GENDER INEQUALITY INCREASES WOMEN'S RISK OF HIV INFECTION IN MOSHI, TANZANIA

ZHIHONG SA AND ULLA LARSEN

Department of Sociology, University of Maryland, USA

Summary. This study examined the hypothesis that multiple dimensions of gender inequality increase women's risk for HIV infection using a population-based survey of 1418 women aged 20 to 44 in Moshi, Tanzania. Three forms of HIV exposures were assessed reflecting gender power imbalance: economic exposures (age difference between partners and partner's contributions to children's expenses), physical exposures (coerced first sex and intimate partner violence) and social exposures (ever had problems conceiving). Behavioural risk factors included number of sexual partners for women in the last three years, partner had other wives or girlfriends, non-use of condom and alcohol use at least once a week in the last 12 months. Multivariate logistic regression analysis showed that a woman had a significantly elevated risk for HIV if she had a partner more than 10 years older (OR=2·5), her partner made low financial contributions to children's expenses (OR=1·7), or she experienced coerced first sex before age 18 years (OR=2·0) even after taking into account the effects of risk behaviour factors. The association between ever had problem conceiving and HIV infection was explained away by risk behaviour factors. The findings lend support to the hypothesis that economic deprivation and experience of sexual violence increase women's vulnerability to HIV, providing further evidence for extending the behavioural approach to HIV interventions to incorporate women's economic empowerment, elimination of gender-based violence and promotion of changing attitudes and behaviours among men.

Introduction

Women and girls in sub-Saharan Africa are severely affected by the HIV epidemic. In 2005, two-thirds of the 40·3 million people infected with HIV worldwide lived in sub-Saharan Africa, where heterosexual contact is the predominant mode of HIV transmission, as did three-quarters of all women with HIV (UNAIDS/WHO, 2005). Within the region, 57% of adults infected with HIV are women. Young women are disproportionately infected compared with young men. The prevalence of HIV was 4·6% and 1·7% among women and men aged 15 to 24 (UNAIDS/WHO, 2005).

Tanzania, one of the poorest African nations, has been hard hit by the HIV pandemic. The overall prevalence in 2005 was 7% among adults aged 15 to 49 (TACAIDS, NBS & ORC Macro, 2005). HIV prevalence reached 11% in urban areas, almost twice the levels found in rural areas. Women of younger age cohorts (aged 20 to 39) were more likely to be infected than men.

Different dimensions of gender inequality are increasingly recognized as important determinants of women's vulnerability to HIV infection (for example, Wingood & DiClemente's (2000) quantitative application of the Theory of Gender and Power to women's HIV risk and Mumtaz *et al.*'s (2005) study on gender and condom use using the Demographic and Health Survey data from sub-Saharan Africa). An understanding of the impact of gender inequality in enhancing HIV transmission among women is essential for the development of effective HIV intervention strategies, but empirical assessment of this issue remains limited, particularly in sub-Saharan Africa. A majority of the studies on gender inequality and HIV risk examine and demonstrate the association between various dimensions of gender power imbalance and HIV risk factors (Maman *et al.*, 2000; Garcia-Moreno & Watts, 2000; Jewkes *et al.*, 2003; Mumtaz *et al.*, 2005). Despite the ample evidence showing association between proximate risk factors and HIV, the direct linkage between gender inequality and HIV cannot be established based on the assumption that risk factors lead to HIV infection. Only a few studies provide evidence on the association between gender inequality and women's HIV infection (van der Straten *et al.*, 1998; Gregson *et al.*, 2002; Maman *et al.*, 2002; Dunkle *et al.*, 2004). For example, Maman and colleagues (2002) find a strong association between history of physical or sexual violence with a current partner and HIV serostatus among women younger than 30 years who voluntarily attended HIV counselling and testing in urban Tanzania. However, most of these studies (van der Straten *et al.*, 1998; Gregson *et al.*, 2002; Maman *et al.*, 2002) focus on a specific aspect of gender inequality, particularly gender-based violence. Thus the multiplicity of connections between gender inequality and HIV risk has mainly been neglected. Moreover, none of the latter studies attempts to explain the mechanisms through which gender inequality operates to increase women's HIV risk, although gender inequality and risk factors heighten women's HIV risk through complex interrelationships (Wingood & DiClemente, 2000; Jewkes *et al.*, 2003). These limitations are addressed by Dunkle and colleagues (2004) who show that women who have experienced intimate partner violence or have a controlling male partner are at increased risk of HIV infection after taking into account risk behaviour, shedding important light on the linkage between multiple dimensions of gender inequality and women's risk for HIV. However, the findings are based on women who attended antenatal care. Extended investigations on the connections between gender inequality, risk behaviour and HIV risk using representative data are needed to obtain findings that can be generalized to the whole population.

