

HIV Risk Perception and Risk Behaviors among Men Who Have Sex with Men in Nigeria

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Abstract

Background: Some studies have shown that greater perceived vulnerability to HIV is associated with less involvement in risk taking. We evaluated prevalence and correlates of HIV risk perception among men who have sex with men (MSM) in Nigeria.

Methods: A cross sectional study using respondent driven sampling (RDS) was conducted in six Nigerian states in 2010. Weighted HIV risk perceptions were calculated using an RDS analytic tool. Logistic regression was used to determine correlates of HIV risk perception, stratified by state.

Results: The total number of MSM ranged from 217 in Abuja to 314 in Cross River state. Median age ranged from 22 years in Cross River state to 26 years in Kano. HIV risk perception ranged from 10% in Cross River state to 58% in Kaduna state and was 38%, 44%, 19% and 20% in Kano, Lagos, Abuja and Oyo states respectively. Factors associated with HIV risk perception include purchasing sex (AOR: 3.11, 95% CI: 1.09-8.88) and never being tested for HIV (AOR = 0.34, 95% CI: 0.14 - 0.85] in Cross River; no comprehensive knowledge of HIV (AOR = 0.21, 95% CI: 0.05 - 0.90) and receptive anal partners (AOR = 10.07, 95% CI: 2.07 - 49.02) in Abuja; being older than 25 years (AOR = 0.16, 95% CI: 0.03 - 0.98) in Kano; no exposure to peer education in Kaduna (AOR = 0.08, 95% CI: 0.01 - 0.89); never being tested for HIV in Lagos (AOR = 0.11, 95% CI: 0.03 - 0.40) and Oyo state (AOR = 0.21, 95% CI: 0.06 - 0.80) and selling sex (AOR = 3.24, 95% CI: 1.00 - 10.61) in Oyo state.

Conclusion: This study shows that HIV risk perception and comprehensive HIV knowledge are very low among MSM in Nigeria. Heterogeneity in associated factors suggests that targeted interventions are needed to increase HIV risk perception in the different states. The role of HIV counseling and testing in increasing risk perception needs further evaluation.

Keywords: Perception; HIV/AIDS; HIV risk perception

Introduction

Perception (a hybrid of belief and attitude) is assumed to predict behavior [1]. Risk perceptions refer to people's beliefs about their vulnerability to danger or harm [2]. Perception of health risk is a key dimension of most health behavior models [3,4] used to construct health promotion campaigns particularly those targeting HIV-related risk behaviors [1]. Studies have shown that greater perceived vulnerability to HIV is associated with decreased involvement in risk taking [5,6]. However, given that knowledge influences risk perception [7], risk perception may be further described as an intermediate step between knowledge and behavior change [7]. Thus, failure of knowledge to impact perception was adduced as one of the reasons why HIV incidence remained between 3 and 4% in South Africa in the five years prior to 2010 [3]. Other factors that have been reported to influence risk perception include stigma, [8] knowing someone with HIV/AIDS [9,10] and the extent to which individuals are connected to their peers, families and even schools [9,11].

The health belief model [12,13] and the theory of planned behavior [14,15] are founded on the principle that there is a relationship between beliefs, attitudes and behavior. Whilst some studies have documented association between beliefs and attitudes and relevant behaviors [1,16-20], a few studies have found no association [21]. Cognitive theory proposes that data are not merely uncritically assimilated, rather they are filtered and interpreted by the perceiver whose community norms,

ideologies and historical experiences impact on how the information is processed, altered and stored [7]. Gender, race/ethnicity, age, education, social class and sexual orientation are some categories which influence people's experiences and understanding of a disease [22]. Protection motivation theory [23] categorizes response to messages into threat appraisal, which assesses the severity of the threat and the probability of the event's occurrence and coping appraisal which assesses the efficacy of a protective response and the individual's ability to perform the protective response. The extended parallel process model [24] expands on the protection motivation theory and postulates that individuals, when exposed to a fear-arousing communication, initiates both the threat and coping appraisals and the more they believe they are vulnerable to a serious threat, the more motivated they are to engage in coping appraisal. The Information-Motivation-Behavioral Skills (IMB) model theorizes that information, motivation and behavioral

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skills are fundamental determinants of HIV preventive behaviors [25]. Information and motivation influences an individual's objective and perceived abilities to perform various behaviors involved in sexual risk reduction [25]. A meta-analysis of these theories [26] showed that perception of vulnerability to and the severity of a disease had positive significant effects on intentions and behaviors, i.e. vulnerability is an important determination of intention and behavior change. Sheeran et al. (2013) conducted a meta-analysis of risk appraisal, a composite variable consisting of risk perception, anticipatory emotions (e.g., fear, worry), anticipated emotions (e.g., regret, guilt), and perceived severity and showed that interventions that were successful in heightening risk appraisals led to changes in subsequent intentions and behavior. They observed that heightening each element of risk appraisal had reliable effects on intentions and behaviors of small, or small -to-medium, magnitude.

Studies on HIV risk perception are limited and those available have used different social constructs to evaluate risk perception. Constructs to evaluate risk perception can be broadly classified into single item measures that rely on cognitive assessment of risk as the possibility, chance or likelihood of becoming infected with HIV [27] and multiple item measures which cover different dimensions of risk perception and may include psychometric properties of the risk perception measures [28]. Overall, HIV risk perception has been reported to be less than 50% for both heterosexual men [29] and women [30]. Among men who have sex with men [MSM], Klein and Tilley reported that over 50% of the HIV-negative men felt they had a slight or no chance of contracting HIV [1]. They also showed no difference in HIV knowledge between men who perceived themselves as having no or slight risk and those who perceived themselves as having great risk of contracting HIV. Mahfoud et al. reported a risk perception of 67% among MSM in Lebanon [31] and another study in Nigeria reported less than 50% HIV risk perception among MSM and also showed a positive association between HIV risk perception and HIV seropositivity [32].

In Nigeria and in thirty-one other countries in Africa [33], MSM are highly stigmatized and criminalized which makes provision of and access to HIV prevention and treatment interventions challenging. This paper assessed HIV risk perception and sexual risk behaviors among MSM across six Nigerian states in an effort to appropriately guide HIV prevention interventions among MSM.

