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Determinants of Self-Perceived HIV Risk in Young South Africans Engaged in Concurrent Sexual Relationships

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Abstract

Concurrent sexual partnerships are increasingly believed to be a key factor explaining the size of the HIV pandemic in Southern and Eastern Africa. Little, however, is known about what determines if persons in concurrent relationships develop a perception of being at risk for HIV infection. Data from a representative sample of 2245 young sexually active inhabitants of Cape Town, South Africa, were analysed using multivariate logistic regression to examine what the correlates of HIV risk were in both those involved in concurrent relations (termed the high risk group) and in those not (the low risk group). A considerable difference was noted between males and females. In the high risk group, amongst the males, secondary level education (as compared with primary or post-secondary level), and believing in monogamy (as a means of HIV risk reduction) were correlated with a decreased-perception-of-HIV-risk. The usage of drugs was associated with an increased-perception-of-HIV-risk. Amongst the females, a longer time since sexual debut, having experienced sexual coercion, a greater number of sex partners in the past year and knowing someone who died of AIDS were correlated with an increased-HIV-risk-perception (*Afr. J. Reprod. Health* 2010; 14[3]: 171-181).

Résumé

Déterminants des risques du VIH auto -perçu chez les jeunes sud-africains qui se lancent dans des rapports sexuels concomitants. On croit de plus en plus que les rapports sexuels concomitants constituent un des facteurs clé qui expliquent l'ampleur de la pandémie du VIH au sud et à l'est de l'Afrique.. Néanmoins, l'on connaît très peu ce qui détermine si les gens qui se lancent dans des rapports concomitants développent une perception de courir un risque d'être infectés par le VIH. A l'aide d'une régression logistique multifactorielle, nous avons analysé des données d'un échantillon représentatif de 2245 jeunes gens sexuellement actifs qui sont domiciliés à Cape Town en Afrique du Sud, pour examiner les corrélats du risque du VIH chez à la fois ceux qui se lancent dans les rapports concomitants (qu'on appelle le groupe à risque élevé) et chez ceux qui ne le sont pas (le groupe à risque faible). Nous avons constaté une différence importante entre les mâles et les femelles. Chez le groupe à risque élevé, parmi les mâles, l'éducation secondaire (par rapport au niveau primaire ou post secondaire) et la croyance en la monogamie (comme moyen de réduire le risque du VIH) ont été corrélé avec une perception réduite du risque du VIH. L'usage des drogues a été lié à une perception élevée du risque du VIH. Chez les femelles, une plus longue période depuis le début sexuel, ayant subi une coercition sexuel, un nombre augmenté des partenaires sexuels au cours de l'année passée et la connaissance d'une personne qui est morte du SIDA ont été corrélés avec une perception élevée du risque du VIH (*Afr. J. Reprod. Health* 2010; 14[3]: 171-181).

Key words: HIV risk perception, sexual partner concurrency, health belief model, illness representation theory, social identity theory, cognitive dissonance theory.

Introduction

The available evidence suggests that South Africa's very high HIV prevalence and AIDS death rates have not translated into a sufficiently reduced HIV incidence rates. A recent study from rural Kwazulu-Natal revealed that adult HIV incidence has been stable between 3 and 4% over the past 5 years with no downward trend[1]. This is despite generally high levels of knowledge as to the basic modes of spread of the virus. One of the reasons for this failure of translation of knowledge into practise has been related to the fact that knowledge of HIV transmission has not impacted on the intermediate step between knowledge and behaviour change – perception of risk. Only a small proportion of the population regard themselves to be at any significant risk for HIV. A study by MacPhail and Campbell found that 70% of young South African men thought that they were at no risk of contracting HIV[2].

Amongst adolescents, not only do most individuals perceive themselves to be at no or very low risk of HIV infection, but this proportion hardly varies between those who are HIV positive (73%) and

those who are HIV negative (62%)[3]. Perception of risk is a key dimension of most health behaviour models[4]. The health belief model, for example, explicitly theorizes that perceived risk results in behaviour change. According to this model, individuals would stick to one partner at a time, if they perceive that the risk of becoming infected with HIV outweighs the costs of fidelity[5].

