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# HIV non-testing, perpetration of violence against women, and sexual risk-behaviour: A cross-sectional analysis of South African peri-urban township men

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## ABSTRACT

Despite HIV testing having improved globally, men remain disproportionately less likely to test for HIV. While violence against women (VAW) and HIV risk have a strong association among women, few studies explore men around VAW perpetration, risky-sexual behaviour, and HIV testing. Males aged 18–42 years were recruited from a peri-urban settlement near Johannesburg, South Africa. Data were from an endline of a trial. We used logistic regression to assess odds of non-HIV testing using STATA 13. At endline, 1508 men participated in the study. Of these nearly one-third (31.6%,  $n = 475$ ) had not tested for HIV in the past year. HIV non-testing was significantly lower among men who were single, older, did not complete high school and were less food secure. VAW perpetration retained a significant association with HIV non-testing after controlling for socio-demographics (AOR = 0.73, 95%CI = 0.58–0.93). In multivariate models, HIV non-testing was also associated with inconsistent condom use (AOR = 0.64, 95%CI = 0.48–0.85), problem drinking (AOR = 0.72, 95%CI = 0.55–0.94) and reporting of all four risky sexual behaviours (AOR = 0.70, 95%CI = 0.49–1.01). Data suggests that one-third of men who never test for HIV in this setting may represent a high-risk group. Future campaigns could consider behaviour change around non-violence, relationship quality, and gender norms alongside HIV testing.

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HIV testing; men; inequitable masculinities; violence against women; sexual risk behaviour; South Africa

## Background

### Introduction

Globally, a quarter of people living with HIV are unaware of their HIV status (UNAIDS, 2018a). HIV testing is a crucial strategy to help population groups access HIV/AIDS services to prevent spread, link to treatment, care and support (Hlongwa et al., 2019; Vandormael et al., 2018). Undiagnosed HIV infections could undermine global goals of ensuring that 90% of all people living with HIV know their status by 2030 (Joint United Nations Programme on HIV/AIDS, 2014). In addition

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to ensuring their own health, HIV testing can reduce the risk of onwards transmission to partners (Das et al., 2010).

Men remain disproportionately less likely to test for HIV than women (Novitsky et al., 2015; Schell et al., 2016), including in South Africa (45% vs. 59%, respectively) (National Department of Health [NDoH], 2017); and less likely to link to care after they test HIV positive (Bor et al., 2015). The significant under-representation of the male population with respect to HIV is known as the 'HIV blind-spot' (Pascoe et al., 2018; Shand et al., 2014). While recent efforts to increase men's HIV testing have been promising (Colvin, 2019; Fleming et al., 2016; Pascoe et al., 2018), less work has explored the concurrent sexual risk behaviours that men use while avoiding HIV testing. This is crucial to understand since undiagnosed, HIV positive men may drive high rates of onwards transmission.

Ample research has suggested that men who display inequitable masculinities are more likely to perpetrate violence against women (VAW) (Salazar et al., 2020). Inequitable masculinities refer to the beliefs and actions that protect and reinforce the dominant position of men in society (Connell, 2005; Pleck, 1995). In South Africa, inequitable masculinities (physical strength, virility, insatiable sexual drive, avoiding healthcare as a sign of maleness) are deeply embedded and often frame health outcomes for female partners and men themselves (Graaff & Heinecken, 2017; Levon et al., 2017).

Gender-inequitable beliefs that give men power over women shape men's sexual risk taking (Jewkes et al., 2015; Jewkes & Morrell, 2012), and may similarly underpin men's HIV non-testing. In sub-Saharan Africa, it has been suggested that inequitable masculinities influence men's behaviour towards HIV testing (Sileo et al., 2018), though less empirical data exists for this association. Gender and masculinity certainly determine men's HIV risk perception and hinder the utilisation of healthcare service spaces among men (Camlin et al., 2016; De Allegri et al., 2015; Leblanc & Andes, 2015; Skovdal et al., 2011). Inequitable gender norms among men are also associated with men avoiding HIV treatment (Pulerwitz et al., 2019).