Methods

Ethics statement

Ethical approval for this study was obtained from the Institutional Review Boards of the Nigerian Institute of Medical Research [NIMR] and Family Health International (FHI), New York. Participation in the study was voluntary and verbal informed consent, as approved by both NIMR and FHI was obtained from all participants prior to commencement of the study. Verbal consent was preferred to written as not all respondents were literate. The interviewer signed on behalf of the respondent on the consent form and consent was verified by the study supervisor. Minimum age of respondent was 16 years as approved the Child's Right Act of Nigeria. However, only participants aged 18 years and older were interviewed for this study. All data were anonymized and no identifiers collected.

Study setting and participants

Participants from six states - Lagos and Oyo in the South-west, Kaduna in the North-west, Kano in the North-east, the Federal Capital territory [FCT] and Cross River in the South-south of Nigeria were

recruited into the Integrated Biological and Behavioral Surveillance Survey (IBBSS), a national study conducted between April and May 2010. These states represent five of six geo-political zones of Nigeria where HIV prevention activities targeted at MSM at various intensities have been implemented since 2008.

Study procedures

Respondent driven sampling [RDS] was used to recruit MSM. MSM were defined as any man aged 18 years and above who reported anal sexual contact with another man in the 6 months leading up to the survey. This methodology has been described in detail elsewhere [32,34,35]. In brief, RDS is a type of chain referral network sampling that combines 'snow ball sampling' with a mathematical model that weights the sample to compensate for the non-random sampling method of sample recruitment [31,34,35]. Five initial recruits (seeds) were selected in each state based on referral from community based organizations working with MSM in the states and efforts were made to diversify the seeds by age, education and socioeconomic status. When recruitment was declining due to saturation of a seeds' network, a new seed was activated. Each seed was given three serially numbered recruitment vouchers to recruit their peers who were also MSM. Each voucher was numbered to include the identification number of the original recruiter and subsequent recruits were also given a maximum of three vouchers to recruit their peers in successive waves. Vouchers were limited to three to prevent an over-representation of particular traits in the sample, as recommended by Heckathorn [34]. Each participant received an incentive of N500 [approx. \$4 USD] for participating, and an additional N500 for each successful recruit who successfully entered the study, yielding a maximum compensation of N2000 [approximately \$13 USD].

Based on prevalence of 53% for condom use at last anal sex with non-paying partners among MSM in the 2007 IBBSS, a sample size of 216 participants in each state was required to detect a 15% difference in the behavioral indicator with 95% confidence and 80% power. Behavioral data were collected using a standard, structured pre-coded questionnaire. To ensure validity, the survey instrument was pilot tested and issues identified were addressed prior to the main survey. Ethical approval was obtained from the Nigerian Institute of Medical Research [NIMR] and Family Health International, New York.

Study measures

Study questionnaires elicited information on socio-demographic characteristics, type of sex partners, sexual risk behaviors, comprehensive knowledge of HIV and HIV risk perception. Transactional sex was assessed both with female and male partners. Type of anal sex practiced was categorized as "insertive penile sex" or "receptive penile sex". Comprehensive knowledge of HIV was determined using the UNAIDS criteria [36] and was measured by respondents providing correct answers to three known methods of HIV transmission and rejecting two misconceptions of HIV/AIDS. A binary outcome of "1" was designated if all questions were answered correctly and "0" if any of the questions was answered incorrectly. HIV risk perception was assessed by asking MSM "do you feel you are at risk of infection with HIV?" with response options being "yes or no". Consistent condom use with sexual partners during transactional and non-transactional sex was assessed by asking the questions "how often did you or your male partner use a condom every time you had sex in the last six months?" while condom use at last sex was assessed by the question "the last time you had anal sex did you or your partner use a condom?". Transactional sex was assessed by asking "have you received money or gift in exchange for sex in the last 6 months?"