Cognitive theory adds an extra dimension to this perspective. Here, individuals are understood as active processors of information – data is not merely uncritically assimilated, but rather it is filtered and interpreted by the perceiver. Community norms, ideology and historical experience can all impact on how the information is processed, altered and stored[6].

Most individuals are, however, unable or unwilling to rely on such complex risk evaluation calculations in deciding on a path of action. Work by Douglas[7] had shown that most people utilise mental images and intuitive devices as either a supplement or a substitute for these calculations. These more intuittive frameworks originate in peoples cultural understandings. In this regard, sex, race/ethnicity, age, education, class and sexual orientation are some of the categories which influence people's experience and understanding of disease. The social identity literature builds on this perspective. Social identity involves knowing that we "belong to particular groups, together with the emotional and value significance of group membership[8]." Bing a member of a particular group is then linked to various "recipes for living" which involve group specific practices and norms[9]. These group-based social identities in turn shape and constrain health-related behaviours. A further dimension which has been shown to be relevant in how individuals and groups perceive health threats are the "illness representation theories" that people use to understand illness and respond to it. Ethnographic evidence from South Africa has shown that these illness representation theories for Sexually Transmitted Infections (STIs) vary extensively between different cultural groups[10]. In Xhosa and Zulu speakers, for example sexual transmission of fluids is considered as only one of many causes of STIs. Other causes include: bewitchment, unclean toilet practices and having sex with a woman during menstruation[10].

Other factors which have been noted to impact on perception of HIV risk include stigma[11], self efficacy, issues pertaining to gender equality, personal knowledge of someone with HIV/AIDS[12,13] and the extent to which individuals are connected to their peers, families and even schools[14],[13]. Although some studies have found no relationship between HIV risk perception and sexual behaviour[15], a large number of studies have found a positive association[17],[16].

Consensus is emerging that the rapid and extensive spread of HIV in Southern and Eastern Africa is related not so much to the lifetime numbers of sexual partnerships, but rather to the high proportion of these partnerships that are arranged concurrently[18]. Populations with high concurrency rates produce sexual networks with a high proportion of individuals that are connected to one another and thereby offer a "super-highway" for HIV spread[27]. A recent joint inquiry by the Southern African Development Community and UNAIDS concluded that "high levels of multiple and concurrent sexual partnerships by men and women, with insufficient, correct condom use, combined with low levels of male circumcision are the key drivers of the HIV epidemic in the (Southern African) region"[19]. If concurrency is such an important driving force of HIV in the region, then a major concern must be how little is known as regards the local awareness of the dangers of concurrency and what the determinants of this awareness are.

We used data from the Cape Area Panel Survey (CAPS) to examine the individual, partnership, and familial determinants of HIV risk perception in two groups of young South Africans – those who have been involved in concurrent relationships and those who have not.

Data and Methods

CAPS are a representative longitudinal study of adolescents aged 14-25 living in Cape Town. It uses a two stage probability sample of households. The first stage sample used the 1996 census enumeration areas as a sampling frame. Since these areas are generally homogenous as far as race is concerned, the white and African areas were oversampled so as to obtain relatively equal numbers of youth in each of the three racial categories. The second stage randomly sampled households in each of the chosen enumeration areas. In each of the elected household, youth questionnaires were administered to up to three young people, and one adult completed the household questionnaire. 4752 adolescents were interviewed in the first wave in 2002 and in the second wave in 2004. In the third wave conducted in 2005, 3324 of the initial 4752 individuals were re-interviewed. Participants were interviewed about their socio-demographic, education, employment, health ailments and sexual behaviour histories. The retention rate between waves one and three was 75% overall, but varied by racial group – Africans (70%), coloureds (85%), and whites (60%). The lower retention rate amongst whites is typical of survey research in South Africa and is thought to be related to a higher rate of moving out of the area and higher opportunity costs involved in completing the questionnaire[25] (For a complete details of sampling methodology, non-response and

Table 1. The distribution of individuals according to risk behaviour and risk perception in numbers and percentage of the total sample.