Reaching more men with HIV testing and treatment, particularly in high endemic African settings is critical to breaking cycles of HIV transmission and reducing HIV incidence among younger women, who bare the greater proportion of HIV disease burden (Mathenjwa et al., 2019; UNAIDS, 2018b; Vandormael et al., 2018). Therefore, a better understanding of the characteristics of men who are less likely to seek HIV testing services, perpetrate VAW and engage in risky sexual behaviours is critical in designing behavioural change programmes that may address these gaps.

In addition to HIV/AIDS, interpersonal violence is one of the top four causes of mortality in South Africa (Pillay-van Wyk et al., 2016). Previous researchers have reported well-established links between hegemonic masculinity, VAW and HIV risk among women (Dunkle et al., 2006; Dur-eval & Lindskog, 2015; Jewkes et al., 2010; Rwafa et al., 2019). However, the same research has not occurred among men who perpetrate VAW. In a context that is hyper-endemic for both HIV/AIDS and VAW, it is important to understand perceived HIV risk among those who are most likely to perpetrate physical and/or sexual VAW, as well as engage in other sexual risk behaviours and how this relates to HIV non-testing behaviour. If gender and power dynamics of male's VAW has been found to be correlated with HIV risky sexual behaviours, such as engagement with casual sex partners (Dunkle et al., 2006), it is plausible that similar masculinities may underpin HIV testing outcomes among men.

This study potentially fills multiple important knowledge gaps with regard to how men are at risk of acquiring or transmitting HIV and what factors influence HIV testing behaviour. Previous studies have not examined HIV non-testing, perpetration of VAW and sexual risk behaviour among heterosexual men in much detail. Research to date has tended to focus on HIV testing behaviour of men who have sex with men (Beyrer et al., 2016; Nel et al., 2013; Wirtz et al., 2013) or factors that influence HIV testing among men (Fleming et al., 2016; Fleming et al., 2019; Sileo et al., 2018). We hypothesised that men who are less likely to test for HIV, perpetrate VAW and engage in risky sexual behaviours. The purpose of

the study was to test the hypothesis that men, who are less likely to test for HIV, perpetrate VAW and engage in risky sexual behaviours.

### **Conceptual framework**

Based on the influence of masculinity on health and health practices, we used the theoretical framework of Health, Illness, Men and Masculinities (HIMM) to help describe potential pathways that may influence HIV non-testing, perpetration of VAW, as well as sexual risk behaviours among men. The HIMM framework explores masculinities as a social determinant of health among men and helps provide explanations as to why health disparities exist among men and women, as well the recognition that men themselves are a diverse social group (Evans et al., 2011). The framework helps researchers and policy makers consider men's health outcomes in a larger social context within which masculinities are defined and reproduced (Evans et al., 2011). According to Connell (2005), multiple forms of masculinities or different types of masculinities exist within socially diverse contexts, such as hegemony, subordination, complicity and marginalisation which are related to each other and determine men's health and health practices (Connell, 2005).

### **Methods**

#### ***Design, context, study site and sampling***

South Africa is a multi-racial/multi-ethnic society. Given the social and historical context of racial apartheid in the country, as well as the complex ways this has shaped notions of masculinity and the perpetration of VAW, we conducted a cross-sectional endline analysis of 1508 (63%) out of an initial 2046 group of heterosexual men. Participants were aged between 18 and 42 years, residing in a peri-urban settlement near Johannesburg, South Africa. The peri-urban settlement was established in the early 1990s and comprised primarily of black residents who migrated to Johannesburg in search of employment from other provinces or nearby countries. Data were collected in a trial of a multi-level intervention for preventing men's use of sexual and gender-based violence (SGBV) in urban South Africa (Christofides et al., 2018). At baseline, participants were conveniently recruited into the study through neighbourhood clusters and followed-up over a period of 24-months (2016–2018).

#### ***Data collection***

Data were collected in the participant's choice of language (English, isiZulu, Sesotho, or Tswana), using standardised self-administered questionnaires on mobile devices. The data collection tool was self-completed on tablet computers using an audio-computer assisted self-interview software (Open Data Kit). Data were collected using various forms that considered the following: screening, socio-demographic characteristics, parenting, substance/alcohol use, gender beliefs and partnership characteristics, use of violence, mental health, as well as social action. In this paper, we decided to use only the endline data, making this a cross-sectional analysis.