Characteristic	Cross River [n = 314]		FCT [n = 217]		Kaduna [n = 275]		Kano [n = 299]		Lagos [n = 220]		Oyo [n = 233]	
	Unweighted % [n]	Weighted % [95% CI]	Unweighted % [n]	Weighted % [95% CI]	Unweighted % [n]	Weighted % [95% CI]	Unweighted % [n]	Weighted % [95% CI]	Unweighted % [n]	Weighted % [95% CI]	Unweighted % [n]	Weighted % [95% CI]
HIV Risk perception	8.3 [23]	9.7 [6.2-13.9]	23.2 [44]	19.3 [8.7-29.6]	55.6 [84]	57.5 [41.4-73.8]	45.9 [56]	38.3 [23.0-57.2]	50.3 [75]	43.9 [29.5-59.3]	25.6 [53]	20.3 [9.2-26.3]
Age												
<25 years	72.3 [201]	72.9 [65.4-80.4]	58.5 [117]	64.3 [48.2-76.6]	51.4 [147]	64.5 [54.4-74.3]	48.4 [146]	47.5 [38.2-58.0]	72.6 [166]	74.9 [64.5-82.7]	64.8 [151]	73.4 [64.4-81.2]
Median age, years [IQR]	22 [19-26]		24 [22-28]		25 [22-30]		26 [21-34]		23 [20-26]		24 [21-28]	
Educational level												
Not complete secondary	14.7 [46]	13.3 [8.5-18.4]	34.7 [69]	33.4 [17.1-42.0]	29.0 [83]	39.5 [28.5-49.1]	36.5 [109]	43.6 [33.0-53.7]	17.2 [37]	25.0 [15.7-35.1]	9.4 [22]	12.0 [6.3-18.6]
Type of sexual partners / sexual behavior in the past 12 months												
Girlfriend	15.2 [42]	17.5 [11.5-24.3]	36.5 [70]	37.2 [23.6-50.1]	45.0 [122]	53.0 [40.0-62.4]	46.9 [138]	52.5 [43.7-64.6]	65.3 [139]	74.4 [63.3-82.6]	51.3 [116]	49.9 [38.6-61.8]
Female sex worker	0.7 [2]	†	2.1 [4]	2.5 [0.1-6.8]	18.8 [51]	26.8 [15.8-35.6]	23.8 [70]	26.2 [20.2-37.6]	7.0 [15]	7.4 [3.5-12.7]	9.7 [22]	8.0 [3.7-12.8]
Bought sex from men [§]	18.2 [49]	9.3 [5.5-13.3]	9.0 [16]	5.9 [1.3-12.3]	38.3 [96]	29.3 [20.2-40.2]	44.4 [130]	45.5 [36.4-56.1]	13.1 [26]	13.6 [7.2-22.1]	10.1 [21]	4.6 [2.5-8.2]
Sold sex to a man [§]	19.0 [51]	13.0 [8.7-17.3]	43.1 [78]	34.2 [25.7-52.0]	36.0 [91]	38.9 [28.6-51.9]	64.8 [191]	54.1 [44.0-64.6]	39.7 [79]	41.8 [31.5-53.3]	28.7 [60]	27.6 [18.5-35.1]
Type of sexual act												
Insertive	77.4 (239)	76.2 [69.7 - 82.8]	61.5 [131]	68.0 [57.0 - 79.0]	70.5 [198]	56.7 [44.5 - 69.0]	75.2 [224]	74.8 [61.6 - 88.0]	57.7 [127]	62.1 [51.2 - 72.9]	79.9 [179]	80.3 [72.4 - 88.1]
Receptive	53.4 (165)	45.7 [38.4 - 52.9]	70.0 [149]	57.1 [44.3 - 69.9]	65.8 [185]	71.7 [62.3 - 81.1]	80.2 [239]	77.2 [64.0 - 90.4]	63.2 [139]	61.9 [50.3 - 73.6]	40.2 [90]	32.4 [23.3 - 41.5]
Condom use with different male partners in last 6 months												
Consistent use when buying sex	50.0 [10]	†	68.8 [11]	†	57.1 [40]	72.1 [45.4-91.3]	14.7 [14]	3.9 [0.0-13.4]	71.4 [100]	†	50.0 [10]	†
Consistent use when selling sex	52.0 [26]	43 [25.6-58.0]	50.0 [34]	30.6 [5.2-81.7]	37.7 [32]	64.3 [37.1-75.6]	11.9 [21]	10.1 [4.4-18.0]	48.7 [86]	41.7 [18.4-76.7]	44.1 [26]	37.5 [12.6-57.5]
Consistent use in non-commercial sex	17.6 [38]	13.9 [9.3-23.0]	57.4 [58]	59.6 [43.3-85.5]	45.3 [62]	46.1 [16.1-54.8]	7.7 [11]	8.1 [1.9-13.7]	47.2 [69]	46.3 [23.0-55.3]	49.2 [88]	41.8 [30.3-60.9]
Comprehensive knowledge and exposure to HIV information												
Comprehensive HIV knowledge	55.8 [155]	53.1 [44.9-61.1]	44.7 [97]	37.3 [23.0-48.5]	18.5 [53]	16.2 [7.8-25.5]	5.4 [16]	6.4 [2.9-10.5]	31.8 [70]	29.3 [21.1-39.3]	43.4 [101]	31.3 [23.3-41.0]
Ever had HIV test	43.5 [121]	37.9 [30.9-45.6]	62.8 [125]	47.3 [31.8-63.2]	61.0 [122]	58.7 [46.4-73.9]	69.2 [144]	70.9 [61.8-82.7]	64.3 [117]	59.5 [44.1-69.1]	56.9 [128]	46.3 [33.0-56.8]
Knows someone who died of AIDS	26.0 [81]	27.5 [20.9-34.1]	47.0 [93]	35.8 [23.0-45.5]	57.3 [161]	52.5 [41.4-62.0]	47.8 [143]	51.0 [40.8-60.7]	29.3 [63]	19.8 [13.5-29.7]	14.7 [34]	10.2 [5.0-17.5]
Received HIV information in the past 12 months	82.0 [227]	84.5 [79.5-89.5]	68.8 [137]	55.1 [39.4-71.1]	80.3 [224]	77.5 [66.9-86.3]	78.9 [236]	80.8 [73.1-87.6]	73.0 [157]	64.8 [55.3-76.5]	77.7 [181]	78.8 [70.5-86.7]

Table 1: Socio-demographic, HIV risk perception, and sexual behavior characteristics of MSM in Nigeria.

† a group recruited exclusively within its own group so RDSAT could not compute a result § Sexual history with men was restricted to a 6 month recall period

Data management and analyses

Data were entered centrally using CS Pro version 3.2 and double data-entry was conducted for 25% of questionnaires to ensure data quality. Respondent Driven Sampling Analytic Tool (RDSAT) version 5.6 was used to calculate population estimates with 95% confidence intervals (CI). Equilibrium distribution was calculated with a convergence radius of 2% of the sample estimate for essential variables (HIV risk perception, type of sexual partners, risk behaviors) in all six states. A partition analysis was conducted on the outcome variable (HIV risk perception) using RDSAT and individualized weights subsequently derived for HIV risk perception. These weights were then exported into STATA 12.0 to conduct weighted bivariate and multivariate analysis. Using a manual, forward step-wise approach, variables in the bivariate logistic regression analyses significant at the level of $p < 0.20$ were entered into a multivariate logistic regression model to identify predictors of HIV risk perception among MSM. Variables attaining p -values ≤ 0.05 from the Likelihood Ratio test were retained in the model. Due to the sampling methodology used, data could not be aggregated and thus were analyzed per state. The RDSAT uses data from the recruitment network to generate individualized weights, which are then used to obtain population estimates for variables of interest. Thus aggregating data would result in the loss of this network component, which is required by RDSAT to compute the individualized weights.

Results

Socio-demographic characteristics

Table 1 shows characteristics of MSM surveyed. A total of 314, 217, 275, 299, 220 and 233 MSM were surveyed in Cross River, FCT, Kaduna, Kano, Lagos and Oyo states respectively. A total of 5 seeds were used in Cross River, Oyo and Kano states, while 7, 8 and 12 seeds were used in Lagos, Kaduna and FCT respectively. About two-thirds of respondents were less than 25 years in all states surveyed except in Kano state (48%). Median age ranged from 22 years, interquartile range (IQR) 19-26 years in Cross River state to 26 years (IQR: 21-34 years) in Kano. Except for Kano state (56%), about two-thirds of respondents had completed secondary level education. Median age of sexual debut was 16 years for FCT, Kaduna and Lagos, 17 years for Cross River and 18 years for Kano and Oyo states.

Sex partners and sexual risk behaviors

Except for Cross River (18%) and FCT (37%), about half of the respondents had sexual relationships with females in the 12 months prior to the survey. Across all states, the commonest type of female partnership in the past 12 months prior to the survey was with girlfriends and this ranged from 18% in Cross River to 74% in Lagos. Less than one-tenth of respondents reported having had sex with a female sex worker (FSW) in the 12 months prior to the study, except for participants from Kaduna (27%) and Kano (26%). Purchasing sex

from men in the six months prior to the survey was reported by 5% of participants in Oyo to a high of 46% in Kano state, while selling sex ranged from 13% in Cross River state to 54% in Kano state. Consistent condom use among men who purchased sex ranged from 4% to 72%, while among those who sold sex consistent condom use ranged from 10% to 64%. Consistent condom use in non-commercial sex ranged from 8% to 60%.

