

Journal of AIDS and HIV Research

Volume 9 Number 11 November 2017

ISSN 2141-2359



*Academic
Journals*

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Full Length Research Paper

HIV/AIDS-related stigmatization and discrimination and coping strategies among people living with HIV/AIDS (PLHIV) at the anti-retroviral (ARV) Clinic, University College Hospital Ibadan, Nigeria

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Received 15 September, 2017; Accepted 6 October, 2017

The aim of this study was to determine the magnitude of HIV/AIDS related stigmatization, discrimination and coping strategies among people living with HIV/AIDS (PLHIV) at University College Hospital Ibadan. The study adopted a descriptive cross-sectional study design carried out among 700 PLHIV selected using a systematic random sampling technique from May to June 2010. A validated pretested questionnaire was used to collect the data which was analysed using SPSS version 16. The mean age of the respondents was 40.0 ± 9.40 years and more were females (474, 67.70%). About 212 (30.30%) have experienced stigmatization with verbal insult (138, 65.10%), subjection to ridicule (134, 63.20%) and avoidance by friends (89, 42.0%) being the most reported forms of induced stigmatization/discrimination. In addition, there was no significant relationship of experiencing stigmatization/discrimination by gender ($P=0.097$). However, more females experienced physical assault than male. Strategies adopted by respondents in coping with stigmatization and discrimination were unmoved 376 (53.70%), prayer 321 (45.90%) and ignoring the person 281 (40.10%). The study reported prevalence of various forms of stigmatization and discrimination against PLHIV. Therefore, there is need for more awareness campaign in communities on the dangers of HIV-related stigmatization and discrimination on the health of PLHIV.

Key words: Social discrimination, perception, stigmatization, social support, HIV/AIDS.

INTRODUCTION

The Human Immunodeficiency Virus (HIV) infection and the Acquired Immune Deficiency Syndrome (AIDS)

remain a disease of public health concern in Nigeria. This is because Nigeria is the most populous country in sub-

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Saharan Africa and is one of the countries highly affected by the HIV/AIDS scourge (UNAIDS, 2014; Dahlui et al., 2015). The estimated number of people living with HIV (PLHIV) as at 2015 is 3.4 million people giving a prevalence of 3.2% among the adult population (UNAIDS, 2015). Since the first case of AIDS in Nigeria was reported in 1986, Nigeria adopted antenatal care sentinel surveillance as the system for monitoring the epidemic, in line with WHO guidelines (UNAIDS, 2015). The first sentinel survey gave a prevalence of 1.80%; thereafter, it increased to 5.4% in 1999 and peaked at 5.8% in 2001. The prevalence declined to 4.4% in 2005, 4.1% in 2010 and 3.0% in 2014 (UNAIDS, 2015). Furthermore, in Oyo State, the prevalence of HIV, based on the result of the national sero-surveillance studies conducted in 1992 and 2004, were 0.1 and 4.2%, respectively (FMOH, 2005). It was also reported that there was no town or village that had not reported cases of HIV and AIDS and about 85% of the infections were reported to have been contracted through unprotected heterosexual intercourse (FMOH, 2005). The international community embraced the goal of universal access to HIV prevention, treatment, care and support in 2005. This has led to universal access to diagnosis, treatment and care for PLHIV (Monjok et al., 2009; UNGASS, 2005; World Health Organization, 2006).

The three documented phase of the AIDS epidemic in most countries include “epidemic of HIV infection”, “epidemic of AIDS” and stigmatisation. The third phase is very challenging as it is characterized by discrimination, blame and denial (Mann, 1987). Nigeria appears to be in between the full AIDS epidemic phase and the stigma and discrimination phase. Experiencing the weight of AIDS epidemic and also seeing a lot of discrimination of PLHIV. HIV and AIDS-related stigma and discriminatory conduct provide opportunities for the spread of the infection (FMOH, 2002). This is because to avoid the unpleasing consequences of revealing their status, stigmatized persons may conceal their sero-positivity from others most especially their sexual partners thereby leading to the spread of the infection (Tsai et al., 2013; Pennebaker, 1989; Katz et al., 2013). This practice undermines prevention efforts and support and also increases the impact of the infection on individuals, families, communities and nations (Population Council Horizons, 2002). Furthermore, the stigma and discrimination attached to being diagnosed with HIV/AIDS is far bigger and considerably different from being diagnosed with more prevalent non-communicable diseases like diabetes, cancer and hypertension. This may be due to the fact that HIV is primarily transmitted through sexual intercourse and people sometimes erroneously link HIV infection with sexual promiscuity. Self-stigmatisation which can manifest as self-blaming and shame can lead to psychological consequences such as depression, withdrawal and feelings of worthlessness (UNAIDS, 2002). The effect of stigmatizing PLHIV and

self-stigmatization by PLHIV all lead to social exclusion. This study therefore focuses on exploration of stigma and discrimination from the perspective of the stigmatized and their coping strategies among PLHIV at Anti-Retroviral Viral clinic, University College Hospital Ibadan, Nigeria.

MATERIALS AND METHODS

Study design

The study was a descriptive cross sectional study of persons living with HIV and AIDS at the President Emergency Plan for AIDS Relief (PEPFAR), University College Hospital (UCH).

Study area

University College Hospital Ibadan is one of the 15 Federal University Teaching Hospitals in Nigeria. The hospital is located in Ibadan, the largest city in West Africa. It is established to serve as a teaching hospital for medical and allied professionals. The hospital consists of various clinics, including PEPFAR; the PEPFAR clinic UCH is jointly managed by the Government of the United State of America, the Nigerian government in collaboration with UCH, Ibadan and Harvard School of Public Health.

Study population

Adult persons attending PEPFAR clinic constituted the study population. They were persons living with HIV and AIDS. The clinic as at the time of the study had approximately 11000 patients of different socio-demographic characteristic; approximately 35 new patients were admitted per day.

Sample size determination

The formula for single proportion was used in calculating the sample size with 50% used as the proportion and 99% as the confidence interval.

$$N = z^2 \times p (1 - p) / d^2$$

$$N = 2.578^2 \times 0.5 (1 - 0.5) / 0.05^2 = 665$$

The calculated sample size of 665 was increased to 700 so as to address possible cases of attrition or incomplete responses. Thus, the study recruited 700 participants out of 11,000 in the PEPFAR register as at September, 2009.

Sampling procedure

A sampling interval of 16 was calculated, thus the first respondent was randomly selected; thereafter, every 16th patient on the PEPFAR register was selected for the study. Peradventure any of the 16th person decline to participate, then the 17th person was selected. Thus, 420 females and 280 males were selected for the study in all HIV/AIDS clinic days between the month of May and June 2010.

Instruments for data collection

The instrument for data collection was a semi-structured validated

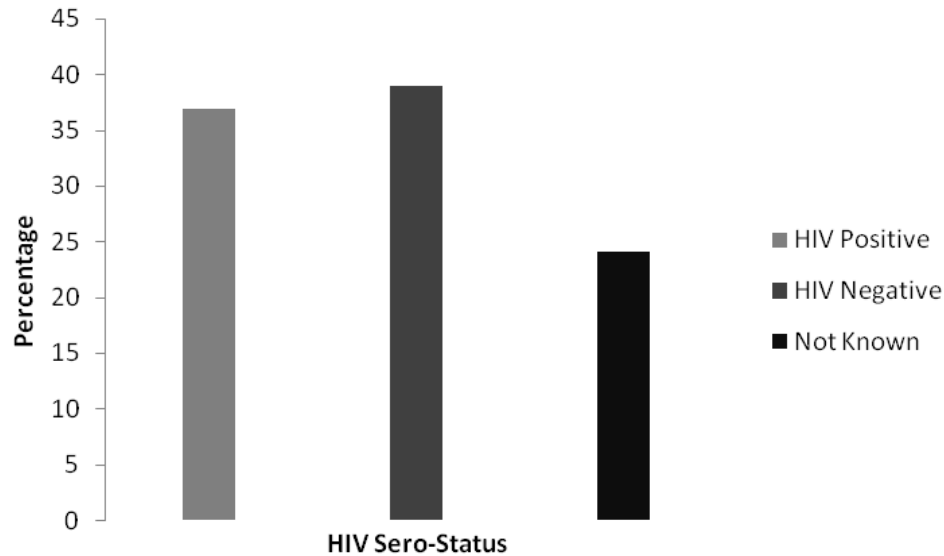


Figure 1. HIV status of respondents' sexual partners.

questionnaire divided into five sections (sections A to E). Section A focused on respondents' demographic characteristics; section B was on experiences relating to HIV-related stigma and discrimination. Section C was used to assess respondents' attitude, consequences/effects of HIV-related stigma and discrimination; while section D explored respondents' past and prevailing coping strategies to HIV-related stigma and discrimination experiences.