	Self perceived risk of HIV	
	Low	**High**
Low risk group	A. 856 (38%)	B.158 (7%)
High risk group	C. 937 (42%)	D. 294 (13%)

attrition rates, see Lam et al. 2006)[20]. All of our analyses are weighted with sampling weights correcting for sample design and appropriate wave non-response.

Statistical Analysis

The dependent variable evaluated was the individual's self-reported assessment of their risk of being infected by HIV as determined by their answer to the following question: "Do you think you have no risk, a small risk, a moderate risk or a great risk of getting the AIDS virus?" 80% reported themselves as being at no or very low risk (43% no risk and 37% very low risk) and 20% regarded themselves as being at some or great risk (11% some risk and 9% great risk). A total of 2245 individuals answered this question (out of a total of 2468 respondents who were sexually active by wave three and completed the wave 3 questionnaires) and the analyses were limited to these individuals.

The classification of risk behaviour was intentionally focussed on markers of concurrency, given both its central importance in the spread of HIV in Southern and Eastern Africa and how little is known about its determinants and perceptions of its associated risks. Respondents were grouped into two sexual behavioural categories. They were classified as high risk if they ever engaged in a concurrent sexual relationship or if they were sure or suspicious that any of their past or present partners had had a sexual relationship with someone else during their own sexual relationship. The remainder were classified as the low risk group. The addition of those individuals who had 3 or more sexual partners in the preceding 12 months into the high risk group increased this group from 1231 to 1245 individuals. This had little effect on the analyses and it was decided not to include the 3-or-more sex-partners dimension in the definition of the high risk group, so as to be able to focus the analysis on aspects of partner concurrency. Our high risk group (54% of the total – Table 1) comprised a similar proportion to other studies of HIV risk factors in Cape Town youth. In Simbayi's study in Cape Town, for example, the high risk group comprised 62% of the individuals[21].

The independent variables selected were based on an extensive literature review and were grouped into the following basic categories: demographic, sexual behaviours, HIV knowledge/exposure, partnership characteristics and moral judgements to HIV/AIDS.

The demographic variables evaluated were age, sex, race/ethnicity, education and wealth. Education was broken into four categories based on the highest educational outcome attained: Grades 0-7, Grades 8-11, Grade 12, a Post-Secondary degree or diploma. Wealth quintiles were used to represent wealth, with wealth quintile 1 representing the richest and 5 the poorest (Table 2). The income cut offs for these quintiles (expressed in per capita income) were determined from the last Census of metropolitan Cape Town. The wealth quintiles variable was established as follows: each house is allocated to one of five income bands based on the per capita income of the household i.e. the total household income divided by the number of inhabitants in the household.

The sexual behaviour variables examined were; age at sexual debut, time since sexual debut, number of lifetime sex partners, sex duress (where the respondent answered in the affirmative to the question: Have you ever had sexual intercourse when somebody was physically forcing, hurting, or threatening you) and did the respondent use a condom during their last sexual encounter.

The partnership characteristics were categorized as marital status and the age gap with the most recent partner - which was broken down into three groups (respondent is 5 or more years older than the partner, partner is five or more years older than the respondent and those with less than a five year age gap). Two measures of how structurally embedded the relationship were included. These were whether or not the partner knows the respondents friends and family.

HIV/AIDS exposure was assessed by asking if the respondent personally knew someone who had died from HIV/AIDS. HIV/AIDS prevention knowledge was evaluated by asking respondents "how can people protect themselves from getting infected with HIV/AIDS?" All their answers were then collected. Each respondent mentioned on average 1.9 methods and the three most common responses were: abstaining from sexual relations, using condoms, and sticking to one sex partner. These are henceforth termed the "believers in abstaining," "the believers in condomizing" and the "believers in monogamy" respectively.

HIV-related stigma was assessed by a variable which asked: "Would you still be friends with someone if they were HIV+?"

Drug usage was assessed via two variables: alcohol usage in the previous month and the use of recreational drugs other than alcohol in the previous month.

All variables were derived from wave three. Because of previously noted large gender differences

Table 2. Distribution of selected dependent and independent variables by sex and risk behaviour (Weighted population expressed in %).

