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## RESEARCH ARTICLE

### MEASURING RELATIONAL VARIABLES TO EXAMINE COMPLEX SEXUAL BEHAVIOURS AND THE SPREAD OF HIV/AIDS THROUGH INTERCOURSE AMONGST SEXUAL GROUPS

\*<sup>1</sup>Godwin Aondohemba Timiun and <sup>2</sup>Timothy J. Scrase

<sup>1</sup>Department of Sociology, Benue State University, Makurdi, Benue State, Nigeria West Africa

<sup>2</sup>School of Global, Urban and Social Studies RMIT University, Melbourne, Australia

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#### ABSTRACT

**Background:** Despite the efforts to prevent the spread of HIV/AIDS through programme interventions targeting individuals, the persistent high rates of HIV/AIDS through heterosexual relationships in Nigeria further underscores the need to examine the effects of relational variables such as sexual intimacy on sexual behaviours, multiple partners and HIV/AIDS risk. It has been acknowledged that sexual networking could influence the spread of HIV, however, the role of relational variables in the spread of HIV amongst stable relationships, and sexual networks remains unclear. Hence the focus of this study is on sexual intimacy and HIV risk amongst sexual groups such as dyad, triad, or more partners in Nigeria, where high numbers of new HIV/AIDS infection are within marital or cohabitation relationships. **Methods:** A sample of 1,621 (864 women; 757 men; 815 HIV seropositive; 806 HIV seronegative) respondents, who participated in survey and in-depth interviews, were selected from two clinics and two other locations using multi-stage and purposive sampling methods. SPSS (version 21) software was used for quantitative data analysis while the qualitative data was analysed quantitatively. **Results:** Age ( $P = 0.05$ ), sex ( $P = 0.001$ ), education ( $P = 0.017$ ), relationship status ( $P = 0.000$ ), number of sexual partners ( $P = 0.000$ ), had sex while drunk ( $P = 0.000$ ) and HIV status ( $P = 0.000$ ) significantly correlate with levels of sexual intimacy. Relational variables provide a better understanding of complex sexual behaviours in sexual groups and HIV/AIDS risk. **Conclusion:** The levels of sexual intimacy are the relationship pathways through which factors such as age, sex, relationship status, number of sexual partners, education, had sex while drunk and HIV status influence sexual behaviours and HIV risk amongst groups. Targeting sexual groups instead of the individual to curb the spread of HIV in high incidence areas would be more rewarding. Hence there would be improvement in the sexual wellbeing of the individuals and the public.

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## INTRODUCTION

In 2013, the burden of HIV in Nigeria was estimated to be about 220, 394 new infections, 210,031 HIV related deaths, 1,476,741 requiring drugs, and 3,229,757 individuals living with HIV (NACA, 2014). While in 2011, the global new cases of HIV among adults were 2.5 million, 1.8 million were from Sub-Saharan Africa with recorded cases of 1.7 million HIV/AIDS related deaths (UNAIDS, 2012). Further, in Sub-Saharan Africa, there are a high number of individuals with HIV/AIDS in seemingly less 'risky' heterosexual relationships. For example, in Zambia, 60% of the newly infected cases of HIV/AIDS in 2008 amongst adults were through heterosexual transmission within marriage or cohabitation (Dunkle, 2008).

\*Corresponding author: Timiun, Godwin Aondohemba  
Australian Catholic University, 115 Victoria Parade, Fitzroy Vic  
3065, Melbourne, Australia

Similarly, in Swaziland, between 50 and 65% new cases of HIV/AIDS infection in 2009 came from marriage and cohabitation relationships respectively, while in the same year in Lesotho, the infection rate was between 35 and 62% for marriage and cohabitation respectively (Khobotlo, 2009). About 62% of people living with HIV/AIDS in Kenya, and 78% of those living with HIV/AIDS in Malawi in 2009 were in long-term sexual relationships (Anand, 2009). Furthermore, the National Agency for the Control of HIV/AIDS (NACA, 2012), reported that over 80% of adults living with HIV/AIDS in Nigeria in 2011 were infected through heterosexual relationship within marriage or cohabitation. Despite the efforts to prevent the spread of HIV/AIDS through programme interventions targeting individuals, the persistent high rates of HIV/AIDS through heterosexual relationships in Nigeria further underscores the need to examine the effects of relational variables such as sexual intimacy on sexual behaviours, multiple partners and HIV/AIDS risk. It has been

