SEXUAL CONCURRENCY AND MALE CONDOM USE: EMPIRICAL EVIDENCE FROM THE SOUTH AFRICAN CONSTRUCTION INDUSTRY

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This study examined factors influencing condom use consistency among male construction workers with regular partners, casual partners, and sex workers in the Western Cape. Data from 450 participants across 18 sites revealed that 54% had engaged with all three partner types in the past 3 months. Condom use was assessed using a five-point Likert scale, showing that 44% never used condoms with regular partners, 34% with casual partners, and 39% with sex workers. A condom use scale score, summing across partner categories, indicated inconsistent practices overall. Hierarchical regression analysed demographic, experiential, behavioural, and cognitive factors in relation to consistent condom use. Results showed that perceived control over condom use, fear of HIV infection, and positive condom attitudes were associated with higher consistency. Cognitive and experiential factors collectively explained more variance in condom use than demographics or behaviour alone. Given advances in HIV treatment, understanding experiential variables - such as previous STI diagnoses, knowing HIV+ individuals or those on ARV medication, or someone who died from HIV/AIDS - is crucial for intervention design.

Keywords: condom use, construction workers, HIV/AIDS, concurrent sex, masculinity

INTRODUCTION

South Africa has one of the world's highest HIV prevalence, with an estimate of 12.7% (95% CI 12.0 - 13.4) among all ages in 2022 (Human Sciences Research Council (HSRC), 2023). Furthermore, certain economic sectors, such as construction (Harinarain and Haupt, 2014), mining (Benton, 2020) and transportation (e.g., long-distance truck driving) (Delany-Moretlwe *et al.,* 2014), have been identified as being particularly susceptible to HIV/AIDS due to factors such as low education levels of a predominantly male workforce, work-related travel, and most importantly, the historical association of worker hostels with sex workers (Vosloo, 2020).

Condoms provide triple protection against HIV, unintended pregnancy and a range of STIs. The South African government has been implementing a national male condom distribution programme since 1992 and a female condom distribution programme since 1998 (Beksinska *et al.,* 2012). Despite this, there are indications that condom use is declining (Shrader *et al.,* 2021). According to the most recent national HIV

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Bowen, P, Yakubu, K and Govender, R (2024) Sexual Concurrency and Male Condom Use: Empirical Evidence from the South African Construction Industry *In:* Thomson, C and Neilson, C J (Eds) *Proceedings of the 40th Annual ARCOM Conference,* 2-4 September 2024, London, UK, Association of Researchers in Construction Management, 289-298.

prevalence, incidence and behavioural survey (SABSSM VI), less than half of individuals aged between 25 - 49 with more than one partner in the last year reported that they used a condom at last sex (40.9 % for females and 44.0% for males) (HSRC, 2023). Perceived reduction of sexual pleasure has been identified as a key barrier to condom use (Osuafor *et al.,* 2017). Consequently, the observed decrease in condom use is partly attributable to the increased availability of PrEP (pre-exposure prophylaxis) and other prevention alternatives (e.g., vaginal rings) which are generally not perceived to reduce sexual pleasure (Rousseau *et al.,* 2021).

While biomedical interventions such as PrEP are likely to revolutionise HIV/AIDS prevention and treatment, HIV/AIDS is more than a biomedical issue; it is deeply entrenched in complex and multilevel social, economic, and cultural contexts. Thus, interventions which aim to address the myriad individual, dyadic, community, and structural drivers of HIV risk and transmission remain salient (Abdool Karim, 2021). Extending previous research (Yakubu *et al.,* 2023; Bowen *et al.,* 2017), this study reports research findings in relation to the predictors of consistent condom use among male construction workers who indicated that they had been concurrently involved with regular partners, casual partners and sex workers.

Theoretical Framework

Sexual Concurrency

The contribution of concurrent sexual relationships to the HIV epidemic is well recognised (Kenyon at al., 2016). However, empirical evidence is both limited and inconsistent (Lurie and Rosenthal, 2010). This is due, in part, to the variety of definitions and measures of sexual concurrency (Kretzschmar *et al.,* 2010). In 2009, UNAIDS convened an expert consultation that recommended that sexual concurrency be defined as "overlapping sexual partnerships in which sex with one partner occurs between two episodes of sex with another partner" (Maher *et al.,* 2011, p 2). Similarly, Mah and Halperin (2010) define concurrency to be the "overlap of one or more sexual partnerships for a period of one month or longer. One-month accounts for the approximate time duration of acute HIV infection, which is an important element for transmission during concurrent partnerships" (Mah and Halperin, 2010, p. 12).