The aim of this study was to explore the association between multiple dimensions of gender inequality, risk behaviour and HIV infection, using data from a population-based survey of women aged 20 to 44 in Moshi, Tanzania. The study's main interest was to assess the associations between different manifestations of gender inequality and HIV infection, and investigate whether the associations remain after controlling for the effects of behavioural risk factors.

Conceptual framework

According to Connell's (1987) Theory of Gender and Power, the sexual division of labour, the sexual division of power, and the structure of cathexis are three overlapping but distinct structures that serve to maintain persistent gender inequalities at the societal and relational levels. Extending the Theory of Gender and Power, Wingood & DiClemente (2000) conceptualize women's heightened HIV risk as a function of the three structural gender disparities that generate different exposures (influences external to a woman) and risk factors (individual level influences) for HIV. This theoretical framework emphasizes that none of the three structures is independent of the others. Rather, they interact to elevate women's risk for HIV.

The sexual division of labour limits women's equal access to education and formal wage economy resulting in gender inequality in economic resources. The latter reinforces women's economic dependency on men and increases women's 'economic exposures' to HIV (Wingood & DiClemente, 2000). The theory hypothesizes that as the economic inequity between men and women increases and favours men women will be at greater risk for HIV. However, literature on Western societies shows that absolute economic disadvantages of women such as living below the poverty line or being underemployed/unemployed increase women's vulnerability to HIV (Wingood & DiClemente, 2000). It is well documented that poorer women in sub-Saharan Africa may be at increased risk for HIV infection (Heise & Elias, 1995; Wojcicki, 2005).

Closely related to the sexual division of labour is the sexual division of power that is maintained by the abuse of authority and control in relationships (Wingood & DiClemente, 2000). Women's economic dependency on men exacerbates their vulnerability to male control and abuse of power. Sexual division of power, intertwined with sexual division of labour, increases women's 'physical exposures' to HIV infection, particularly through physical and sexual violence. Maman *et al.* (2000) hypothesize that violence increases women's risk for HIV in three ways. For one, sexual violence by an infected partner can directly result in HIV infection, probably because violent men are more likely than non-violent men to be HIV positive (Dunkle *et al.*, 2004). Young girls who are sexually abused may be more susceptible to HIV infection due to their immature genital system (Greenberg *et al.*, 1992). Second, violence may increase a woman's HIV risks indirectly by limiting her ability to negotiate safe sex. In sub-Saharan Africa, fears of violence may prevent women from requesting condom use and refusing sex (Blanc *et al.*, 1996); sexual violence also results from women's negotiation for risk protection (van der Straten *et al.*, 1998; Koenig *et al.*, 2004a). Third, women who have experienced sexual abuse as a child or coerced sexual initiation are more likely to engage in high-risk sexual behaviours later in life (Dunkle *et al.*, 2004; Erulkar, 2004; Koenig *et al.*, 2004b).

The structure of social norms and affective attachments (the 'structure of cathexis' according to Connell (1987)) refers to social and cultural norms that dictate gender-based sexual behaviours and expressions shaping women's 'social exposures' to HIV (Wingood & DiClemente, 2000). The theory assumes that women who are more accepting of traditional norms and beliefs have higher risk for HIV. For instance, in most societies, cultural norms dictate women's ignorance about sex and passiveness in sexual interactions, making it difficult for women to perceive risk or to negotiate safe

sex (Rao Gupta, 2000). In societies where the status of motherhood is highly valued and related to women's economic livelihood, the desire to reproduce undermines risk protection thus increasing women's risk for HIV (Wingood & DiClemente, 2000).

