% CI:0.07–1.45). Primary education and secondary education were not significantly associated. Religious affiliation was not significantly associated. Women who belonged

to JW and SDA had elevated crude odds compared to those who were Catholics, Protestants and Pentecostals and remained non-significant after adjustment. Women Muslims and Masonics did not differ from those who were Catholics, Protestants and Pentecostals. Place of residence was not associated with risky sexual behaviour. Residence across Chawama, Kabwata, Kanyama, Lusaka Central, Mandevu, Matero, and Munali was not significantly associated with risky sexual behaviour in either model.

Mobility and contextual factors

Mobility emerged as the strongest predictor in both models. Days spent out for trading were strongly associated with risky sexual behaviour. In the adjusted model, women who spent less than 5 days out had significantly higher odds of risky sexual behaviour compared to those who spent no days out (aOR = 11.91, 95% CI:4.12–34.45, $p < 0.01$). Similarly, women who spent 6 or more days out also had significantly higher odds (aOR = 8.29, 95% CI:3.16–21.74, $p < 0.01$). Type of accommodation during travel did not show a significant association with the outcome, risky sexual behaviour. There were no significant differences between women staying in hostels, hotels, or lodges. Economic status was not significantly associated with risky sexual behaviour in the adjusted model.

Sexual behaviour and health factors

No significant associations were observed between risky sexual behaviour and paid sex or frequency of condom use.

Substance use

Alcohol and drug use was not significantly associated with risky sexual behaviour. Women who reported no alcohol and drug use had higher but non-significant odds compared to those who reported use (cOR = 2.23, 95% CI:0.38–12.93; aOR = 1.88, 95% CI:0.28–12.51).

In summary, the analysis of 499 women informal cross-border traders identified days spent out for trading as the only significant predictor of risky sexual behaviour, with those spending less than 5 days (aOR = 12) and 6 or more days (aOR = 8) out showing much higher odds of engaging in such behaviour. Other socio-demographic factors, including age and education, lost significance after adjustment. Although tertiary education appeared protective initially, this was not sustained in the adjusted model. In addition, contextual, behavioural and health factors, and substance use had no significant associations.

Discussion

This study examined the determinants of risky sexual behaviour among women informal cross-border traders in Lusaka, Zambia, focusing on demographic, socioeconomic, migratory, and behavioural factors. The findings reveal that mobility, sexual partnership patterns, and STI status are the most significant predictors of risky sexual behaviour, while most demographic and socioeconomic variables lose significance in the multivariable analysis. These results highlight the importance of contextual and behavioural drivers over static individual characteristics in shaping sexual risk.

A key finding of this study is the strong association between mobility measured by days spent away from home and risky sexual behaviour. Women who spent time away from home were more than ten times more likely to engage in risky sexual behaviour compared to those who did not travel. Our finding that mobility predicts risk aligns with literature on structural drivers of HIV [6]. The robustness of results to Firth Penalised and Exact models suggests no bias from skewed data. This is consistent with evidence identifying mobility as a structural driver of HIV risk in sub-Saharan Africa [3, 16]. Mobility disrupts stable social networks and reduces community-level monitoring, increasing exposure to high-risk sexual networks and opportunities for casual or transactional relationships. Mobile women traders may experience social isolation and economic pressures that elevate engagement in risky sexual practices [11]. However, mobility alone does not necessarily increase risk unless combined with vulnerabilities such as economic instability or gendered social pressures [3]. The type of accommodation used by respondents was not significantly associated with risky sexual behaviour, suggesting that other factors may be more influential in determining sexual behaviour.

The study found that respondents with tertiary education were less likely to engage in risky sexual behaviour, although this association was not statistically significant. This finding is consistent with previous studies that have reported a negative association between education and risky sexual behaviour [16, 33]. The results also showed that respondents who belonged to JW and SDA were more likely to engage in risky sexual behaviour compared to Catholics, Pentecostals and Protestants, which may be related to differences in religious teachings and cultural practices [32]. Women in higher and middle-income areas may have better access to healthcare, improved living conditions, and reduced economic pressure, supporting findings that urban inequality and informal settlement conditions influence HIV risk [3].

Economic status was not statistically significant in multivariable analyses, although descriptive patterns suggested higher risky sexual behaviour among women with poorer economic conditions. This aligns with studies linking economic vulnerability to transactional sex and reduced negotiation power in sexual relationships [17]. Women in informal cross-border trade often face financial uncertainty, which may compel engagement in risky coping strategies, although the influence of economic status may operate indirectly through mobility and sexual networks [3]. Contrary to some expectations, demographic factors such as age, marital status, and education were not significant predictors of risky sexual behaviour after adjustment. This finding aligns with evidence that behavioural and contextual factors often outweigh static demographic variables in predicting HIV risk [18]. While education can enhance awareness of HIV prevention, its effect may be limited in high-risk environments with structural constraints.

Condom use was not significantly associated with risky sexual behaviour in adjusted models, which is inconsistent with previous studies that have reported a positive association between condom use and safe sex practices [34, 36]. However, the results showed that respondents who never used condoms had a higher proportion of low-risk respondents, suggesting that other factors may be influencing condom use decisions.

The study found that respondents who did not use alcohol and drugs were less likely to engage in risky sexual behaviour, although this association was not statistically significant. This finding is consistent with previous studies that have reported a positive association between substance use and risky sexual behaviour [35]. Unlike some literature, this study did not find a significant association between alcohol and drug use and risky sexual behaviour. While substance use can impair judgment and increase unsafe sexual practices [16], the lack of association may reflect context-specific dynamics or the predominance of mobility and sexual networks as primary drivers.

