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ORIGINAL PAPER

The Associations of Voluntary Counseling and Testing Acceptance and the Perceived Likelihood of Being HIV-Infected Among Men with Multiple Sex Partners in a South African Township

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Abstract This paper examines the socio-demographic factors and sexual risk behaviors (condom use, number of sexual partners, STI symptoms) associated with voluntary counselling and testing (VCT) acceptance and self-perceived risk of being HIV-infected among black men with multiple and younger sex partners in a South African township outside of Cape Town. Using respondent driven sampling, we interviewed 421 men, of whom 409 (97.3%) consented to provide a dried blood spot, 12.3% were HIVinfected (95% confidence intervals [CI.] 8.3, 16.9) and 47.2% (CI. 41.1, 53.6) accepted on site VCT. Twenty six percent (CI. 20.2, 30.7) reported having an HIV test in the past year. Few men perceived themselves as very likely to be infected with HIV (15.6%; CI. 10.4, 20.5). VCT acceptance was significantly associated with being older, married or living with a partner, having higher education, having four to six partners in the past three months and testing HIV positive. Self-perceived likelihood of being HIV infected was significantly associated with low condom use and having seven or more partners in the past three months, and testing HIV positive. These findings indicate that men correctly understand that engaging in certain HIV risk behaviors increases the likelihood of HIV-infection. However, those who perceive themselves at high risk of having HIV do not seek testing. Further investigation into the psychological and cultural barriers to reducing risky sexual behaviors and accessing VCT and other HIV services is recommended.

Keywords South Africa · HIV/AIDS · Voluntary counseling and testing · Most at risk populations · Respondent driven sampling

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Background

In an effort to increase access to antiretroviral therapy services, it is important to identify groups at high risk for HIV-infection and scale-up HIV testing services to reach these groups. Sexually active adolescents and adults living in urban townships or informal settlements are among the groups most at risk for HIV infection in South Africa (Shisana et al. 2005). Within this group are men with multiple concurrent partnerships, often with younger female sexual partners, who are at high risk of contracting HIV and also infecting this younger female population

(Dunkle et al. 2007; Hallett et al. 2007; Halperin and Epstein 2004; Jewkes et al. 2003; Southern African Development Community 2006).

Over the past several years, the South African government and international donor organizations have been strengthening and expanding voluntary counseling and testing (VCT) services, and improving access to antiretroviral therapy in the country (Birdsall et al. 2004). First established in South Africa at antenatal clinics, VCT services have since been expanded to general primary care services, including tuberculosis, family planning and sexually transmitted infections (STIs) (MSF 2003). In just 2 years, (2002–2004) the number of clinics offering VCT increased from 0.9 per 100,000 to 5.6 per 100,000 and VCT acceptance has increased by 67% (Dorrington et al. 2004; WHO 2004). As of August 2007, there were 4,215 operational VCT centers in South Africa, 180 located in the Cape Town area [South African National Department of Health (personal communication) Pretoria, 2007].

Despite this progress, less than a third ($\approx$30%) of South Africans have been tested for HIV (Shisana et al. 2005). VCT programs are important entry points to access HIV care and treatment services. VCT is also a key HIV prevention tool because individuals who know their HIV status may be less likely to practice high-risk sexual behaviors compared with individuals who have not been tested (Marks et al. 2005; Glick 2005). Given that a large percentage (range: 14–40%) of South African men have multiple concurrent sexual partners and practice unprotected sex (Halperin and Epstein 2004; MSF 2004; Shisana et al. 2005; Shisana and Simbayi 2002) it is important to encourage this high-risk population to utilize VCT to learn their HIV status and to access care and treatment if indicated.