Based on the UNAIDS recommended definition, participants who indicated that they had engaged in sex with a regular partner, a casual partner and a sex worker over a 3-month period were considered as being in a concurrent sex partnership. A regular sex partner (RSP) was defined as "someone whom the respondent knows very well", a casual sex partner (CSP) was defined as "someone whom the respondent does not know very well", and a sex worker (SW) was defined as "someone whom the respondent pays for sex" (Yakubu *et al.,* 2023).

Explanations of Condom Use

Several theories have been posited to understand and predict condom use. The health belief model suggests that individual condom use is influenced by five constructs: Perceived risk of contracting HIV/AIDS, perceived severity of HIV/AIDS, perceived benefits and perceived barriers of using a condom, cues to action, and confidence in one's ability to use a condom (condom use self-efficacy) (Wulfert and Wan, 1995). The reasoned action approach, which has its roots in Fishbein and Ajzen's (2010) theory of planned behaviour/reasoned action, proposes that an individual's intention to use a condom is the proximal determinant of their future condom use. Intentions are in turn influenced by attitude toward condom use, perceived control over condom use

and perceived norms (subjective, descriptive and injunctive norms) (McEachan *et al.,* 2016).

While the aforementioned theories have been successfully used to explain condom use, they have been criticised as hyper-focusing on the individual level of analysis. Consequently, there have been calls for explanations of condom use to be inclusive of multi-level factors that expand beyond the individual level (Kaufman *et al.,* 2014). In line with the recommendation for multi-level approaches, this study makes use of constructs from the health belief model and the reasoned action approach in a multi-level framework.

METHOD

This research was conducted using a cross-sectional questionnaire survey. Questionnaires were available in English, Afrikaans and isiXhosa, the most spoken languages in the province. The questionnaire design was based on an instrument originally developed by the HSRC (see Kalichman and Simbayi, 2008), modified by Bowen *et al.,* (2017) for use in the construction industry, and subsequently employed in a modified and expanded form by Yakubu *et al.,* (2023). In particular, the questionnaire included items which measured constructs from the health belief model and the theory of planned behaviour in a multi-level perspective. It also included items that were used as indicators of influences beyond the individual level. In this regard, demographic variables (e.g., age, education, work status) were considered as reflective of structural-level influences; experiential variables (e.g., having had an STI, knowing someone who is HIV +) were considered reflective of social and normative influences; while behavioural variables (e.g., alcohol consumption, HIV testing) and cognitive variables (e.g., attitude toward condoms, perceived control over condom use) were considered reflective of individual-level influences. Full details of the variables, sample items, point of scales, as well as sources of the scale items, are available in Yakubu *et al.,* (2023). All seven measures are well-validated, and in all instances higher scores indicate higher levels of the construct of interest. A condom use scale score was computed by summating the scores of the respective RSP, CSP, and SW scores.

Convenience sampling was used for the selection of construction firms and sites, as well as the workers interviewed. The sample frame consisted of all male employees present when researchers visited the sites by prior arrangement. Ethical clearance was obtained from the researchers' university. 450 site-based unskilled and skilled workers drawn from 18 construction sites and across 7 construction companies were surveyed. Data were collected from mid-March to early June 2019. Yakubu *et al.,* (2023) examined separately the multi-level predictors of condom use for each of RSP (n = 426), (CSP) (n=287), and SW (n=251). Given that the focus of the present study is limited to participants in concurrent sex partnerships, defined as overlapping relationships with RSP, CSP and SW, the analysis presented here is based on the 245 workers who indicated that they had sexual relations with all three categories of partners in a 3-month period leading up to the study.

All participants were male, aged between 18 and 60 (M = 35; Md = 33), with a majority in the 20 - 39 age group. 73% were black 'African', with 55% describing themselves being single, widowed, separated, or divorced. Nearly 68% had at most primary education, whilst 29% had secondary level education. 59% were casual / contract workers. Nearly 15% had previously had an STI, 46% knew someone who

was HIV+, 53% knew someone who had died of AIDS, and 40% knew of someone currently on ARVs. 28% had never tested for HIV.