acknowledged (Timiun, 2012 and Watts, 1992), that sexual networking could influence the spread of HIV, however, the role of relational variables in the spread of HIV amongst stable relationships, and sexual networks in Nigeria remains unclear. African culture tolerates monogamy and polygamy, hence there are sexual groups such as dyad, triad or multiple partners who may not be in sexual networks such as sex workers. Understanding complex sexual behaviours in dyad, triad, quadruple or more partners who are in conceivably 'low risk' sexual relationships is important for programme intervention to curb the spread of HIV in Nigeria and Africa through sexual intercourse. This study thus examines sexual intimacy, its correlates and sexual behaviours, and HIV risk amongst these seemingly 'low-risk' groups utilising the sexual webs model (Timiun, 2012). The theory of concurrent sexual partnerships (Watts, 1992; Kretzschmar, 1996; Morris, 2000), which suggests how concurrent sexual relationships could aid the spread of HIV through intercourse, has not provided the relationship pathway between other (individual, family and community) variables, and relational variables that could influence HIV infection within sexual relationships. Moreover, there is evidence to suggest that not all sexual relationships are in network situations (Reniers, 2010), and a sizeable number of African men have far less frequency of intercourse in a month (3.2 times) to warrant the rapid spread of HIV as estimated by proponents of concurrency theory (Caraël, 1995 and Brewis, 2005). Generally, there is the need to further research into sexual behaviours in an African context, especially in countries and regions where monogamy and polygamy are acceptable forms of marriage. In several communities, marital unions co-exist with cohabitation and casual sexual relationships, so it is difficult and near impossible to identify network structures, actors and nodes to examine the spread of HIV/AIDS through sexual intercourse as specified by network theory. Furthermore, the theory has not specified any relational variable which is influenced by individuals, family and community variables to scale up unsafe sexual behaviours and HIV risk.

**Theoretical Conception:** The theoretical conception of this research is that sexual behaviour, especially unsafe sex, results to unwanted pregnancies and sexually transmitted diseases including HIV. Although there are contending opinions of what sexual act constitute safe or unsafe sexual behaviours, the belief that once the sexual outcomes of sexually transmitted diseases including HIV/AIDS are against the primary motives of the participants, it can be considered unsafe sexual behaviour. In this context, unwanted pregnancies, STDs and HIV/AIDS are linked to unsafe sexual behaviours (Timiun, 2012). The sexual webs model is a social approach which provides a theoretical model of contextual issues surrounding unsafe sexual practices and associated outcomes such as sexual transmitted diseases and unwanted pregnancies. However, reference will be made to HIV/AIDS only in this paper. The model is based on constructs such as 'sexual capacity', 'sexual motivation', 'sexual performance' and 'levels of intimacy' in the sexual groups known as "Sexual Webs". This model is multi-level incorporating individual, family, community and relational variables to provide robust postulates for the examination of contextual issues influencing sexual behaviours. According to (Timiun, 2012), sexual capacity variables refers to the entire demographic – family, socioeconomic status, community and global factors – that influence the ability of an individual to negotiate and perform sexual acts. Sexual motivation is the expected benefits or any