#### ***Data measurements***

The outcome variable of interest was HIV testing behaviour. At study endline, men were asked to respond to the question 'have you tested for HIV in the last 12 months'. We dichotomised the dependent variable into HIV testing vs. HIV non-testing. HIV testing data was based on self-reported information from the study participants.

Exposure variables included relationship characteristics, sexual risk behaviours and masculinities – adherence to harmful masculinity norms. Recent physical and/sexual VAW was measured

using the WHO multi-country study instrument, which asks about intimate partner violence (IPV) perpetration and rape of a non-partner in the last 12 months (Garcia-Moreno et al., 2006). Perpetration of VAW was measured by combining both physical (5-item) and/sexual (3-item) violence and rape of a non-partner. Men were asked to respond 'never', 'once', 'few' or 'many' to perpetration of either physical and/or sexual violence against current or most recent partner in the past 12 months. Responses were dichotomised into never vs. ever ( $\geq 1$ ). Men were asked about forced non-partner sexual experiences with women in the last 12 months by responding 'never', 'once', 'few' or 'many' using a 5-item scale. We dichotomised responses into never vs. ever ( $\geq 1$ ). Control in relationships was assessed using a 9-item Sexual Relationship Power Scale (SRPS). Men were asked to respond 'strongly disagree', 'disagree', 'agree' or 'strongly agree' to statements related to their current or most recent relationship with their partner, including, 'if my partner asked me to use a condom, I would be angry'. Response items were added together to create a score. Higher scores indicated more controlling behaviour ( $\alpha = 0.83$ , range 9–36). Gender beliefs were measured using an 11-item Gender Equitable Men's Scale (GEMS). Men were asked to respond 'strongly disagree', 'disagree', 'agree' or 'strongly agree' to statements on their opinion about relations between men and women, including: 'I think a woman cannot refuse to have sex with her husband'. Items were added together to create a score. Higher inequity was indicated by higher scores ( $\alpha = 0.88$ , range 11–44).

Sexual risk behaviours were measured using the following four variables: men were asked to report on how often they used condoms in the last 12 months (never, sometimes, often and always). Responses were added together to create a dichotomous variable, not consistent vs. always condom use. Sex with a sex worker was measured by asking men 'how many times have you had sex with a prostitute in the last 12 months'. Responses were dichotomised to be never vs. ever ( $\geq 1$ ). Multiple sexual partnerships were measured by asking men 'how many main partners have you had sex with in the last 12 months?' This included adding up responses for 'makhwapheni' (meaning 'side dishes', which colloquially refers to casual partners a man has beside his main partner). Responses were dichotomised to be never ( $< 1$ ) vs. ever ( $\geq 2$ ). Problem drinking in the past 12 months was assessed using the 9-item Alcohol Use Disorders Identification Test scale (Saunders et al., 1993). Men were asked to report 'never', 'monthly or less', '2–4 times a month', '2–3 times a week' or '4 or more times a week' to statements about their use of alcohol, including 'how often do you have a drink containing alcohol'. We dichotomised the outcome, such that scores  $> 8$  indicated problem drinking ( $\alpha = 0.81$ , range 0–36).

In addition, we looked at the some covariates in the analyses. Men's socio-demographics were measured as follows: age in years; high school level of education (matriculated from high school vs. not); Migrancy status in Gauteng Province (non-migrant vs. migrant); length of stay in the peri-urban settlement in years; employment status in the past 12 months (never worked vs. worked); food security in the past month (less secure score on the Household Hunger Scale  $\geq 6$  vs. more secure score  $< 6$ ) (Deitchler et al., 2010); relationship status (single vs. partnered); and length of relationship with main partner in years.

### Statistical analysis

Analysis of data presented in this paper was restricted to the 1508 men who participated at endline. We analysed the data using STATA 13 software (College Station, Texas, USA). Descriptive statistics were calculated in order to characterise the men who participated in the study and presented as proportion (percentage %) and or means with standard deviations (SD) depending on the type of variable reported. Statistical tests for association between the covariates and the outcome HIV testing were performed using Pearson chi-square ( $X^2$ ) or sign rank test. A *p*-value of  $\leq 0.05$  was considered statistically significant in this analysis.