As depicted in Figure 1, 16.7% of participants always used a condom with their regular sex partner, 29.4% always used a condom with a casual sex partner and 33.9% always used a condom with a sex worker. The low level of condom use with regular partners as compared to casual partners or sex workers can be attributed to a greater level of trust and emotional intimacy. Overtime, as trust and familiarity grows, couples may become more comfortable taking the risk of not using condoms, especially if they are confident in each other's sexual exclusivity and STI status. Furthermore, a desire for a more pleasurable sexual experience may lead persons in committed relationships to prioritise other forms of STI prevention such as PrEP or PEP over condoms. It is important, however, to note that more than a third (34%) of participants who reported sex with a casual partner in the last 3 months had not used a condom consistently. Regarding condom use with a sex worker in the last 3 months, 39% of participants stated that a condom had never been used. Notably, only 34% of participants who reported sex with a sex worker in the last 3 months had always used a condom.

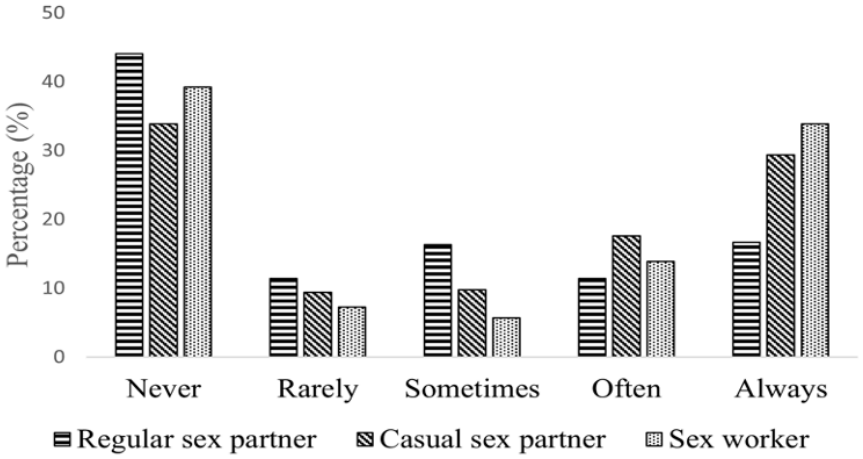

Figure 1: Use of condoms with various categories of sexual partner in the last 3 months (n = 245)

FINDINGS

Hierarchical multiple linear regression modelling was used to explore the predictors of consistent condom use. First, multiple regression analysis was performed with the demographic variables serving as independent variables. A second multiple regression was done with a new set of independent variables (experiential variables) together with the first set of independent variables. This allowed estimates of the contributions of the independent variables to be computed. This process was continued until all the independent variables had been entered into the regression model.

Hierarchical Regression Modelling

The hierarchical regression modelling is depicted in Table 1. The demographic variables, entered in Block 1, explained 1.7% of the variance in consistent condom use. None of the demographic variables were significantly associated with consistent condom use. This model as a whole was not significant, $F(4, 235) = 1.017$, $p = .399$. After entry of the experiential variables (Block 2), the total variance explained by the

model as a whole was 6.9%, F(8, 231) = 2.155, p < .05. The experiential variables explained an additional 5.20% of the variance in consistent condom use after controlling for demographic characteristics. In this model, knowing someone who had died from HIV/AIDS was significantly associated with consistent condom use. Specifically, participants who indicated that they did know a person who had succumbed to HIV/AIDS were more likely to report higher levels of consistent condom use.

Table 1: Hierarchical regression analysis of consistent condom use by male workers who have engaged in concurrent sex with a regular sex partner (RSP), causal sex partner (CSP) and sex worker (SW over a 3-month period (n=245)

Variables	Model 1	Model 2	Model 3	Model 4
Block 1: Demographics				
Relationship status (D1)	-.859	-.783	-.741	-.581
Age (D2)	-.001	.002	.000	-.005
Education (D3)	.604	.290	.248	-.270
Work status (D4)	.440	.236	.245	-.027
Block 2: Experiential				
Previously had an STI (E1)		1.111	.953	.039
Know someone who is HIV+ (E2)		-.517	-.528	-.127
Know someone who died because of HIV/AIDS (E3)		-1.282*	-1.213*	-.855
Know someone on ARV medication (E4)		-.240	-.249	-.280
Block 3: Behavioural				
Alcohol consumption (AUDIT) (B1)			.006	-.025
HIV Testing (B2)			.287	-.038
Block 4: Cognitive				
Feelings of depression (C1)				.030
HIV/AIDS knowledge (C2)				.100
Non-scientific beliefs about HIV/AIDS (C3)				-.113
Perceived control over condom use (C4)				.252***
Fear of HIV infection (C5)				.121*
Positive attitude toward condom use (C6)				.154*
Constant	7.100	10.769	10.491	4.060
R^2	.017	.069	.074	.279
ΔR^2	.017	.052	.005	.205
F	1.017	2.155*	1.837	5.392***
ΔF	1.017	3.255*	.593	10.551***

Note: *$p < .05$; **$p < .01$; ***$p < .001$; Unstandardized regression coefficients are presented in the table.

