Community factors shaping the sexual behavior of married males in 8 African countries

Background: An estimated 40 million people presently live with HIV/AIDS. In 2004 an estimated 4.9 million new HIV infections occurred, and there were an estimated 3.1 million AIDS related deaths. Countries in Sub-Saharan Africa face a disproportionate burden of the HIV/AIDS epidemic, containing over 70% of those living with HIV/AIDS. It is now recognized that heterosexual transmission is the most common mode of transmission of HIV in developing countries: in Africa slightly over 80% of HIV infections are acquired heterosexually. Although much attention has been given to the individual and familial factors that influence the sexual behaviors that precipitate heterosexual transmission, the role of structural elements of the community in shaping male sexual behaviors remains poorly understood. The primary aim of this project was to investigate **the associations between community-level characteristics and the sexual behaviors of married men (15-54)** using nationally representative data from the most recent Demographic and Health Surveys (DHS) that have been conducted in 8 African countries: Chad (2004), Ghana (2003), Malawi (2004), Nigeria (2003), Tanzania (2004-05), Uganda (2006) Zambia (2001-02) and Zimbabwe (1999). A secondary aim of this proposal was to identify the relative contribution of individual, household and community level factors in shaping the sexual behaviors of married males in eight differing cultural and economic settings that are experiencing differing levels of the HIV/AIDS epidemic. The analysis focused on sexually active married males aged 15-54 at the time of the survey, and the following hypotheses were tested in each setting.

1. The sexual behavior of males is associated with prevailing community-level patterns of sexual and demographic behavior.
2. Additional community level characteristics including a) economic prosperity, b) knowledge of HIV/AIDS, c) exposure to health messages, and d) gender norms are significantly associated with the sexual behavior of married males (15-54 years).
3. Associations between community level characteristics and male sexual behavior will persist after controlling for individual and household level factors.
4. The associations between male sexual behavior and community level characteristics will be mediated by individual and household level factors.

As a result of this analysis we were be able to identify community characteristics associated with the sexual behavior of adult heterosexual men in eight economically and culturally contrasting environments, experiencing differing levels of the HIV/AIDS epidemic. The examination of these issues in 8 contrasting countries allowed the identification of a common set of factors that influence male sexual behavior, thus increasing the transferability of the research results to other settings. By identifying the hierarchy of factors associated with male sexual behavior this research suggests entry points for interventions that aim to reduce the heterosexual transmission of HIV. An understanding of the hierarchy of influences on male sexual behavior combined with the identification of a common set of factors that are associated with specific sexual behaviors provides information that can be used in the development of behavioral interventions aimed at stemming heterosexual transmission of HIV.

Data & Methods: This study makes use of the latest Demographic and Health Surveys (DHS) for each of the countries; Chad (2004), Ghana (2003), Malawi (2004), Nigeria (2003), Tanzania (2004-05), Uganda (2006) Zambia (2001-02) and Zimbabwe (1999). The DHS regularly collect data on fertility, family planning and maternal health among women of reproductive age (WRA 15-49), together with standard demographic and socioeconomic characteristics of the individual and household members. The DHS individual questionnaires include a module on HIV/AIDS that is standardized across countries, providing standard dependent and independent variables

for the analysis. The module collects data on knowledge of HIV/AIDS, source of knowledge, attitudes to HIV/AIDS, and recent sexual behavior. Questions on sexual behavior relate to number of sexual partners (both marital and non-marital), use of condoms, and age at first sex. The DHS also collect data on knowledge of and attitudes towards the use of reproductive health services, attitudes towards gender roles, and exposure to health care messages in the media. In each of the study countries a companion survey of males was also conducted. The men's questionnaire collected much of the same information as the women's questionnaire, but was shorter because it did not include a reproductive history or questions on maternal and child health. The male questionnaire in all three countries collected the same information on HIV/AIDS as was collected in the women's questionnaire. The analysis samples are a sub-sample of married males aged 15-54: Chad (1510), Ghana (2551), Malawi (2893), Nigeria (1799), Tanzania (2110), Uganda (2068) Zambia (1310) and Zimbabwe (5322). Table 1 shows the sample sizes and sexual behaviors of married men in each of the study countries.