We used logistic regression to estimate odds of non-HIV testing among the study participants, reported as crude (unadjusted) and adjusted odds ratio (AOR). Three multivariate logistic models

were built, by entering together some covariates that had a  $p$ -value of  $\leq 0.25$  in the bivariate analysis (Sun et al., 1996). Traditional cut-off points (like 0.05 or 0.1) can fail to identify known important variables (Bendel & Afifi, 1977; Mickey & Greenland, 1989). Using forward selection stepwise regression Model 1 ( $n = 1484$ ) included socio-demographics and relationship factors, Model 2 ( $n = 1458$ ) further had inequitable masculinities, and Model 3 ( $n = 1453$ ) had previously included covariates plus sexual risk behaviours (Table 4).

### **Ethical considerations**

The University of the Witwatersrand Human Research Ethics Committee provided ethical clearance (Trial registration number NCT02823288) (Christofides et al., 2018). Procedures of the study were in accordance with ethical recommendations of the United Nations' Multi-Country Study on Men and Violence. Permission to collect data was sought from study participants. To maintain confidentiality, the study used de-identified data.

## **Results**

### **Socio-demographics and relationship characteristics of all men**

Table 1 shows the socio-demographic characteristics of all study participants. The majority of the participants were Black Africans. The mean age of the men was 29.4 years ( $SD = 5.8$ ), aged from 18 to 42. Less than half of the men had completed high school/matriculated (42.5%,  $n=641$ ). Most of the participants had migrated from outside Gauteng Province in which the peri-urban settlement was located (72.4%,  $n = 1733$ ). The mean length of stay in the peri-urban settlement among participants was 11.3 years ( $IQR = 1-36$ ). Nearly a quarter of the men had not been employed in the past 12 months (24%,  $n = 359$ ). Results showed that more than half of the participants were less secure about their food status in the past month (55.6%,  $n = 833$ ). The majority of men were partnered (88.3%,  $n = 1332$ ). The mean length of the men's relationships with their primary partner was 5.4 years (range 0–15). Nearly one-third of participants had not tested for HIV in the past 12 months (31.6%,  $n = 475$ ), compared to the majority of men who tested (70%,  $n = 1027$ ).

### **Inequitable masculinity norms and recent physical and/sexual VAW among men**

In the past year, nearly a third of the men had ever perpetrated VAW (32.9%,  $n = 494$ ). At endline, more than a quarter of the men had partner controlling behaviours (27.4%,  $n = 408$ ). While, a third of the men had gender inequitable beliefs (33.1%,  $n = 490$ ).

### **Sexual risk behaviours among participants**

We show the risky sexual behaviours of all men on Table 2. At endline, the majority of men used condoms inconsistently in the last 12 months (72.8%,  $n = 1012$ ). One-fifth of the men ever had sex with a sex worker in the past year (22.5%,  $n = 663$ ). Most of the participants reported having multiple sexual partners in the past 12 months (62.0%,  $n = 856$ ), with an average number of 3.2 sexual partners (range 0–9). More than a quarter of men exhibited problem drinking in the past 12 months (27.5%,  $n = 406$ ), mean score 5.9 ( $SD = 6.6$ ). One in ten participants reported all four risky sexual behaviours (9.3%,  $n = 140$ ).

### **Relationship between covariates under study and HIV testing among men at endline**

Results from the bivariate associations between socio-demographics, relationship characteristics, inequitable masculinities, risky sexual behaviours and HIV testing at endline are