other thing(s) that encourage individuals to engage in sex. The way individuals intend to perform sex and obtain the expected benefits are part of motivation aspects. Furthermore, sexual performance refers to the things the individual actually does to initiate a sexual encounter, enhance sex or during behave during sexual encounters. Lastly, sexual webs are the different types of sexual relations: heterosexual, bisexual, homosexual, lesbian. The terms of agreement and beliefs about sex, various personal characteristics and sexual activities amongst sexual partners may define a sexual web. The terms of agreement may be implicitly or overtly expressed which may constitute rituals before or during sex (beliefs, gifts, drugs or/and alcohol use, romance or foreplay etc.). Different sexual webs may be defined by: intergenerational sexual relations; sexual relations amongst drug and/or alcohol users; sexual relations involving private and brothel sex workers; secret sexual relations involving married individuals, widows, and widowers; sexual relations involving unemployed or employed single individuals; and sexual relations amongst adolescents and youths. Instances where a sexual partner got fed up with the other's sexual debut, and recent second encounters may be an indication that they belong to different sexual webs. For further information on the perspectives of sexual behaviours and sexual webs model [see 14] and on eco-social perspectives, see (Krieger, 2001). Programme interventions to prevent the spread of HIV through sexual intercourse advocate on either keeping only one sexual partner, or the utilisation of condoms with non-regular partners. The question is, however, do individuals keep only one sexual partner? Or do individuals use condoms regularly with non-regular partners? To keep only one sexual partner requires a high degree of sexual intimacy, especially in most of Africa where the culture tolerates multiple partnerships. Hence the levels of sexual intimacy could be influenced by the number of sexual partners (sexual performance) as well other variables such as education, income, culture and poverty (sexual capacity), the desire to have children and favours (sexual motivation), and the symbolic meaning attached to the relationships (sexual web variable).

## MATERIALS AND METHODS

**Quantitative Methods:** The multi-stage sampling method was used in selecting 1,601 respondents in four different locations (Mkar, Aliade, Udei and Jovkyundan which are towns and villages from Gboko, Gwer, Guma and Konshisha Local Government Areas of Tiv land respectively). An eight page questionnaire with closed and open ended questions (on background characteristics, sexual intimacy, risky sexual behaviours, alcohol consumption and HIV) was used for data collection in the first stage. Face to face interviews were conducted with the respondents by the researcher (correspondent-author), with the aid of some research assistants. The questionnaires were pretested by conducting a mock data collection with 50 respondents before the actual data collection exercise. The internal consistency and reliability of the data collection instrument was very high. The quantitative data collection lasted for five months between April and August, 2014. Completed questionnaires were scrutinised in the field to ensure exactness of the recorded information. Thereafter, they were retrieved and stored in a well secured office, accessed by the researcher alone. At the completion of data collection, the responses were coded and entered into Statistical Product and Service Solution (SPSS) version 21 software, which has provision for the Generalised

Linear Regression with Cumulative Link, which was used for the analysis of the quantitative data [see 14]. It should be noted that the response variable, sexual intimacy, is an ordinal variable with 6 categories. The probability of obtaining subcategory  $c_i$  across  $C$  categories of the dependent variable in  $N$  trials is not evenly distributed. In other words, the probability is not normally distributed. In this case, the sum of the probabilities across the 6 categories of sexual intimacy will add to 1. The random value such as the mean obtained from this kind of distribution is not assumed to have come from normal distribution, because categorical variables assume finite or countable infinite number of values (Heck, 2012). Categorical variables are better described by binomial or multinomial probability distributions rather than normal distribution.

As stated above, sexual intimacy is an ordinal variable; however, there are no studies of this nature to provide empirical evidence from existing literature to suppose that the influence of the independent variables on the categorical membership of this variable follows that pattern. Thus, to accommodate the existence of a parallel structure where the independent variables have same effect on the odds of being in each successive category, a multinomial logistic regression is preferred over ordinal logistic regression (Hox, 2010). The multinomial distribution is an extension of the Bernoulli probability distribution where the categorical variable has more than two categories. The other categories are separately compared to the selected reference group. Hence the choice of Generalised Linear Model with cumulative logit link for multivariate analysis. The data is replete with categorical variables with more than two categories including the dependent variables.

**Qualitative Methods:** In this segment of data collection, purposive sampling was used in selecting 20 respondents who participated in in-depth interviews. Five individuals were selected in each location. The interviews were conducted in Tiv language using an interview guide with questions on a range of factors (poverty, intimacy etc.) influencing unsafe sexual behaviours and sexual intimacy. An audio recorder was used for recording the discussions during the in-depth interviews for the purpose of transcription after the data collection sessions. The data were transcribed and analysed by the researcher following the principles of concurrent transformative strategy (either nested or concurrent triangulation). It ensures that better insight would be obtained from the qualitative data to provide deeper understanding of some findings from the quantitative data (Moore, 2008). The findings from the qualitative data provided further insight into the intricacies of sexual behaviours.