There are numerous reasons why high-risk individuals, particularly men, choose not to seek HIV testing and know their HIV status. Some fear that being HIV-infected will result in community and familial stigmatization (Kalichman and Simbayi 2003) and that testing positive for HIV may lead to other undesirable outcomes, such as having to disclose one's status to sexual partners and potentially having to change enjoyable, but risky, behaviors (IRIN Plus News 2005; Levack 2005). Other barriers to accessing VCT include the perceived lack of confidentiality, insufficient information and knowledge, inadequate and unskilled staff, long waiting times and inconvenience (Benatar 2004; Birdsall et al. 2004; Hutchinson and Mahlalela 2006; Kalichman and Simbay 2003; MSF 2003, 2004; Killewo et al. 1998; Mabunda 2006; Shisana et al. 2005). Of particular concern are individuals' perceptions, often inaccurate, that they are not at risk for HIV (MSF 2004). A recent national household HIV behavioral and sero-prevalence survey in South Africa found that men who perceived themselves as less likely to be HIV-infected (self-perceived low risk of infection) were more likely to test positive for HIV (Shisana et al. 2005). Inaccurate perceptions of HIV risk may lead to increased risk behaviors. On the other hand, individuals who accurately recognize themselves at high risk, acknowledge their vulnerability to HIV infection and, in turn, may become more receptive to HIV education and related services such as VCT (Sethosa and Peltzer 2005; Zachariah et al. 2003). Exposure to VCT leads some individuals to transition from risky to safer behaviors (Coovadia 2000; De Zoysa et al. 1995; Glick 2005; Glick and Sahn 2004; UNAIDS 2004; Voluntary HIV-1 Counseling and Testing Efficacy Study Group 2000; Weinhardt et al. 1999). Determining linkages between the self-perceived risk of being HIV-infected and willingness to seek VCT could provide information about why someone is more or less likely to access VCT (Akwara et al. 2003; Cleland 1995).

This paper examines socio-demographic factors and sexual risk behaviors (condom use, number of sexual partners, STI symptoms) associated with VCT acceptance and self-perceived risk of being HIV-infected among black men with multiple and younger sex partners in a South African township outside of Cape Town. It also explores whether those who perceive themselves more likely to be HIV-infected have sought testing in the past year, and whether they chose to learn their HIV status when offered testing as part of a survey to assess HIV prevalence and behaviors. Findings from this survey can inform program implementers and policy makers to bolster efforts to encourage higher rates of VCT acceptance (Sweat et al. 2000; Voluntary HIV-1 Counseling and Testing Efficacy Study Group 2000; WHO 2003).

Methods

Survey Design

In 2006, an HIV prevalence and risk behaviors survey was conducted in a township outside of Cape Town, South Africa. The survey location was selected based on an assessment of the population's vulnerability to HIV infection by the Western Cape Department of Health Working Group on HIV Prevention (Department of Health 2005; Shaikh et al. 2006; Statistics South Africa 2001).

The survey took place from August to December, and used respondent-driven sampling (RDS). RDS is currently used to gather HIV biological and behavioral data from hard-to-reach, socially networked populations (Heckathorn 1997, 2002). RDS begins with a set of non-randomly selected members of the survey population who, after participating in the survey, are given a set number of

coupons with which to recruit eligible peers. Peers who receive a coupon can choose to enroll in the survey by redeeming their coupon at the interview location advertised on the coupon. Participants are given an incentive for completing the survey and for recruiting their peers who complete the survey.

Eligible males were 18 years and older who had >1 female sexual partner in the previous 3 months who was <24 years old or ≥3 years younger than the participant and living in the sampled township. The age cut-off for sexual partners (<24 years old or ≥3 years younger than the male participant) was based on research that age differences between young women and their older male partners are a significant HIV risk factor for young women by mixing populations with different sero-prevalence levels (Dunkle et al. 2007; Kelly et al. 2003; Luke 2003, 2005; Shisana et al. 2005).

This survey used 15 non-randomly selected men who met the eligibility criteria and were found through contacts with ministry of health workers and a local nurse. These initial recruits were selected based on their ability to recruit other eligible males and on their differences in age, marital status and occupation. Initial recruiters, as well as each participant who completed the survey, received up to three recruitment coupons with which to recruit other eligible males. The coupons included a unique number for use in linking recruiters to their recruits and in linking each participant's questionnaire to their biological specimen.