In summary, after Firth penalised adjustment, days spent out for trading was the only factor independently associated with risky sexual behaviour, with both less than 5 days and 6 or more days out conferring approximately 8 to 12-fold higher odds compared to no days out. These findings underscore the relevance of mobility-related vulnerability and contextual factors, as well as promoting safe sex practices and condom use. These results underscore the need for interventions that target behavioural and contextual determinants to reduce HIV and STI risk in this population.

Study Limitations

This study had several limitations. First, its cross-sectional design precludes causal inference and establishes only associations between demographic, mobility-related, and behavioural factors and risky sexual behaviour. Second, although we considered rare-events logistic regression, it was inappropriate given the common outcome prevalence of 83.4% high-risk behaviour, which is prone to sparse-data bias and overestimation of odds ratios under conventional maximum likelihood. We therefore applied Firth Penalised logistic regression as the primary analysis to reduce small-sample bias, with exact logistic regression as a sensitivity check. Third, data were self-reported, making them susceptible to recall bias and social desirability bias, which may have led to underreporting of sensitive behaviours such as multiple sexual partnerships, transactional sex, and inconsistent condom use. Fifth, the sampling frame was limited to women traders operating at COMESA Market in Lusaka (single site, design effect 1.0), limiting generalisability to other markets, border towns and rural settings. Despite these constraints, the study provides important evidence on the sociodemographic, mobility-related, and sexual health determinants of risky sexual behaviour among women engaged in cross-border trade and offers a foundation for targeted HIV prevention interventions in mobile populations.

Conclusion

This study examined the determinants of risky sexual behaviour among women informal cross-border traders in Lusaka, Zambia, revealing a persistently high prevalence of risk across the population and highlighting the complex interplay of mobility, behavioural, and structural factors. The findings demonstrate that mobility, particularly the number of days spent away from home, is the most significant predictor of risky sexual behaviour, with women who travel frequently being substantially more likely to engage in high-risk practices compared to those who remain within their home environments. This underscores the role of mobility in disrupting social networks, reducing community-level monitoring, and

increasing exposure to high-risk sexual networks. In addition, the frequency of condom use was found to significantly increase the likelihood of risky sexual behaviour, pointing to the importance of cumulative exposure within sexual networks.

While socioeconomic factors such as economic status and place of residence were not consistently significant in the multivariable analysis, observed patterns indicate that structural inequalities, including poverty and living conditions, still play an important contextual role in shaping vulnerability. Similarly, demographic characteristics such as age, marital status, and education did not independently predict risky sexual behaviour after controlling for other factors, reinforcing the conclusion that behavioural and contextual determinants are more influential in this population. These findings suggest that risky sexual behaviour among women informal cross-border traders is not merely an outcome of individual choice but is deeply embedded in broader socioeconomic and mobility-related contexts. In light of these insights, the study recommends the implementation of targeted, context-specific interventions that address both behavioural and structural drivers of risk. Key strategies should include the expansion of mobile and cross-border health services to improve access to HIV testing, STI screening, and counselling; the promotion of behavioural change communication programmes that emphasise partner reduction, consistent condom use, and improved risk awareness; and the strengthening of economic empowerment initiatives to reduce reliance on transactional sex and enhance women's financial independence. Furthermore, improving access to comprehensive sexual and reproductive health education is essential to address misconceptions, enhance risk perception, and encourage preventive behaviours. Finally, the study calls for integrated, multi-sectoral approaches that tackle the underlying structural drivers of vulnerability, including poverty, gender inequality, and inadequate urban living conditions, through collaboration between public health institutions, trade associations, and community-based organisations. Overall, addressing risky sexual behaviour in this population requires a holistic approach that combines individual-level interventions with broader structural reforms to effectively reduce HIV and STI risk among women engaged in informal cross-border trade.

Abbreviations

aOR
Adjusted Odds Ratio
CBTA
Cross-Border Traders Association
CI
Confidence Interval
COMESA
Common Market for Eastern and Southern Africa
cOR
Crude Odds Ratio
HIV
Human Immunodeficiency Virus

JW
Jehovah's Witness
SDA
Seventh-Day Adventist
STIs
Sexually Transmitted Infections

Declarations

Ethical approval and consent to participate

Ethical approval for this study was obtained from the University of Zambia's School of Humanities and Social Sciences Research Ethics Committee (HSSREC: 2018-June-005, No. 153760602331). All respondents received an information sheet explaining the purpose, procedures, and voluntary nature of the study. Written informed consent was obtained from each participant prior to data collection. Questionnaires were administered in a private and secure location to ensure confidentiality. Participation was restricted to women aged 18 years and above who were members of the CBTA and who owned or rented a shop or container at the COMESA Market. Thus, all procedures involving human participants and/or human data were conducted in accordance with relevant ethical guidelines and regulations, including the principles of the Declaration of Helsinki.

Consent for publication

Not applicable

Clinical trial number

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

SM conceptualized the study and performed data curation for the project. ML and MP contributed to the formal analysis. SM and ML developed the methodology. SM wrote the original draft. MP performed the overall review of the manuscript for intellectual content. Finally, all authors reviewed, edited and approved the manuscript.

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Data Availability

The raw data analysed during this study are available upon reasonable request from the author, who is a PhD candidate at the University of Zambia (simsonmwale@yahoo.com).

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