HIV risk perception and comprehensive knowledge

HIV risk perception ranged from a low of 10% in Cross River state to a high of 58% in Kaduna state. Among other states surveyed, risk perception was 38%, 44%, 19% and 20% in Kano, Lagos, FCT and Oyo states, respectively.

Except for Cross River state (53%), less than two-fifths of respondents in all states had comprehensive knowledge of HIV. Over 50% of respondents in all states had received some information about HIV in the 12 months prior to the survey. Risk perception was significantly different among those with comprehensive knowledge in three of six states surveyed. In the FCT, 29% of those with comprehensive HIV knowledge vs. 16% ($p < 0.01$) of those without comprehensive knowledge perceived themselves at risk to HIV. In Kaduna, 28% of those with comprehensive HIV knowledge vs. 51% ($p < 0.01$) of those without comprehensive knowledge perceived themselves at risk to HIV, while in Kano 6% of those with comprehensive HIV knowledge vs. 52% ($p < 0.001$) of those without comprehensive knowledge perceived themselves at risk to HIV (Table 2).

HIV risk Perception and risk behaviors

HIV risk perception differed between those who engaged in sexual risky behaviors and those who did not. In Cross River state, 16% of those who purchased sex vs. 7% ($p < 0.05$) of those who did not purchase sex perceived themselves at risk of HIV. In Oyo state, 42% of those who sold sex vs. 22% ($p < 0.001$) of those that did not sell sex, perceived themselves at risk of HIV. In Kaduna, 39% of those who engaged in multiple sexual partnership vs. 64% ($p < 0.05$) of those that did not, perceived themselves at risk of HIV while in Lagos state, 57% of those who engaged in multiple sexual partnerships vs. 36% that did not ($p < 0.05$) perceived themselves at risk of HIV. HIV risk perception were significantly higher (data not shown) among those who had ever had an HIV test compared to those who never had an HIV test in Cross River (14% vs. 4.1%; $p = 0.002$), FCT (28% vs. 14%; $p = 0.023$), Kano (63% vs. 11%; $p < 0.001$), Lagos (58% vs. 28%; $p < 0.001$) and Oyo states (36% vs. 13%; $p < 0.001$).

Factors associated with HIV risk perception

Tables 3-5 show factors associated with HIV risk perception. In Cross River state, compared to those who did not engage in transactional sex, those who purchased sex were more likely to feel at risk to HIV (Adjusted Odds Ratio [AOR] = 3.11, 95% CI: 1.09 - 8.83)

Perceived at risk	Comprehensive Knowledge (%)		Paid for sex (%)		Received money for sex (%)		Had multiple sex partners (%)		Ever had HIV test (%)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Cross River	11.0	5.8	15.8	7.2*	12.5	8.0	9.0	6.4	14.4	4.2**
FCT	29.2	16.0**	37.5	21.4	19.7	25.2	25.1	14.0	28.2	13.6 *
Kaduna	28.3	50.5**	45.5	38.8	35.4	44.9	38.7	63.6*	48.2	33.3
Kano	6.3	51.9***	38.9	45.9	47.2	46.8	45.5	54.6	62.9	11.4***
Lagos	42.2	56.6	57.1	51.7	54.0	51.7	57.3	36.4*	58.4	27.5***
Oyo	24.5	26.6	30.0	27.0	41.5	22.0**	29.7	21.4	36.0	13.0***

Table 2: HIV risk perception by comprehensive knowledge and sexual risk behaviors.

Cross River					FCT				
Multivariate Analysis	Crude OR (95% I)	p value	Adjusted OR (95% CI)	p value	Multivariate Analysis	Crude OR (95% I)	p value	Adjusted OR (95% CI)	p value
Age (yrs)					Age (yrs)				
<25	1				<25	1		1	
>25	1.28 (0.48 - 3.40)	0.626			>25	2.36 (0.75 - 7.39)	0.142	0.53 (0.14 - 2.04)	0.356
Education					Education				
Not complete secondary	1				Not complete secondary	1		1	
Completed secondary	3.55 (0.60 - 21.00)	0.162	0.98 (0.24 - 4.00)	0.980	Completed secondary	3.32 (0.89 - 12.41)	0.074	0.49 (0.07 - 3.37)	0.465
Transactional sex					Transactional sex				
None	1		1		None	1			
Sold sex	2.46 (0.72 - 8.46)	0.150	2.79 (0.78 - 10.00)	0.116	Sold sex	0.61 (0.19 - 1.95)	0.400		
Bought sex	3.83 (1.33 - 10.99)	0.013	3.11 (1.09 - 8.83)	0.043	Bought sex	0.82 (0.16 - 4.15)	0.809		
Comprehensive knowledge					Comprehensive knowledge				
Yes	1				Yes	1		1	
No	0.47 (0.17 - 1.29)	0.142	0.69 (0.29 - 1.67)	0.411	No	0.26 (0.08 - 0.90)	0.032	0.21 (0.05 - 0.90)	0.035
Had receptive sex in the last six months					Had receptive sex in the last six months				
No	1				No	1		1	
Yes	1.49 (0.60 - 3.71)	0.386			Yes	3.53 (0.89 - 14.04)	0.074	10.07 (2.07 - 49.02)	0.004
Had insertive sex in the last six months					Had insertive sex in the last six months				
No	1				No	1			
Yes	1.60 (0.43 - 6.00)	0.484			Yes	0.97 (0.30 - 3.18)	0.957		
Exposure to peer educator in the past 12 months					Exposure to peer educator in the past 12 months				
Yes	1				Yes	1		1	
No	0.08 (0.01 - 1.25)	0.071	0.08 (0.01 - 1.46)	0.089	No	0.22 (0.05 - 1.00)	0.050	0.12 (0.02 - 0.84)	0.032
Ever tested for HIV					Ever tested for HIV				
Yes	1		1		Yes	1		1	
No	0.17 (0.06 - 0.49)	0.001	0.34 (0.14 - 0.85)	0.021	No	0.22 (0.06 - 0.87)	0.030	0.23 (0.04 - 1.41)	0.111

Table 3: Factors associated with HIV risk perception among MSM in Cross River state and FCT.