**Ethical Issues:** Application for Ethics clearance was sent to Australian Catholic University (ACU) human research ethic committee (HREC), and Ethics approval was given in March, 2014. The researcher has adhered completely to the ethical provisions of both the University and other regulatory bodies (Nigeria) involved in overseeing research conducted involving human beings. The Ethics clearance from ACU was accepted by the Benue State University Ethics Committee for the conduct of this study. The research was conducted with integrity noting its responsibilities to all stakeholders. Both the consent to participate in the study and for the publication of the findings was obtained from the participants using ACU consent forms before data collection activities commenced.

**Definition of Sexual intimacy in this study:** Two perspectives have guided the definition of sexual intimacy in this study: (1) the crux of the message for prevention of HIV infection in Nigeria, and other parts of Africa, is that individuals should keep to only one sexual partner, or always use condoms with non-regular partners. This implies individuals should be in sexually exclusive relationships (one sexual partner); its variant is non-sexual exclusivity (more than one sexual partner); (2) almost all romantic intimacy leads to sexual intercourse. It can be argued that sexual intercourse can vary by number of times and the way it is performed. It can also be influenced by variables such as love, pleasure, the desire for children, and many other variables. Integrating the perspectives, sexual intimacy (dependent variable) has been defined as keeping one sexual partner in the past five years whose HIV status is known (positive or negative) and not being aware that he or she is in another sexual relationship. The frequency of sexual intercourse as an index of sexual intimacy has been subsumed in the time dimension of five years in which the variable is measured. Studies in African countries such as Lesotho, Tanzania, Togo, Burundi and Cote d'Ivoire have reported mean coital frequency amongst people with regular partners to be 4.0 times and 3.2 times for adult men and women respectively in a month (Caraël, 1995). In Mali, Malawi and Burkina Faso, the number of times women have sex in their first year of marriage varies from 4.4 times within a month in Malawi to 3.2 times in Mali and Burkina Faso. The average number of sexual intercourse drops below 3.2 times as the marriage gets older (Brewis, 2005). If an average of one (1) sexual intercourse per month amongst the respondents is assumed, they would have had 60 sexual intercourse in 5 years; if higher average of 2 times per month is assumed, they would have had 120 sexual intercourse in 5 years. Given the number of sexual intercourse possible within the period of five years, we submit that the differences in sexual intercourse among the respondents would have no effect on the inference drawn with respect to levels of intimacy. Based on the variation in responses from the field <sup>b</sup>, sexual intimacy has six categories: No intimacy =1; Very low intimacy =2; Low intimacy =3; Moderate intimacy =4; High intimacy =5; Very high intimacy =6. (Reference group- very high intimacy = 6). The first four categories are more associated with unsafe sexual practices than the last two.

## RESULTS AND DISCUSSION

**Quantitative Results:** Sexual intimacy is a relational variable in sexual groups (sexual webs like dyad, triad etc.) who are married, single or in cohabitation relationship, while education, age, and sex are sexual capacity variables. Whereas the variable 'had sex while drunk' is a sexual performance variable, the desire to have children is a motivation variable for sexual relationships. Age ( $P = 0.05$ ; OR = 0.223; CI = 0.048 - 1.039) and educational attainment ( $P = 0.017$ ; OR = 0.603; CI = 0.398-0.914) are significantly associated with categorical membership in sexual intimacy as well as 'had sex while drunk' ( $P = 0.000$ ; OR = 0.471; CI = 0.359 -0.618), relationship status ( $P = 0.000$ ; OR = 0.239; CI = 0.188 - 0.304), sex ( $P = 0.001$ ; OR = 1.482; CI = 1.187 -1.849), HIV status ( $P = 0.000$ ; OR = 0.652; CI = 0.523 - 0.814) and 'number of sexual partners' ( $P = 0.000$ ; OR = 0.310; CI = 0.256 - 0.375). In describing the relationship between educational attainment and sexual intimacy, the reference group is those tertiary level qualifications.