			Low Risk Group		High Risk Group	
			Female	**Male**	**Female**	**Male**
	Perceived HIV risk	Low	86.2	84.3	76.0	76.2
		High	13.8	15.7	24.0	23.8
Demography	Age	15-19 years old*	23.4	21.1	24.4	23.3
		20-24	66.4	68.7	63.7	63.3
		>=25	10.3	10.2	11.9	13.4
	Race	African*	20.0	22.8	48.2	59.4
		Coloured	62.0	55.6	45.4	33.5
		White	18.0	21.6	6.5	7.1
	Education (maximum grade attained)	Grade 0-7*	9.5	7.0	11.1	7.6
		Grade 8-11	43.6	40.1	54.2	55.5
		Grade 12	30.6	29.0	27.6	25.5
		Post Matric Degree / Diploma	16.3	23.8	7.2	11.4
	Income quintile	1 (Richest)	13.0	18.0	27.4	35.6
		2	16.7	21.0	25.9	27.7
		3	19.1	18.7	18.1	15.6
		4	27.2	17.7	17.7	12.7
		5 (Poorest)	24	24.5	11.0	8.0
Sexual behaviour	Age at sexual debut	<= 15 years old	19.6	13.1	38.2	24.8
		16-17	43.0	37.7	48.1	43.9
		>=18	37.4	49.2	16.6	31.3
	Time since sexual debut (years)	0-2*	25.5	31.3	13.3	19.5
		3-4	26.9	27.3	25.0	28.1
		5-6	26.1	23.0	27.5	26.3
		>=7	21.5	18.4	34.2	26.0
	Sex duress	Yes	8.1	7.8	8.8	12.3
		No	91.9	92.1	91.2	87.7
	Used condom during last sexual encounter	yes	62.3	40.6	65.1	56.2
		No	37.7	59.4	34.9	43.8
	Number of sex partners in last 12 months	0 or 1	91.7	98.3	63.6	87.9
		2	5.8	1.3	24.7	8.8
		>=3	2.5	0.5	11.7	3.3

in HIV risk behaviour and risk perception, our results were split along gender lines. Analyses were conducted in STATA Version 10, utilizing the survey methodology to adjust for the complex two stage survey design. When appropriately weighted for over sampling of Africans and whites, as well as non response, the results are representative of metropolitan Cape Town. Bivariate and multivariate logistic regression was utilized to evaluate the strength of the association between HIV risk perception and the independent variables. Risk factors that were found in the bivariate analysis to be associated with a lack of perception of HIV risk at a significance level of $p<0.1$ were included in the final multivariate logistic regression analysis. In the multivariate analysis, risk factors were regarded as significant at a p-value of less than 0.05.

Results

We stratified our analysis according to high risk behaviour (where high risk is defined according to concurrent relationships as described above). Considering HIV risk perception separately in the low and high risk groups generates four groups. We

were most interested in the group C, who engaged in high risk sex, but did not perceive themselves to be at risk of HIV infection. Because these individuals do not understand that they are at high risk, they are not likely to perceive any behaviour change messages as being relevant to them. It is important to characterise who is in this group and why they do not see themselves as being at risk so as to come up with behaviour modification programmes that resonate with these individuals. Group D, who likewise engage in high risk activities but understand that they are at risk for HIV infection are more likely to take precautions to reduce their risk of HIV and are likely to be more responsive to HIV education interventions. Our analysis thus compares HIV risk perception in group C with D and group A with B.

In bivariate analysis of risk perception in those in the *high* risk group (Table 3), the following variables were associated with perceived risk at a p-value of <0.1: In males, education levels 2 and 3, being married and believing in condomizing and monogamy were all associated with a lower risk perception. Having consumed drugs, knowing someone who died of AIDS and a longer time since sexual debut were associated with a higher risk perception. In females, a longer time since sexual debut, having experienced sex duress, having had 2 or more sexual partners in the previous year and knowing someone who died of AIDS were correlated with an increased HIV risk perception. Inclusion of these significant variables into the multivariate models revealed that for the females, only an increased time since sexual debut and knowing someone who had died of AIDS remained significant (p-value <0.05). For the males, only education levels 2 and 3, were significantly correlated with a decreased- and the use of drugs an increased- perception of HIV risk (p-value <0.05)

The bivariate analysis of perceived risk in the *low* risk group (Table 4) revealed the following relationships to be significant at a p-value of <0.1: In males, parents discussing HIV was associated with a higher risk perception, whereas African ethnicity and believing in monogamy were associated with a lower HIV risk perception. In females, secondary level education up to grade 11 (Matric and a post-matric qualifications showed a trend in the same direction) and believing in condomization were associated with an increased perception of HIV risk. Being married or African were associated with a decreased risk perception.

