Explaining condom use among male construction worker clients of sex workers in the Western Cape, South Africa

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Abstract

Male clients of sex workers constitute an important but understudied population in sub-Saharan Africa's HIV epidemic. Approximately 10% of sexually active men in the region report having engaged in sex with a sex worker, and in South Africa, an estimated 42% of new heterosexual HIV infections are attributable to male clients of sex workers. This study examined the behavioral and cognitive determinants of self-reported condom use among 227 male construction workers in the Western Cape who reported sex with a female sex worker in the preceding three months. Participants were recruited across 18 construction sites operated by seven companies. Three measures of condom use were assessed: condom use at last sex, frequency of condom use over the past three months, and intention to use a condom at next sex. Logistic and multiple regression models identified engagement in risky sexual behaviors, HIV/AIDS transmission knowledge, attitudes toward condom use, and perceived control over condom use as significant predictors across the three models. The findings highlight the unique risk environment created by labor mobility, informality, limited access to health services, criminalization of sex work, and entrenched masculinities within the construction sector. Importantly, the analysis demonstrates the value of using both retrospective and prospective measures to explain condom-use behavior, with intention to use condoms showing the strongest explanatory power. These insights have implications for the design of future survey instruments and interventions aimed at reducing HIV risk among male clients of sex workers.

Keywords: construction workers, male clients of sex workers, condom use, cross-sectional surveys, research methodology, HIV/AIDS

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Introduction

Sex workers remain a key population disproportionately affected by HIV and other sexually transmitted infections in South Africa. Recent estimates place HIV prevalence among female sex workers (FSW) at 62.1% (Kassanjee et al., 2022). This high burden reflects structural inequalities, including gender and income disparities, poverty, and the criminalization of sex work, which collectively constrain access to health services and increase vulnerability to violence (Richter & Huysamen, 2023; HSRC, 2023; Matlala & Odeku, 2021). These structural risks extend beyond sex workers themselves to their male clients, who play a central but understudied role in sustaining HIV transmission (Richter et al., 2013).

One in ten sexually active men in sub-Saharan Africa report ever paying for sex, and those who do are approximately 50% more likely to be living with HIV than men who have not (Hodgins et al., 2022). Although mathematical models attribute only about 5% of new heterosexual HIV infections directly to FSW, as many as 42% are estimated to involve their male clients (Stone et al., 2021).

Consistent condom use remains a challenge, with studies identifying client preference for condomless sex, extra payment for unprotected intercourse, alcohol and drug use, and perceived reduction in pleasure as key barriers (Quaife et al., 2018; George et al., 2019; Bekker et al., 2015; Randolph et al., 2007). Fear of client violence further limits sex workers' ability to negotiate condom use (Coetzee et al., 2017; Mukumbang, 2017).

Despite their central role in HIV transmission, male clients of sex workers (MCSW) have received limited empirical attention (Morse-Karzen, 2020). Research challenges—including stigma, legal risks, and difficulties accessing hard-to-reach populations—have contributed to this gap (Huschke & Coetzee, 2020). Yet, understanding this group is critical for targeted HIV prevention. Evidence from South Africa's labor sectors suggests that male-dominated, highly mobile industries, such as mining, trucking (Makhakhe et al., 2017), the military (Mankayi, 2006), and construction foster social environments conducive to transactional sex (Campbell, 2001, 2000; Delany-Moretlwe et al., 2014; Harinarain & Haupt, 2014).

The South African construction industry, characterized by a largely male and often migrant workforce, shares many of these structural and social features. Within this context, the present study examines predictors of condom use among self-identified male clients of sex workers employed in the construction industry in the Western Cape. Drawing on the Health Belief Model (Buldeo & Gilbert, 2015) and the Reasoned Action Approach (Conner et al., 2017), the study assesses three alternative measures of self-reported condom use and evaluates their explanatory power within a multi-level behavioral framework.

The Health Belief Model (HBM) provides a cognitive framework for understanding why individuals engage or fail to engage in protective behaviors, such as condom use. It posits that health behavior is influenced by one's perceived susceptibility to infection, perceived severity of the health threat, perceived benefits of preventive action, and perceived barriers to taking that action. Later adaptations of the model highlight the importance of self-efficacy and cues to action that trigger behavioral change (Buldeo & Gilbert, 2015). Within the context of male clients of sex workers, perceptions of risk, benefits, and barriers to condom use can powerfully shape condom-related decisions.

The Reasoned Action Approach (RAA) complements the HBM by emphasizing the role of behavioral intention as the most immediate predictor of action. Intention is influenced by three key constructs: attitudes toward the behavior (favorable or unfavorable evaluations of condom use), perceived social norms (beliefs about whether others support condom use), and perceived behavioral control (the perceived ease or difficulty of using condoms) (Conner et al., 2017).

Integrating the HBM and RAA allows for a comprehensive understanding of condom-use behavior by combining cognitive appraisals of risk and benefit with motivational and social-cognitive determinants of intention. Although the constructs of self-efficacy and perceived behavioral control stem from different theoretical traditions, they are conceptually related. Both capture an individual's belief in their ability to perform a specific behavior under varying circumstances. In the HBM, self-efficacy refers to confidence in one's capacity to take preventive action despite potential barriers, while in the RAA, perceived behavioral control encompasses both internal confidence and external situational factors that may facilitate or hinder the behavior. High self-efficacy often translates into stronger perceived control, reinforcing behavioral intention and increasing the likelihood of condom use. Together, these constructs

illuminate how male clients' sense of agency and confidence shape their condom-use decisions.