Males who presented a valid coupon to the interview location were screened for eligibility, provided information about the survey, and asked to consent to the survey. After consenting, eligible participants were interviewed by trained South African interviewers in IsiXhosa language using a 106 item questionnaire developed by the Medical Research Council and the Ministry of Health, Cape Town, South Africa.

Upon completing the interview, participants were asked to provide a dried blood spot (DBS) sample to a trained nurse to test for HIV antibodies. Participants could receive their test results on-site within 30 min of providing the DBS along with anonymous HIV pre- and post-test counseling with a trained counselor using VCT procedures established by the Western Cape Department of Health. Rapid tests were conducted with First Response® test kits and those with reactive test results were re-tested using an HIV-TriLine confirmatory test. All men with positive test results received information about the nearest public health clinics in order to receive follow-up care and treatment. All DBS samples were transported to the Global Clinical and Viral Laboratory in Durban and tested for HIV antibodies with Vironostika® HIV-1 Microelisa System. Results from lab tests were not given to participants but were used in the final analysis of HIV status.

Eligible participants received an incentive of a cellular phone recharge voucher worth R60 (±US$8) for completing the interview and providing a DBS. Those who recruited eligible peers received another incentive worth R20 (±US$2.75) for each recruit who presented a coupon, fulfilled the eligibility criteria, and enrolled in the survey.

A sample size of 430 was calculated based on estimated HIV prevalence of between 25 and 33% in the survey township (MSF 2003; Shaikh et al. 2006) with a precision of 25 ± 5% and a design effect of 1.5. Design effects are used in sample size calculations to account for potential biases introduced through sampling methodologies; at the time of this survey a design effect of 1.5 was recommended for surveys using RDS methods (D. Heckathorn, personal communication 2005).

Measures

The authors examined participants' acceptance of on-site VCT and the self-perceived likelihood (very likely, somewhat likely or very unlikely) of being HIV-infected. Participants were asked their age, marital status (single/never married or ever married/living w/partner), education (<grade 8, grade 8–12) and whether they currently earned money from a job, rather than receiving financial support from friends or family. Questions on behavioral risk factors included reporting an STI symptom (dysuria, discharge from penis, or sores on genital or anus) in the past 12 months, condom use with a casual or "one-off"[1] partner (categorized into never, sometimes and always) in the past 3 months, and number of sex partners (casual, "one-off" and main partners) in the past 3 months which was categorized into ≤3, 4–6, and ≥7. Participants were also asked the number of males they knew who were 18 years and older, had >1 female sexual partner <24 years old or ≥3 years younger than the male participant in the previous 3 months, lived in the sampled township, and who they had seen in the past 3 months. This question provides data on the participants' social network size which is essential to weighting RDS data for analysis.

Data Analysis

Proportion estimates and 95% confidence intervals (CI) were calculated using the RDS Analysis Tool 5.6 (RDSAT), a software package specifically developed to analyze data collected through RDS (www.respondent-drivensampling.org). RDSAT was developed to minimize

[1] A 'casual partner' is a woman with whom the man has sexual relations on an infrequent but ongoing basis; a 'one-off' partner is a woman with whom the man had sex on one occasion only.

biases associated with chain referral sampling by weighting participants' social network sizes and controlling for homophily and recruitment patterns (Salganik and Heckathorn 2004). Estimates generated by RDSAT are purportedly representative of the population from which it derives; males, 18 years and older, who had >1 female sexual partner <24 years old or ≥3 years younger than the male participant in the previous 3 months, and lived in the sampled township (Salganik 2006; Salganik and Heckathorn 2004; Heckathorn 1997, 2002).

We used cross tabulations and chi square tests (χ^2) to assess the statistical significance of associations between the acceptance of HIV counseling and test results (VCT acceptance) and self-perceived likelihood of being HIV-infected (HIV risk perception) and with specific categorical variables. In the univariate and multivariate analyses, RDSAT 5.6 generated sample weights were applied to VCT acceptance and HIV risk perception to estimate odds ratios (ORs) of each covariate. In the multivariate analysis, adjusted odds ratios (AORs) were estimated with a full model of all covariates for each of the two dependent variables. Level of significance is based on $p = 0.05$. Adjusted and unadjusted ORs and corresponding *P*-values were calculated using STATA, version 9.0. Missing values were omitted from the analyses.