In the males, multivariate analysis revealed a more than three-fold increase in risk perception if their parents discussed HIV with them. Having had 2 or more sex partners in the last 12 months retained its association with an increased risk perception. In the multivariate analysis of the female group, individuals who believed in condomization were almost five times more likely to perceive themselves as being at risk of HIV.

Discussion

As young South Africans age, they rapidly become infected with HIV (Among females HIV prevalence increases from 6.7% in 15-19 year olds to 21.1% in 20-24 year olds and to 32.7% among 25-29 year olds. The corresponding figures for males are 2.5%, 5.1% and 15.7%)[22]. It would be reasonable to expect that a high proportion of young South Africans would feel at risk of acquiring this infection. The data presented here, however, shows that only 19% of the youth in Cape Town regard themselves as being at some or great risk of HIV. It is particularly disconcerting that only 24% of those in the group involved in concurrent sexual relationships consider themselves to be at risk of HIV. In a separate multivariate analysis of all the sexually active respondents in wave 3 we found that respondent concurrency was correlated with a higher rate of HIV risk perception in the coloured and white groups but not the Africans - who had the highest concurrency rates[23]. Given the key role of concurrency in the ongoing high levels of HIV transmission in the area this identifies an area of HIV prevention requiring urgent attention[24]. In working out a public health response it is useful to see what factors are associated with increased HIV risk perception in both the groups which do and do not engage in concurrency. In both these groups, marked gender differences were found. In the high risk group, among the females, an increased time since sexual debut and knowing someone who had died of AIDS were associated with an increased risk perception. These associations fit well within the predictions of the health belief model and have been demonstrated elsewhere[25]. The main programmatic implication we may draw from these findings, is that there is an added population level benefit of dealing with the factors which inhibit persons infected with HIV from disclosing to more of their social circle - at least in females we confirm the link which has been found elsewhere between self-perception of HIV risk and personally knowing people affected by the disease[25]. In males, the finding that persons with intermediate levels of education (secondary level education up to grade 12) were less likely to perceive their HIV risk than those with only primary or post secondary education is particularly worrying. Further stratification of the analysis along racial/ethnic lines revealed that this relationship was only present in the African males. This suggests that the life skills based education at secondary level and various national communication strategies are failing to adequately convey the dangers of concurrency to pupils. Anderson et al's multivariate analysis of HIV risk perception in Cape Town revealed that, despite having considerably higher HIV rates, African males and females, had a lower perception of risk than the other two race/ethnic groups (excluding the coloured females

Table 3. Bivariate and multivariate logistic regression predicting perceived risk of HIV infection in the high risk groups by sex.