Accordingly, this study draws on both frameworks to examine how attitudes, perceived control, knowledge, and risk behaviors relate to self-reported condom use among male construction worker clients of sex workers.

Measuring Condom Use

Sexual behavior is a largely private activity, subject to varying degrees of multi-level constraints (Fenton et al., 2001). And so, a key challenge in the measurement of sexual behavior is the generation of unbiased and precise measures. It is also critical to account for contextual factors that shape behavior when measuring condom use. As Yakubu et al. (2023) emphasize, specifying the type of sexual partner is essential for improving the validity and reliability of survey data. Condom use behavior often varies depending on whether the partner is a spouse, casual partner, or sex worker, and aggregating all partners can obscure meaningful patterns. This level of specificity allows researchers to uncover nuanced relationships and better target interventions.

Similarly, understanding the reason for condom use, that is, whether for contraception or STI prevention, adds another layer of interpretive depth. Graham et al. (2005) notes that individuals using condoms primarily for contraception may demonstrate different usage patterns or incorrect application compared to those using them for disease prevention. Clarifying the purpose helps assess not only frequency and consistency but also the potential efficacy of condom use.

Method

Participants and setting

A convenience sampling method (Leedy & Ormrod, 2014) was employed to select construction companies and workers. The sample population comprised all male employees present on site on the designated date and time when the participating companies had scheduled the field research visits. Data were collected across 18 construction sites spanning seven construction companies in the Western Cape province of South Africa. Furthermore, the sample included both unskilled workers and skilled tradesmen, as well as site clerks and technicians. Questionnaires were administered in three of South Africa's 11 official languages, namely, English, Afrikaans, and IsiXhosa, which are the most commonly spoken languages in the Western Cape region. Potential participants were informed about the nature of the survey and reassured that the survey was voluntary, confidential, and anonymous. At least three researchers proficient in all three languages were present for each site visit. The time taken by participants to complete the questionnaire largely depended on their education level and literacy, typically ranging from 45 minutes to an hour and a half. Data analysis indicated that participants had a good understanding of the questions. Specifically, the following checks were undertaken—consistency checks (comparing responses to similar or related questions to identify inconsistencies that might suggest misunderstanding) and range checks (reviewing numerical responses for reasonableness and identifying outliers that might indicate a misunderstanding of the question). No anomalies were detected. Participants who gave informed consent then completed the survey. Data were collected from mid-March to June 2019. This study was approved by the Ethics in Research Committee of the Faculty of Engineering and the Built Environment, University of Cape Town (March 8, 2019).

A sex worker is defined as "someone whom the participant pays for sex," a casual sex partner is defined as "someone whom the

respondent does not know very well," and a regular partner is defined as "someone whom the respondent knows very well" (Yakubu et al., 2023). Yakubu et al. (2023) have separately assessed condom use for regular sex partners (RSP) (n = 426), casual sex partners (CSP) (n = 287), and sex workers (SW) (n = 251). Notably, the analysis presented in this study focuses solely on the sub-sample of 227 participants who indicated that they had engaged in sexual intercourse with a sex worker.

Measures

Condom use with sex workers

Three measures of condom use were employed in the current study.

The first is a measure asking respondents to indicate a 'yes' or a 'no' to the following question:

Did you use a condom the last time you had sex with a sex worker? (HCU)

The second is a frequency measure on a 5-point scale asking respondents to indicate how often they used a condom (in the last three months):

In the last three months, how often did you use a condom with a sex worker? (PCU)

The third is a frequency measure asking respondents to indicate on a 5-point scale, how likely they are to use a condom the next time they have sex with a sex worker:

The next time you have sex with a sex worker, how likely is it that you will use a condom? (FCU)

The first two measures of condom use are retrospective. Long recall periods increase the likelihood of inaccurate reporting. And so, recall bias is a potential problem and limitation of the PCU measure in this study. The other retrospective measure, HCU, does not include a recall period, asking instead about respondents' last sexual encounter. Focusing exclusively on the last sexual event has fewer problems with recall; however, it may not accurately reflect an individual's condom use beyond their last sexual encounter.

The third measure of condom use, FCU, was prospective, asking respondents about their ability to realize an intended action of condom use in the future. As with all self-report data, social desirability bias, the tendency of respondents to answer questions in a manner that will be viewed favorably by others, can affect this measure.

In the current study, the aforementioned are substantively taken as measures of past condom use i.e., frequency of condom use in the last three months (PCU); present condom use (most recent), i.e., condom use at last sex (HCU); and future condom use, i.e., intention of using a condom at next sex (FCU).

Control over condom use (CC)

Condom use self-efficacy was assessed using four items adapted from Kabikira (2010). Participants were asked the degree to which they agree or disagree with statements about condom use (e.g., "I am confident I will be able to make sure a condom is used every time I have sex"). Response options ranged from 'strongly disagree'= 1 to 'strongly agree'= 5. Scale scores range from 4 to 20, with higher scores indicative of higher levels of confidence in using a condom (α = .93).