Although no published data exists on logistic regression analyses using RDS data, sample weights necessary to conduct these analyses were recently added to the new version of RDSAT 5.6. RDSAT-generated sample weights take into account the variations in participants' network sizes (degree weight) and differential recruitment and homophily (recruitment weight) (Heckathorn 2007). To test the theory that RDSAT generated weights are valid for conducting regression analyses, the authors compared the output of a separate univariate analysis of two dependent variables, VCT acceptance and HIV risk perception, from RDSAT 5.6, of which the estimates and bootstrap generated CI have been validated as representative of the sampled target population (Salganik 2006; Salganik and Heckathorn 2004; Volz and Heckathorn 2007), and STATA 9.0 with and without using RDSAT exported weights.

RDSAT generated estimates were more similar to that of STATA with the RDSAT weights than to STATA without the RDSAT weights. The same was found for the CI for HIV risk perception but not for VCT acceptance. In the latter, there were more similarities between STATA with and without weights than either of the STATA groups and RDSAT. We conclude that regression analyses using RDSAT generated weights produced more accurate estimates than without RDSAT generated weights. However, the RDSAT weighting in STATA appear to overstate the CI and *p*-values appear to overstate the true significance. Until these processes using RDSAT are validated through rigorous statistical methods, p-values should be interpreted with caution.

Results

We were able to interview 421 men before the survey completion date of December 10, 2006. Among those men interviewed, 409 (97.3, CI. 95.4, 98.9) consented to provide and 200 (47.5%) accepted on-site VCT. The weighted estimate for the population of interest suggests 47.2% would have accepted VCT, if available (CI. 41.1, 53.6), that 12.3% are HIV-infected (CI. 8.3, 16.9), and that 26.0% (CI. 20.2, 30.7) had an HIV test in the past year.

Sampled men had a median age of 30 years (range 18–62). The largest proportion of men in the population were single/never married ($n = 283$; 80.5%, CI. 73.7, 85.9), had some education (grades 8–12) ($n = 343$; 90.9%, CI. 86.6, 94.9) and earned money from work ($n = 275$; 71.0, 64.0, 77.5). Almost half reported always using condoms in the previous 3 months with casual and "one-off" partners ($n = 169$; 49.4%, CI. 41.0, 55.6) and had 4–6 sexual partners during the previous 3 months ($n = 155$; 45.3%, CI. 38.3, 51.3). The majority reported no past year STIs ($n = 226$; 63.5%, CI. 56.8, 69.6).

Accepting On-Site VCT

Results of a regression analysis of socio-demographic variables indicated that men ≥35 years were significantly more likely (2.5 times) than younger men to accept on-site VCT (and receive their test results offered at the RDS interview site during the survey). Men who were ever married or living with a partner versus those who were single or never married were 1.8 times more likely to accept on-site VCT. Men with higher education (≥8th grade) were significantly more likely to accept on-site VCT than those with lower education (≥8th grade) (Table 1).

Having 4–6 partners in the past 3 months (1.9 times more likely than those who had ≤3 partners) was significantly associated with accepting on-site VCT; those who reported ≥7 partners were 1.2 times more likely (not significant) than those who had ≤3 partners to accept on-site VCT. Having had an HIV test in the past year (twice as likely as those who had not had an HIV test in the past year) was significantly associated with accepting on-site VCT.