Kano					Kaduna				
Multivariate Analysis	Crude OR (95% I)	p value	Adjusted OR (95% CI)	p value	Multivariate Analysis	Crude OR (95% I)	p value	Adjusted OR (95% CI)	p value
Age (yrs)					Age (yrs)				
<25	1		1		<25	1			
>25	0.69 (0.23 - 2.09)	0.514	0.16 (0.03 - 0.98)	0.048	>25	1.25 (0.037 - 4.24)	0.727		
Education					Education				
Not complete secondary	1		1		Not complete secondary	1			
Completed secondary	3.52 (1.02 - 12.18)	0.047	3.74 (0.72 - 19.37)	0.115	Completed secondary	2.85 (0.54 - 15.13)	0.219		
Transactional sex					Transactional sex				
None	1		1		None	1			
Sold sex	0.15 (0.02 - 1.07)	0.058	0.23 (0.02 - 2.27)	0.206	Sold sex	0.49 (1.00 - 2.44)	0.384		
Bought sex	0.08 (0.01 - 0.53)	0.009	0.16 (0.02 - 1.27)	0.083	Bought sex	0.52 (0.12 - 2.21)	0.376		
Comprehensive knowledge					Comprehensive knowledge				
Yes	1		1		Yes	1			
No	5.53 (0.63 - 48.56)	0.123	3.09 (0.41 - 23.65)	0.276	No	1.32 (0.28 - 6.28)	0.727		
Had receptive sex in the last six months					Had receptive sex in the last six months				
No	1				No	1			
Yes	1.44 (0.37 - 5.60)	0.601			Yes	0.47 (0.13 - 1.66)	0.240		
Had insertive sex in the last six months					Had insertive sex in the last six months				
No	1		1		No	1			
Yes	0.45 (0.12 - 1.73)	0.247	0.11 (0.02 - 0.56)	0.008	Yes	0.56 (0.16 - 2.00)	0.367		
Exposure to peer educator in the past 12 months					Exposure to peer educator in the past 12 months				
Yes	1		1		Yes	1			
No	0.06 (0.01 - 0.80)	0.034	0.01 (0.00 - 0.07)	<0.001	No	0.06 (0.01 - 0.27)	0.050	0.08 (0.01 - 0.89)	0.04
Ever tested for HIV					Ever tested for HIV				
Yes	1		1		Yes	1		1	
No	0.16 (0.03 - 0.82)	0.029	0.62 (0.11 - 3.37)	0.578	No	0.38 (1.00 - 1.45)	0.157	0.44 (0.09 - 2.04)	0.290

Table 4: Factors associated with HIV risk perception among MSM in Kano and Kaduna states.

while those who had never tested for HIV were less likely to feel at risk to HIV [AOR = 0.34, 95% CI: 0.14 - 0.85] compared to those who had ever tested. In the FCT, those who were receptive anal partners were more likely to feel at risk to HIV [AOR = 10.07, 95% CI: 2.07 - 49.02]. Those who did not have comprehensive HIV knowledge [AOR = 0.21,

95% CI: 0.05 - 0.90] and those who had no exposure to a peer educator in the 12 months prior to the survey [AOR = 0.12, 95% CI: 0.02 - 0.84] were less likely to feel at risk to HIV. In Kano state, those aged greater than 25 years were less likely to feel at risk to HIV [AOR = 0.16, 95% CI: 0.03 - 0.98] compared to those aged less than 25 years. Also those who

Lagos					Oyo				
Multivariate Analysis	Crude OR (95% I)	p value	Adjusted OR (95% CI)	p value	Multivariate Analysis	Crude OR (95% I)	p value	Adjusted OR (95% CI)	p value
Age (yrs)					Age (yrs)				
<25	1		1		<25	1			
>25	0.53 (0.20 - 1.37)	0.188	0.51 (0.15 - 1.74)	0.283	>25	1.43 (0.55 - 3.71)	0.463		
Education					Education				
Not complete secondary	1				Not complete secondary	1		1	
Completed secondary	2.24 (0.56 - 8.92)	0.252			Completed secondary	5.12 (0.75 - 35.02)	0.096	5.03 (0.45 - 55.83)	0.188
Transactional sex					Transactional sex				
None	1				None	1		1	
Sold sex	1.02 (0.34 - 3.07)	0.978			Sold sex	2.83 (1.00 - 8.11)	0.053	3.24 (1.00 - 10.61)	0.052
Bought sex	0.84 (0.20 - 3.59)	0.815			Bought sex	1.90 (0.42 - 8.48)	0.400	1.72 (0.28 - 10.60)	0.558
Comprehensive knowledge					Comprehensive knowledge				
Yes	1				Yes	1		1	
No	2.90 (1.17 - 7.23)	0.022	1.67 (0.60 - 4.64)	0.325	No	2.39 (0.98 - 5.80)	0.055	2.46 (0.91 - 6.64)	0.075
Had receptive sex in the last six months					Had receptive sex in the last six months				
No	1				No	1		1	
Yes	0.75 (0.28 - 2.00)	0.562			Yes	2.08 (0.80 - 5.40)	0.134	1.38 (0.49 - 3.85)	0.543
Had insertive sex in the last six months					Had insertive sex in the last six months				
No	1		1		No	1			
Yes	2.26 (0.90 - 5.71)	0.084	2.15 (0.57 - 8.19)	0.261	Yes	0.73 (0.24 - 2.18)	0.570		
Exposure to peer educator in the past 12 months					Exposure to peer educator in the past 12 months				
Yes	1		1		Yes	1		1	
No	1.62 (0.56 - 4.70)	0.374	1.93 (0.58 - 6.39)	0.281	No	0.22 (0.07 - 0.73)	0.013	0.59 (0.15 - 2.23)	0.450
Ever tested for HIV					Ever tested for HIV				
Yes	1		1		Yes	1		1	
No	0.24 (0.09 - 0.65)	0.005	0.11 (0.03 - 0.40)	0.001	No	0.14 (0.05 - 0.38)	<0.001	0.21 (0.06 - 0.80)	0.022

Table 5: Factors associated with HIV risk perception among MSM in Lagos and Oyo states.

had engaged in insertive anal sex [AOR = 0.11, 95% CI: 0.02 - 0.56] and those who had no exposure to a peer educator in the 12 months prior to the survey [AOR = 0.01, 95% CI: 0.00 - 0.07] were less likely to feel at risk to HIV. In Kaduna state those who had not been exposed to a peer educator were less likely to feel at risk to HIV [AOR = 0.08, 95% CI: 0.01 - 0.89]. In Lagos state, those who had never tested for HIV [AOR = 0.11, 95% CI: 0.03 - 0.40] were less likely to feel at risk to HIV. In Oyo state, those who sold sex were more likely to feel at risk to HIV [AOR = 3.24, 95% CI: 1.00 - 10.61] compared to those who did not sell sex while those who had never tested for HIV were less likely to feel at risk to HIV [AOR = 0.21, 95% CI: 0.06 - 0.80].