Method of data collection

On each day of data collection, the questionnaire was administered to the respondent after adequate explanation of the purpose of the study. The interview was either interviewer-administered or self-administered depending on the respondents' level of education. The questionnaires were retrieved back from each respondent immediately after completion and reviewed for incompleteness and necessary correction.

Validity and reliability

The questionnaire was reviewed in-house among experts in health promotion and education, medical sociologists, and a medical statistician for face, construct and content validity. Similarly, to improve the reliability of the instrument, the questionnaire was pre-tested among 70 PLHIV receiving care at Saint Mary Catholic Hospital Eleta, Ibadan. The Cronbach Alpha Correlation Co-efficient was used to determine the reliability of the instrument.

Data analysis

Administered questionnaires were edited and coded with the use of a coding guide. The data in each questionnaire were entered into a computer and was analysed using the Statistical Package for Social Sciences (SPSS Version 16, IBM Corp., Chicago, USA). In addition, descriptive statistics, Chi square and t-test were used to test for variables of interest at $P < 0.05$.

Ethical consideration

The study proposal was submitted to the UI/UCH Ethical Review

Committee for evaluation and approval. Official permission and approval was also obtained from the management of Saint Mary Catholic Hospital, Eleta Ibadan where the pre-test was carried out and from the PEPFAR authority where the actual study was conducted.

RESULTS

Socio-demographic characteristics

The ages of respondents ranged from 14 to 79 years with a mean age of 40.0 ± 9.4 years. A large proportion of the respondents 474 (67.7%) were females. Respondents' occupations include the following: trading 330 (47.2%), retired civil servants 128 (18.3%), artisan 76 (10.9%) and 35 (5.0%) were unemployed. Majority of the respondents were married 483 (69.0%) and 498 (71.1%) had secondary education and above Table 1).

According to Table 2, majority of the respondents (508, 72.50%) were screened for HIV because they were sick while less than two third (448, 64.0%) and 178 (25.40%) of facilities where the respondents were screened was owned by the Federal Government and individuals, respectively. In addition, majority of the respondents (666, 95.10%) had sexual partners, of which 582 (87.30%) and 55 (12.40%) sexual partners were their spouse and boyfriend/girlfriend, respectively. Furthermore, more than two third of the respondents 508 (72.60%) were aware of their partners HIV status and only less than one third 212 (30.30%) affirmed that they had ever experienced stigmatization or discrimination as a result of their HIV status.

According to Figure 1, 36.90% of the respondents' sexual partners were HIV positive, while 39.0% were HIV negative and 24.10% do not know the HIV status of their sexual partners.

Table 1. Socio-demographic characteristics of respondents

Characteristic	Frequency (N=700)	Percentage
Sex		
Male	226	32.3
Female	474	67.7
Age group*		
<30	94	13.4
30 - 39	256	36.6
40 - 49	243	34.7
≥50	107	15.3
Occupation		
Trading	330	47.2
Retired civil servant	128	18.3
Artisan	76	10.9
Teaching	52	7.4
Unemployed	35	5.0
Driver	35	5.0
Student	29	4.2
Civil servant	10	1.4
Clergy	3	0.4
Traditional ruler(King)	1	0.1
Politician	1	0.1
Marital status		
Married	483	69.0
Single	85	12.1
Widow	73	10.4
Separated	37	5.3
Divorced	19	2.7
Cohabitation	3	0.4
Education status		
No formal education	67	9.6
Primary education	135	19.3
Secondary education	245	35.0
**Tertiary education	253	36.1

*Mean age = 40.0 ± 9.4; age: ≤ 19 years= 0.6%; 20-24 years= 2.7%; 25-29 years = 10.1%.

**National Certificate Examination=10.3%, Technical school=9.1%, Ordinary National Diploma=10.0%, Higher National Diploma=3.7%, Bachelor degree=2.3%, Postgraduate=0.7%.

The HIV/AIDS induced stigma and discrimination ever perpetrated against PLHIV were manifested in several forms including the following: physical assault 51 (24.1%), verbal abuse/insult 138 (65.1%), subjection to ridicule 134 (63.2%), avoidance by friends 89 (42.0%) and not treated humanely like other patients 55 (25.9%). Experiences of induced stigma within the three months preceding the study also includes physical assault 7 (13.7%), denial of job opportunity 7 (15.2%), sacked from job 5 (14.7%) and refusal of medical care in a health care facility 5 (20.0%) (Table 3).

The forms of self-stigmatization ever experienced included: fear of HIV status disclosure to family members 377 (53.9%), fear of disclosing HIV status to friends 485 (69.3%), stoppage of attendance to social functions 124 (17.3%), stoppage of visiting friends 137 (19.6%), feeling ashamed of accessing medical care 206 (29.4%) and limiting social functions or gatherings attended by them 177 (25.3%). Within the last three months preceding the study, however, only 111 (29.4%) were afraid of disclosing their HIV status to family members, 128 (26.4%) were afraid of disclosing to friends (Table 4).

Table 2. HIV screening and sexual related issues.

Variable	Frequency	Percentage	P-Value
Respondents' reasons for undergoing HIV testing			
Sickness	508	72.5	
Routine HIV screening	67	9.6	
Pregnancy	65	9.3	
Spousal influence/Persuasion	51	7.3	
Radio/Media message	4	0.6	
Marriage influence	3	0.4	
Needle prick	2	0.3	
Ownership of screening centre used by respondents during the study period			
Federal Government	448	64.0	
Private	178	25.4	
NGO/CBO/FBO	46	6.7	
Mission	24	3.4	
Local Government/Health Centre	3	0.4	
State	1	0.1	
Have sexual partners			
Yes	666	95.1	
No	34	4.9	
Identity of sexual partner(s)			
	N=666		
Spouse	582	87.3	
Boyfriend/Girlfriend	55	12.4	
*Casual sex partner	29	4.4	
Awareness of partners HIV status			
Yes	508	72.6	0.03
No	192	27.4	
Respondents who had ever experienced stigmatization and/or discrimination as a result of their HIV status			
Yes	212	30.3	0.097
No	488	69.7	

*Causal sex partners including rape, NGO: Non-Governmental Organisation, CBO: Community Based Organisation, FBO: Faith Based Organisation.

As shown, Table 5 highlighted the attitudinal tendencies of others perceived by respondents to be stigmatizing. More than half of the respondents 365 (52.2%) were of the view that people with HIV are often treated as if it is their fault. Slightly above half of the respondents 363 (51.8%) agreed that people physically back away from or refuse to associate with someone because of HIV. In addition, less than half of the respondents 329 (47.0%) agreed that some close relations were afraid of rejection by the society when a family member has HIV. Four hundred and three (59.0%) of the respondents agreed that some friends withdraw from interacting or visiting after hearing that he/she has

HIV. Appreciable proportions of the respondents either disagree or strongly disagree with the attitudinal tendencies of others (Table 5).

Common strategies adopted by respondents for coping with stigma and discrimination as a result of their HIV status included the following: unmoved 376 (53.7%), ignore the person 281 (40.1%), and prayer 321 (45.9%). Others include challenging the person discriminating against them 65 (9.3%), threaten legal action 27 (3.9%) or report that experience to support group 53 (7.6%) (Table 6).

As shown in Figure 2, a small proportion of the respondents (27.7%) reported that they were members of

Table 3. Forms of induced stigma and/or discrimination experienced by PLHIV.

Stigma/discrimination	Ever experienced (N= 212)		Experienced within last 3 months*	
	Number	%	Number	%
Physical assault				
Yes	51	24.1	7	13.7
No	161	75.9	44	86.3
Abused/Insulted				
Yes	138	65.1	15	10.8
No	74	34.9	123	89.2
Subjected to ridicule				
Yes	134	63.2	16	12.0
No	78	36.8	118	88.0
Excluded religiously				
Yes	34	16.0	4	11.8
No	178	84	30	88.2
Sent out of the family				
Yes	39	18.5	4	10.3
No	172	81.5	35	89.7
Excluded from school				
Yes	24	11.3	1	4.2
No	188	88.7	23	95.8
Denied job opportunity				
Yes	46	21.7	7	15.2
No	166	78.3	39	84.8
Sacked from Job				
Yes	34	16.0	5	14.7
No	178	84.0	29	85.3
Loose promotion benefit				
Yes	32	15.1	4	12.5
No	180	84.9	28	87.5
Avoided by friends				
Yes	89	42.0	8	9.0
No	123	58.0	81	91.0
Refuse visa or entry to any country				
Yes	18	8.5	3	16.7
No	194	91.5	15	83.3
Ejected from house				
Yes	35	16.5	2	5.7
No	177	83.5	33	94.3
Refused medical care in a health care facility				
Yes	25	11.8	5	20.0

Table 3. Cont'd.