**Table 1. Correlates of Sexual Intimacy**

Variables	B	Test of Significance		Odd Ratio	95% Confidence Interval for Odd Ratio	
		df	Sig.		Lower	Upper
Sexual intimacy (no intimacy)	-6.834	1	0.000	0.001	0.000	0.005
Very Low intimacy	-5.762	1	0.000	0.003	0.001	0.016
Low intimacy	-5.409	1	0.000	0.004	0.001	0.023
Moderate intimacy	-2.169	1	0.008	0.114	0.023	0.569
Very high intimacy	-1.705	1	0.037	0.182	0.037	0.906
Age (18-19yrs)	-0.975	1	0.227	0.377	0.078	1.834
20-24yrs	-1.247	1	0.115	0.287	0.061	1.356
25-29yrs	-1.314	1	0.093	0.269	0.058	1.246
30-34yrs	-1.399	1	0.073	0.247	0.053	1.140
35-39yrs	-1.131	1	0.152	0.323	0.069	1.514
40-44yrs	-1.500	1	0.056	0.223	0.048	1.039
45-49yrs	-1.047	1	0.190	0.351	0.073	1.678
50-54yrs	-0.880	1	0.278	0.415	0.085	2.035
55-59yrs	-1.303	1	0.117	0.272	0.053	1.385
Sex (Male)	0.393	1	0.001	1.482	1.187	1.849
Educational levels						
No schooling	-0.506	1	0.017	0.603	0.398	0.914
Primary	-0.250	1	0.141	0.779	0.558	1.087
Secondary	-0.144	1	0.238	0.866	0.682	1.099
Relationship status						
Single	-1.430	1	0.000	0.239	0.188	0.304
Cohabiting	-2.404	1	0.044	0.090	0.009	0.935
Would like children						
Strongly disagree	0.239	1	0.371	1.270	0.752	2.146
Disagree	-0.118	1	0.445	0.889	0.657	1.203
Agree	-0.160	1	0.203	0.852	0.666	1.090
Sex while drunk						
Yes	-0.753	1	0.000	0.471	0.359	0.618
No	-0.306	1	0.040	0.736	0.550	0.986
HIV status (Positive)	-0.427	1	0.000	0.652	0.523	0.814
Condom use last six months preceding study						
Did not use	-0.039	1	0.885	0.961	0.564	1.638
Used sometimes	-0.081	1	0.571	0.922	0.696	1.221
Use always	0.035	1	0.847	1.036	0.724	1.482
Number of sexual partners	-1.172	1	0.000	0.310	0.256	0.375

Note: Source of data is from field survey, 2014

Individuals with no formal schooling are 39.7 times less likely to be in very high sexual intimacy relative to primary versus tertiary (chances are 22.1 times less likely), and secondary versus tertiary (chances are 13.4 times less likely). Similarly, individuals with primary education are 21.3 times less likely to be in very high sexual intimate relative to no formal schooling versus tertiary, and secondary versus tertiary. For the variable 'had sex while drunk', the chances are 53.9 times less likely that individuals who had sex while drunk would be in very high sexual intimacy relative to those who did not have sex while drunk versus those who don't drink (chances being 26.4 times less likely). In comparison with the married, the chances are 91 times less likely that those cohabiting would be in very high intimacy relative to single versus married (the chances being 76.9 times less likely), while the chances are 77.7 times less likely that those aged 40-44years would be in very high intimacy relative to 25-29 versus 60+ (chances being 73.1 times less likely); 30-34 versus 60+ (chances being 75.3 times less likely) and the other age groups compared with those who are 60 years and above. Furthermore, the chances are 1.5 times high for men to be in very high sexual intimacy relative to women, while those with higher number of sexual partners (2 or more) are 69 times less likely to be in very high sexual intimacy relative to those who have lesser number of sexual partners. Those who are HIV positive are 34.8 times less likely to be in very high sexual intimacy relative to those who are HIV negative. There is a negative relationship between levels of sexual intimacy, and number of sexual partners, condom use in the last six months preceding the study, and had sex while drunk.