Discussion

This is the first study in Nigeria to critically look at HIV risk perception and its correlates among MSM in Nigeria. Using identical methodologies across all states allowed for between state comparisons. We identified significant heterogeneity in HIV risk perception and sexual risk behaviors by state.

Except for Kaduna state, self-perceived risk for HIV infection was less than 50% in all states surveyed. In comparison to states surveyed in the 2007 IBBS, HIV risk perception was marginally higher in Lagos (42% vs. 44%) and Kano states (32% vs. 38%) while it was lower in Cross River (15% vs. 10%) between 2007 and 2010. However, our findings are higher than those reported by Klein et al. which showed that relatively few MSM thought that they had a pretty good chance (8.8%) or a very good chance of contracting HIV (3.7%) in the United States. A recent study in Tanzania [37] also reported low levels (36.7%) of HIV risk perception among MSM.

Numerous theories in social and health psychology including the psychometric paradigm [38,39], the health belief model [40], the

parallel process model [41], protection motivation theory [42], the extended parallel process model [24], the precaution adoption process model [43] and the prototype/willingness model [44], accord risk perception a central role in determining behavior. Meta-analyses of correlational studies have shown that risk perceptions have significant albeit small associations with both intention and behavior change [2]. Furthermore, heightening other components of risk appraisal achieves a larger impact on intention and behavior. de Hoog et al. (2007) showed that heightening severity of a threat, regardless of the medium of communication (e.g. use of scary images) was associated with a positive and significant effect on intention and behavior change. They also observed in their study that the stronger the effect of vulnerability on intentions, the stronger the intention to engage in a protective action and behavior, thus they conclude that vulnerability plays an important role in the acceptance of fear arousing communication [26]. In addition coping appraisal, i.e., response efficacy (the efficacy of a protective response in averting the threat) and self efficacy (the individual's ability to perform the protective response) have also been shown to increase the effect on intention and change [2,26]. HIV prevention interventions in Nigeria are devoid of these assessments and this calls for an urgent review of intervention programs in Nigeria to assess the messages used in behavior change communication interventions as well as incorporate measures and systems to assess coping appraisals and consequently heighten them to achieve a larger impact on behavior change communication.

Global report of comprehensive knowledge among MSM remains sparse [45]. Knowledge has been shown to influence perception [7]; however comprehensive knowledge as defined by UNAIDS was observed to be under 50% in all states surveyed except Cross River state [53%]. This low level of HIV knowledge has been observed generally

among MSM in low and middle income countries [45] which may explain the low levels of HIV risk perception observed in all states. It would be futile to expect desired behavioral change without the right steps needed to influence and impact the desired change. This highlights a major HIV prevention intervention need that demands significant efforts being deployed to increase HIV comprehensive knowledge and risk perception among MSM. However, lack of knowledge about HIV transmission alone, does not account for MSM low risk perception of acquiring HIV [1]. Risk denial and health-related optimism play a key role as has been shown that MSM who engage in HIV-related risk behaviors have optimistic outlooks about their health and health practices, thereby minimizing their perceptions of harm [1,46]. A recent study among MSM in China revealed that erroneous beliefs and misconceptions about HIV such as the belief that AIDS is a foreign disease, cleaning after sex prevented transmission, being the insertive partner during sex was not risky and their sex partner(s) could be trusted were some of the reasons adduced for low HIV risk perception [47].

MSM who had ever had an HIV test had higher risk perception in five out of the six states surveyed, yet only 32% of MSM in Nigeria had ever been tested and received their results. In addition, there was a positive association of ever been tested and HIV risk perception in three out of the six states when other confounders were controlled for at the multivariate level. The role of HIV testing and counseling [HCT] in increasing HIV risk perception needs further evaluation. Furthermore, as the entry point into HIV prevention, care and treatment in Nigeria, it is imperative to scale up HCT in Nigeria, especially among hard to reach most-at-risk populations (MARPS) such as MSM as a means of establishing their HIV status and increasing their HIV risk perception though appropriate risk profiling coupled with individualized counseling may then be deployed with the aim of increasing safer sexual behaviors among MSM. Between 2007 and 2010, HIV prevalence increased from 12% to 17% among MSM [48] but decreased from 4.6% to 4.1% [48] among the general population and thus further highlights the need for scaling up HCT among this group. Studies have shown that greater perceived vulnerability to HIV is associated with lesser involvement in risk taking [5,6] and most likely bring about risk behavior reductions in at-risk populations [6,49]. HIV prevention programs are usually administered through peer educators and involve group sessions that do not take into cognizance different risk profiles. Risk assessment is elicited only during HCT. The public health care system does not offer services tailored to MSM and health staff capacity are not adequate to provide optimal prevention services including risk assessment to MSM. There is thus a need to conduct large-scale sexual diversity training in the public health sector to raise awareness and improve HIV prevention services to MSM in Nigeria.

Despite engaging in risky sexual behaviors, including multiple sexual partnerships, consistent condom use was observed to be low. Consistent condom use during transactional sex was less than 75% in all states surveyed and less than 60% in non-transactional sex, revealing a potent HIV transmission bridge within this group. Furthermore, the presence of bisexuality though lower than that observed in a study in Southern Africa (54%) [50] suggests that HIV transmission to the general population through sexual intercourse with women is an HIV prevention need that must be addressed.

Factors associated with HIV risk perception varied in each state surveyed and suggests that HIV prevention must be targeted, state or location specific and evidenced based. The states surveyed varied in language, culture and religious dominance and these factors may come

to play in appropriately providing HIV prevention services. In the FCT, those who were receptive anal partners were more likely to feel at risk to HIV and this has been observed in a study by Klein et al. [1]. Studies have shown that risk of transmission is higher through receptive sex [32] therefore, identifying MSM who prefer to engage in receptive sex is an important prevention strategy and their sexual health needs to be adequately addressed. Those with no contact to peer educators or no comprehensive knowledge were less likely to feel at risk to HIV, which highlights the need to increase comprehensive knowledge of HIV among this group in order for them to appropriately assess their risk to HIV and subsequently reduce their risk behaviors. The overall low comprehensive HIV knowledge coupled with low access to HIV prevention information will continue to inhibit progress in individual assessment of HIV risk and may explain the lack of association of other risk factors with HIV risk perception.