No	187	88.2	20	80.0
Refused nursing care in a health care facility				
Yes	30	14.2	8	26.7
No	181	85.8	22	73.3
Maltreated by health care personnel				
Yes	46	21.7	7	15.2
No	166	78.3	39	84.8
Disclosure of HIV status without consent by health personnel				
Yes	47	22.2	7	14.9
No	165	77.8	40	85.1
Not treated humanely like other patients				
Yes	55	25.9	5	9.1
No	157	74.1	50	90.9
Humiliated				
Yes	99	46.7	10	10.1
No	113	53.3	89	89.9

*This refers to last three months preceding the study.

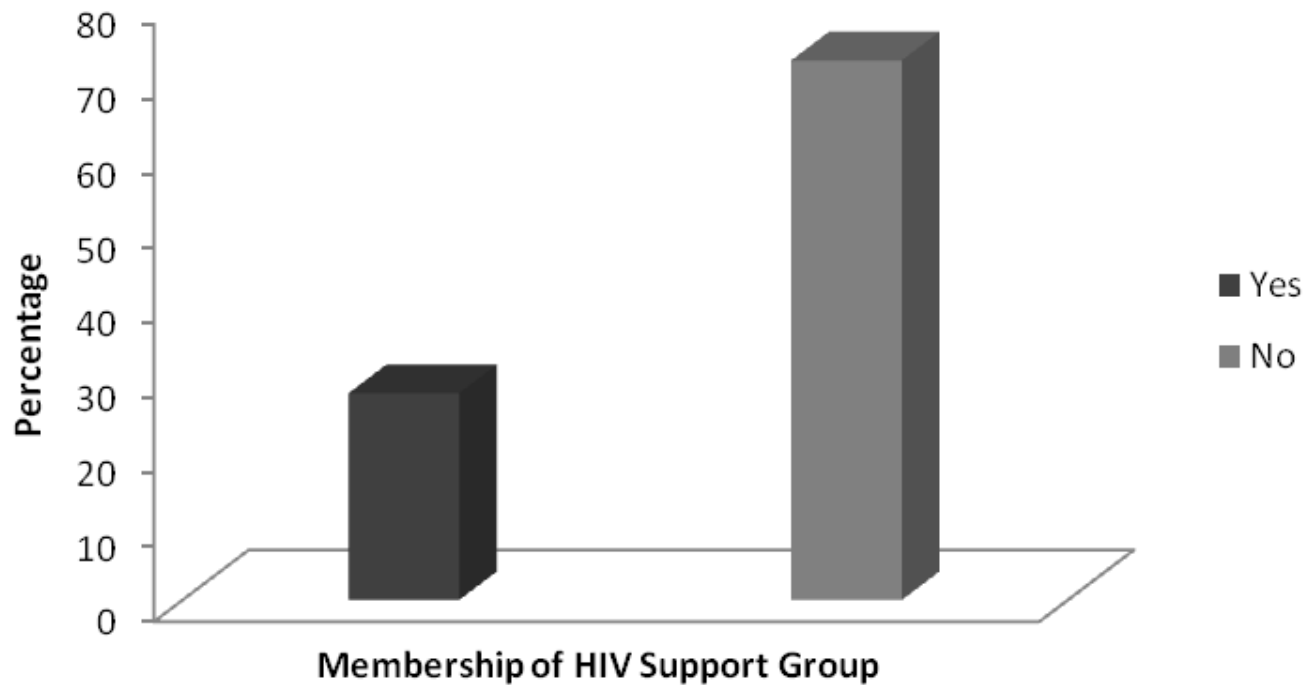


Figure 2. Respondents' membership of HIV social support groups.

a social support group for PLHIV; while 72.3% were not in any support group.

Coping strategies discussed among PLHIV in support group as highlighted by the respondents were: Not

Table 4. Respondents' experience of self-stigmatization.

Experiences of self-stigmatization by stigma indicator	Ever experienced N=700		Experienced within last 3 months	
	Number	%	Number	%
Isolate self from family functions because of HIV status				
Yes	123	17.6	24	19.5
No	577	82.4	99	80.5
Scared of disclosing status to family members				
Yes	377	53.9	111	29.4
No	323	46.1	266	70.6
Scared of disclosing status to friends				
Yes	485	69.3	128	26.4
No	215	30.7	357	73.6
Worthless because of HIV status				
Yes	137	19.6	32	23.4
No	563	80.4	105	76.6
Stopped social functions because of HIV status				
Yes	124	17.7	33	26.6
No	576	82.3	91	73.4
Exclude self from religious activities because of HIV status				
Yes	99	14.1	24	24.2
No	601	85.9	75	75.8
Stopped visiting some friends because of being looked down upon				
Yes	137	19.6	37	27.0
No	563	80.4	100	73.0
Stopped going to the office or to work because of HIV status				
Yes	83	11.9	16	19.3
No	617	88.1	67	80.7
Ashamed of accessing medical care				
Yes	206	29.4	50	24.2
No	494	70.6	156	75.8
Stopped applying for Jobs because of HIV status				
Yes	117	16.7	22	18.8
No	583	83.3	95	81.2
Limit the social functions or gatherings attended				
Yes	177	25.3	37	20.9
No	523	74.7	140	79.1
Stay indoor most times because of my HIV status				
Yes	150	21.4	32	21.3
No	550	78.6	118	78.7

Table 5. Societal attitudes towards persons with HIV perceived to be stigmatizing by respondents.

Attitudinal tendencies of others perceived to be stigmatizing	Strongly Agree (%)	Agree (%)	Undecided (%)	Disagree (%)	Strongly Disagree (%)	Total (%)
Persons with HIV are often treated as if it is their fault	17.3	34.9	5.0	19.1	23.7	100.0
People physically backing away from or refuse to associate with someone because of HIV	10.0	41.8	8.1	15.7	24.4	100.0
Close relations' fear and rejection by society when a family member has HIV	14.1	47.0	8.7	13.7	16.4	100.0
Failure to be interacting or visiting friend after hearing that he/she has HIV	13.3	45.7	8.4	15.6	17.0	100.0
Avoidance of physical contact with an HIV positive persons by people	15.6	40.3	7.4	15.7	21.0	100.0
Blaming HIV positive persons on their menial failings	14.4	42.5	10.0	16.4	16.7	100.0
People fear to relate with persons with HIV	22.7	43.1	6.9	13.3	14.0	100.0
Societal treatment of people with HIV with disdain	26.0	41.0	7.3	13.0	12.7	100.0

stigmatize one-self 34 (19.6%), living positively 66 (38.1%), not giving room for discrimination to occur 25 (14.5%) (Table 7).

DISCUSSION

The study showed majorities of the respondents were between the ages of 30 and 49 years and were females. This is similar to the findings of a study carried out in Abeokuta South-West Nigeria (Ojieabu et al., 2014). This finding is in line with those of the National Agency for the Control of AIDS 2016, report and a study by Dahlui et al. (2015), which highlighted the occurrence of stigmatization and discrimination among PLHIV. Similarly, the study reported various forms of stigmatization and discrimination which were perpetrated against the respondents. This finding is in line with previous studies which showed stigma and discrimination perpetrated against PLHIV from colleagues, friends and the community (Ogbuji and Oke, 2010; Blackstock, 2005; Zierler et al., 2000; Bharat, 2011). Furthermore, the respondents also highlighted various forms of self-stigmatization they adopted primarily to

conceal their HIV/AIDS status. This fear of revealing their HIV status might breed a culture of silence, sadness, hopelessness, anxiety and fear which can impact their quality of life negatively (Ogbuji and Oke, 2010).

The findings of the study shows that the society still exhibit some attitudinal tendencies which is stigmatizing to PLHIV. This finding is consistent with previous study which reported negative attitude such as the use of the cynical phrase “AIDS family” towards PLHIV (Alubo et al., 2002). This calls for more enlightenment campaign targeted at communities in order to reduce the attitudinal stigma and discrimination associated with HIV/AIDS.

The study also highlights various strategies adopted by the respondents in coping with HIV/AIDS-related stigma and discrimination. Some of the coping strategies highlighted are in line with a previous study in Ibadan South-West Nigeria (Ogbuji and Oke, 2010). The most important strategy as underlined by the respondents is belonging to an HIV/AIDS social support group which can act as reinforcing mechanism in coping with stigma and discrimination which according to the study is still

prevalent in the society.