Hence it can be inferred that lower levels of sexual intimacy are associated with unsafe sexual behaviours and HIV risk, while higher levels of sexual intimacy are associated with safer sexual behaviours and less HIV risk. Those who are single, cohabiting or married are exposed to the risk of HIV given the chances of being in lower levels of sexual intimacy based on their sexual behaviours. The lower the sexual intimacy, the higher the unsafe sexual behaviours and the risk of HIV in seemingly stable relationships. Sexual capacity, sexual motivations and performance variables influence levels of sexual intimacy.

**Qualitative Results:** As earlier indicated, the concurrent transformative strategy utilised in this study provided further insight into the qualitative data based on the already developed concepts and themes in the quantitative data. Intricacies of sexual behaviours support the fact that relational variables, such as sexual intimacy, are critical in understanding sexual behaviours and HIV risk. Individuals who are keeping multiple partners have low sexual intimacy and higher chances of infection. One of the female respondents complained of her husband's involvement in multiple sexual relationships and her fear for infection and waste of hard earned resources in the statement below:

*Men are having several sexual partners. I have problems with my husband on this issue. I don't understand his movements, but when I complain, he gets angry. I am not happy. I don't want my husband to look for other women because he may get disease and infect me, he may use our hard earned money to buy things for other women (Female; 22 years, married).*

Similarly, those who engage in sexual intercourse while drunk are less likely to be conscious of the risk associated with their action. The risky behaviours have been captured in the following narrative:

*Drinking places have contributed to the problem of fornication. Men and women alike drink alcohol; when some women get drunk, they will sleep with them, and sometimes they don't even know what they are doing ( Male; 19 years, single)*

Qualitative findings on culture indicate that women have less power with regard to condom use during intercourse or adoption of other family planning methods. One of the respondents reports that:

*Some women can control themselves but those that are married cannot take decision about sex and family planning without their husband's consent. The men want children, so if a woman is doing family planning without their knowledge and they come to know, it leads to crisis and divorce (Female; 38 years, married).*

Structural factors such as culture affects sexual intimacy through inequality in education and income. These can be explained using sexual capacity concept. Culture can either enhance or mar someone's capacity to negotiate safer sex, and hence the level of exposure to HIV risk. Due to cultural norms women have less capacity to negotiate for safer sexual performance. Relatively they are in lower levels of sexual intimacy, and thus, more exposed to HIV risk than the men in the study area. Structural factors, as well as background variables, are capacity variables.

## DISCUSSION

**The Strength of Sexual Webs Model in Providing Concepts for measuring relational variables:** The major strength of the sexual webs model in providing concepts for measuring intimacy (relational variable) and as an explanation of sexual behaviour are as follows. First, it possesses postulates that attempts to measure the range of perspectives of sexual behaviour which, we argue, is required for research into better comprehending the contextual issues influencing unsafe sexual behaviours. Second, it can be used for quantitative or qualitative studies or both. Third, it can be utilised by researchers from disciplines like public health, psychology, and sociology interested in sexual behaviour research. Fourth, it is the only health behaviour model that possess constructs for quantitative and qualitative operationalisation of relational variables. Fifth, the concept of sexual transitivity partner overcomes the methodological hiccup involving the measurement of the number of sexual partners in a polygamous sexual relationships; for instance, an individual with two wives, and his two wives can be viewed as keeping two sexual partners each (holding any possibility of illicit sex elsewhere constant) if and only if, the concept of sexual transitivity is applied. Sixth, and finally, the utilisation of the sexual webs model across the disciplines for the study of sexual behaviours can enhance comparison of findings. This study has measured sexual intimacy on a scale with casual sex (no intimacy) on one end of the scale and sexual exclusivity (very high intimacy) on the other end to study its effect on the spread of HIV. Between these two extremes there is very low intimacy, low intimacy, moderate intimacy and high intimacy.

This implies that the sexual intimacy of each partner in the population can be studied with the scale. It may be possible to identify each partner's needs based on their level of sexual intimacy. The levels of sexual intimacy provides the relationship pathway between sexual capacity, sexual motivation and sexual performance variables and HIV infection. The focus is on partners in sexual relationship, the levels of intimacy and HIV risk, rather than individuals, as it was the case with previous studies.