Study Limitations

Our study was a cross-sectional study hence, it should be interpreted with caution as there was no comparison group to track and measure risky behaviors. Risk perception, though a complex and multifaceted construct, was measured as a dichotomous variable. Thus, may not appropriately capture the various factors that influence risk perception. Risk perception may have therefore been under-reported in this study. The role of social desirability bias cannot be overlooked as sexual risky behaviors were self-reported and respondents may have adjudged that their risk perception should align with the answers they had provided for sexual risk behaviors. Methods to reduce social desirability bias, such as audio computer assisted self-interview may be invaluable in measuring sexual risk behaviors and HIV risk perception. Also, some participants could have been HIV infected and aware of their status, thus influencing their risk perception. Stigma has also been shown to affect risk perception [8]. MSM face double stigma; from external stigma and discrimination from homophobic population and internalized homophobia which has been shown to be associated with HIV risk behaviors and serves as a barrier to accessing health care services including less responsiveness to HIV prevention activities [50-52]. Data on stigma was not available and thus its contribution to HIV risk perception could not be assessed. Future studies should include a measurement of internalized homophobia and also stigma to provide a more robust analysis of HIV risk perception among this highly stigmatized group.

Conclusion

The perception of HIV risk transmission among MSM in Nigeria is low. Furthermore, most measures of sexual risk behaviors were not associated with HIV risk perception among MSM in Nigeria and raises pertinent signs that risks behaviors will continue unabated if appropriate actions are not employed. Assessment of risk perception must include assessment of perceived severity and coping appraisals to appropriately guide behavior change communication interventions. Low comprehensive knowledge of HIV coupled with low exposure to HIV prevention services will continue to inhibit appropriate HIV risk assessment among MSM and thus limit the reduction of sexual risk behavior among MSM in Nigeria. Increasing the level of consistent condom use both in homosexuals and bisexuals is an urgent HIV prevention need in order to mitigate HIV transmission within MSM and between MSM and the general population. Further research is needed to evaluate the role of stigma and discrimination, both external and internal on HIV risk perception. Finally, given the heterogeneity in factors associated with HIV risk perception in the different states

surveyed, targeted and evidenced based interventions are needed to ensure appropriate individual risk assessment and thus heighten HIV risk perception among MSM in Nigeria.

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Contributors

GE conceived the study. GE and SBA participated in the study design. SBA coordinated data collection. GE performed the statistical analysis. GE and SL drafted the article. SBA, SL and BA provided critical review of the article. All authors contributed to and have approved the final manuscript.