Although these findings were not significant, those who tested positive for HIV were 1.5 times as likely as those who did not to accept on-site VCT; those who perceived themselves most likely infected with HIV were less likely to accept on-site VCT than those who perceived

Table 1 Estimates and 95% confidence intervals[a], odds ratios (*OR*)[b] and adjusted odds ratios (*AOR*)[c] with *p*-values for predictors of VCT acceptance at study time among men in with multiple sexual partners, Cape Town, South Africa, 2006

Variable	Accepted on-site VCT								
	Yes			No			OR	AOR	*p*-value
	N = 200			*N* = 221					
	N	%	95% CI	*N*	%	95% CI			
Age									
≤24	48	29.0	19.5, 38.8	90	43.6	33.8, 53.1	Ref.[d]	Ref.	
25–34	97	44.7	35.5, 54.1	108	46.1	37.4, 55.2	1.7	1.1	0.86
≥35	54	26.3	18.4, 35.4	21	10.2	5.3, 16.4	4.8	2.5	0.03
Marital status									
Single/never married	119	76.7	68.2, 84.6	162	83.1	73.9, 89.9	Ref.	Ref.	
Ever married/Live w/partner	50	23.3	15.4, 31.8	33	16.9	10.1, 26.1	2.1	1.8	0.05
Education									
(<grade 8)	21	13.9	6.7, 22.4	8	68.2	59.3, 77.3	Ref.	Ref.	
(>grade 8)	153	86.1	15.8, 33.8	188	31.8	92.2, 98.4	0.31	0.4	0.03
Earn money from work									
No	36	76.1	66.2, 84.2	58	68.2	59.3, 77.3	Ref.	Ref.	
Yes	137	23.9	15.8, 33.8	138	31.8	22.7, 40.8	1.1	1.1	0.78
HIV status									
Negative	160	85.3	77.7, 91.5	188	89.5	84.4, 94	Ref.	Ref.	
Positive	37	14.7	8.5, 22.3	22	10.5	5.8, 15.6	2.0	1.5	0.20
Past year HIV test									
No	115	71.2	65.3, 80.9	154	77.7	69.6, 84.4	Ref.	Ref.	
Yes	58	28.8	19.1, 34.7	41	22.3	15.6, 30.4	2.0	2.0	0.01
Likelihood of being HIV infected									
Very unlikely	42	31.7	22.0, 41.5	61	38.5	27.9, 45.6	Ref.	Ref.	
Somewhat likely	84	52.9	53.5, 64.0	85	45.5	38.2, 56.7	1.4	1.4	0.18
Very likely	43	15.4	8.6, 21.4	43	16.0	9.6, 23.2	1.5	1.8	0.09
STI symptoms (past 12 months)									
No	103	57.6	48.9, 67.6	122	68.2	58.6, 75.6	Ref.	Ref.	
Yes	71	42.4	32.4, 52.1	74	31.8	24.2, 41.4	1.1	1.0	0.98
Condom Use with casual and "one-off" sexual partners (past 3 months)									
Always	85	52.3	39.9, 60.7	82	45.1	34.6, 54.3	Ref.[d]	Ref.	
Sometimes	52	31.7	23.7, 42.8	68	33.8	25.7, 41.3	0.7	0.6	0.13
Never	33	16.0	10.5, 23.5	82	21.1	14.0, 31.1	0.7	0.7	0.34
Number of sex partners (past 3 months) including steady, casual and "one-off" partners									
2–3	27	19.2	11.4, 27.3	36	22.0	14.1, 29.7	Ref.[d]	Ref.	
4–6	79	51.9	42.3, 60.6	76	40.4	31.5, 48.7	1.4	1.9	0.05
7 or more	68	28.8	21.8, 37.9	84	37.6	29.6, 47.4	1.1	1.2	0.54

[a] Weighted by social network size and recruitment patterns (Heckathorn 2002; Salganik and Heckathorn 2004)

[b] Weighted by degree and recruitment weight (Heckathorn 2007)

[c] Weighted by degree and recruitment weights and adjusted for all other characteristics listed in the table in a logistic regression model

[d] *p*-value provided for overall differences in variables with more than two levels: age $p = 0.00$; likelihood of being HIV infected $p = 0.27$; condom use $p = 0.34$; number sex partners $p = 0.42$

themselves somewhat likely and very unlikely at risk for HIV; those who self-reported STI symptoms in the past 12 months were no more likely to accept on-site VCT than those who reported no STI symptoms; and those who reported sometimes or never using condoms in the past 3 months with casual and "one-off" partners were less likely to accept on-site VCT than those who reported always using condoms.