When the behavioural variables were entered (Block 3), the total variance in consistent condom use explained by the model as a whole was 7.4%, F(10, 229) = 1.837, p = .055. However, this model was not significant. As in Model 2, knowing someone who had died from HIV/AIDS was significantly associated with consistent condom use. The behavioural variables explained an additional .50% of the variance in consistent condom use after controlling for demographic and experiential characteristics. After entry of the cognitive variables (Block 4), the total variance in consistent condom use explained by the model as a whole was 27.9%, F(16, 223) = 5.392, p < .001. The cognitive variables explained an additional 20.5% of the variance in consistent condom use after controlling for demographic, experiential, and behavioural characteristics. In this model, each of perceived control over condom use (β = 0.252; p < 0.001), fear of HIV infection (β = 0.121; p < 0.05) and holding a positive attitude toward condom use (β = 0.154; p < 0.05) was positively associated with consistent condom use.

DISCUSSION

Aventin *et al.,* (2021) have synthesized evidence from studies that describe the determinants of condom use among adolescents in South Africa, and have recommended that given the existence of multi-level barriers and facilitators of condom use, interventions should, likewise, take a multi-level approach that incorporates locally-relevant understanding of the individual-, interpersonal- and structural-level barriers and facilitators to condom use among adolescents and other population groups.

In this study, an aggregated condom use scale score was utilised as a dependent variable measuring consistent condom use among male construction workers engaged in sexual concurrency over a 3-month period. The effect of four groups of independent variables were tested, namely, demographic, experiential, behavioural, and cognitive groups. The demographic group included variables which were instrumentally used to measure structural influences on condom use, the experiential group measured the health system, community and interpersonal influences, and behavioural and cognitive groups measured individual level influences.

Education and work status were included in the demographic group to account for the effect of economic factors. However, both education and work status were found not to be statistically significant in any of the models. This finding contradicts findings from previous studies which suggest that people of a high socioeconomic status are more exposed to diverse media opportunities and educational materials, and so can discuss issues related to HIV/STIs quite frequently with better understanding of transmission modes, have fewer misconceptions, show more positive attitudes toward condom use, and have unbiased assessment of their personal sexual risk.

Relatedly, Maharajh and Haffejee (2021) report on women's perspectives of male condom use and identify outcome measures that will assist in understanding barriers to male condom use in South Africa. They note that a significant number of women in heterosexual relationships face difficulties in negotiating condom use with their partners, particularly if they are financially dependent on their partner. While women with higher education levels were determined to be able to negotiate condom use more easily than were their less educated peers, they nevertheless conclude that when designing interventions with the objective of increasing condom use, it would not be wrong to view women as a vulnerable group who are not always able to control their own protection. As a result, they recommend that more interventions should focus on condom use self-efficacy and the development of assertive negotiation skills for women. They also argue that such interventions should be adapted to include male perspectives, and which address the unequal gender dynamics in heterosexual relationships in a South African setting.

The study findings align with the extant literature which points to interpersonal and individual level influences as proximal determinants of consistent condom use, e.g., cognitive variables such as condom use self-efficacy, fear of HIV infection (Bowen *et al.,* 2016) and a positive attitude toward condom use (Mpeta *et al.,* 2021). Perceived control over condom use, fear of HIV infection and holding a positive attitude toward condom use were all found to be positively associated with consistent condom use after controlling for demographic, experiential and behavioural characteristics.

Incorporating demographic variables in the explanation of health behaviour is viewed as good practice, and a methodologically robust way of approximating the role played

by structural and institutional influences (Armoon *et al.,* 2021). A hierarchical regression model allows one to juxtapose the relative contributions of different blocks of independent variables in the explained variance of a dependent variable. The results of the hierarchical regression analysis suggest that the experiential and cognitive variables are significant in explaining consistent condom use, whilst demographic and behavioural variables are not. Furthermore, the cognitive variables were determined to account for a greater proportion of explained variance in consistent condom use than do the experiential variables.