References

1. Klein H, Tilley DL (2012) Perceptions of HIV risk among internet-using, HIV-negative bare backing men. *Am J Mens Health* 6: 280-293.
2. Sheeran P, Harris PR, Epton T (2014) Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies. *Psychol Bull* 140: 511-543.
3. Kenyon C, Zondo S, Badri M (2010) Determinants of self-perceived HIV risk in young South Africans engaged in concurrent sexual relationship. *Afr J Reprod Health* 14: 171-181.
4. Prohaska TR, Albrecht G, Levy JA, Sugrue N, Kim JH (1990) Determinants of self-perceived risk for AIDS. *J Health Soc Behav* 31: 384-394.
5. Brooks RA, Lee SJ, Stover GN, Barkley TW (2011) HIV testing, perceived vulnerability and correlates of HIV sexual risk behaviours of Latino and African American young male gang members. *Int J STD AIDS* 22: 19-24.
6. Jemmott LS, Jemmott JB, Hutchinson MK, Cederbaum JA, O'Leary A (2008) Sexually transmitted infection/HIV risk reduction interventions in clinical practice settings. *J Obstet Gynecol Neonatal Nurs* 37: 137-145.
7. Eiser R (1986) *Social psychology: Attitudes, cognition and social behavior*. Cambridge University Press, Cambridge.
8. Weinstein ND (1988) The precaution adoption process. *Health Psychol* 7: 355-386.
9. Macintyre K, Brown L, Sosler S (2001) "It's not what you know, but who you knew": examining the relationship between behavior change and AIDS mortality in Africa. *AIDS Educ Prev* 13: 160-174.
10. Macintyre K, Rutenberg N, Brown L, Karim A (2004) Understanding perceptions of HIV risk among adolescents in KwaZulu-Natal. *AIDS Behav* 8: 237-250.
11. VanLandingham MJ, Suprasert S, Grandjean N, Sittitritai W (1995) Two views of risky sexual practices among northern Thai males: The Health Belief Model and the Theory of Reasoned Action. *J Health Soc Behav* 36: 195-212.
12. Bledsoe LK (2006) Smoking cessation: An application of theory of planned behavior to understanding progress through stages of change. *Addict Behav* 31: 1271-1276.
13. Rosenstock IM, Strecher VJ, Becker MH (1994) The Health Belief Model and HIV risk behavior change. In DiClemente RJ (Ed.), *Preventing AIDS: Theories and methods of behavioral interventions*. Plenum Press, New York, NY.
14. Ajzen I (1985) From intention to actions: A theory of planned behavior. In Kuhl J, Beckmann J (Eds.), *Action-control: From cognition to behavior*, Heidelberg, Springer, Germany: 11-39.
15. Ajzen I (1991) The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50: 179-211.
16. Barden-O'Fallon JL, deGraft-Johnson J, Bisika T, Sulzbach S, Benson A, et al. (2004) Factors associated with HIV/AIDS knowledge and risk perception in rural Malawi. *AIDS Behav* 8: 131-140.
17. Maswanya ES, Moji K, Horiguchi I, Nagata K, Aoyagi K, et al. (1999) Knowledge, risk perception of AIDS and reported sexual behavior among students in secondary schools and colleges in Tanzania. *Health Educ Res* 14: 185-196.
18. Boone TL, Lefkowitz ES (2004) Safer sex and the health belief model: Considering the contributions of peer norms and socialization factors. *Journal of Psychology and Human Sexuality* 16: 51-68.
19. Williams PB, Sallar AM (2010) HIV/AIDS and African American men: Urban-rural differentials in sexual behavior, HIV knowledge, and attitude towards condoms use. *J Natl Med Assoc* 102: 1139-1149.
20. Essien EJ, Ogungbade GO, Ward D, Fernandez-Esquer ME, Smith CR, et al. (2008) Injecting drug use is associated with HIV risk perception among Mexican Americans in the Rio Grande Valley of South Texas, USA. *Public Health* 122: 397-403.
21. Adetunji J, Meekers D (2001) Consistency in condom use in the context of HIV/AIDS in Zimbabwe. *J Biosoc Sci* 33: 121-138.
22. Douglas M (1985) *Risk acceptability according to the Social Sciences*. Russell Sage, New York.
23. Rogers RW (1983) Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In Cacioppo JT, Petty RE (Eds.), *Social Psychophysiology: A sourcebook*, Guilford Press, New York: 153-176.
24. Witte K (1992) Putting the fear back into fear appeals: The extended parallel process model. *Communication Monographs* 59: 329-349.
25. de Hoog N, Stroebe W, de Wit JBF (2007) The Impact of Vulnerability to and Severity of a Health Risk on Processing and Acceptance of Fear-Arousing Communications: A Meta-Analysis. *Review of General Psychology* 11: 258-285.
26. Reynolds GL, Fisher DG, Latimore A, Edwards AS, Napper LE (2006) Racial/ethnic differences in HIV/AIDS vulnerability and risk perception among illicit drug users in Los Angeles County. *International Conference on AIDS*, Toronto, Canada, 2006.
27. Napper LE, Fisher DG, Reynolds GL (2012) Development of the perceived risk of HIV scale. *AIDS Behav* 16: 1075-1083.
28. Klein H, Elifson KW, Sterk CE (2003) "At risk" women who think that they have no chance of getting HIV: self-assessed perceived risks. *Women Health* 38: 47-63.
29. MacPhail C, Campbell C (2001) 'I think condoms are good but, aai, I hate those things': condom use among adolescents and young people in a Southern African township. *Soc Sci Med* 52: 1613-1627.
30. Mahfoud Z, Afifi R, Ramia S, El Khoury D, Kassak K, et al. (2010) HIV/AIDS among female sex workers, injecting drug users and men who have sex with men in Lebanon: results of the first biobehavioral surveys. *AIDS* 24 Suppl 2: S45-54.
31. Merrigan M, Azeez A, Afolabi B, Chabikuli ON, Onyekwena O, et al. (2011) HIV prevalence and risk behaviours among men having sex with men in Nigeria. *Sex Transm Infect* 87: 65-70.
32. Smith AD, Tapsoba P, Peshu N, Sanders EJ, Jaffe HW (2009) Men who have sex with men and HIV/AIDS in sub-Saharan Africa. *Lancet* 374: 416-422.
33. Heckathorn DD, Semaan S, Broadhead RS, Hughes JJ (2002) Extensions of respondents-driven sampling: a new approach to the study of injection drug users aged 18-25. *AIDS and Behavior* 6: 55-67.
34. Eluwa GI, Strathdee SA, Adebayo SB, Ahonsi B, Adebajo SB (2013) A profile on HIV prevalence and risk behaviors among injecting drug users in Nigeria: should we be alarmed? *Drug Alcohol Depend* 127: 65-71.
35. http://www.unicef.org/infobycountry/stats_popup4.html
36. Mmbaga EJ, Dodo MJ, Leyna GH, Moen K, Leshabari MT (2012) Sexual Practices and Perceived Susceptibility to HIV Infection among Men who have Sex with Men in Dar Es Salaam, Mainland Tanzania. *J AIDS Clinic Res* S1: 012.
37. Slovic P (1987) Perception of risk. *Science* 236: 280-285.

38. Slovic P (1992) Perception of risk: Reflections on the psychometric paradigm. In Krinsky S, Godling D (Eds.), *Social theories of risk*. Praeger, Westport, CT, pp. 117-152.
39. Rosenstock IM (1974) Historical origins of the health belief model. *Health Education Monographs* 15: 328-335.
40. Leventhal H (1970) Findings and theory in the study of fear communications. *Advances in Experimental Social Psychology* 5: 119-186.
41. Rogers RW (1983) Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In Cacioppo JT, Petty RE (Eds.), *Social psychophysiology*. Guilford Press, London, England, pp.153-176.
42. Weinstein ND (1988) The precaution adoption process. *Health Psychol* 7: 355-386.
43. Gibbons FX, Gerrard M, Blanton H, Russell DW (1998) Reasoned action and social reaction: willingness and intention as independent predictors of health risk. *J Pers Soc Psychol* 74: 1164-1180.
44. Wagenaar BH, Sullivan PS, Stephenson R (2012) HIV knowledge and associated factors among internet-using men who have sex with men (MSM) in South Africa and the United States. *PLoS One* 7: e32915.
45. Hart TA, James CA, Hagan CM, Boucher E (2010) HIV optimism and high-risk sexual behavior in two cohorts of men who have sex with men. *J Assoc Nurses AIDS Care* 21: 439-443.
46. Ma W, Ding X, Lu H, Ma X, Xia D, et al. (2013) HIV risk perception among men who have sex with men in two municipalities of China--implications for education and intervention. *AIDS Care* 25: 385-389.
47. Cohen DJ, Bruce KE (1997) Sex and mortality: Real risk and perceived vulnerability. *Journal of Sex Research* 34: 279-291.
48. Federal Ministry of Health (2010) *Integrated Biological and Behavioral Surveillance Survey*. Federal Ministry of Health, Abuja, Nigeria.
49. Baral S, Trapence G, Motimedi F, Umar E, lipinge S, et al. (2009) HIV prevalence, risks for HIV infection, and human rights among men who have sex with men (MSM) in Malawi, Namibia, and Botswana. *PLoS One* 4: e4997.
50. Vu L, Tun W, Sheehy M, Nel D (2012) Levels and correlates of internalized homophobia among men who have sex with men in Pretoria, South Africa. *AIDS Behav* 16: 717-723.
51. Adebajo SB, Eluwa GI, Allman D, Myers T, Ahonsi BA (2012) Prevalence of internalized homophobia and HIV associated risks among men who have sex with men in Nigeria. *Afr J Reprod Health* 16: 21-28.
52. Huebner DM, Davis MC, Nemeroff CJ, Aiken LS (2002) The impact of internalized homophobia on HIV preventive interventions. *Am J Community Psychol* 30: 327-348.