The possible limitation in the study is that the authors relied absolutely on the responses of the participants of the study in reporting the various forms of stigma and discrimination. There was no independent confirmation of the various forms of stigmatization and discrimination reported in the study.

Conclusion

The study has shown prevalence of various forms of stigmatization and discrimination against PLHIV. Con-sequently, it appears that there is a general negative perception about HIV/AIDS and the people living with it; and unfortunately this has resulted in negative attitude towards PLHIV within the society. Although, the HIV and AIDS (Anti-Discrimination) Act, 2014, has been passed to protect the rights and dignity of PLWHA by eliminating all forms of discrimination based on HIV status; there is need for more health education campaigns across com-munities nationwide to translate the phobia associated with HIV/AIDS to caring for PLHIV.

Table 6. Strategies adopted for coping with HIV and AIDS-related stigma/discrimination by respondents.

Coping strategy*	Number	%
Unmoved		
Yes	376	53.7
No	324	46.3
Challenged/Confronted the person		
Yes	65	9.3
No	635	90.7
Threaten legal action		
Yes	27	3.9
No	673	96.1
Report to support group		
Yes	53	7.6
No	647	92.4
Ignore the person(s)		
Yes	281	40.1
No	419	59.9
Quarrel with the person(s)		
Yes	15	2.1
No	685	97.9
Pray		
Yes	321	45.9
No	379	54.1
Cry		
Yes	87	12.4
No	613	87.6
Singing		
Yes	16	2.3
No	684	97.7
Disclosure to partner		
Yes	7	1.0
No	693	99.0
Enlighten them		
Yes	8	1.1
No	692	98.9

*These were multiple responses.

Table 7. Coping strategies for HIV and AIDS-related stigma/discrimination discussed among PLHIV in support group meetings.

Strategy	N=173	%
Living positively	66	38.1
Not stigmatize oneself	34	19.6
Not giving room for discrimination	25	14.5

Table 7. Contd.

Disclosing ones HIV status to kill stigma	14	8.1
Ignoring the person stigmatizing one	12	6.9
Be happy with everybody	10	5.8
Reporting to Support group	8	4.6
Reporting to legal authority	4	2.4

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

The authors appreciate the Management and Staff of PEPFAR at the University College Hospital, Ibadan and the respondents who voluntarily participated in the research.

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Full Length Research Paper

Determinants of condom use at last sex by South African construction workers

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Received 21 August, 2017; Accepted 6 October, 2017

Due to its fragmented nature, the typically remote location of project sites and considerable reliance upon migrant workers, the construction industry in South Africa is adversely affected by the HIV/AIDS pandemic. The correct and consistent use of condoms is critical to combatting the spread of infection and reinfection. The demographic, behavioural and AIDS-related knowledge determinants of condom use at last sexual encounter were investigated in a survey of 512 site-based construction workers in the Western Cape Province. Half of all survey participants reported not having used a condom at last sexual encounter. Respondents most likely to have not used a condom were predominantly 'Black' African, single, in the 27 to 36 and 37 to 49 years old age groups, and those engaging in risky sexual behavior. Gender, education, employment position, alcohol consumption and cannabis ('dagga') use were not found to be significantly related to condom use, nor was the extent of workers' AIDS-related knowledge. Workplace interventions by employers (in response to requests by the South African government for greater private sector involvement), whilst focusing on all employees, should concentrate their efforts on identifying and targeting those demographic sub-populations that are at greatest risk for lack of condom use. Particular attention should be given to construction workers who are migratory (rural to urban work-seekers), working on sites in remote areas, or working in environments where the appeal and likelihood of risky sexual behavior are anticipated to be greatest.

Key words: Condom use, construction workers, South Africa.

INTRODUCTION

The national prevalence of HIV/AIDS in South Africa is reportedly one of the highest in the world (Simbayi et al., 2014), and has risen from 10.6% of the population (5.2

million persons) in 2008 to 12.2% (6.4 million persons) in 2012 (Shisana et al., 2014). The national prevalence varies by age, gender, race, locality type, and province.

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Shisana et al. (2014) reported that, overall, nearly two-thirds of respondents (65.5%) indicated that they had tested for HIV, with significantly more females (71.5%) testing than males (59%). No differences were detected in testing on the basis of race. Shisana et al. (2014) reported the engagement in antiretroviral treatment (ART) for people living with HIV (PLWH), as follows: by gender (male: 25.7%; female: 34.7%); by age (15 to 24 years: 14.3%; 25 to 49 years: 31.2%; 50+ years: 42.7%); and by race (Black African: 30.9%; 'Other' 41.3%). The study also found that nearly two thirds of both males and females reported having tested within the last year.

In 2017, HIV-related deaths in South Africa accounted for around one quarter of all deaths (25.03%), down from 41.93% in 2002 (Statistics South Africa, 2017). This improvement in mortality outcome is largely attributed to the extensive rollout of the antiretroviral treatment (ART) in the public health system in the intervening years (Karim et al., 2009). The country currently has the largest ART programme in the world in terms of the absolute number of persons with treatment exposure.

The significant up-scaling of the national ART programme was achieved after an earlier period of considerable 'AIDS-denialism' by the government. Post-2008 the SA government accelerated its efforts to combat the pandemic on all fronts, including a robust prevention of mother-to-child transmission (PMTCT) programme, greater availability of ART, and improved access to condoms (Karim et al., 2009; Woldesenbet et al., 2012). The condom programme saw considerable expansion in a few years. Between 2007 and 2010, the distribution of male condoms increased by 60%, from 308.5 million to 495 million a year. In the same period, the number of female condoms distributed increased from 3.6 million to 5 million (South African National AIDS Council and National Department of Health, 2012). In addition to this public sector effort, Goal 5 of the National Strategic Plan (NSP) for HIV, TB and STIs (South African National AIDS Council (SANAC), 2017) proposes "... *deeper involvement of the private sector and capacitation of civil society sectors and community networks ...*". This has been elaborated into calls for the private sector to engage in workplace intervention programmes, including use of peer educators, support and capacity building, condom distribution, and antiretroviral therapy. The link between unprotected sexual intercourse and the risk of HIV infection has been clearly established (World Health Organisation, 2002), and correct and consistent condom use is pivotal to controlling the spread of HIV/AIDS (UNAIDS/UNFPA, 2004). Condom use is reported to reduce the risk of HIV transmission by between 80% (Weller and Davis, 2002) and 90% (UNAIDS, 2013).

The benchmark survey research into HIV prevalence and incidence in South Africa is the South African National HIV Prevalence, Incidence and Behaviour Survey, conducted jointly by the Human Sciences Research Council and the Medical Research Council

(Shisana and Simbayi, 2002; Shisana et al., 2005; Shisana et al., 2009; Shisana et al., 2014). In comparing the findings emanating from four national HIV prevalence surveys in South Africa (2002, 2005, 2009, 2014), Shisana et al. (2014) noted that condom use at last sexual intercourse encounter (hereafter termed 'condom use at last sex') increased significantly from 2002 to 2008 in the overall population, but then decreased significantly in 2012, despite more people being aware of their HIV status. This decrease in condom use at last sex was evident in all three age cohorts (15 to 24 years; 25 to 49 years; and 50 years and older), and for both genders except among females aged 50 years and older. There were also significant gender differences within each age cohort, with males consistently reporting higher rates of condom use at last sex than females in the period since the 2002 survey (Shisana et al., 2014).

High rates of unprotected sexual intercourse (28 to 54%) have been found in surveys in the general population in South Africa (Crepaz and Marks, 2003; Olley et al., 2005). MacPhail and Campbell (2001) examined condom use by young people in a South African township and identified six factors that adversely influence condom use: low perceptions of risk; peer group norms and expectations; relative lack of condom availability (or failure to ensure appropriate availability); adult attitudes and preferences about condoms and sex; male-skewed gendered power relations; and adolescent condom affordability. Hargreaves et al. (2007) identified poor and inconsistent male condom use as a key driver of HIV infection in South Africa.

Illicit drug use and excessive use of alcohol before sexual intercourse have been found to be associated with risky lifestyles and lack of condom use (Parry et al., 2005; Kalichman et al., 2007; Peltzer et al., 2011; Seth et al., 2011). Studies relating condom use to factors such as knowledge of how to use a condom and knowledge of STI transmission (Eggers et al., 2014), and to HIV-related knowledge (Villar-Loubet et al., 2013), suggest that HIV knowledge may be an important predictor of sexually risky behaviour in the South African context (Scott-Sheldon et al., 2013).