**Limitations of the sexual webs model:** We acknowledge that authors that are not familiar with the terms of reference of the constructs will find it a somewhat difficult to locate their variables within the major four constructs. For instance, an author who wants to examine the influence of economic deprivation on sexual intimacy (relational variable) but does not know that economic deprivation in Sub-Saharan Africa is a structural factor, and therefore a sexual capacity variable, may find it difficult to use the model. However, we would like to recommend a careful perusal of the perspectives of sexual behaviour, explained at the beginning of this paper, as a take off stage and further study of the referenced works on sexual webs model for enhanced understanding.

## Conclusion

The sexual webs model provides constructs that are useful for studying relational variables in sexual relationships (dyad, triad etc.), whether the individuals are single, married or in cohabitation. Lower levels of sexual intimacy and its correlates such as levels of education, age, had sex while drunk, the sex act itself, and multiple sexual relationships exposes partners to HIV risk. Women in the study area are more likely to be in lower levels of sexual intimacy due to cultural norms and low levels of educational attainment. They possess less capacity to negotiate for safer sexual performance, and thus more exposed to HIV risk than men. They would be found in the lower levels of sexual intimacy (no intimacy, very low intimacy, low intimacy and moderate intimacy) more than the men. The UNAIDS [19] vision of zero new infections of HIV/AIDS requires thorough re-examination of the effects of contextual factors such as relational variables on sexual behaviours that predispose partners in marital unions or other long-term sexual relationships to HIV/AIDS infections. This can only be done effectively with the utilisation of the sexual webs model that provides the construct for examining relational variables. Programme interventions addressing relational variables such as levels of sexual intimacy and its correlates of levels of educational attainment, age, had sex while drunk, the sex act, and multiple sexual relationships would achieve better results than the current focus on the individuals. Thus, we argue, programme interventions to change sexual behaviours with the intention to reduce HIV infections should address the correlates of levels of sexual intimacy. The current approach, where uniform services are delivered to each individual rather than partners and as if all are at the same level of intimacy, will not effectively produce the desired results. Future efforts aimed at reducing new HIV infections amongst dyad, triad and more partners in the study area should consider the findings from this research. Programme interventions should strengthened to focus on sexual intimacy amongst partners. Reducing HIV infections which occur in seemingly less risky relationships such as dyad, triad, or more partners which had been one of the major sources of infection, would significantly

bring down HIV incidence rates in Nigeria and enhance the sexual wellbeing of partners and the public.

### List of Abbreviations and Meaning

<b>CI</b>	Confidence interval
<b>HIV/AIDS</b>	Human Immune Virus/ Acquired Immune Deficiency Syndrome
<b>OR</b>	Odd Ratio
<b>SPSS</b>	Statistical Package and Service Solutions
<b>UNAIDS</b>	Joint United Nations Programme on HIV/AIDS Declarations

**Ethics approval and consent to participate:** Both ethics approval and consent to participate in the research were obtained before the study (see methods section for more information).

**Consent to Publish:** Both the consent to participate in the study and for the publication of the findings was obtained from the participants using ACU consent form before data collection activities.

**Availability of data and material:** The datasets during and/or analysed during the current study are not publicly available due to ethical issues but are from the corresponding author on reasonable.

**Competing interest:** The author declares no conflict of interest.

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### Endnotes

a Tivland is divided into two major blocks- the Ipusu and Ichongu blocks. The Multi-Stage Area sampling method was used for obtaining samples of respondents for quantitative data collection using the questionnaire, while purposive sampling was utilised to select respondents for qualitative data collection using in-depth interviews. One urban and one rural area were selected from each of the two blocks (four areas in all – two urban areas and two rural areas). One hospital was selected from each of the two blocks to sample people living with HIV/AIDS and who come to the centres to collect Anti-retroviral drugs. The other segment of the sample was drawn amongst residents in the communities who were aware that they are not HIV positive. A probability sampling without replacement (raffle draws) was used in selecting Gwer West (urban area) and Guma (rural area) from the homogeneous settlements of Ichongu block; while Gboko (urban area)