Positive attitude towards condom use (PDC)

To assess positive and negative attitudinal dispositions toward condom use, a modified short-form *Attitudes Toward Condoms Scale* (ATCS) (Roy et al., 2013) was included in the questionnaire. The short-form ATCS comprises of 10 items structured into three dimensions: *condom vs. sexual satisfaction* (three items), *condom vs. gender* (three

items), and *condom vs. sexual interest* (four items).

For the present study, four items from this scale were used to measure positive attitudinal disposition toward condom use: all three items from the *condom vs. sexual satisfaction* dimension (e.g., "proper use of condoms enhances sexual pleasure") and one item from the *condom vs. gender* dimension ("men who use condoms show concern and responsibility to their partner[s]"). Viewed together, these four items capture both instrumental and affective components of attitudes toward condom use. Participants indicated their level of agreement on a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Scale scores ranged from 4 to 20, with higher scores reflecting more positive attitudes toward condom use (α = .76). The number of items retained for each construct is summarized in Table 1.

Perceived norm (PCP)

Perceived norms regarding condom use were assessed with one item from the *condom vs. gender* subscale of the short-form *Attitudes Toward Condoms Scale* (ATCS) (Roy et al., 2013): *"*Using condoms is unmanly." Responses were rated on a 5-point scale from 1 ("strongly disagree") to 5 ("strongly agree"), with higher scores reflecting a stronger perception of peer or societal pressure against condom use. Although this single-item measure captures a narrow facet of perceived norms—specifically, masculine expectations that discourage condom use—it offers a direct and contextually salient indicator of gendered social pressure. Previous behavioral studies have used similar single-item measures to assess concrete, unidimensional normative beliefs when space or field conditions limit questionnaire length (e.g., Bergkvist & Rossiter, 2007; Francis et al., 2004; Ajzen, 2006).

Covariates

Based on the literature review, we explored demographic, experiential, behavioral, and cognitive variables as covariates of condom use in the regression analysis. The categorization of experiential, behavioral, and cognitive covariates was guided by a synthesis of the Health Belief Model (HBM) and the Reasoned Action Approach (RAA), situated within a multi-level conceptual framework proposed by Kaufman et al. (2014). Kaufman and colleagues highlight that health behaviors are influenced by determinants across multiple levels—individual, interpersonal, community, institutional, and structural—and recommend tailoring analyses to the levels most relevant to available data. In this study, we focused on individual-level determinants, consistent with the constructs emphasized in the HBM and RAA. Accordingly, we grouped variables into three domains: experiential (e.g., knowing someone with HIV or prior unspecified STI experience, reflecting cues to action and perceived susceptibility), behavioral (e.g., risky sexual behavior and substance use, reflecting past behavior), and cognitive (e.g., attitudes toward condom use, perceived control and norms, and HIV knowledge, reflecting belief-based appraisals). This organization maintained theoretical coherence while allowing for a structured empirical test of individual-level predictors of condom use.

Specifically, the following demographic variables were hypothesized: age (Stoner et al., 2019; Evans et al., 2016), education (Hargreaves & Glynn, 2002), relationship status (Shisana et al., 2016), employment status (De Wet-Billings & Billings, 2020), and province of domicile (Ntshiqa et al., 2018). Five experiential variables were hypothesized: whether the participant knew an HIV-positive person, a person who had

Table 1
List of demographics, measures, covariates, sample items, and response options

Items and Constructs	No. of items	Response options and point of scales
Condom use with sex workers		
Did you use a condom the last time you had sex with a sex worker? [Q37d]	-	'No' =0; 'Yes' = 1'
In the last 3 months, how often did you use a condom with a sex worker? [Q38d]	-	'Never' = 1 to 'Always' = 5
The next time you have sex with a sex worker, how likely is it that you will use a condom? [Q39d]	-	'Never' = 1 to 'Always' = 5
Demographic		
D1. Relationship status [Q3]	-	'Divorced, separated, widowed, or never married'=0; 'Married/living with a partner'=1
D2. Age [Q1]	-	Years
D3. Education [Q6]	-	'Primary or less' = 1; 'Secondary exposed to/completed'= 2; 'Tertiary exposed to/completed' = 3
D4. Employment status [Q8]	-	'Casual or contract' = 1; 'Permanent' = 2
D5. In which Province in your home or village" [Q11]	-	'Western Cape' = 1; 'Non-Western Cape' = 2
Experiential		
E1. Do you know someone with HIV? [Q34a]	-	'No'=0; 'Yes'=1
E2. Do you know someone who has died because of HIV/AIDS? [Q34b]	-	'No'=0; 'Yes'=1
E3. Do you know where you can get ARV medication? [Q53b]	-	'No'=0; 'Yes'=1
E4. Do you know someone on ARV medication? [Q53c]	-	'No'=0; 'Yes'=1
E5. Previously had an STI?	1	'No'=0; 'Yes'=1