As such an individual woman's risk for HIV is shaped by three interrelated structures of gender inequality that translate into a sexual power imbalance favouring men. In other words, gender disparities embedded in social, economic and cultural systems may impede women's ability for risk protection, increase their sexual risk behaviours and, subsequently heighten their vulnerability to HIV. The social processes influencing women's HIV risks are context-specific, however. Therefore, women's risk for HIV needs to be interpreted in light of broad economic conditions, and social and cultural norms in sexual relationships in Tanzania. Within a gender and power framework, three forms of exposure were identified that reflect underlying power disparities or restrictions of women's ability to negotiate the terms of sexual encounters in Tanzania: economic exposures (age difference between partners and whether partner provides financial support to children), physical exposures (women's experiences of coerced first sex and intimate partner violence) and social exposures (whether the woman ever had problems conceiving). The gender power imbalance in Tanzania, within these three domains, may create the basis for sexual interactions that place women in powerless positions, setting the stage for women's heightened risk for HIV.

Background

Gender inequality is a central feature of Tanzanian society. Tanzanian women occupy subordinate positions in economic spheres and sexual relationships vis-à-vis men. Underpinning the gender disparity is a patriarchal system that deprives women of land ownership and limits their access to education and formal employment (Omari, 1994). Despite the dramatic changes in recent decades, marriage and sexual practices continue to be governed by strong patriarchal traditions and institutions (Larsen & Hollos, 2003; McCloskey *et al*., 2005; Wight *et al*., 2006). Polygamy has been replaced by widespread, socially sanctioned extramarital relationships for men. While the practices of bride-price are declining, sex is largely viewed as a form of reciprocity and exchange. Sexual decision-making is dominated by men such that condoms are rarely used. A strong mandate for fertility also contradicts the notion of condom use (Lugalla *et al*., 1999).

Age difference between partners

It is well recognized that sexual mixing of younger women and older men, which is generally characterized by economic asymmetry, poses a high HIV risk for women and girls in sub-Saharan Africa (Meekers & Calves, 1997; Gregson *et al*., 2002; Kelly *et al*., 2003; Luke, 2003; Longfield *et al*., 2004). Maintaining sexual relationships with older men is a common practice among Tanzanian women, and the sexual mixing is primarily economically motivated (Lugalla *et al*., 1999). For example, due to declining family income amidst increasing educational costs, many female adolescents resort to sexual partnerships with older men to obtain fees and expenses that allow them to

stay in school. Older men have had more sexual partners and are more risky. Economic dependency limits women's and girls' ability to leave a risky relationship and to negotiate protection (Luke, 2003; Longfield *et al.*, 2004). It was therefore expected that women who partnered with a man of older age would be more likely to be infected with HIV.

Partner's financial support

Economic deterioration in Tanzania in the past two decades has increasingly made men withdraw from the household head and breadwinner roles and responsibilities, and left women to fend for themselves (Silberschmidt, 2001). With few marketable skills, women often have no alternative source of livelihood other than to rely on sexual networking as an economic strategy to sustain their families (Heise & Elias, 1995; Lugalla *et al.*, 1999). In some areas of Africa, it is not uncommon for married women to take on additional partners in exchange for economic support withheld by their husbands who have other wives or girlfriends (Orubuloyte *et al.*, 1991; Hattori & Dodoo, 2007). It was predicted that women whose partners made low financial contributions would have an elevated risk for HIV infection due to their greater need to exploit sexual networking.

Violence against women

In Tanzania, sexual norms are culturally defined as men's aggressiveness and women's passiveness (Wight *et al.*, 2006). Men and women are socialized to believe that decisions concerning sex are largely a right of men, and it is women's duty to have sex with men (Garcia-Moreno *et al.*, 2005). Suspected infidelity of women is considered sufficient ground for punishment. Men often use force to compel women to engage in sex in response to women's challenge of their infidelity or women's refusal of sex (Lary *et al.*, 2004; Wight *et al.*, 2006). More than 41% of Tanzanian women report having ever experienced physical or sexual violence by an intimate partner; 14% of sexually experienced women report forced first sex (Garcia-Moreno *et al.*, 2005). Under the context of prevalent violence against women, it was anticipated that both coerced first sex and intimate partner violence would be related to women's elevated risk for HIV.

Traditional norms about fertility

Sexual behaviour in Tanzania is largely organized to ensure procreation (Lugalla *et al.*, 1999). While motherhood is an important part of womanhood, fathering many children is a sign of manhood and success (Lugalla *et al.*, 1999; Hollos & Larsen, 2007). Infertility is stigmatized and it is the women who are blamed for the condition. In Tanzania, similar to other African societies, the birth of the first child is considered an essential step in union formation, and delayed childbearing or infertility may result in women's delayed marriage, divorce or women and their partners seeking multiple partnerships (Lugalla *et al.*, 1999; Hattori & Larsen, 2007; Hollos & Larsen, 2007).