Sample Sizes and Behaviors of Males (15-54) in 8 Study Countries

	Ghana N=2551	Malawi N=2893	Nigeria N=1799	Tanzania N=2110	Chad N=1510	Zambia N=1310	Zimbabwe N=5322	Uganda N=2068
Tested for HIV and knows results	7.6	15.6	27.8	15.3	7.8	12.8	20.9	26.9
Recently had high risk sex	7.7	7.3	11.5	16.1	16.0	12.8	4.4	16.3
Has paid for sex	5.5	12.3	9.8	6.7	1.6	1.7	1.0	1.4
Uses a condom with regular partner	13.7	13.0	15.5	16.7	11.2	16.1	21.3	15.1
Has had more than one sexual partner in <3 mths	26.4	22.36	34.2	40.2	32.4	40.2	29.5	34.4
Number of partners	0-9	0-23	0-17	0-18	0-42	0-158	0-20	0-20

The analysis focuses on the role of community-level factors in shaping high risk sexual behavior among married men. The analysis models an ordinal variable measuring whether the respondent reports that he had risky sex in the 3 months prior to the survey. An index of risky sexual behavior was created, which included: paying for sex, having more than one sexual partner, none use of condoms with any sexual partner. The outcome ranged from 0-3. Multilevel models provide a framework for analyzing data that has a hierarchical structure, while also allowing a systematic analysis of how covariates measured at various levels of a hierarchical structure affect the outcome variable. Each of the DHS data sets has a hierarchical structure, with participants nested within PSUs and PSUs nested within districts. The multilevel modeling strategy accommodates the hierarchical nature of the data corrects for the biases in parameter estimates and standard errors resulting from the clustering of data. Separate multilevel ordinal models are fitted for males in each of the 8 countries. For each model, two levels of variance are considered, the PSU and the district. In addition to standard individual-level (demographic, economic, knowledge) and household-level (economic) variables, the models consider several dimensions of the community as potential influences on married men's sexual behavior:

1. Economic
- The percentage of men in the community currently employed
- The percentage of women in the community currently employed
- The percentage of men with at least primary education
- The percentage of women with at least primary education

2. HIV/AIDS Knowledge
- The percentage of men who report 3 ways to avoid HIV transmission
- The percentage of women who report 3 ways to avoid HIV transmission
- The percentage of men who report testing for HIV
- The percentage of women who report testing for HIV

3. Demographic
- The mean age at marriage for women in the community
- The mean age at first childbirth for women in the community

4. Gender Roles
- Ratio of men to women with primary education
- Mean community score on index of attitudes towards gender based violence
- Mean community score on index of attitudes towards roles of men

5. Sexual Behavior
- Percentage of men in the community who report using a condom at last sex
- Mean number of sexual partners for men in the community

Results: Mixed results were found for the association between age and the reporting of risky sexual behavior. In Chad, older men (40+) had lower odds of reporting risky sex than young men (15-19), while in Nigeria older men had increased odds of reporting risky sex than young men. Relative to never married men, in all 8 countries married men had lower odds of reporting risky sex; in Chad, Ghana, Zimbabwe and Malawi men who were cohabiting also had lower odds of reporting risky sex, while in Uganda cohabiting men actually had higher odds of reporting risky sex than never married men. Residency in a rural area reduced the odds of a man reporting risky sex in Chad, but increased the odds for a man in Zambia. In Malawi, Tanzania and Uganda, men with primary education were significantly more likely to report risky sex than men with no education; no other relationships were identified between risky sex and education. Across all 8 countries men with an age at first sex of greater than 21 had lower odds of reporting risky sex than men with a sexual debut of less than 15 years. In Uganda, Zambia, Nigeria and Zimbabwe, men who reported exposure to media also reported increased odds of risky sex. In 6 of the 8 countries, employed men had greater odds of reporting risky sex. Few significant relationships were identified between household wealth and risky sex; in Nigeria men in the richest households had lower odds of risky sex, while in Uganda men in the richest household had increased odds of risky sex. The community factors shaping risky sexual behavior varied across countries. Residence in a community in which a high percentage of men were employed reduced the odds of risky sexual behavior for men in Tanzania and Zimbabwe. Higher levels of female employment increased risky sex among men in Tanzania and Malawi, but reduced the odds of risky sex for men in Zambia. In both Chad and Nigeria, living in a community in which a higher percentage of men had at least primary education reduced the odds of risky sex. Similarly, in Malawi, Uganda, Zambia, Chad and Nigeria living in a community in which a higher percentage of women had at least primary education reduced the odds of risky sex. In Uganda, more tolerant attitudes towards gender-based violence were associated with increased odds of risky sex, while the reverse was true in Nigeria. Also in Nigeria, more traditional views of men's roles were associated with increased odds of risky sex. In Zambia, men living in communities with a higher mean age at marriage for women had lower odds of