Behavioral		
B1. Risky sex behavior (sexual encounters) (Scale score range: 9-45); α = .89	9	'Never' = 1 to 'Always' = 5
B2. Risky sex behavior (alcohol and drugs) (Scale score range: 6-30); α = .84	6	'Never' = 1 to 'Always' = 5
B3. AUDIT (Scale score range: 0-40); α = .89	10	'Never' = 0 to 'Daily or almost daily' = 4
B4. DUDIT (Scale score range: 0-44); α = .87	11	'Never' = 0 to 'Daily or almost every day' = 4
Cognitive		
C1. Presence of depressive symptoms (Scale score range: 10-40); α = .84	10	'Rarely or none of the time' = 1 to 'All of the time' = 4
C2. HIV/AIDS knowledge (Scale score range: 0-5); α = .62	5	'True'=0; 'Don't know'=0; 'False'=1
C3. Control over condom use (Scale score range: 4-20); α = .93	4	'Strongly disagree'=0 to 'Strongly agree'=5
C4. Perceived threat of HIV infection (Scale score range: 5-25); α = .68	5	'Extremely unlikely' = 1, to 'Extremely likely'= 5
C5. Positive attitude toward condom use (Scale score range: 4-20); α = .76	4	'Strongly disagree'=1 to 'Strongly agree'=5
C6. Perceived norm	1	'Strongly disagree'=1 to 'Strongly agree'=5

died because of HIV/AIDS, where to obtain ARV medication, a person on ARV medication, and having been previously diagnosed with an unspecified STI (Higgins et al., 2008). Four behavioral variables were hypothesized: risky sexual behavior in terms of sexual encounters (α = .89) (Turchik & Garske, 2008), risky sexual behavior in terms of sex-related substance use (α = .84) (Celio et al., 2016), alcohol abuse (α = .89) (Saunders et al., 1993), and drug abuse (α = .87) (Berman et al., 2003). Besides the three cognitive variables indicated above (CC, PDC, PCP), three additional cognitive variables were hypothesized as potential covariates, namely, fear of HIV infection (α = .68) (Gore et al., 2020), HIV/AIDS transmission knowledge (α = .62). (Carey & Schroder, 2002), and presence of depressive symptoms (α = .84) (Andresen et al., 1994). In all instances, higher scale scores indicate higher levels of the construct of interest. Full details of all variables are provided in Table. 1. The dimensionality, validity, and reliability of the scales have been well demonstrated (see, for example, Bowen & Zhang, 2021, 2022; Bowen et al., 2022). With this particular sub-sample, the nine scales employed indicated alpha values ranging from .62. to .93, indicating marginal to excellent reliability (Hair et al., 2014. Only two scales indicted alpha values below .70, namely, C2 "HIV/AIDS Knowledge" (.62) and C4 "Perceived threat of HIV infection" (.68), respectively. The low alpha value for C4 is likely due to its knowledge scoring regimen , especially as 62% of respondents did not achieve higher scores than three out of five correct answers. Items in a scale with fewer response options are associated with lower alpha values (Weng, 2004). Neither of the two scales indicated an improvement in internal consistency as a result of the removal of one or more items.

Analysis

Given the dichotomous nature of the first dependent variable (HCU) (use of a condom at last sex with a sex worker), a Chi-Square test for independence or Fisher's Exact Test was used to examine the association between use of a condom at last sex with a sex worker ('no' / 'yes'), five demographic characteristics (D1, D2, D3, D4, D5), and five experiential characteristics (E1, E2, E3, E4, E5). An independent samples t-test was then used to compare age (D2), the four behavioral scale scores (B1, B2, B3, B4), and the six cognitive variable scores (C1, C2, C3, C4, C5, C6) for the response to whether or not a condom was used at last sex with a sex worker. This approach provides insight into the relationships between the dependent and predictor variables. For all inferential statistics, 95% confidence intervals and a 5% significance level were used, with significance defined as $p<0.05$.

Thereafter, binomial logistic regression was performed to assess the impact of the predictor variables on the likelihood that respondents would report that they had used a condom at last sex with a sex worker (HCU). Binomial logistic regression is a robust test of association, as it assesses the impact of each predictor on the dependent variable while considering the influence of other predictors in the model. Furthermore, binomial logistic regression makes no assumptions about the distribution of scores of the predictors but is sensitive to high correlations between predictors. The Likelihood ratio Chi-square test was used to assess the overall association between the predictors and the dependent variable, and provides an assessment of the unique contribution of each predictor on condom use at last sex with a sex worker. Finally, multiple linear regression was used to assess the ability of the demographic, experiential, behavioral, and cognitive independent variables to predict frequency of condom use

with sex workers over the last three months (PCU) and condom use intentions at next sex with a sex worker (FCU). Multiple regression allows for the analysis of relationships between a dependent variable and multiple independent variables, providing a more comprehensive understanding of complex phenomena. It enables researchers to assess the individual influence of each predictor, control for confounding variables, and improve predictive accuracy. Multiple regression can determine how well a set of variables is able to predict a particular outcome, which variable in a set of variables is the best predictor of an outcome, and whether a particular predictor variable is still able to predict an outcome when the effects of another variable(s) are controlled for. Thereafter, the models were compared to examine which measure accounted for the greatest proportion of explained variance, and to examine whether the predictors differed across the different measures of condom use.

Results

First, the full dataset was examined for anomalies. No outliers were identified in the data. In addition to consistency and range checking, data cleaning was undertaken. Twenty-four participants (9.56%) had missing data for the dependent variables. A complete case analysis (listwise deletion) approach to missing data was adopted, and any observation that had a missing value was excluded. Consequently, the sample size was reduced from 251 to 227.

Demographic characteristics

The participants were all males, aged 18 to 60 years (M=35; Md=33). Seventy-four percent were Black African, with 45% describing themselves as being married or in a long-term relationship. Nearly 22% had at most primary education, whilst 72% had completed secondary level education or had been exposed to it. Fifty-eight percent were casual / contract workers, and 47% were domiciled in the Western Cape. Forty-five percent knew someone with HIV, 54% knew someone who had died because of HIV/AIDS, 63% knew where to obtain ARV medication, and 39% knew someone on ARV medication. Fifteen percent reported a previous unspecified STI diagnosis.