Self-Perceived Likelihood of Being HIV-Infected

Few men perceived themselves as very likely infected with HIV (15.6%; $n = 87$, CI: 10.4, 20.5). The largest proportion of men perceived themselves as somewhat likely HIV infected (48.3%, $n = 169$, CI: 43.2, 56.4), and 36.1% ($n = 104$, CI: 28.4, 41.6) perceived themselves as very unlikely HIV-infected. Men who had a past year HIV test (26.0%) reported perceiving themselves as being very likely to have HIV, 30% less often than those who did not have a past year HIV test. In contrast, men who always used condoms in the past 3 months with casual or "one-off" partners, and men who reported using condoms sometimes and never were 3.2 and 7.8 times, respectively, more likely to perceive themselves as very likely HIV-infected. Men with ≥7 partners in the past 3 months reported perceiving

Table 2 Estimates and 95% confidence intervals[a], odds ratios (*OR*)[b] and adjusted odds ratios (*AOR*)[c] with *p*-values for predictors of likelihood of being HIV-infected among men with multiple sexual partners, Cape Town, South Africa, 2006

Variable	Self-perceived likelihood of being HIV-infected											
	Very unlikely			Somewhat likely			Very likely			OR	Adj. OR	*p*
	N = 104			*N* = 169			*N* = 87					
	N	%	95% CI	*N*	%	95% CI	*N*	%	95% CI			
Age												
≤24	41	38.9	28.6, 51.1	49	29.2	19.0, 39.5	31	41.7	21.2, 55.1	Ref.[d]	Ref.	
25–34	48	50.2	35.1, 60.5	90	49.7	41.4, 58.7	43	49.2	36.2, 66.8	1.3	1.1	.66
≥35	14	11.0	4.8, 21.7	30	21.1	13.5, 30.4	13	9.1	2.1, 21.7	1.4	1.1	.85
Marital status												
Single/never married	78	80.4	71.8, 89.5	127	79.0	70.8, 86.6	68	81.4	65.2, 91.4	Ref.	Ref.	
Ever married/live w/partner	23	19.6	10.5, 28.2	39	21.0	13.4, 29.2	19	18.6	8.6, 34.8	1.0	.8	.52
Education												
(<grade 8)	8	6.8	1.7, 17.1	15	10.1	4.8, 17.4	5	6.3	0.0, 14.4	Ref.	Ref.	
(>grade 8)	96	93.2	82.9, 98.3	154	89.9	82.6, 95.2	82	93.7	85.6, 34.8	1.1	.9	.86
Earn money from work												
No	30	28.9	17.8, 38.5	44	29.0	19.3, 40.8	17	17.3	6.9, 25.3	Ref.	Ref.	
Yes	74	71.1	61.5, 82.2	124	71.0	59.2, 80.7	70	82.7	74.7, 93.1	1.3	1.9	.50
HIV status												
Negative	90	90.4	78.0, 96.9	143	88.6	81.6, 93.8	65	80.2	65.1, 90.2	Ref.	Ref.	
Positive	7	9.6	3.1, 22.0	24	11.4	6.2, 18.4	21	19.8	9.8, 34.9	2.5	2.2	.01
Past year HIV test												
No	71	71.5	61.4, 82.6	119	71.0	63.6, 79.9	70	70.0	75.5, 93.7	Ref.	Ref.	
Yes	33	28.5	17.4, 38.7	49	29.0	20.1, 36.4	16	16.0	6.3, 24.5	0.7	0.7	0.17
STI symptoms (past 12 months)												
No	67	68.9	57.0, 79.7	109	65.6	54.4, 72.8	40	41.1	27.3, 55.0	Ref.	Ref.	
Yes	37	31.1	20.3, 43.0	60	33.3	27.2, 45.6	47	58.9	45.0, 72.7	1.5	0.8	0.29
Condom use with casual and "one-off" sexual partners (past 3 months)												
Always	72	68.1	55.8, 79.1	74	44.5	33.2, 55.3	16	16.8	8.3, 28.0	Ref.[d]	Ref.	
Sometimes	21	22.0	12.7, 34.6	68	42.3	32.4, 52.9	27	35.9	21.4, 48.4	3.0	3.2	0.00
Never	11	18.1	55.8, 79.1	23	13.2	6.7, 21.0	42	47.4	33.3, 62.3	7.4	7.8	0.00
Number of sex partners (past 3 months) including steady, casual and "one-off" partners												
2–3	31	32.2	19.3, 40.7	22	18.4	11.2, 26.2	9	10.7	2.6, 17.3	Ref.[d]	Ref.	
4–6	50	50.9	40.2, 63.3	71	44.4	35.6, 54.4	27	33.5	21.0, 46.8	1.9	1.8	0.19
7 or more	23	16.8	10.4, 27.9	76	37.3	27.6, 46.6	51	55.8	42.7, 71.2	4.8	3.4	0.00