reporting risky sex, while in Tanzania men living in communities with a higher mean age at first birth for women had a lower odds of reporting risky sex.

Discussion: The results demonstrate that there is no single community influence on men's sexual behavior, and the significant community-level factors vary across each of the 8 study settings, as community-level indicators reflect culturally and contextually specific practices. Elements of the community that influenced married men's sexual behavior included, prevailing gender norms, demographic behaviors, and economic development, although there was also variation is the significant factors across countries. The results stress the hierarchy of influences that exist on married men's sexual behavior, highlighting the need to focus beyond the individual level when address such behavior. From a methodological perspective, the results show the ability to use publicly available data sources to identify community influences on health behavior. From a public health perspective, the results highlight a range of community level factors that can be harnessed in the development of interventions aimed at improving safer sexual practices and stemming the heterosexual transmission of HIV.

Multilevel ordinal regression model of risky sexual behavior for married men in 4 African countries

	Malawi	Tanzania	Uganda	Zambia
Individual				
Age (15-19)				
20-24	1.01 (0.74, 1.35)	1.13 (0.92, 2.10)	0.97 (0.68, 1.39)	1.04 (0.74, 1.54)
25-29	0.95 (0.66, 1.35)	0.97 (0.86, 1.57)	1.30 (0.87, 1.95)	0.96 (0.56, 1.65)
30-34	1.08 (0.73, 1.61)	0.92 (0.60, 1.41)	1.31 (0.84, 2.03)	0.81 (0.48, 1.37)
35-39	1.01 (0.65, 1.57)	0.89 (0.56, 1.41)	1.39 (0.84, 2.08)	0.81 (0.54, 1.39)
40+	1.14 (0.78, 1.69)	0.79 (0.51, 1.22)	0.98 (0.63, 1.51)	0.76 (0.45, 1.89)
Marital Status (never married)				
Married	*0.13 (0.10, 0.18)*	*0.36 (0.27, 0.48)*	*0.34 (0.24, 0.47)*	*0.22 (0.14, 0.34)*
Cohabiting	*0.59 (0.38, 0.92)*	1.39 (0.92, 2.10)	*1.60 (1.07, 2.39)*	1.41 (0.28, 1.69)
Widowed/ Separated/ Divorced			0.93 (0.61, 1.42)	*0.55 (0.29, 0.99)*
Resident in a rural area	0.82 (0.61, 1.09)	1.17 (0.87, 1.57)	0.89 (0.64, 1.24)	*1.51 (1.10, 2.08)*
Education (None)				
Primary	*1.37 (1.02, 1.89)*	*1.45 (1.03, 2.07)*	*1.84 (1.14, 2.98)*	1.65 (0.88, 3.12)
Secondary	1.07 (0.73, 1.57)	1.14 (0.71, 1.85)	1.23 (0.72, 2.09)	1.28 (0.65, 2.49)
Higher	0.93 (0.45, 1.91)	1.24 (0.65, 2.36)	1.43 (0.77, 2.67)	0.57 (0.23, 1.41)
Age at first sex (<15)				
16-20	0.96 (0.79, 1.17)	0.83 (0.67, 1.03)	1.03 (0.83, 1.27)	0.85 (0.67, 1.08)
21+	*0.57 (0.43, 0.75)*	*0.38 (0.28, 0.51)*	*0.66 (0.47, 0.95)*	*0.58 (0.39, 0.85)*
Reports regular exposure to radio, television and newspaper	1.01 (0.77, 1.37)	1.02 (0.81, 1.23)	*1.25 (1.01, 1.56)*	*1.31 (1.01, 1.73)*
Currently employed	*1.27 (1.02, 1.61)*	*1.68 (1.17, 2.38)*	*2.08 (1.11, 3.89)*	*1.87 (1.35, 2.59)*
Index of attitudes towards male roles	*1.18 (1.04, 1.34)*	1.10 (0.99, 1.23)	*1.13 (1.02, 1.27)*	*1.18 (1.03, 1.34)*
Index of attitudes towards violence against women	1.04 (0.94, 1.16)	1.06 (0.99, 1.14)	1.05 (0.97, 1.13)	1.05 (0.97, 1.15)
Household				
Household wealth quintile (1)				
2	1.14 (0.85, 1.54)	0.98 (0.73, 1.30)	1.02 (0.75, 1.39)	
3	1.08 (0.81, 1.45)	1.05 (0.78, 1.42)	1.02 (0.73, 1.42)	
4	1.21 (0.95, 1.60)	0.95 (0.70, 1.29)	1.15 (0.82, 1.61)	
5	1.33 (0.95, 1.88)	1.45 (0.97, 2.16)	*1.54 (1.04, 2.07)*	
Community Economics				
Percentage of men currently employed	1.30 (0.92, 1.85)	*0.42 (0.21, 0.81)*	0.69 (0.19, 2.49)	0.81 (0.47, 1.39)
Percentage of women currently employed	1.03 (0.69, 1.54)	*2.10 (1.17, 3.76)*	1.45 (0.72, 2.94)	*0.53 (0.33, 0.85)*
Percentage of men with at least primary education	0.87 (0.45, 1.67)	1.30 (0.69, 2.44)	0.81 (0.32, 2.02)	0.59 (0.18, 1.94)
Percentage of women with at least primary education	*0.48 (0.26, 0.87)*	0.64 (0.34, 1.18)	*0.42 (0.21, 0.81)*	*0.42 (0.16, 0.98)*