**Table 1.** Socio-demographics, relationship characteristics and inequitable masculinities of participants.

Characteristic	Endline, n = 1508 Number (%)
<i>Age</i>	
Mean age in years $\pm$ SD	29.4 $\pm$ 5.8 (IQR = 18–42)
<i>Ethnicity</i>	
Other racial/ethnic groups	21 (1.4)
Black/African	1478 (98.6)
<i>Highest school level education</i>	
Secondary or less	876 (57.5)
Completed high school/Matriculated	641 (42.5)
<i>Migrancy in Gauteng Province</i>	
Non-migrant	659 (27.6)
Migrant	1733 (72.4)
<i>Length of stay in peri-urban area</i>	
Mean stay length in years $\pm$ SD	11.3 $\pm$ 6.0 (IQR = 1–36)
<i>Employment in the past 12 months</i>	
Never worked	359 (24.0)
Worked	1137 (76.0)
<i>Food security in the past month</i>	
Mean score $\pm$ SD	5.9 $\pm$ 2.5 (IQR = 3–12)
Less secure (score $\leq$ 6)	833 (55.6)
More secure (score $>$ 6)	665 (44.4)
<i>Relationship status</i>	
Single	176 (11.7)
Partnered	1332 (88.3)
<i>Length of relationship with main partner</i>	
Mean relationship length in years $\pm$ SD	5.4 $\pm$ 4.3 (IQR = 0–15)
<i>IPV perpetration in the past year</i>	
Never	1105 (73.6)
Ever	397 (26.4)
<i>Rape of a non-partner in the past 12 months</i>	
Mean $\pm$ SD	0.9 $\pm$ 2.3 (IQR = 0–15)
Never	1195 (79.5)
Ever	309 (20.5)
<i>Physical and or sexual VAW in the last 12 months</i>	
Never	1010 (67.1)
Ever	494 (32.9)
<i>Sexual Relationship Power Scale</i>	
Mean relationship control score $\pm$ SD	19.4 $\pm$ 5.2 (IQR = 9–36)
Non-controlling	1080 (72.6)
Controlling	408 (27.4)
<i>Gender Belief Scale</i>	
Mean gender belief score $\pm$ SD	21.9 $\pm$ 6.3 (IQR = 11–44)
Equitable	989 (66.9)
Inequitable	490 (33.1)

displayed on [Table 3](#). The following socio-demographic measures were associated with men's HIV testing behaviour: highest school education level, food security in the past month, and marital status. In terms of inequitable masculinity norms, recent VAW perpetration was associated with never testing. All risky sexual behaviours under study for the past year were associated with not testing for HIV – inconsistent condom use, sex with a sex worker, multiple sexual partnerships, and problem drinking.

### **Association of HIV testing with socio-demographics, hegemonic masculinities and sexual risk**

At endline, after adjusting for socio-demographics and relationship factors in multivariate analysis, highest level of school education (AOR 1.41, 95% = 1.12–1.78), food security (AOR 1.45, 95% CI = 1.15–1.81) and being partnered (AOR 1.71, 95% = 1.23–2.39) remained statistically significant with more likelihood of testing for HIV in the multivariate logistic Model 1 ([Table 4](#)).

**Table 2.** Descriptive statistics of sexual risk behaviours among all men.

Characteristic	Endline, <i>n</i> = 1508 Number (%)
<i>Consistent condoms use in the last 12 months</i>	
Always	1012 (72.8)
Non-consistent	378 (27.2)
<i>Sex with a sex worker in the past 12 months</i>	
Never	663 (77.5)
Ever	192 (22.5)
<i>Multiple sexual partners in the past year (<math>\geq 3</math>)</i>	
Never	3.2 $\pm$ 2.7 (range = 0–9)
Ever	525 (38.0)
Ever	856 (62.0)
<i>Problem drinking in the past year (AUDIT <math>\geq 8</math>)</i>	
Mean score $\pm$ SD	5.9 $\pm$ SD 6.6 (IQR = 0–36)
Non-problem drinking (score $\leq 8$ )	1072 (72.5)
Problem drinking (score $> 8$ )	406 (27.5)

Note: AUDIT: Alcohol use disorders identification tool.

**Table 3.** Bivariate association between socio-demographics, relationship characteristics, hegemonic masculinities, risky sexual behaviours and HIV testing among men.