and Konshisha (rural area) were selected from the Ipusu using the same method. General Hospital, Aliade was then selected from Gwer West, while NKST Hospital, Mkar was selected from Gboko to obtain samples of those living with HIV. The table of random numbers was used in selecting Udei from Guma out of several other rural settlements such as Kaseyor, Yerwata, Ukohor, Umenga, Agasha, Daudu, Uluva, Yogbo etc. Similarly, Jovkyundan was selected from Konshisha out of other rural settlements such as Tse-Agberagba, Gungul, Korinya, Agbeede, Awajir, Tsuwe, Mbaakpur, Achoho, Iber, Akputu etc

A total sample size of 1621 individuals including men and women aged between 18 and 65 years old, who are presumed to be sexually active, were selected in total. The sample excludes those below the age of 18years; those with AIDS and opportunistic infections, pregnant women and those who were mentally ill. Sample size determination was guided by the

$$\text{formula } n = \frac{z^2 pq}{d^2}$$

Where  $z$ = standard normal deviation at 95%, which is 1.96

$p$  = Proportion of partners in sexual exclusivity relationship in previous studies; but Since search in literature has not yielded that proportion from study of this nature

$p$ , will be considered to be 50%, which is 0.5

$q = 1 - p$ ,  $d = 0.05$  level of precision

$$n = \frac{z^2 pq}{d^2} = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} = 384$$

More than 384 respondents were selected from each of the four location as follows:

Urban-Ipusu – 411; Urban-Ichongu – 394; Rural-Ipusu - 396; Rural-Ichongu – 400. It bring the total numbers of respondent to 1601.

A sample size of 805 individuals were randomly selected using systematic sample method after the list of people living with HIV who attend clinic in the hospitals was obtained by the research team. The rest of the respondents (976) were sampled from their residences after the villages were selected using table of random numbers. Purposive sampling method was also used in selecting 20 respondents for in-depth interviews.

Sexual intimacy is further logically divided into six levels reflecting the different responses that might be obtained from the field. This is a case of ordinal dependent variable ordered from 'No intimacy' to 'very high intimacy'. In other words, it is from 'casual sex' to 'sexual exclusivity.'

The variants of sexual intimacy are:

- (1) Keeping one sexual partner in the past five years whose status is known (positive or negative) and not being aware that he or she is keeping another sexual relationship (Very High intimacy)
- (2) Keeping one sexual partner in the past five years whose HIV/AIDS status (positive or negative) is not known and not being aware that he or she is keeping another sexual relationship (High intimacy)

- (3) Keeping more than one sexual partner in the past five years whose HIV/AIDS statuses (positive or negative) are known and not being aware that they are keeping other sexual relationships (moderate intimacy)
- (4) Keeping more than one sexual partner in the past five years whose HIV/AIDS statuses (positive or negative) are not known and not being aware that they are keeping other sexual relationships (moderate intimacy)
- (5) Keeping one sexual partner in the past five years whose HIV/AIDS status (positive or negative) is known and being aware that he or she is keeping another sexual relationship outside the formal union (low intimacy)
- (6) Keeping one sexual partner in the past five years whose HIV/AIDS status (positive or negative) is not known and being aware that he or she is keeping another sexual relationship outside the formal union (low intimacy)
- (7) Keeping more than one sexual partner in the past five years whose HIV/AIDS statuses (positive or negative) are known and being aware that at least one of them is keeping other sexual relationship(s) outside the formal union (very low intimacy)
- (8) Keeping more than one sexual partner in the past five years whose HIV/AIDS statuses (positive or negative) are not known and being aware that at least one of them is keeping other sexual relationship(s) outside the formal union (very low intimacy)
- (9) Keeping only casual relationships in the past five years (no intimacy)

Levels of sexual intimacy: No intimacy =1; Very low intimacy =2; Low intimacy =3; Moderate intimacy =4; High intimacy=5; Very high intimacy =6. (Reference group- very high intimacy = 6)

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