Bivariate relationships between condom use at last sex with a sex worker and predictor variables

Bivariate tests of association (χ^2 test or Fisher's Exact Test) were used to explore the relationship between condom use at last sex with a sex worker (HCU) and each of the categorical predictor variables (Table 2). Single workers were more likely to report not using a condom at last sex with a sex worker than were those in a relationship ($\chi^2 = 4.49$, $p < .05$). Knowing someone who had died from HIV/AIDS was positively associated with a higher likelihood of condom use ($\chi^2 = 6.27$, $p < .05$). Likewise, workers who knew where to obtain ARV medication were significantly more likely to have used a condom ($\chi^2 = 8.66$, $p < .05$). Knowing someone currently on ARV medication was also associated with greater condom use ($\chi^2 = 4.92$, $p < .05$). Finally, having previously been diagnosed with an unspecified STI was positively related to condom use ($\chi^2 = 4.79$, $p < .05$).

Independent-samples *t*-tests were conducted to compare age, behavioural, and cognitive scale scores between workers who did or did not use a condom at last sex with a sex worker (Table 2). Older workers reported greater condom use ($M = 36.62$, $SD = 9.48$) than younger workers ($M = 32.83$, $SD = 10.01$), $t(227) = -2.87$, $p = .002$. Workers who used condoms had higher risky-sexual-behavior (sexual-encounters) scores ($M = 15.89$, $SD = 14.34$) than those who did not ($M = 14.34$, $SD = 6.11$), $t(227) = -1.80$, $p = .037$. Control-over-condom-use scores were also

Table 2
Characteristics of participating male construction workers reporting use of a condom at last sex with a sex worker (n=227)

Characteristics	Total	%	Condom used No		Condom used Yes		χ^2
			n	%	*n*	%	*p*-value
Dependent variable							
Use of condom at last sex with sex worker (No. vs. Yes)	227	100	87	38.3	140	61.7	-
Independent variables							
Demographic							
Marital status[a]							.040*
Single	126	55.5	56	64.4	70	50	
Married / Long-term relationship	101	44.5	31	35.6	70	50	
Age[b]	-	-	-	-	-	-	.002**
Education[a]							.482
Primary or less	49	21.6	17	19.5	32	22.9	
Secondary exposed or completed	163	71.8	66	75.0	97	69.3	
Tertiary exposed or completed	15	6.6	4	4.6	11	7.9	
Employment status[a]							.580
Casual or contract	132	58.1	53	60.9	79	56.4	
Permanent	95	41.9	34	39.1	61	43.6	
Province domiciled[a]							.585
Western Cape	106	46.7	43	49.4	63	45.0	
Non-Western Cape	121	53.3	44	50.6	77	55.0	
Experientia*l*							
Know someone with HIV[a]							
No	125	55.1	51	58.6	74	52.9	.413
Yes	102	44.9	36	41.4	66	47.1	
Know someone who died from HIV/AIDS[a]							.014*
No	104	45.8	49	56.3	55	39.3	
Yes	123	54.2	38	43.7	85	60.7	

Know where you can get ARV medication[a]							.004**
No	80	36.2	41	48.2	39	28.7	
Yes	141	63.8	44	51.8	97	71.3	
Know someone on ARV medication[a]							.034*
No	134	60.6	60	69.8	74	54.8	
Yes	87	39.4	26	30.2	61	45.4	
Previously has an STI[a]							.033*
No	194	85.5	80	92.0	114	81.4	
Yes	33	14.5	7	8.0	26	18.6	
Behavioral							
Risky sexual behavior (sexual encounters) [b]	-	-	-	-	-	-	.037*
Risky sexual behavior (alcohol and drugs) [b]	-	-	-	-	-	-	.379
AUDIT[b]	-	-	-	-	-	-	.349
DUDIT[b]	-	-	-	-	-	-	.418
Cognitive							
Presence of depressive symptoms[b]	-	-	-	-	-	-	.125
HIV/AIDS knowledge[b]	-	-	-	-	-	-	.055
Control over condom use[b]	-	-	-	-	-	-	.002**
Perceived threat of HIV infection[b]	-	-	-	-	-	-	.034*
Positive attitude towards condom use[b]	-	-	-	-	-	-	.237
Perceived norm[b]	-	-	-	-	-	-	.373

Note. [a]Chi-square test / Fisher's Exact Test (as appropriate); [b]Independent samples t-test; *p<0.05; **p<0.01; ***p<0.001

higher among condom users (M = 13.78, SD = 5.26) than non-users (M = 11.73, SD = 5.28), $t(227) = -2.85$, p = .002. Finally, perceived risk of HIV infection was higher among those who reported condom use (M = 12.05, SD = 4.59) compared to non-users (M = 10.94, SD = 4.21), $t(227) = -1.83$, p = .034).