[a] Weighted by social network size and recruitment patterns (Heckathorn 2002; Salganik and Heckathorn, 2004)

[b] Weighted by degree and recruitment weights (Heckathorn 2007)

[c] Weighted by degree and recruitment weights and adjusted for all other characteristics listed in the table in a logistic regression model

[d] *p*-value provided for overall differences in variables with more than two levels: Age $p = 0.48$; condom use $p = 0.00$; number sex partners $p = 0.00$

themselves as very likely to be HIV-infected 3.4 times more often than men who had ≤3 partners. There are significant associations between self-reported STIs in the past year and men's self-perceived higher likelihood of being HIV-infected (Table 2). There were no associations between self-perceived levels of likelihood of being HIV-infected and socio-demographic variables such as age, marital status, education and earning income from a job.

Discussion

Accepting On-Site VCT

We found no significant differences in accepting on-site VCT for those with different levels of self-perceived HIV risk perception (Table 1). We also found no significant differences in accepting on-site VCT and some common measures of high risk behaviors such as infrequent condom use and having a higher number of sex partners (≥7). However, we did find that having 4–6 partners was significantly associated with accepting on-site VCT. The reason for these conflicting results is unclear. Other surveys conducted in South Africa have found no significant association between VCT acceptance and having multiple sexual partners and low condom usage (Hutchinson and Mahlalela 2006; Kalichman and Simbayi 2003).

One limitation of this survey is that participants who refused the rapid test were not asked why they refused, nor were participants who chose to learn their status asked why they made that choice. It is difficult to conclude that those who may have already known their HIV status were those who refused on-site VCT. There was no significant difference in accepting on-site VCT based on HIV serostatus. However, those who had received an HIV test in the past year were more likely to accept on-site VCT. This could be interpreted in a couple of ways. For example, it could be that men who already had an HIV test recognized the importance of getting tested and so they requested to be tested again. On the other hand, it could also be an indication that these men wanted to confirm their previous test results. Another limitation was the inability to validate the eligibility criteria, specifically whether participants did have sex partners with a 3 year age difference. The sample consisted of high risk men and it is unlikely that a directional bias would result from a misreported age of sex partners.

Self-Perceived Likelihood of Being HIV-Infected

Few men in the sampled township perceived themselves as being very likely to be HIV-infected. Low HIV risk perception is consistent with findings in large-scale studies conducted in South Africa (Pettifor et al. 2004; Shisana et al. 2005; Shisana and Simbayi 2002). Men's self-perceived likelihood of being HIV-infected was not associated with any of the selected socio-demographic variables. The factors that were most associated with a higher HIV risk perception included testing positive for HIV, sometimes or never using condoms with casual and "one-off" partners and having a higher number of sexual partners—An indication that these men accurately perceive their risk level for being HIV infected.