Community Behavior & Knowledge				
Mean score for men on attitudes towards violence against women	1.26 (0.95, 1.66)	0.97 (0.79, 1.18)	*1.32 (1.05, 1.66)*	0.95 (0.75, 1.21)
Mean score for men on attitudes towards male roles	0.83 (0.65, 1.07)	0.96 (0.84, 1.10)	0.97 (0.84, 1.34)	0.98 (0.85, 1.14)
Community Demographics				
Mean age at marriage for women	1.02 (0.88, 1.15)	0.93 (0.84, 1.03)	1.07 (0.95, 1.20)	*1.35 (1.19, 1.53)*
Mean age at first birth for women	1.01 (0.88, 1.16)	*0.83 (0.74, 0.93)*	0.94 (0.83, 1.07)	0.76 (0.31, 1.91)

Multilevel ordinal regression model of risky sexual behavior for married men in 4 African countries

	Chad	Nigeria	Ghana	Zimbabwe
Individual				
Age (15-19)				
20-24	1.06 (0.69, 1.63)	1.34 (0.89, 2.03)	0.99 (0.70, 1.39)	*1.42 (1.13, 1.79)*
25-29	0.98 (0.61, 1.58)	*2.11 (1.33, 3.33)*	0.74 (0.45, 1.19)	*1.40 (1.06, 1.84)*
30-34	0.57 (0.32, 1.01)	*1.83 (1.08, 3.09)*	0.72 (0.45, 1.15)	1.23 (0.89, 1.69)
35-39	0.97 (0.54, 1.73)	*2.00 (1.11, 3.60)*	0.71 (0.36, 1.17)	0.92 (0.64, 1.31)
40+	*0.55 (0.32, 0.95)*	*2.69 (1.57, 4.67)*	0.87 (0.45, 1.18)	0.78 (0.55, 1.09)
Marital Status (never married)				
Married	*0.14 (0.09, 0.21)*	*0.17 (0.11, 0.24)*	*0.14 (0.10, 0.21)*	*0.10 (0.08, 0.13)*
Cohabiting	*0.45 (0.29, 0.70)*	0.67 (0.37, 1.21)	*0.49 (0.31, 0.78)*	*0.12 (0.07, 0.19)*
Widowed/ Separated/ Divorced			0.75 (0.49, 1.13)	1.01 (0.77, 1.33)
Resident in a rural area	*0.60 (0.36, 0.99)*	1.10 (0.85, 1.41)	1.03 (0.90, 1.18)	0.82 (0.63, 1.06)
Education (None)				
Primary	0.82 (0.55, 1.21)	1.04 (0.69, 1.56)	1.13 (0.80, 1.60)	0.86 (0.49, 1.52)
Secondary	0.74 (0.48, 1.16)	1.12 (0.71, 1.75)	1.28 (0.91, 1.79)	0.85 (0.48, 1.52)
Higher	0.72 (0.40, 1.32)	0.99 (0.60, 1.64)	1.22 (0.75, 1.99)	0.69 (0.35, 1.29)
Age at first sex (<15)				
16-20	1.07 (0.79, 1.43)	0.89 (0.66, 1.20)	1.09 (0.82, 1.43)	0.89 (0.73, 1.09)