Binomial logistic regression analysis of the relationship between use of a condom at last sex with a sex worker and the demographic, experiential, behavioral, and cognitive variables (Model 1)

A test of the full Model 1 against a constant-only model was statistically significant, indicating that the predictors as a set reliably distinguished between workers having used a condom at last sex with a sex worker and those who did not (χ^2 = 340.409, $p < 0.05$ with $df = 21$). The -2 Log Likelihood was 259.112. The Nagelkerke's R^2 of .197 indicated a moderate relationship between prediction and grouping. It also suggests that the predictors explained approximately 19.7% of the shared variance in the dependent variable. The Hosmer and Lemeshow Goodness-of-Fit Test (χ^2 = 3.528, p=.897 with df = 8) indicated a good fitting model. Prediction success overall was 68% (82% for condom used and 46% for condom not used).

The Likelihood Ratio Test evaluates the *overall* relationship between an independent variable and the dependent variable. The Likelihood Ratio Test statistics provide an indication of the *unique* contribution of each independent variable to the prediction of condom use at last sex with a sex worker. A statistically significant unique contribution was made by risky sexual behavior (sexual encounters) (χ^2 = 4.339, p<0.05 with df = 1). Notably, none of the other variables made significantly unique contributions.

Table 3 depicts the significance of the relationship between the various categories of the independent (predictor) variables and condom use at last sex with a sex worker contrasted against their respective reference categories. The reference category for the dependent variable is not having used a condom at last sex with a sex worker. The OR (OR=1.081, 95% CI=1.003, 1.165) indicated that workers engaging in higher levels of risky sexual behavior (sexual encounters) were 1.08 times more likely than their counterparts to have used a condom at last sex with a sex worker. Age, although not significant, was notably on the cusp, with p=.066.

Multiple regression analysis of condom use with a sex worker in terms of frequency of condom use over the last 3 months and intentions of condom use at next sex with a sex worker (Models 2 and 3)

Preliminary analyses tested for violation of the assumptions of normality, linearity, multicollinearity, and heteroscedasticity. No abnormalities were detected. Notably, the normality of distribution of the two continuous dependent variables was examined using their skewness and kurtosis statistics, determined to be .005, -1.804; and -.099, -1.779, respectively. These statistics fall within the boundaries of acceptability (-2 to +2) indicated by Hair et al. (2022).

The first multiple linear regression analysis (Model 2) explored the determinants of frequency of condom use with a sex worker within the preceding three months, using the demographic, experiential, behavioral, and cognitive variables shown in Table 4. The overall model was significant, F(20, 199)=4.046, p<0.001, explaining 28.9% of the variance in condom use with a sex worker in the last three months. In this model, risky sexual behavior (sexual encounters) (β=.050, p<0.05), HIV/AIDS knowledge (β=.184, p<0.05), and control over condom use (β=.104, p<0.001) were found to be significant independent determinants of the frequency of condom use with sex workers in the last three months (see Table 4).

The second multiple linear regression analysis (Model 3) explored the determinants of the intention to use a condom at next sex with a sex worker, again using the demographic, experiential, behavioral, and cognitive variables shown in Table 4. The overall model was significant, F(20,

Table 3
Binomial logistic regression model of the relationship between use of a condom at last sex with a sex worker and characteristics of male construction workers (n=227)

Characteristics	Adjusted odds ratios (aOR)[+]	
	aOR	**95%CI**
Demographic		
Marital status	.670	.321 – 1.402
Single		
Married / Long-term relationship	-	-
Age	1.037[++]	.998 – 1.079
Education		
Primary or less	.721	.170 – 3.054
Secondary exposed or completed	.580	.155 – 2.171
Tertiary exposed or completed	-	-
Employment status		
Casual or contract	1.089	.570 – 2.078
Permanent	-	-
Province domiciled		
Western Cape	.729	.372 – 1.427
Non-Western Cape	-	-
Experientia*l*		
Know someone with HIV		
No	1.687	.815 – 3.492
Yes	-	-
Know someone who died from HIV/AIDS		
No	.627	.309 – 1.271
Yes	-	-
Know where you can get ARV medication		
No	0.620	.311 – 1.273
Yes	-	-
Know someone on ARV medication		
No	.840	.398 – 1.775
Yes	-	-

Previously had an STI		
No	.574	.206 – 1.596
Yes	-	-
Behavioral		
Risky sexual behavior (sexual encounters)	1.081*	1.003 – 1.165
Risky sexual behavior (alcohol and drugs)	.952	.852 – 1.065
AUDIT	.994	.945 – 1.046
DUDIT	1.036	.919 – 1.168
Cognitive		
Presence of depressive symptoms	.997	.933 – 1.065
HIV/AIDS knowledge	1.152	.899 = 1.474
Control over condom use	1.061	.989 – 1.139
Perceived threat of HIV infection	1.020	.948 – 1.097
Positive attitude towards condom use	.992	.910 – 1.083
Perceived norm	.982	.742 – 1.301

Note. The reference category for the DV is "No"; $^{+}$Model adjusted for all covariates; *p<0.05; **p<0.01; ***p<0.001; ^{++}p=.066

Table 4

Multiple linear regression of frequency of condom use over the last 3 months and intention to use a condom at next sex with sex workers on characteristics of male construction workers (n=227)