Characteristic	HIV testing		<i>p</i> -Value ( $\chi^2$ or sign rank test)
	Not tested <i>n</i> = 475 Mean or %	Tested <i>n</i> = 1027 Mean or %	
<i>Socio-demographics</i>			
Age (years)	29.6	29.3	0.40
Highest level of school education	<b>36.8%</b>	<b>45.0%</b>	<b>0.03</b>
Migrated from outside province,	70.0%	72.1%	0.42
Time living in community (years)	11.7	11.2	0.13
Worked in past 12 months	73.1%	77.4%	0.07
Food secure	<b>38.9%</b>	<b>46.9%</b>	<b>&lt;0.01</b>
<i>Relationship characteristics</i>			
Partnered	<b>84.4%</b>	<b>90.1%</b>	<b>&lt;0.01</b>
Length of relationship	5.3	5.4	1.00
<i>Inequitable masculinities</i>			
Physical and/ sexual VAW in the past year	<b>36.9%</b>	<b>31.1%</b>	<b>0.03</b>
Sexual Relationship Power Scale	2.2	2.2	0.38
Gender Beliefs Scale	2.0	2.0	0.07
<i>Sexual risk behaviours</i>			
Consistent condom use (always)	<b>90 (20.8%)</b>	<b>287 (30.1)</b>	<b>&lt;0.01</b>
Sex with a sex worker in the past year	<b>79 (27.3%)</b>	<b>113 (20.1)</b>	<b>0.02</b>
Multiple partners ( $\geq 3$ ) in the past year	<b>282 (65.9%)</b>	<b>570 (60.1%)</b>	<b>0.04</b>
Problem drinking (AUDIT $\geq 8$ )	<b>147 (32.0%)</b>	<b>259 (25.5%)</b>	<b>0.01</b>

Note: Bold indicates significant variables.

As shown in Table 4, VAW perpetration was associated with lower odds of HIV testing (OR 0.77, 95% CI 0.61–0.97). After adjusting for socio-demographic characteristics, relationship factors and inequitable masculinity norms in the multivariate logistic Model 2, VAW perpetration remained significantly associated with worse HIV testing (AOR 0.73, 95% CI 0.58–0.93).

Table 4 indicates that in Model 3, after adjusting for socio-demographics, relationship characteristics, hegemonic masculinity norms and sexual risk behaviours, men who used condoms inconsistently in the last 12 months were less likely to test for HIV (AOR 0.64, 95% CI = 0.48–0.85) and men who had problem drinking were also less likely to undertake an HIV test (AOR 0.72, 95% CI = 0.55–0.94).

## Discussion

Our results show that at endline, HIV testing was significantly lower among men who perpetrated VAW and engaged in risky sexual behaviour, such as inconsistent use of condoms and problem



**Table 4.** Estimated effects of socio-demographics, relationship characteristics, inequitable masculinities and sexual risk behaviours on HIV testing among men.

	Model 1: Socio-demographics <i>n</i> = 1484 Adjusted OR (95% CI)	Model 2: Masculinities <i>n</i> = 1458 Adjusted OR (95% CI)	Model 3: Gendered risk <i>n</i> = 1453 Adjusted OR (95% CI)
<i>Socio-demographics</i>			
Age (years) ≥30 years	0.84 (0.68–1.05)	0.81 (0.64–1.01)	0.77 (0.60–0.99)*
Highest level of school education	1.40 (1.12–1.75)**	1.41 (1.12–1.78)**	1.28 (1.00–1.64)*
Migrated from outside province	1.11 (0.86–1.41)	–	–
More than 6 years living in township	0.82 (0.64–1.06)	–	–
Worked ever in past 12 months	1.26 (0.98–1.62)	1.20 (0.93–1.56)	1.50 (0.90–1.59)
Food secure	1.40 (1.11–1.74)**	1.45 (1.15–1.81)**	1.50 (1.17–1.91)**
<i>Relationship characteristics</i>			
Partnered	1.80 (1.21–2.30)**	1.71 (1.23–2.39)**	1.95 (1.33–2.86)**
Length of relationship >5 years	1.11 (0.87–1.42)	–	–
<i>Inequitable masculinities</i>			
Physical and/ sexual VAW in the past year	0.77 (0.61–0.97)*	–	0.80 (0.61–1.04)
Gender inequitable beliefs	0.80 (0.64–1.01)	–	0.93 (0.72–1.21)
Overpowering in relationships	1.91 (0.71–1.16)	–	–
<i>Sexual risk behaviors</i>			
Inconsistent condom use in the past year	0.61 (0.47–0.80)***	–	0.64 (0.48–0.85)**
Multiple partners in the last 12 months	0.78 (0.61–0.99)*	–	0.87 (0.67–1.13)
Sex worker use in the last 12 months	0.67 (0.48–0.93)*	–	–
Problem drinking in the past 12 months	0.73 (0.57–0.93)*	–	0.72 (0.55–0.94)**

Notes: OR: odds ratio; CI: confidence interval.