Due to women's and men's high risk sexual behaviours associated with childlessness, it is predicted that women who ever had problems conceiving would have a higher risk for HIV.

Data and Methods

Data

The analysis was based on a population-based survey of women aged 20–44 years in Moshi urban district in northern Tanzania (Larsen *et al.*, 2006). The data were collected between November 2002 and March 2003 using a two-stage sampling design. In the first stage, 150 clusters were selected with probability proportional to the number of women aged 20–44 years in the study area. In the second stage, eighteen households were selected randomly within each cluster. Women who were *de facto* or *de jure* residents of the selected households were invited to participate in the interview. All interviews were in-person and were conducted in Swahili by local nurses after the respondent provided written informed consent. The interview collected information on social and demographic characteristics, sexual practices, marriage, fertility and women's experience of intimate partner violence. This research project was approved by the Ethics Committees of the Kilimanjaro Christian Medical Centre (KCMC), the Tanzania National Institute for Medical Research, and the Institutional Review Boards of Harvard School of Public Health, University of Maryland, and the Centers for Disease Control and Prevention.

After the interview, free testing for HIV-1 (for brevity HIV will be used in the rest of the paper), HSV-2, syphilis, gonorrhoea, chlamydia and trichomoniasis were offered after obtaining written consent from participants. To assure confidentiality, HIV test results were given individually by the interviewer who administered pre-test counselling and collected the blood sample. Anti-retroviral therapy for HIV infection was not available in this community at the time of the survey. All the women who participated in the survey were offered free STIs/HIV pre-testing counselling. The study offered all tested women free post-test counselling for HIV and free treatment for all other STIs in accordance with the guidelines of the Tanzania Ministry of Health. Respondents who did not respond to the treatment were referred to a nearby health centre. Women who were deemed infertile were referred to KCMC for investigation and possible treatment. The project covered all travelling and medical expenses.

Serology testing was done weekly. HIV infection was determined by using two enzyme-linked immunosorbent assays (ELISAs). Vironostika HIV Uni-Form II plus O (Organon, Boxtel, The Netherlands) was used for screening and reactive samples were confirmed by using the Wellcozyme HIV ELISA test (Murex 1.2.0, Murex Biotech Ltd, UK). Respondents were considered HIV seropositive if both ELISA tests were positive. Samples with discordant ELISA test results were confirmed by Western blot tests (Bio-Rad Laboratories Ltd, Dartford, UK).

Among the 2192 women who were invited to participate in the survey, 2019 women (92% of eligible women) completed the interview, and 1418 (65% of eligible women) provided blood samples and were tested for HIV infection. The analyses were based on the 1418 women who consented to the HIV testing, including 122 women

who reported they had never had sex, because some of these women were HIV positive or had a child.

Prior studies based on this data set show that women who participated in the HIV testing were younger, less educated, non-consistent condom users, had a younger age at first sex, had higher incidence of coerced first sex or intimate partner violence, and more symptoms of sexually transmitted infections (STIs) compared with women who were not tested for HIV, suggesting that women with higher risk of HIV are more likely to have been tested for HIV (Kapiga *et al.*, 2006).

Indicators of gender inequality

Gender inequality was assessed by three sets of variables, each reflecting one dimension of exposure to HIV. The most common measures of women's economic exposures to HIV in the US literature include education, poverty and employment status (Wingood & DiClemente, 2000). However, the socioeconomic status measurements that elucidate risk for HIV in more developed countries may not have the same validity in illustrating differential risk in Tanzania where poverty and unemployment are widespread and education is declining (Wojcicki, 2005). In this analysis, a large age gap between a younger woman and her older partner and partner's contributions to children's expenses were used as proxies for women's economic exposure to HIV infection. As noted earlier, it is believed that a large age gap between partners can capture economic asymmetries between a woman and her male partner in Tanzania, as in some other sub-Saharan African countries. Based on existing studies on sexual mixing in this area (Gregson *et al.*, 2002; Luke, 2003; Longfield *et al.*, 2004), age difference between partners was categorized as partner is the same age or younger, partner is 1–9 years older, partner is more than 10 years older, and partner's age is unknown or missing. In line with the literature review, male partner's low financial contribution was used as a proxy of women's economic constraint. Partner's financial contribution was measured by partner's contributions to children's health care and children's school fees. Men who did not contribute or contributed only on one item were classified as making low contributions to children's expenses.