Despite being disproportionately adversely affected by the HIV/AIDS pandemic (Bureau for Economic Research (BER)/ South African Business Coalition on HIV/AIDS (SABCOHA), 2004), the construction industry was initially one of the slowest sectors to respond (Meintjes et al., 2007). A variety of factors contribute to the heightened exposure of the sector to the pandemic. Construction work is fragmented in nature and diverse in terms of location and type of work. The industry is dominated by small firms including an informal sector about which little is known. It has comparatively low levels of worker education and literacy (especially for older workers). There is widespread use of 'informal' labour (even in the formal industry), and migratory workers are a prominent feature of its workforce. The temporary nature of construction projects is reflected

in the lack of permanent employment status for many workers. Productivity takes priority over working conditions (Meintjes et al., 2007).

Bowen et al. (2008), in a national study of 7226 construction workers, reported an estimated HIV occurrence of 13.9% in the industry, higher than that for the general population. However, little research has been conducted into condom use and risky sexual behaviours amongst construction workers. This paper reports on condom use at last sex by construction workers in terms of their demographic and lifestyle risk behaviour characteristics, and AIDS-related knowledge.

METHODOLOGY

Study design and population

The study design involved a cross-sectional survey adopting a quantitative method of data analysis, and complied with the requirements of the Research Ethics Committee of the Faculty of Engineering and the Built Environment at the University of Cape Town. Data collection involved a questionnaire administered on site. The survey participants ($n=512$) comprised unskilled and skilled workers and site office-based staff drawn from 6 construction companies on 18 sites in the Western Cape. The companies were selected purposively (aimed at construction workers) and on a convenience basis (by using personal contacts and contacts from previous research studies) following Leedy and Ormrod (2009). The printed questionnaire was administered in a supervised field setting to all employees present when researchers visited each construction site.

Separate questionnaires were prepared in three languages: Afrikaans, English and *isiXhosa* (an indigenous African language); representing the most commonly spoken languages in the Western Cape region. Experts in the other two languages translated the initial English-language instrument.

On each site, with the co-operation of the respective construction company, workers were gathered together and informed about the nature of the study. They were assured that their participation was entirely voluntary and anonymous, and told that they could withdraw such participation at any time. Large offices, comprising re-used shipping containers with tables and chairs, were used for workers to complete the questionnaires in relays on each site. No incentives were offered for participation. The supervising field researchers included a female and two males proficient in all three languages. Their responsibility covered only guidance on the meaning of questions, and they were not allowed to advise participants about their answers. Male field administrators assisted male participants and the female administrator assisted female participants. Every effort was made to maintain participants' dignity and privacy at all times. The time taken to complete the questionnaires ranged from 30 min to 1 h.

Data management

Data collection

The questionnaire design was drawn from items in instruments previously used for general population surveys in South Africa by Kalichman and Simbayi (2003, 2004). Questions asked for demographic details included condom use at last sex, alcohol consumption and drug (cannabis/'dagga') use over the preceding 3 months, lifestyle risk behaviour within the last 3 months, and the level

of AIDS-related knowledge. The catalogue of questions and scale measures is shown in Table 1.

Questionnaire items

Demographic characteristics: These cover age, gender, ethnicity, education level, employer (participating firm: anonymously labeled for analysis as A to F), employment position, and domestic relationship status. Ethnic options include: 'Black' African; 'Coloured' (mixed race); Indian; and 'White'. These categories continue to be used in post-1994 South Africa as a measure of transformation of the economy and for employment equity purposes, and have no other connotation. For analytical reasons the latter three groups are combined as 'Other' in the data processing. Education is differentiated into three levels of achievement: 'At most primary schooling', 'Secondary schooling', and 'Tertiary education or higher'. Employment status is categorized as 'Permanent', 'Temporary (Contract)', and 'Casual'. These are the distinctions generally found in the South African construction industry. Domestic relationship status is recorded as either 'Married or long-term relationship' or 'Single'.

Condom use at last sexual act: This is a dichotomous ('yes'/'no') question.

Substance use: Two questions are used to explore participants' alcohol and 'dagga' (cannabis) use in the preceding 3 months. For each, response options are 'never', 'once', and 'more than once'.

Variable development

Questionnaire item responses were transformed into variables for analysis; with scale measures devised for risky sexual behaviour (as a lifestyle risk) and level of AIDS-related knowledge.

Risky sexual behaviour (lifestyle risk): The scale measure for risky sexual behaviour uses three dichotomous ('yes'/'no') items, drawn from Kalichman and Simbayi (2003, 2004). For example, '*Have you had 2 or more sex partners in the past 3 months?*'. The scale is scored for the number of affirmative responses (thus ranging from 0 to 3), with higher scores indicating higher levels of risky sexual behaviour.

AIDS-related knowledge: The scale measure for this variable uses seven items drawn from Carey et al. (1997) and Kalichman and Simbayi (2003, 2004). For example, '*Must a person have many different sex partners to get AIDS?*'. Response options were 'yes', 'no', or 'don't know'. The scale is scored for the number of correct responses (range 0 to 7), with higher scores indicating higher levels of correct AIDS-related knowledge.

Data analysis

The software application IBM SPSS Ver. 24.0 for Macintosh (IBM Corporation, 2013a) was used for data analysis and confirmatory factor analysis (CFA) was carried out with IBM AMOS Ver. 24.0 for Windows (IBM Corporation, 2013b). Missing value analysis yielded less than 5% missing values, with most items having less than 2%. This meant that listwise deletion of cases with missing values was appropriate (Graham, 2012).

CFA covered the lifestyle risk and AIDS-related knowledge scale measures. Four critical fit indices (Kline, 2011) determined the degree of fit of the measurement model (with index values reflecting good model fit indicated in parenthesis): χ^2/df ratio (less than 4); comparative fit index (CFI of 0.95 and greater); root mean square

Table 1. Catalogue of survey questionnaire items and characteristics of construction workers ($n=512$).

Characteristics	Total	%	Condom at last sex (Yes)		Condom at last sex (No)		χ^2 <i>p</i> -value
			Number	%	Number	%	
Condom used at last sexual act (Yes/No)	-	-	251	49.7	254	50.3	-
Demographic							
Age							
26 and younger	100	20.7	47	19.8	53	21.5	0.022
27 to 36	173	35.8	95	40.1	78	31.7	
37 to 49	141	29.2	72	30.4	69	28.0	
50 and over	69	14.3	23	9.7	46	18.8	
Gender							
Male	455	91.4	224	90.7	231	92.0	0.634 ^b
Female	43	8.6	23	9.3	20	8.0	
Race / ethnicity							
'Other'	192	38.5	61	24.6	131	52.2	<0.001 ^b
'Black African'	307	61.5	187	75.4	120	47.8	
Level of education							
Primary or less	143	29.0	79	32.1	64	25.9	0.139
Secondary	255	51.7	127	51.6	128	51.8	
Tertiary or higher	95	19.3	40	16.3	55	22.3	
Employer							
Firm A	180	35.7	80	31.9	100	39.4	0.003
Firm B	79	15.6	47	18.7	32	12.6	
Firm C	86	17.0	37	14.7	49	19.3	
Firm D	119	23.6	61	24.3	58	22.8	
Firm E	15	3.0	5	2.0	10	3.9	
Firm F	26	5.1	21	8.4	5	2.0	
Employment position							
Permanent	300	61.5	146	60.3	154	62.6	0.524
Temporary / Contract	166	34.0	87	36.0	79	32.1	
Casual	22	4.5	9	3.7	13	5.3	
Relationship status							
Married / Long-term relationship	316	65.3	132	54.5 (41.8)	184	76.0 (58.2)	<0.001 ^b
Single	168	34.7	110	45.5 (65.5)	58	24.0 (34.5)	

Table 1. cont'd

Behavioural							
Alcohol use^a							
Never	213	43.0	110	45.1	103	41.0	
Once	56	11.3	28	11.5	28	11.2	0.607
More than once	226	45.7	106	43.4	120	47.8	
'Dagga' (Cannabis) use^a							
Never	437	88.1	219	89.4	218	86.9	
Once	18	3.6	5	2.0	13	5.2	0.173
More than once	41	8.3	21	8.6	20	8.0	
Risky sexual behavior (lifestyle risk scale)							
Lifestyle risk scale score (range 0-3)	M	SD	M	SD	M	SD	
LR1. Have you had 2 or more sex partners in the last 3 months? ^a	0.32	0.63	0.43	0.74	0.22	0.49	<0.001 ^c
LR2. Have you ever received money, housing, gifts or food for sex?							
LR3. Have you ever given money, housing, gifts or food for sex?							
AIDS-related knowledge (knowledge scale)							
AIDS Knowledge scale score (range 0-7)	M	SD	M	SD	M	SD	
AK1. Can men give AIDS to women? (Yes)	4.81	2.02	4.66	2.07	4.97	1.96	0.099 ^c
AK2. Can women give AIDS to men? (Yes)							
AK3. Must a person have many different sex partners to get AIDS? (No)							
AK4. Does washing after sex help protect someone from getting AIDS? (No)							
AK5. Can a pregnant woman give AIDS to her baby? (Yes)							
AK6. Can the use of vitamins and healthy foods cure AIDS? (No)							
AK7. Can traditional African medicines cure AIDS? (No)							

^aReported for the past three months; ^bFisher's Exact Test; ^cIndependent-samples t-test. For AIDS-related knowledge, correct responses are indicated in parentheses. For relationship status, percentages in parentheses (in each row) indicate the extent of condom use at last sex. Source: Bowen et al. (2015).

error of approximation (RMSEA 0.06 and less); and Hoelter critical N (CN index 200 and greater). Model improvements and parsimony were tested using the Chi-square difference test (Tabachnick and Fidell, 2014).