This finding suggests that in the current, mature stage of the HIV/AIDS epidemic, characterised by biomedical advancements and trans-national economic agreements that have transformed an HIV+ diagnosis from a deadly disease to a manageable chronic illness, some of the indicators that have traditionally been used to understand the diversity of groups within a population (i.e., age, education, marital status, and work status) may be limited in understanding condom use. Specifically, the statistically significant contribution of experiential variables, including whether a participant had been previously diagnosed with an STI, whether they know someone who is HIV+, someone who has died from AIDS or someone on ARV medication may be better at addressing specific challenges associated with HIV-related health behaviours in an era of Universal Test and Treatment and same-day ARV initiation (Onoya *et al.,* 2021). Such experiential variables may also better reflect the motivations linked to consistent condom use in the context of increased availability of alternative HIV preventive measures such as PrEP, PEP and vaginal rings (Nel *et al.,* 2016), which are not perceived as decreasing sexual pleasure.

Recognising the diversity within a population allows for the development of interventions that are tailored to address specific challenges faced by different groups and the design of interventions which are inclusive. While previous studies have focused on condom use among the construction workforce (Bowen *et al.,* 2017a; 2017b), the present study is the only one which has specifically sampled male construction workers concurrently involved with regular sex partners, casual sex partners and sex workers. Given this focus, the study has practical implications for interventions targeting sexual concurrency among male construction workers. Some of the specific intervention strategies emerging from the findings are highlighted below:

1. Male clients of sex workers should be specifically targeted as a group for condom promotion interventions. When interventions target only sex workers, they place the onus of safe sex practices solely on them. Including male clients of sex workers in the response is essential for breaking the chain of infection, reducing stigma and promoting shared responsibility.

2. Over half of study participants (54%) indicated that they had been engaged in a sexual concurrent relationship. Given the ubiquity of polygamous cultures in Southern Africa as well as the thriving sex industry historically associated with worker hostels and camps, men working in male-dominated industries such as construction can be specifically targeted by interventions addressing the role of multiple and concurrent sexual partnerships in HIV/AIDS transmission.

3. Someof the indicators that have traditionally been used to understand the diversity of groups within a population (i.e., age, education, marital status, and work status) may be limited in understanding condom use in the current stage of the HIV/AIDS epidemic in South Africa. Specifically, the statistically significant contribution of

experiential variables, including whether a participant had been previously diagnosed with an STI, whether they know someone who is HIV+, someone who has died from AIDS or someone on ARV medication may be better at addressing specific challenges associated with HIV-related health behaviours in an era of Universal Test and Treatment and same-day ARV initiation. Moving forward, it is recommended that such variables be included in research on HIV/AIDS prevention.

Generalisability is considered a major criterion for evaluating the quality of a study. Firestone (1993) developed a typology outlining two models of generalisability in quantitative research. The first model involves extrapolating findings from a sample to a population (statistical generalisation), which is the traditional approach used in most quantitative studies. The second model, analytic generalisation, is applicable to both qualitative and quantitative research. It refers to the extent to which findings from a study can be applied to other contexts or settings based on the depth of analysis and theoretical insights. Given the convenience sampling approach adopted, the findings of this study are not statistically generalisable to other populations. However, the study findings are analytically generalisable to other populations. For example, the finding that experiential group of variables explain more variance in consistent condom use than do the demographic and behavioural variables may be applicable to other settings and contexts.

CONCLUSIONS

Condom use in South Africa is in decline. Given that the construction industry is vulnerable to HIV/AIDS, interventions incorporating a contextually relevant understanding of how multi-level factors influence condom use among the construction workforce is critical. This study contrasted different groups of factors influencing condom use among male construction workers who were concurrently involved with regular, casual, and sex worker partners. By means of hierarchical regression modelling, consistent condom use was examined in relation to demographic, experiential, behavioural, and cognitive factors. Results indicate that the cognitive and experiential variables as a group significantly explain the variance in consistent condom use among male construction workers engaged in sexual concurrency. Demographic and behavioural variables were not statistically significant. Specifically, perceived control over condom use, fear of HIV infection, and a positive attitude toward condom use were associated with higher levels of consistent condom use, and experiential variables, including whether a participant had been previously diagnosed with an STI, whether they know someone who is HIV+, someone who has died from AIDS or someone on ARV medication were found to explain more variance in consistent condom use than the demographic and behavioural variables. Targeted interventions within the context of sexual concurrency by male construction workers with regular partners, casual partners, and sex workers, are offered.

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