			Males						Females					
	Bivariate				Multivariate				Bivariate			Multivariate		
	Factor	Category	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
Demographic	Age	15-19 years old*												
		20-24	0.84	0.52-1.33	0.450				1.31	0.82-2.10	0.261			
		>=25	1.32	0.63-2.73	0.458				1.35	0.69-2.64	0.377			
	Race	African*												
		Coloured	1.42	0.92-2.19	0.108				0.67	0.40-1.12	0.131			
		White	0.66	0.21-2.09	0.48				1.15	0.38-3.49	0.803			
	Education (maximum grade attained)	Grade 0-7*												
		Grade 8-11	0.45	0.24-0.94	0.11	0.41	0.21-0.82	0.012	0.78	0.39-1.57	0.486			
		Grade 12	0.48	0.25-0.95	0.03	0.49	0.24-1.01	0.053	0.67	0.39-1.57	0.308			
		Post Matric Degree/Diploma	0.59	0.21-1.65	0.320	0.65	0.22-1.96	0.446	0.82	0.28-2.44	0.728			
	Income quintile	1 (Richest)												
		2	1.39	0.82-2.37	0.221				0.94	0.58-1.52	0.788			
		3	1.37	0.80-2.37	0.245				0.70	0.36-1.38	0.303			
		4	0.99	0.51-1.90	0.983				0.80	0.37-1.69	0.558			
		5 (Poorest)	1.13	0.44-2.94	0.797				1.19	0.37-1.69	0.728			
Sexual behaviour	Age at sexual debut	<= 15 years old												
		16-17	0.74	0.47-1.18	0.208				1.35	0.82-2.23	0.238			
		>=18	0.70	0.39-1.22	0.208				0.78	0.46-1.35	0.377			
	Time since sexual debut (years)	0-2*												
		3-4	0.69	0.36-1.35	0.277	0.68	0.34-1.54	0.265	1.40	0.75-2.63	0.290	1.46	0.78-2.83	0.267
		5-6	0.51	0.24-1.04	0.064	0.57	0.26-1.14	0.144	2.50	1.36-4.58	0.003	2.33	1.20-4.51	0.012
		>=7	1.01	0.54-1.88	0.973	1.02	0.54-1.77	0.957	1.73	0.99-3.01	0.053	1.74	0.94-3.23	0.075
	Sex duress	No	0.80	0.40-1.61	0.535				0.46	0.24-0.88	0.020	0.49	0.27-0.90	0.075
	Used condom during last sexual encounter	No	1.36	0.90-2.05	0.138				1.23	0.81-1.87	0.322			
	Number of sex partners in last 12 months	0 or 1												
		2	1.24	0.77-2.03	0.371				2.08	1.08-4.02	0.029	1.94	0.96-3.94	0.064
		>=3	1.48	0.80-2.76	0.209				1.74	0.35-8.62	0.496	1.65	0.32-8.35	0.538

Table 3. Bivariate and multivariate logistic regression predicting perceived risk of HIV infection in the high risk groups by sex (continued).

Drug usage	Alcohol	No	0.72	0.49-1.08	0.112				0.71	0.45-1.13	0.149			
	Other drugs	No	0.53	0.31-0.90	0.019	0.52	0.30-0.90	0.023	2.18	0.62-7.75	0.224			
HIV knowledge/ exposure	Personally know someone who died from HIV/AIDS	No	0.62	0.40-0.96	0.032	0.70	0.44-1.06	0.133	0.59	0.38-0.92	0.020	0.60	0.38-0.94	0.027
	Volunteered knowledge of HIV avoidance Use condoms	Yes	0.54	0.28-1.05	0.070	0.57	0.27-1.14	0.132	0.71	0.37-1.34	0.289			
	Stick to one sex partner	Yes	0.38	0.15-0.96	0.041	0.40	0.16-1.03	0.059	0.64	0.33-1.25	0.192			
	Abstain	Yes	0.81	0.49-1.33	0.406				1.21	0.78-1.89	0.374			
	Parents discussed HIV	Often	0.90	0.49-1.62	0.718				1.54	0.89-2.64	0.119			
Partnership characteristics	Marital status	Married	0.54	0.32-0.91	0.02	0.72	0.51-1.09	0.144	0.69	0.43-1.11	0.130			
	Partner knows family	No	1.07	0.68-1.68	0.765				1.21	0.72-2.04	0.462			
	Partner knows friends	No	1.09	0.58-2.07	0.779				1.03	0.51-2.07	0.937			
	Age gap with most recent partner	Partner 5 or more years older												
		5-5	1.20	0.34-4.23	0.772				0.95	0.59-1.53	0.819			
		Partner 5 or more years younger	1.59	0.29-8.80	0.595				-					
Moral Judgment	Believes HIV is punishment for sleeping around	No	0.85	0.57-1.26	0.409				0.87	0.60-1.26	0.469			

* Reference group

Table 4. Bivariate and multivariate logistic regression predicting perceived risk of HIV infection in the low risk groups by sex.