Descriptive statistics explored respondent characteristics in relation to condom use at last sex (Table 1). Bivariate analysis examined the relationship between condom use at last sex and demographic and behavioural factors, and AIDS-knowledge (Table 1). Multivariate logistic regression was used to explore the simultaneous association of multiple factors with condom use at last sex (Tables 2 and 3).

For the categorical explanatory variables in the logistic regression, the *reference categories* were: age (50 years and older), gender (female), ethnicity ('Other'), education (tertiary or higher), firm (Firm F), employment position (permanent), relationship status (married or in a long-term relationship), and substance abuse (not having used alcohol or 'dagga' in the last 3 months). For the dependent variable the reference category was '*condom not used at last sex*'. Thus the odds of workers having used a condom at last sex, rather than not having used one, were examined as a function of the different categories of their

demographic characteristics, lifestyle and AIDS-related knowledge scores.

RESULTS

Participant characteristics

Participant characteristics are shown in Table 1.

Table 2. Likelihood ratio tests assessing the contribution of each independent variable.

Effect	χ^2	d.f.	p-value
Intercept	0.000	0	-
Age	5.690	3	0.128
Gender	0.002	1	0.964
Race / ethnicity	18.874	1	0.000***
Level of education	0.190	2	0.909
Firm	7.874	5	0.163
Employment position	2.955	2	0.228
Relationship status	16.895	1	0.000***
Alcohol	0.244	2	0.885
'Dagga' (Cannabis)	3.975	2	0.137
Lifestyle risk	6.951	1	0.008**
AIDS-related knowledge	0.137	1	0.711

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3. Multivariate logistic regression analysis of predictors of condom use at last sexual act.

Condom use at last sex or not ^a	p-value	Odds ratio	95.0% C.I. for odds ratio	
			Lower	Upper
Demographic characteristics				
Age				
26 and younger	0.201	1.784	0.735	4.329
27 to 36	0.050*	2.099	1.001	4.401
37 to 49	0.026*	2.233	1.100	4.531
50 and over (reference)	-	-	-	-
Gender				
Male	0.964	0.982	0.439	2.193
Female (reference)	-	-	-	-
Race / ethnicity				
'Other' (reference)	-	-	-	-
'Black African'	0.000***	3.132	1.853	5.291
Level of education				
Primary or less	0.674	1.177	0.550	2.518
Secondary	0.705	1.126	0.609	2.085
Tertiary or higher (reference)	-	-	-	-
Firm employed by				
Firm A	0.037*	0.315	0.106	0.934
Firm B	0.111	0.392	0.124	1.238
Firm C	0.030*	0.277	0.086	0.886
Firm D	0.030*	0.286	0.092	0.886
Firm E	0.027*	0.155	0.030	0.807
Firm F (reference)	-	-	-	-
Employment position				
Permanent (reference)	-	-	-	-
Temporary / Contract	0.425	0.814	0.492	1.349
Casual	0.100	0.381	0.121	1.201

Table 3. Contd.

Relationship status				
Married / LT relationship (reference)	-	-	-	-
Single	0.000***	2.844	1.709	4.731
Behavioural				
Alcohol use^b				
Never (reference)	-	-	-	-
Once	0.961	1.019	0.488	2.127
More than once	0.651	0.895	0.555	1.446
'Dagga' (Cannabis) use^b				
Never (reference)	-	-	-	-
Once	0.149	0.387	0.107	1.403
More than once	0.223	1.732	0.716	4.193
Risky sexual behavior (lifestyle risk)				
Lifestyle risk score (range 0-3)	0.010**	1.653	1.125	2.428
AIDS-related knowledge				
AIDS Knowledge score (range 0-7)	0.711	1.023	0.907	1.154
Constant	0.360	-	-	-

^aThe reference category is: Condom not used at last sexual encounter; ^bReported for the past three months; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Most participants were male (91%; $n = 461$) and between 18 and 69 years old (mean = 36, SD = 10.86), with most respondents in the 27 to 36 year age group (36%; $n = 168$). Almost two-thirds (62%; $n = 313$) were "Black" African. Primary education was the highest level for 29% ($n = 144$), whilst 52% ($n = 260$) had secondary level education. Sixty-two percent ($n = 304$) of participants were permanent employees; 34% ($n = 167$) were on a contract (project) basis; and 4% ($n = 22$) were casually hired workers. Nearly two thirds of all respondents (65%; $n = 320$) were either married or in long-term relationships. Ten percent ($n = 34$) reported being HIV +. Overall, 50% ($n = 251$) of survey participants had used a condom at last sex. In terms of relationship status, 66% ($n = 110$) of single participants reported condom use at last sex compared to 42% ($n = 132$) of participants who were either married or in a long-term relationship.

Of all survey participants, 57% had consumed alcohol at least once during the preceding 3 months and 12% had smoked cannabis ('dagga') at least once over the same period. For the lifestyle risk scale measure, the overall mean score was $M = 0.32$ ($SD = 0.63$) and for the AIDS-related knowledge measure the overall mean score was $M = 4.81$ ($SD = 2.02$).

Confirmatory factor analysis

No correlated errors were specified in the initial measurement model. Output indices indicated a poor fit to the data (χ^2 / df ratio = 8.538, $p < 0.001$, CFI = 0.765,

RMSEA = 0.121, and Hoelter (95%) = 86). All factor loadings were statistically significant ($p < 0.001$).

However, the modification indices indicated the need for correlated error terms of AK1 ('Can men give AIDS to women?') with AK2 ('Can women give AIDS to men?'). With this path specified, the resultant model presented an excellent fit to the data (χ^2 / df ratio = 1.238, $p = 0.163$, CFI = 0.993, RMSEA = 0.022 (90%: LO = 0.000; HI = 0.041), and Hoelter (95%) = 593), with all factor loadings statistically significant ($p < 0.001$) (Figure 1).

Bivariate tests of association

Bivariate tests of association were used to explore the relationship between condom use at last sex with each of the demographic variables, and with alcohol consumption and 'dagga' use (Table 1). Condom use at last sex was significantly associated with age, [χ^2 (3, $n = 483$) = 9.597]; $p < 0.05$], ethnicity [χ^2 (1, $n = 499$) = 40.126]; $p < 0.001$], employer organisation [χ^2 (5, $n = 505$) = 18.316]; $p < 0.01$], and domestic relationship status [χ^2 (1, $n = 484$) = 24.652]; $p < 0.001$]; but not significantly associated with gender or education (Table 1). Having had two or more sex partners in the last three months was significantly associated with age [χ^2 (3, $n = 485$) = 10.417]; $p < 0.05$], with proportionately more workers in the 26 years and younger age group reporting having had two or more sex partners in the last three months compared to workers in the other age groups. An independent samples t-test indicated a significant difference in lifestyle risk scores for those using