\**p* ≤ 0.05, \*\* *p* < 0.01, \*\*\* *p* < 0.001.

drinking. Multiple risky sexual behaviours were related to men's failure to take-up HIV testing. This data suggests that the one-third of men who never test for HIV in this setting may represent a high-risk HIV group with lower perception of risk. We found that VAW and HIV testing track together; lending strength to the argument that VAW perpetration may go hand-in-hand with risky HIV behaviours.

While men have been recognised as the 'blind spot' of increased HIV testing efforts (Fleming et al., 2019; Pascoe et al., 2018; Shand et al., 2014), HIV testing rates among this heterosexual, male sample living in a peri-urban settlement near Johannesburg were relatively higher than expected. This may be explained, in part, by ongoing testing interventions by non-governmental organisations. For example, national wide testing campaigns (Maughan-Brown et al., 2016), community-based testing (Meehan et al., 2017), self-testing (Perez et al., 2016) and incentivized testing (Black et al., 2014; Nglazi et al., 2012) have all been rolled out in various South African regions.

Men who perpetrated physical and or sexual VAW were less likely to test for HIV, even after controlling for their socio-demographic characteristics. Recent evidence from South Africa, as well evidence from Zambia showed barriers to HIV testing to include men's reluctance to test, due to perceiving health facilities as women's spaces and perceptions that going to test for HIV demonstrated non-masculinity, which might be regarded as being weak (DiCarlo et al., 2014; Katirayi et al., 2017). In KwaZulu-Natal province, South Africa the majority of men who refused to test for HIV reported feeling well, and therefore felt no need to test (Chikovore et al., 2016). Barriers to HIV testing services among men may be linked to lack of perceived individual risk to HIV infection, and feelings of masculinities (Siu et al., 2014). The same reasoning may be attributed to why men fail to access HIV testing services in our study.

Our results revealed that hegemonic masculinity beliefs such as perpetration of VAW were associated with never testing for HIV among participants. We assume that men may avoid testing for HIV while perpetrating VAW and engaging in sexual risky behaviours, like inconsistent condom use. Thereby increasing their own risk of acquiring HIV, greater risks of HIV-related death and heightening rates of onward transmission to sexual partners (Bor et al., 2015; Dunkle et al., 2006). For example, women are more likely to be HIV positive if they are in gender-unbalanced relationships, where men have considerably more power than they did (Rwafa et al., 2019). Men who never tested for HIV in our study while perpetrating VAW may perceive themselves to be at lower risk of HIV infection. Some authors have noted that men's perceived limited vulnerability to HIV can also be linked to expectations of male authority and more gender inequitable beliefs or hegemonic masculinities (Closson et al., 2019; Shand et al., 2014). However, the tool we used to measure gender inequitable beliefs among men was not significantly associated with HIV testing in this study.

Our analysis demonstrated that younger men were more likely to test for HIV. These findings are inconsistent with those observed in Malawi, where older men were three times more likely to take an HIV test (Mandiwa & Namondwe, 2019). Our results may indicate that, as men grow older in this population, their perceived risk of HIV decreases. This result may be explained by the fact that older-men are more likely to be in stable relationships, which they may perceive to be protective from HIV infection as opposed to younger men who are yet to settle down or have multiple sexual partners (Dunkle et al., 2008). We found single men were almost half as likely to have tested for HIV compared to those with long-term partners. These results are comparable to those found in Malawi and Nigeria; which showed that being married increased the likelihood of getting tested for HIV among some men (Mandiwa & Namondwe, 2019; Olakunde et al., 2019). Other scholars have cautioned against the consideration of men as a homogenous group (Fleming et al., 2019). Men who participated in this study may be different from men from other parts of South Africa.