			Males						Females					
			Bivariate			Multivariate			Bivariate			Multivariate		
			OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
Demographic	Age	15-19 years old*												
		20-24	0.91	0.48-1.71	0.773				0.79	0.46-1.34	0.381			
		>=25	0.60	0.17-2.14	0.429				0.57	0.19-1.66	0.301			
	Race	African*												
		Coloured	1.71	0.93-3.13	0.083	1.35	0.59-3.08	0.479	0.58	0.35-0.94	0.030	0.69	0.37-1.27	0.230
		White	1.01	0.34-2.91	0.988	1.16	0.32-4.07	0.821	0.57	0.26-1.22	0.152	0.44	0.16-1.21	0.111
	Education (maximum grade attained)	Grade 0-7*												
		Grade 8-11	0.82	0.31-2.09	0.672				2.99	0.85-10.48	0.087	2.01	0.57-7.09	0.274
		Grade 12	1.07	0.41-2.84	0.886				2.61	0.61-7.68	0.232	1.55	0.42-5.68	0.509
		Post Matric Degree/Diploma	1.20	0.40-3.60	0.747				2.55	0.64-10.03	0.179	2.66	0.57-12.36	0.211
	Income quintile	1 (Richest)												
		2	1.34	0.51-3.51	0.550				0.61	0.29-1.26	0.179			
		3	1.06	0.43-2.59	0.898				0.96	0.50-1.87	0.910			
		4	1.15	0.48-2.78	0.749				1.65	0.84-3.27	0.147			
		5 (Poorest)	1.09	0.42-2.86	0.859				0.69	0.31-1.52	0.357			
Sexual behaviour	Age at sexual debut	<= 15 years old												
		16-17	1.68	0.79-3.59	0.178				0.83	0.42-1.63	0.587			
		>=18	0.98	0.41-2.35	0.966				0.94	0.48-1.86	0.875			
	Time since sexual debut (years)	0-2*												
		3-4	1.26	0.54-2.93	0.584				1.25	0.65-2.41	0.493			
		5-6	1.35	0.63-2.92	0.433				0.71	0.35-1.46	0.355			
		>=7	1.02	0.41-2.57	0.962				0.67	0.30-1.51	0.337			
	Sex duress	No	0.73	0.31-1.75	0.483				0.55	0.24-1.25	0.152			
	Used condom during last sexual encounter	Yes	0.78	0.39-1.54	0.472				0.76	0.44-1.30	0.312			
	Number of sex partners in last 12 months	0 or 1												
		2	0.99	0.23-4.10	0.994	0.79	0.17-3.58	0.754						
		>=3	5.83		0.007	5.84	1.26-27.05	0.024	1.38	0.11-17.24	0.800			
Drug usage	Alcohol	No	0.86	0.51-1.48	0.598				0.97	0.59-1.62	0.922			
	Other drugs	Yes	1.85	0.76-4.5	0.170				0.67	0.08-5.74	0.712			

Table 4. Bivariate and multivariate logistic regression predicting perceived risk of HIV infection in the low risk groups by sex (continued).

HIV knowledge/ exposure	Personally know someone who died from HIV/AIDS	No	0.92	0.46-1.82	0.800				0.74	0.45-1.21	0.225			
	Volunteered knowledge of HIV avoidance	Yes	0.49	0.21-1.16	0.104				2.30	1.00-5.27	0.049	4.65	1.41-15.30	0.012
	Use condoms													
	Stick to one sex partner	Yes	0.44	0.20-0.96	0.039	0.42	0.15-1.16	0.094	0.67	0.35-1.27	0.217			
	Abstain	Yes	1.11	0.61-2.02	0.727				0.87	0.51-1.48	0.598			
	Parents discussed HIV	Often	3.38	1.73-6.57	0.000	3.48	1.30-9.38	0.014	1.58	0.77-3.29	0.213			
Partnership characteristics	Marital status	Married	0.18	0.02-1.41	0.102				0.47	0.22-0.97	0.041	0.57	0.26-1.26	0.167
	Partner knows family	Yes	0.90	0.33-2.45	0.835				1.41	0.44-4.54	0.564			
	Partner knows friends	Yes	0.72	0.09-6.18	0.769				0.98	0.12-8.01	0.984			
	Age gap with most recent partner	Partner 5 or more years older*							8.57	1.04-70.47	0.046			
		5-5	1.20	0.34-4.23	0.772				1.35	0.59-1.53	0.819	0.19	0.21-1.80	0.149
		Partner is 5 or more years younger	1.59	0.29-8.80	0.595				-			0.15	0.14-1.49	0.104
Moral Judgment	Believe HIV is punishment for sleeping around	Yes	1.02	0.53-1.94	0.948				1.37	0.80-2.33	0.237			