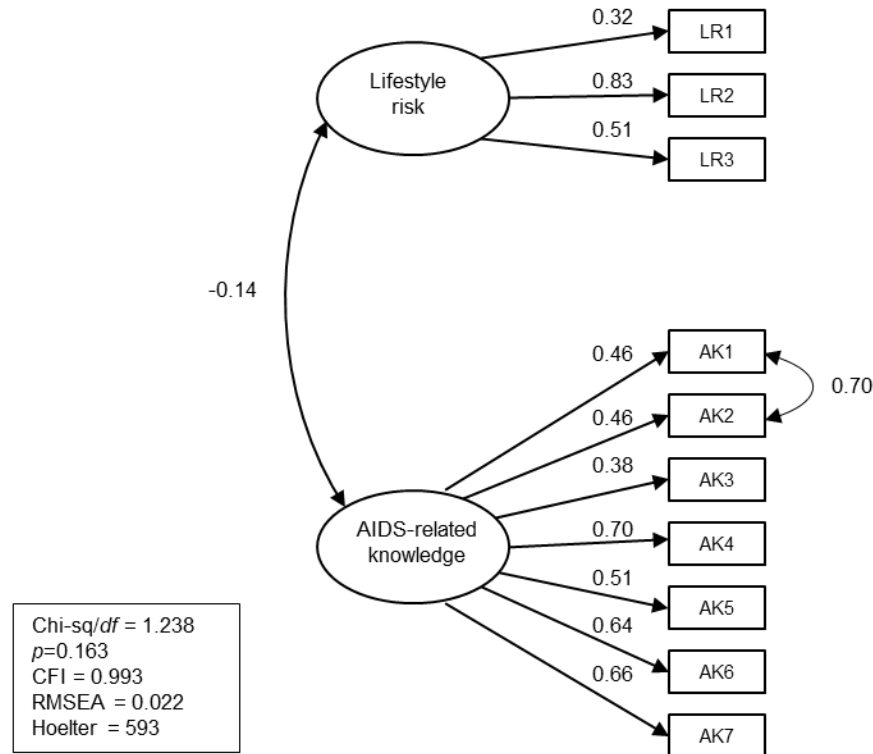


Figure 1. Confirmatory factor analysis.

a condom at last sex ($M = 0.43$; $SD = 0.74$) as compared to those who did not ($M = 0.22$; $SD = 0.49$), indicating that those who reported greater risky sexual behaviour are more likely to use a condom; $t(427) = -3.76$; $p < 0.001$. No significant differences were found in the t-test for mean levels of AIDS-related knowledge. Proportionately more adults in the 27 to 36 and 37 to 49 year old age groups, 'Black' African workers, workers who were single, and workers engaging in more risky lifestyles, reported using a condom at last sexual encounter, than did survey participants in other demographic categories.

With regard to employer organisations, the proportions of workers who reported having used a condom at last sex were significantly different (Table 1), suggesting that some firms were more rigorous or consistent in their promotion of safer sex (probably through greater provision of free condoms). A one-way ANOVA conducted to explore the impact of age on levels of lifestyle risk and AIDS-related knowledge indicated a statistically significant difference in the lifestyle risk scores for the four age groups, $F(3, 483) = 3.74$, $p < 0.05$. Post hoc comparisons using the Tukey HSD test indicated that the mean score in respect of lifestyle risk for workers 50 years and older ($M = 0.14$; $SD = 0.39$) was significantly lower than that of workers in the youngest cohort ($M = 0.45$; $SD = 0.66$). The 27 to 36 years ($M = 0.35$; $SD = 0.67$) and 37 to 49 years ($M = 0.27$; $SD = 0.61$) groups did not differ significantly from either the youngest or the oldest cohorts. For AIDS-related knowledge, there was a statistically significant difference in

the AIDS-related knowledge scores for the four age groups, $F(3, 469) = 4.13$, $p < 0.01$. Post hoc comparisons indicated that the mean score in respect of AIDS-related knowledge for workers 50 years and older ($M = 4.23$; $SD = 1.83$) was significantly lower than that of workers in the youngest <26 year old group ($M = 5.34$; $SD = 1.77$). The 27 to 36 year old ($M = 4.76$; $SD = 2.11$) and 37 to 49 year old ($M = 4.78$; $SD = 2.10$) groups again did not differ significantly from either the youngest or the oldest cohorts.

In essence, the youngest workers reported engaging in the riskiest lifestyles, displayed the highest levels of AIDS-related knowledge, and reported having proportionately more sex partners in the preceding 3 months than all other age groups. However, proportionately more adults in the 27 to 36 and 37 to 49 year old age groups reported condom use at last sex compared to the workers in the youngest and oldest groups.

'Black' workers had significantly lower levels of AIDS-related knowledge ($M = 4.23$; $SD = 2.10$) than workers in the combined 'Other' ethnic category ($M = 5.70$, $SD = 1.51$); $t(475) = 8.92$; $p < 0.001$, but there was no significant difference in lifestyle risk scores between the two groups.

Female workers reported significantly lower levels of lifestyle risk ($M = 0.07$; $SD = 0.26$) than male workers ($M = 0.34$, $SD = 0.64$); $t(102) = 5.47$; $p < 0.001$. They also displayed significantly higher levels of education than male participants [$\chi^2(2, n = 497) = 30.095$; $p < 0.001$] and significantly higher levels of AIDS-related knowledge ($M =$

5.61; SD = 1.78) than males (M = 4.75, SD = 2.02); $t = (55) = -3.03$; $p < 0.01$).

Multivariate analysis

Multivariate logistic regression was used to explore the factors associated with condom use at last sex. Table 2 shows the likelihood ratio tests for assessing the contribution of each independent variable to the prediction of condom use at last sex and this test evaluates the overall relationship between an independent variable and the dependent variable, providing an indication of the unique contribution of each independent variable to the prediction of condom use at last sex. Statistically significant unique contributions were made by ethnicity ($\chi^2 = 18.874$, $p < 0.001$), relationship status ($\chi^2 = 16.895$, $p < 0.001$), and lifestyle risk ($\chi^2 = 6.951$, $p < 0.01$). None of the age, gender, education level, employer organisation, alcohol consumption, and 'dagga' use factors made uniquely statistically significant contributions to the prediction of condom use at last sex. A test of the full model against a constant-only model was statistically significant, indicating that the predictors (as a set) reliably distinguished between workers who used a condom at last sex and those who did not ($\chi^2 = 83.837$, $p < 0.001$ with $df = 21$). Details of the multivariate logistic regression analysis are depicted in Table 3.

When compared with workers aged 50 years or more, workers in the 27 to 36 age group were 2.1 times more likely to have used a condom at last sex (aOR = 2.10; 95% CI: 1.00-4.40). Similarly, workers 37 to 49 years of age were 2.2 times more likely than those 50 years or older to have used a condom (aOR = 2.23; 95% CI: 1.10-4.53). No significant difference in condom use at last sex was found between workers younger than 26 years and those 50 years and older. Both the youngest and the oldest age categories reflected lower use of condoms at last sex than did the two intervening age groups. In other words, construction workers 26 years and younger were as likely not to have used a condom at last sex as those in the 50 years and older age category.

Although female construction workers reported marginally greater use of condoms at last sex than did their male colleagues, the difference was not significant. 'Black' construction workers differed significantly from workers in the combined 'Other' ethnic group regarding condom use at last sex ($p < 0.001$), with 'Black' workers being 3.1 times more likely than workers in the 'Other' group to have used a condom at last sex (aOR = 3.13; 95% CI: 1.85-5.29).

In comparison with workers in Firm F [the firm considered to represent best practice in HIV/AIDS intervention management amongst those surveyed (Bowen et al., 2014)], workers in some other firms were significantly less likely to have used a condom at last sex. The comparisons are: Firm A (69% less likely); Firm C

(72% less likely); Firm D (71% less likely) and Firm E (85% less likely). Although condom use at last sex by workers in Firm B was lower than that exhibited by workers in Firm F, the difference was not significant.

When Firm B [a firm also considered to be proactive in HIV intervention management (Bowen et al., 2014)] was designated as the reference category, workers in all firms other than Firm F reported lower use of condoms at last sex, but not significantly so. In comparison to workers in Firm B, workers in Firm F reported much higher use of condoms at last sex (2.5 times), but the difference was not significant. Firm D is one of the largest firms participating in the survey and Firm E is the smallest, in terms of both number of employees and annual turnover value. Thus, although firm size was not directly entered into the predictive model, these results suggest that workers' condom use at last sex does not relate to firm size, but may be associated with the quality of the construction firm's HIV/AIDS intervention management. In terms of relationship status, single workers were almost three times more likely than those who were married or in long-term relationships to have used a condom at last sex than not to have used one (aOR = 2.84; 95% CI: 1.71-4.73). Construction workers engaging in greater levels of lifestyle risk were almost twice as likely to have used a condom at last sex than not to have used one (aOR = 1.65; 95% CI: 1.13-2.43). This suggests that workers may be aware of their risky lifestyles and take appropriate precautionary measures.

To summarize, the multivariate model indicated that the following were significant in predicting greater likelihood of condom use at last sex: being 27 to 49 years old, 'Black' African, employed by Firm F, single, and engaging in risky sexual behavior. Gender, level of education, nature of employment, alcohol consumption, 'dagga' use, and AIDS-related knowledge were not found to be significant in the multivariate model.