21+	*0.53 (0.36, 0.78)*	*0.41 (0.29, 0.58)*	*0.71 (0.52, 0.99)*	*0.47 (0.37, 0.61)*
Reports regular exposure to radio, television and newspaper	1.13 (0.82, 1.56)	*1.52 (1.16, 1.98*)	0.93 (0.72, 1.20)	*1.19 (1.01, 1.41)*
Currently employed	0.90 (0.62, 1.29)	0.97 (0.70, 1.34)	*1.42 (1.02, 1.96)*	*1.32 (1.11, 1.58)*
Index of attitudes towards male roles	---	*1.18 (1.03, 1.36)*	1.12 (0.98, 1.27)	*1.25 (1.14, 1.36)*
Index of attitudes towards violence against women	---	1.03 (0.94, 1.23)	*1.09 (1.01, 1.19)*	*1.08 (1.01, 1.153*)
Household				
Household wealth quintile (1)				
2	0.91 (0.51, 1.60)	1.06 (0.73, 1.57)	1.08 (0.79, 1.47)	0.95 (0.76, 1.20)
3	1.11 (0.63, 1.94)	1.12 (0.71, 1.75)	1.29 (0.95, 1.80)	0.98 (0.77, 1.25)
4	0.90 (0.50, 1.61)	0.99 (0.60, 1.64)	1.10 (0.73, 1.65)	1.01 (0.76, 1.33)
5	1.29 (0.66, 2.53)	*0.57 (0.36, 0.91)*	1.23 (0.78, 1.95)	0.92 (0.64, 1.32)
Community Economics				
Percentage of men currently employed	1.09 (0.41, 2.90)	0.76 (0.41, 1.38)	0.82 (0.38, 1.74)	*0.50 (0.34, 0.74)*
Percentage of women currently employed	*4.40 (2.31, 8.21)*	0.86 (0.50, 1.47)	1.45 (0.69, 3.04)	0.95 (0.66, 1.35)
Percentage of men with at least primary education	*0.52 (0.26, 0.99)*	*0.42 (0.21, 0.69)*	1.45 (0.75, 2.78)	0.86 (0.17, 3.43)
Percentage of women with at least primary education	*0.58 (0.27, 0.98)*	*0.49 (0.26, 0.91)*	0.79 (0.44, 1.42)	0.64 (0.20, 1.95)

Community Behavior & Knowledge				
Mean score for men on attitudes towards violence against women	---	*0.49 (0.38, 0.62)*	1.06 (0.79, 1.42)	0.90 (0.68, 1.19)
Mean score for men on attitudes towards male roles	---	*1.11 (1.02, 1.23)*	0.94 (0.79, 1.13)	*1.28 (1.05, 1.55)*
Community Demographics				
Mean age at marriage for women	1.14 (0.94, 1.37)	0.99 (0.89, 1.09)	1.03 (0.94, 1.11)	1.06 (0.99, 1.15)
Mean age at first birth for women	1.05 (0.89, 1.25)	0.94 (0.85, 1.05)	0.98 (0.89, 1.07)	0.95 (0.87, 1.04)