who had the lowest risk perception)[25]. These findings suggest that the Health Belief Model is unable to fully explain the patterning of HIV risk perception. A more complete picture would be obtained by including Douglas's concept of "intuitive frameworks," and the "recipes-for-living" notions stemming from the social identity literature. Meyer-Weitz et al's empirical evidence from Cape Town and Mpumalanga of significant cultural differences in "illness-representations" suggest a further dimension that is of likely importance, but we were unable to assess this due to the limitations of the dataset.

That the use of drugs, such as marijuana, is associated with an increased risk perception is likely due to the increased risk behaviours (that we were unable to measure) linked with drug use. A separate multivariate analysis of the correlates of high risk sexual behaviour in Cape Town, found that the use of marijuana (which is commonly utilized in Cape Town) was associated with increased risk behaviour[21]. As far as the analysis in the low risk group is concerned, the fact that parents discussing HIV had an effect on HIV risk perception (but only in males) has, to the best of our knowledge, not been documented in other studies in an African context.

The gendered difference in HIV prevention knowledge is intriguing. In males, believing in monogamy (as a way to reduce HIV risk) showed a trend with reduced perceived HIV risk in both the low and the high risk groups (p=0.059 and 0.094 respectively). In females, there was no similar relationship, but instead there was a large increase in perceived risk in those who believed in condomization (in the low risk group). This may reflect confounding due to an unmeasured variable. For example, those males who believe in monogamy may be less likely to engage in a form of high risk sex that we have not measured.

There are several methodological weaknesses in our analysis. Firstly, it is not possible to determine the direction of causation in this cross-sectional analysis. Secondly, the CAPS dataset is not HIV-serolinked. Thirdly, using risk perception as the dependent variable could be regarded as a recursive model. Individuals may for example regard themselves as being at high risk of HIV and therefore use condoms regularly or they may never have used condoms and therefore regard themselves at high risk. The relevance of risk perception, HIV prevention beliefs and behaviours are all situational. In the setting of persons involved in concurrent relationships, it could be regarded as appropriate if HIV risk perception was lower in those who believed in and regularly used condoms. If however, condom usage is not consistent, as seems to be particularly the case in long-term concurrent relationships[27], and patterns of concurrency are themselves driving HIV spread, then a good case could be made that we should expect all persons involved in concurrent relationships to regard themselves at high risk regardless of reported condom usage. It is very difficult to unpack these complex relationships in the CAPS dataset. A useful way to deal with each of these criticisms would be to incorporate linked HIV testing and more detailed questions relating to both respondent and partner characteristics and HIV knowledge in future waves of CAPS and other similar survey panels in Southern Africa. Finally, the results are representative of a group of young South Africans living in Cape Town and are not generalizable to other age groups or different locations.

South African youth still do not understand the dangers of concurrency sufficiently well. There is an urgent need to devise culturally appropriate ways to better communicate this risk, as well as deal with the myriad of structural and other factors necessary to allow young people to develop the autonomy and capacity for critical thinking necessary to effect behaviour change[9]. Our analysis does not offer any easy answers. Contrary to the Health Belief Model, our results concur with those of others which found that sexual behaviours (such as concurrency) may have more of an impact on HIV prevention knowledge than the reverse[16]. Individuals who are taught that the way to avoid HIV infection is to "Abstain, Be-faithful, Condomize" may simply pick the strategies out of this fruit-salad which provoke least cognitive distress. Dealing with this would require an approach more focused on emphasising "One-partner at a time." A key group would need to be young African males as they have both the highest concurrency rates and a lower perception of HIV risk than other males. The social identity literature is useful in this regard as it illustrates both how group norms are shaped and constrained, but also how they can be renegotiated. It was this kind of renegotiation of group norms which was key to the dramatic decline in HIV incidence in Uganda in the 1990's[27,28].

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