DISCUSSION

About half of the survey participants reported condom use at last sex, exceeding the 36% condom use at last sex findings in the general population by Shisana et al. (2014). The two studies differ significantly in their sampling design - the general population figures are derived from a national probability sample while the current figures are drawn from a purposive convenience sample in only one industry sector based in a single region of the country. Accordingly, it is difficult to directly compare the two figures on condom use, though the rates observed in this study are promising for the sector. The inter-firm comparisons of workers' use of condoms at last sex suggest that more vigorous safe sex campaigns may substantially improve condom practice among employees and be effective in combating the spread of HIV infection.

Demographic and behavioural factors, but not AIDS-

related knowledge, are associated with construction workers' condom use at last sex. Specifically, construction workers in the 27 to 36, and 37 to 49 year age groups, 'Black' African workers, single workers, and those engaging in risky sexual behaviour, are significantly more likely to have used a condom at last sex than other workers.

Significant differences were found in the extent of condom use at last sex between 'Black' African workers and the 'Other' combined ethnic group. This finding is consistent with that of Simbayi et al. (2014), who noted that 'Black' Africans constitute the largest racial grouping nationally and have an HIV prevalence rate 17 times higher than that of both 'Whites' and Indians

Condom use at last sex by workers employed in Firm F was significantly higher in comparison to workers in all other firms, with the exception of Firm B. This finding aligns with the qualitative study by Bowen et al. (2014) of 12 construction firms in the Western Cape where it was found that Firms B and F employed more comprehensive HIV/AIDS interventions for their workers than did the other firms, and exhibited more active involvement by senior management. The importance of this "championing" role cannot be understated.

With respect to domestic relationships, single construction workers were almost three times as likely as workers who were married or in a long-term relationship to have used a condom at last sex. They also reported having had proportionately more sex partners in the previous 3 months, compared to workers in more committed relationships. These findings broadly align with Shisana et al. (2014), who reported that higher percentages of condom use at last sex were found in all age groups among those who were single compared to those who were married or in civil unions. Similarly, it was found that construction workers engaging in more risky sexual behaviour (multiple sex partners and transactional sex) were almost twice as likely to have used a condom at last sex, than were workers whose reported lifestyles were more risk averse. Workers engaging in risky sexual behaviour thus appear to be aware of the dangers thereof and are taking appropriate precautions.

No significantly strong association was found among the construction workers in our survey between condom use at last sex and their gender, education, and employment position alcohol consumption and 'dagga' usage. Regarding alcohol and drug use, a possible explanation may be under-reporting of such use, given the low tolerance of construction firms to such behaviour, the dangerous nature of construction work, and the widespread use of mechanical equipment and hand-tools on construction sites. Construction safety messages may be delivering their intended effect here.

With regard to AIDS-related knowledge, Simbayi et al. (2014) also reported a lack of association between AIDS-knowledge and condom use. It is possible that the effect of awareness and prevention campaigns is beginning to

diminish, and greater effort is needed to refresh the relevant messages. While we found that less secure employment was linked to lower levels of condom use at last sex, the difference in employment position is not significant in this regard.

A key finding of this study is that the higher risk categories of construction workers are those most likely to use condoms regularly, namely: workers 27 to 49 years old, 'Black' African, single, engaging in risky sexual behavior, and employed by companies more actively engaged in HIV/AIDS intervention management. Another key finding is that the youngest construction worker age group is not revealed as a high-risk category, at least not in terms of condom use at last sex. This contrasts with the testing behaviour of the same sample of construction workers, whereby Bowen et al. (2015) found that workers 20 years and younger were the least likely (46%) of any age group to have been tested, and Shisana et al. (2014) found similar results (51%) in relation to the general population. Our finding with regard to construction workers' condom use at last sex and age categories is thus at odds with the national study and requires further investigation employing a larger sample size of construction workers across a greater geographical area.

Conclusion

Using multivariate logistic regression analysis, this study examined the relationship between the demographic characteristics of construction workers, their lifestyle risk behavior, their AIDS-related knowledge, and their use of condoms at last sex.

It was found that: (1) age, ethnicity, firm, relationship status, and lifestyle risk all predict condom use at last sex; (2) gender, level of education, employment position, alcohol consumption and drug use, and level of AIDS-related knowledge are not determinants of regular condom use; (3) workers aged 26 years and younger and workers aged 50 years and older are the least likely to use condoms regularly; (4) 'Black' African workers are the most likely to use condoms regularly; (5) single workers, as opposed to workers who are either married or in long-term relationships, are the most likely to use condoms regularly; (6) workers engaged in risky sexual behavior are almost twice as likely to use condoms regularly as those less so engaged; and (7) workers employed by companies with comparatively more proactive HIV/AIDS intervention management are more likely than workers in less proactive firms to use condoms regularly. These findings provide pointers for better proactive intervention by construction organizations, indicating that a more differentiated and nuanced approach to AIDS awareness and prevention campaigns should be adopted. Sub-groups, rather than the entire industry workforce, may be considered higher risk in terms of inconsistent condom use. Awareness and prevention campaigns should target

all workers irrespective of age, but be mindful that workers in the 27 to 49 year age range are particularly at higher risk, even if they exhibit greater condom use. Workers should be encouraged to use condoms correctly and consistently. Regular and specific attention should be paid to this, through the use of visual media and demonstration models, in all campaigns.

Attention needs to be given to the reasons why workers 26 years and younger are comparatively less inclined than their older (27 to 49 years) colleagues to regularly use condoms, especially given their lifestyle risk behavior and more frequent sexual partners. For example, what roles do norms, peer group influence, condom affordability and availability, and male-gendered power relations play in this decision? All of these may indicate how campaigns can be more nuanced. HIV/AIDS workplace awareness and prevention campaigns, and peer educator training, should pay closer attention to age, ethnicity, and relationship status to positively influence more regular condom use. The location of sites and the use of migrant labour within the industry has been noted as exacerbating the spread of AIDS, but these factors were not directly investigated in our study. The nature of migrant employment, and the remoteness of many project sites in South Africa, places workers in conditions that tend to promote poor lifestyle behaviours, thus increasing their risk of contracting HIV while (in the case of remote sites) also removing them from the proximity of appropriate health care facilities. Workers who are separated from their families for long periods of time, may become prone to using sex workers or having multiple sexual partners, become HIV-positive, and then return to their primary sexual partners to spread the virus in their home communities. Construction organizations thus need to tailor awareness and prevention messages specifically for migrant workers and employees working on remote sites.

This study has shown that, while the condom use behaviours of construction workers are not directly comparable to those in the general population, campaigns and interventions relating to the effectiveness of condom use in combating the spread of HIV/AIDS can be improved among construction companies. This should not be difficult in the formal sector, given appropriate senior management commitment and support. However, reaching into the informal sector of the South African construction industry will be a far more formidable task.

Limitations

The companies involved in our study are representative of construction firms operating in the Western Cape province of South Africa. However, some are also active in other provinces, and would use similar voluntary counseling and testing (VCT) services for HIV/AIDS.

The cross-sectional nature of the survey; the reliance on participants' self-declarations (including possible recall and social desirability bias); and the potential under-reporting of

risky behaviours, are all limitations. Condom use was only measured for the last sex act and does not account for respondents' attitudes towards condoms nor the consistency or correctness of condom use. Moreover, it did not explore the exact nature of condom use by workers who were married or in long-term relationships, nor any differences between them. These aspects required further investigation.

Our investigation used a self-reporting survey instrument. There is a potential risk of common method variance and thus data validity. Method variance is attributable to the measurement method rather than to the construct(s) of interest. Common method biases arise from having a common respondent, a common measurement context, a common item context, or from the characteristics of the items themselves. The potential problem of common method variance is embedded in questionnaire survey research design.

With self-reporting survey instruments such as this one, an issue of response validity arises, particularly with respect to the education level of survey respondents – nearly 30% of the participating construction workers had achieved at most only primary level education. Regardless of the questionnaire language chosen by participants, and regardless of the assistance available from the attending field researchers, the dichotomous and multiple choice tick-box format of the questions may have led some of the more illiterate construction workers to mask their disadvantage by completing the questionnaire on a more or less random basis - a simple subterfuge if pride or potential loss of face would have prevented such participants from seeking help with understanding the questions and answer options.

CONFLICT OF INTERESTS

The authors reported no potential conflicts of interest.

ACKNOWLEDGEMENTS

The authors wish to express their appreciation to the South African Human Sciences Research Council (HSRC) for permitting them to draw on relevant HSRC questionnaires in the compilation of the survey questionnaire employed in this study. This work is based on research supported by the National Research Foundation of South Africa under Grant (UID) 85376. The Grantholder acknowledges that opinions, findings and conclusions or recommendations expressed in any publication generated by the NRF supported research are those of the authors, and that the NRF accepts no liability whatsoever in this regard.

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