Variables	Model 2 Frequency of condom use with sex workers over last 3 months	Model 3 Condom use intention at next sex with sex workers
Demographic		
Relationship status (D1)	.210	.114
Age (D2)	.003	.014
Education (D3)	-.180	-.043
Work status (D4)	-.029	-.160
Province domiciled (D5)	-.092	-.048
Experiential		
Know someone with HIV	-.003	.076
Know someone who died from HIV/AIDS	.277	.265
Know where you can get ARV medication	-.209	-.265
Know someone on ARV medication	.207	.101
Previously had an STI (E1)	-.063	-.150
Behavioral		
Risk sexual behavior (sexual encounters) (B1)	.050*	.038
Risk sexual behavior (substance use during sex) (B2)	.009	.022
Alcohol consumption (AUDIT) (B3)	-.019	-006
Drug consumption (DUDIT) (B4)	.062	.106**
Cognitive		
Presence of depressive symptoms (C1)	-.017	-.020
HIV/AIDS knowledge (C2)	.184*	.298***
Control over condom use (C3)	.104***	.122***
Perceived threat of HIV infection (C4)	.036	.001
Positive attitude toward condom use (C5)	.049	.069*
Perceived norm (C6)	.002	-.009
Constant	-.387	-1.123
R^2	.289	.393
ΔR^2	.289	.393
F	4.046***	6.431***
ΔF	4.046***	6.431***

Note. *p< .05; **p< .01; ***p< 0.001. Unstandardized regression coefficients are presented.

199)=6.431, p<0.001, explaining 39.3% of the variance in intention to use a condom at next sex with a sex worker. In this model, drug consumption (β=.106, p<0.010), HIV/AIDS transmission knowledge (β=.298, p<.001), control over condom use (β=.122, p<0.001), and possessing a positive attitude toward condoms (β=.069, p<0.05) were found to be significant independent determinants of the intention to use a condom at next sex with a sex worker (see Table 4).

Discussion

This study compared three approaches to assessing self-reported condom use among male clients of sex workers (MCSW) in South Africa: a categorical indicator of condom use at last sex (HCU), a frequency-based rating scale for the past three months (PCU), and a prospective measure of the likelihood of condom use at next sex (FCU). All three measures showed statistically significant associations with hypothesized predictors derived from the Health Belief Model (HBM) and the Reasoned Action Approach (RAA), supporting their applicability in explaining HIV-related risk behavior in high-risk occupational groups.

The findings demonstrate that measures incorporating gradation or future orientation (PCU and FCU) explained a larger proportion of variance in condom use than the dichotomous HCU measure. This pattern mirrors prior research showing that continuous or scaled indicators capture the intensity and variability of sexual-risk behavior more effectively than binary outcomes (Francis et al., 2004; Bergkvist & Rossiter, 2007). The higher explanatory power of FCU relative to PCU further indicates that intentions toward future condom use can serve as a valid proxy for behavior, consistent with meta-analytic evidence identifying condom-use intention as one of the strongest behavioral correlates (Widman et al., 2025). Similar intention–behavior congruence has been reported in HIV-testing studies employing the Theory of Planned Behavior (Bogers et al., 2024), reinforcing the predictive validity of prospective measures even in the presence of potential social-desirability bias.

At the theoretical level, the study confirms that attitudes and self-efficacy remain key determinants of condom use, echoing findings from other Africa based studies linking positive condom attitudes and perceived control with higher consistency of use (Leddy et al., 2016). These patterns align with the core propositions of the HBM and RAA—that protective behavior is influenced by beliefs about benefits, perceived barriers, and confidence in one's ability to act. The significant associations observed here underscore how experiential (e.g., HIV knowledge, prior STI experience), behavioral (e.g., substance use), and cognitive domains (e.g., attitudes, self-efficacy) interact to shape condom-use behavior.

Beyond individual cognitions, the study highlights the salience of social norms—especially those rooted in masculine identity—as contextual factors influencing condom use. The negative association between perceived norms and consistent condom use suggests that ideas associated with hegemonic masculinity, such as equating condomless sex with virility or dominance, may discourage protective behavior. This finding is consonant with qualitative and quantitative research in South Africa showing how gendered scripts and peer discourse undermine condom negotiation (Shai et al., 2012; Leddy et al., 2016). Interventions targeting MCSW should therefore extend beyond knowledge dissemination to include gender-transformative strategies that reshape social norms and challenge risk-reinforcing conceptions of masculinity.

While the study's non-probabilistic sample precludes statistical generalization, the results exhibit analytical generalizability (Firestone, 1993; Polit & Beck, 2010; Yin, 2010). The statistically significant associations across all three measures suggest that integrating experiential, behavioral, and cognitive predictors yields theoretically coherent and practically relevant insights. In line with Kaufman et al. (2014), these findings reinforce the value of multi-level models that locate individual decision-making within broader social and structural contexts. Future research should employ longitudinal and mixed-method designs to test these relationships across occupational settings—such as trucking, mining, or hospitality—where mobility, peer influence, and economic precarity may interact to shape sexual-risk practices.

Although both HCU and PCU are retrospective measures and therefore prone to recall bias, PCU additionally offers the advantage of a graded response format that captures the intensity of condom-use behavior. Rating scales, by providing a continuum of options (e.g., "never" to "always"), yield richer and more nuanced data than categorical yes/no responses while also reducing random error by averaging out response tendencies. This design feature may explain the relatively higher R^2 observed for PCU compared with HCU in this study.