Men who reported HIV risk behaviours, such as inconsistent condom use and problem drinking had less likelihood of testing for HIV in this study. There are several explanations for this finding. Men may not be fully aware that their sexual behaviours are actually 'risk' factors to HIV infection, or they may not want to know their HIV status. Our findings are comparable to studies conducted

in Nigeria and Zimbabwe, which demonstrated that men who do not use condoms are less likely to test for HIV (Gazimbi & Magadi, 2017; Olakunde et al., 2019). Prior studies have noted that gender norms are associated with multiple sexual risk behaviours, like unwillingness to use condoms and being tested for HIV among men (Leclerc-Madlala, 2008), and fear of stigma (Shand et al., 2014; Siu et al., 2014). Results from this study and its context are significant to HIV programming as they help explain perpetration of VAW, multiple sexual partnerships and inconsistent condom use, significantly increase the risk of men transmitting HIV and other sexually transmitted infections (STIs) to sexual partners (UNAIDS, 2017).

We found men who had completed high school, and had more food security had greater odds of testing for HIV. Therefore, being educated and having socio-economic security increases likelihood of testing, while experiencing deprivation and marginalisation reduces it. Previous studies in South Africa and Malawi demonstrated similar results; socio-economic status and higher levels of education were associated with the likelihood of taking an HIV test among men (Mandiwa & Namondwe, 2019; Peltzer et al., 2009). More educated men might have a better understanding and knowledge of HIV risk and the benefits of knowing one's HIV status. Studies elsewhere have associated men's HIV testing behaviour with their knowledge of HIV (Carrasco et al., 2018; Stephenson et al., 2013). Our findings show how young men in the community experience extreme social exclusion (no education, food, and employment), which is related to their HIV-testing and perpetration of VAW. Other papers that have come out of the study revealed that food insecurity, childhood trauma, and the influence of the context (Christofides et al., 2020; Hatcher et al., 2020; Gibbs, Hatcher, et al., 2019) affects men's beliefs and behaviours. Men may be better engaged in HIV testing and prevention services if these important social drivers of health behaviour are addressed by future interventions.

### **Study limitations**

Findings from this study should be interpreted in light of some limitations. At endline, there were low follow-up rates, which means the data may be skewed towards traits of men that are easier to follow up. The volunteer sample of the community-based participants means we cannot extrapolate findings to the wider population. The research uses self-reported data, which may potentially introduce social desirability bias from the participants. This is particularly problematic for HIV testing, since men may have anticipated that the 'correct' answer was to say they had tested for HIV. Nevertheless, self-reporting does represent the state of the evidence for many behaviours, including testing and VAW. We aimed to reduce social desirability bias by asking men to self-complete the survey, though this may have introduced other limitations concerning literacy. We met these concerns with voice-recorded versions of each item in the language of the participant's choice. It is also possible that this group of men could have been transgender, bi-sexual or homosexual. However, we did not collect data on gender, but rather invited people who self-identified as men to participate. Since the analysis was conducted at endline only, the findings are cross-sectional in nature and cannot assess causality. There are also limits to generalizability, since this analysis only utilises data from men who were followed to endline, and who may be different from those men who were lost to follow-up. In addition, recall bias could have resulted in measurement bias, such as under-reporting of HIV testing. If this occurred, then it would bias the results towards the null hypothesis.

### **Study implications**

Policymakers and researchers need to address how best to programme activities for high-risk men who fail to test for HIV, perpetrate VAW and engage in HIV sexual risk behaviours. HIV testing programmes in urban South African settings should consider how to reach the male HIV high-risk groups. Interventions that link together social and economic insecurity, personal traumas, inequitable masculinity beliefs and avoidance of HIV testing are required. HIV high-risk men may benefit

from taking-up HIV testing services; including participating in behavioural change programmes that target relationship quality, non-violence and gender norms. We recommend that high-risk groups attend targeted interventions around masculinities and livelihoods, which have shown promise in similar South African township settings (Gibbs, Dunkle, et al., 2019). Addressing all-male groups with proven alcohol and violence-reduction programming alongside HIV testing could be a promising avenue.

## Conclusion

HIV testing was significantly lower among heterosexual men who perpetrated VAW and engaged in risky sexual behaviours. There is need to close the current ‘HIV blind-spot’ gap by reaching men with HIV testing and other behaviour change programming.

## Author contributions

TR conducted the data analysis, and write-up of initial drafts of the manuscript. RM reviewed and commented on manuscripts drafts. DR designed the study and commented on manuscripts drafts. NC designed the study, contributed to the data analysis and commented on manuscript drafts. AH designed the study, contributed conceptually to the analysis, and writing of the manuscript.

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