The finding that men who never used condoms in the past 3 months with a casual or "one-off" partner had a higher HIV risk perception compared with those who sometimes or always used condoms, could indicate that these men understand the benefits of condom use for reducing HIV transmission. However, this has not translated into risk reduction behaviors as just over half of the respondents reported infrequent use or never using condoms. Furthermore, the finding that men who had ≥7 sexual partners in the past 3 months were more inclined to perceive themselves very likely to be HIV-infected compared with the men who had 4–6, and those who had ≤3 partners may indicate that these men have some awareness that having multiple and concurrent sexual partners increases their likelihood of HIV infection (Halperin and Epstein 2004; Wellings et al. 2006). Despite this knowledge, it is concerning that these men continue to engage in such high-risk behavior.

Men who had an HIV test in the past year were less likely than men who did not have a past year HIV test to perceive themselves as very likely HIV-infected. However, respondents who had a past year HIV test were more likely to have also accepted an HIV test result during the survey. These findings can have a couple of possible interpretations. First, given that respondents were not asked whether they knew their HIV status, it may be that those who were tested in the past year may already have known that they were HIV negative, resulting in a lower HIV risk perception. Second, familiarity with VCT may encourage repeat testing.

Conclusions

This analysis investigates whether socio-demographic characteristics, HIV status, having a past year HIV test and HIV behavioral risk factors appear to exert independent effects on VCT acceptance and HIV risk perception among men with multiple sex partners in a South African township outside of Cape Town. The survey shows that high HIV risk perception was significantly associated with being HIV-infected, but did not significantly increase the person's acceptance of on-site VCT.

It is interesting to note that in comparison to 97.3% who consented to provide a DBS, 26% reported that they had a past year HIV test and 47.2% accepted their HIV test results as offered during the survey. Given that this township has numerous VCT centers (SA Census data 2005; Statistics of South Africa 2005) and that sexually active males in South Africa are extremely vulnerable to HIV infection because of their sexual behaviors, it is unfortunate that this population is not accessing available services.

One reason for the higher percentage of men accessing HIV counseling and testing during this survey could be due to the nature of the RDS methodology which relies on a system of recruitment by trusted peers who themselves have undergone the survey. Using the RDS recruitment methodology could be effective in increasing VCT acceptance among this high-risk population. It is also possible that these men chose to learn their test results during the survey because VCT was proactively offered to them rather than participants having to seek out HIV testing at a VCT site or health care facility. This is in line with the provider-initiated HIV testing guidelines recently released by the World Health Organization (WHO 2007). Participants may have also felt comfortable learning their status in an environment where they felt at ease as there were no long queues and testing was anonymous. In addition, the finding that respondents who had an HIV test in the past year were more likely to have also accepted an HIV test during the survey, suggests that familiarity encourages (repeat) testing. Interestingly, findings of a cross-sectional household survey conducted in the same survey township suggested that having a partner who had undergone VCT (and for men, an acquaintance) was strongly associated with VCT acceptance (MSF 2004), underscoring the link between familiarity with the procedure and in this case (possibly) repeat testing.

However, since participants were not asked the reasons for choosing to learn their results during the survey, further investigation about barriers to HIV testing among this population is recommended. Some of our findings (e.g., no independent associations between infrequent condom use and having $\geq$7 sex partners with VCT acceptance) are difficult to interpret. A qualitative follow up on these findings would be important to better understand these findings.

Free condoms are widely available in the survey township at local health facilities and in local drinking establishments, or are sold inexpensively in various locations in the township. Given that men who reported infrequent condom use with casual or "one-off" partners were more likely to have a higher self-perceived likelihood of being HIV-infected, further investigation on reasons men choose not to use condoms and how to design condom promotion programs for this population is recommended.

We found that men correctly understand that engaging in certain HIV risk behaviors increases the likelihood of HIV-infection. However, those who perceive themselves at high risk of having HIV do not seek testing. Further investigation into the psychological and cultural barriers to reducing risky sexual behaviors and accessing VCT and other HIV services is recommended. Changing current male social behaviors to delegitimize norms and acceptability of multiple sex partners and unprotected sex is a complex and challenging task. Nonetheless, these key issues must be addressed in order to have an impact on reducing HIV transmission in South Africa.

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