FCU, as a prospective measure, avoids recall bias by focusing on future intentions rather than past behavior. While such measures are vulnerable to social-desirability bias, they offer several advantages, including greater ease of response and improved data validity. Participants may find it simpler to express intentions about future behavior than to recall prior behavior accurately. This prospective framing not only enhances predictive accuracy but also yields actionable insights for intervention design. Consistent with meta-analytic findings (Widman et al., 2025) and TPB-based structural models (Bogers et al., 2024), the present study affirms that intentions to use condoms are reliable proximal predictors of actual condom-use behavior.

A limitation of this study is that perceived norms were measured using a single item, reflecting gendered expectations about masculinity and condom use. While concise measures can be valid for specific, context-bound beliefs, they may not capture the multidimensional nature of social norms (e.g., descriptive versus injunctive components). Given the strong influence of hegemonic masculinity on sexual behavior in South Africa (Leddy et al., 2016; Shai et al., 2012), future research should incorporate multi-item scales that distinguish peer, partner, and cultural normative influences to provide a more comprehensive assessment.

Despite the limitations inherent in non-probability sampling, the study provides preliminary evidence supporting the validity of three distinct approaches to measuring self-reported condom use among MCSW. The associations between hypothesized predictors and condom-use outcomes are consistent with broader health-behavior literature favoring multi-level frameworks that map a wide range of factors across individual and structural domains (Kaufman et al., 2014). These relationships can guide future studies exploring whether similar patterns hold across other high-mobility occupational sectors, such as long-distance trucking or mining.

In sum, although the findings are not statistically generalizable, their analytical generalizability is significant. The statistically significant associations between measures and predictors observed here provide both theoretical and practical insights and lay a solid empirical foundation for future research on condom use among male clients of sex workers in South Africa.

Implications for Health Behavior Research

This study addresses a critical gap in HIV prevention research in South Africa by focusing on male clients of sex workers (MCSW), a high-risk yet underexamined population. By comparing three distinct measures of condom use—use at last sex (retrospective), frequency over time, and future intention—this research demonstrates the value of nuanced, theory-informed measurement in understanding sexual risk behavior. Findings show that prospective measures of intention explain a greater proportion of variance in behavior than retrospective reports, suggesting these may be more effective indicators for designing targeted interventions.

The study also affirms the utility of behavioral health frameworks, particularly the Health Belief Model and the Reasoned Action Approach, in explaining condom use among mobile, informal-sector workers in South Africa. Key psychosocial factors, such as self-efficacy, attitudes toward condom use, and HIV/AIDS transmission knowledge significantly predicted condom use behavior. These findings provide actionable insights for public health practitioners designing workplace-based or mobile interventions, especially in male-dominated industries such as construction, mining, and transportation.

Importantly, this study emphasizes the need to consider context-specific structural barriers—such as stigma, gender norms, and criminalization of sex work—that affect health behavior. Future research should further investigate these intersecting influences and test tailored interventions using mixed-method and longitudinal designs. Overall, the findings underscore the importance of expanding behavioral health research to include marginalized male populations who play a pivotal but often overlooked role in STI transmission dynamics.

Conclusion

Cross-sectional survey designs, while limited in establishing causality due to their lack of temporal data and control over confounding variables, offer valuable snapshots of respondents' behaviors and attitudes. This study examined three measures of self-reported condom use among male construction worker clients of sex workers: HCU (use during last sex with a sex worker), PCU (frequency over the last three months), and FCU (likelihood of future use). Despite the limitations of recall and social desirability biases, each measure was found to be statistically significant, with prospective measures like FCU showing advantages in reducing recall bias.

The study highlights the importance of both retrospective and prospective measures in understanding condom use behaviors. The higher R^2 values of PCU and FCU suggest the value of nuanced, continuous measures over dichotomous ones like HCU. Though not statistically generalizable, the findings offer preliminary evidence and valuable insights for future research and intervention design, underscoring the multi-level factors influencing condom use. Future studies can build on these results to test hypotheses across more representative samples and diverse contexts, thereby enhancing the robustness and applicability of these findings in public health strategies.

Discussion Questions

The findings of this study raise important questions for both researchers and practitioners working in HIV prevention, particularly within the South African context. The construction industry, characterized by high levels of informality, labor mobility, and limited health service access, creates a distinctive risk environment for male clients of sex workers. In addition, structural factors, such as the criminalization of sex work, entrenched masculinities, and unequal power

dynamics, complicate condom negotiation and uptake. The application of social cognition frameworks such as the Health Belief Model and Reasoned Action Approach offers a valuable lens for examining these behaviors but also invites deeper reflection on their adaptability in real-world settings. The following discussion questions aim to stimulate further conversations about how behavioral research can inform tailored and context-sensitive interventions.

In the context of South Africa's construction industry, where informal employment and internal migration are prevalent, how can HIV prevention programs incorporate prospective behavioral measures—such as intention to use condoms—to enhance intervention relevance and impact?

How can the Health Belief Model and Reasoned Action Approach be adapted to account for the structural and cultural constraints that shape condom use decisions among male clients of sex workers in South Africa?

Given that condom use self-efficacy, attitudes toward condoms, and HIV/AIDS transmission knowledge were significant predictors of condom use intentions, how can these psychosocial factors be targeted more effectively in behavior change interventions?

What explains the association between higher levels of risky sexual behavior and more frequent condom use in this study, and how might this finding be interpreted in designing messaging strategies?

With the prospective measure (intention to use condoms) yielding the highest explanatory power, how should future survey instruments and interventions balance retrospective versus prospective assessments of sexual behavior?

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