Coerced first sex and lifetime intimate partner violence were used as measures of physical exposures to HIV. Women were asked if their first sex was wanted, unwanted but happened anyway, or forced, as well as their age at first sex. This variable was re-coded into a dichotomous measure of coerced first sex by merging those who reported unwanted first sex with those who reported forced first sex. This variable was further classified as coerced first sex before age 18 years or after age 18 years (median age at first sex for women was 18). Women were asked how often in the last 12 months or over the lifetime their husband or partner (1) threatened to hurt her physically or (2) hit, slapped, kicked or otherwise physically hurt her. In addition, women were asked one question from the Sexual Experiences Survey (Koss & Oros, 1982): 'In the last 12 months or ever in your life, have you ever had sexual intercourse when you didn't want to because your husband or partner threatened or used some degree of physical force to make you (twisting your arm, holding you down, etc)?' Positive responses on the three items (threats of physical abuse, physical abuse and sexual assault) were counted to indicate the presence of lifetime intimate partner

violence. The experience of lifetime partner violence was used because women's HIV risk may increase with the cumulative experience of violence. The inclusion of threats allows for a broader measure of abuse. Threats and physical attacks were highly concordant; 74% of the women who reported threats also reported physical attacks. Concordance was equally high for sexual assault and physical abuse.

Whether a woman ever had problems conceiving was considered a proxy of social exposure to HIV infection. By using the variable 'ever had problems conceiving', it was expected to capture the broad impacts that traditional norms of reproduction have on women's sexual behaviours and HIV risks in the community (Hollos & Larsen, 2007). The strict measure of infertility was not included because many couples try to conceive shortly after initiating regular, unprotected intercourse and some couples may not be infertile following the definition of infertility, although they perceive themselves as having problems conceiving.

Risk behaviour

Risk behaviour was measured by four variables. Women's reporting of number of sexual partners in the last three years was classified as zero, one and two or more sexual partners. Type of current partnership was defined as monogamy, partner has other wives or girlfriends, and no partner, unknown or missing. It was expected that women who reported having multiple sexual partners in the last three years or who reported their partner having other wives or girlfriends were at an elevated risk for HIV. Condom use was measured by whether the woman had used a condom in the last 12 months. Women who drank alcohol at least once a week were expected to have a higher risk for HIV. Age at first sex was not included because it was highly correlated with coerced first sex.

Background characteristics

Several background characteristics were used as control variables in the multi-variate analyses for empirical and theoretical considerations. Age, union status and tribe were included because they are well known predictors of HIV and they were associated with HIV infection at the $p \leq 0.10$ level of significance (Table 1). Although education and cash-earning of women were not significantly related to HIV in this sample, they were also controlled. Education is an important aspect of women's status. Education is a protective factor for women's HIV infection in the US, but the association between education and HIV is inconsistent in Tanzania (Wingood & DiClemente, 2000; Wojcicki, 2005). Women who have personal earnings may be more empowered economically, but their economic contributions to the household challenge traditional gender roles and may provoke intimate partner violence, which potentially puts these women at risk for HIV infection (Schuler *et al.*, 1998; Wojcicki, 2005).

Statistical analysis

First, the distributions of all women and women with HIV infection are presented by background characteristics, indicators of gender inequality and risk behaviour. The association between background characteristics and HIV infection was estimated

Table 1. Percentage distribution of background characteristics of women aged 20–44, and by HIV-1 infection, Moshi, Tanzania, 2002–2003

	Sample size[a] n (%)	HIV-1+[a] n (%)	p value[b]
Total	1418 (100·0)	154 (10·3)	
Age (years)			0·03
20–24	453 (31·6)	34 (7·2)	
25–34	604 (42·7)	73 (11·4)	
35–44	360 (25·6)	47 (12·5)	
Union status			<0·0001
In union	859 (61·3)	82 (9·4)	
Divorced/separated	140 (10·2)	32 (21·6)	
Widowed	42 (3·0)	7 (13·1)	
Never in union	377 (25·5)	33 (7·8)	
Education			0·46
Primary incomplete or less	136 (9·8)	20 (13·1)	
Primary complete	963 (69·1)	104 (10·3)	
Secondary incomplete and above	319 (21·2)	30 (9·2)	
Earn cash income			0·70
No	505 (35·4)	55 (9·9)	
Yes	913 (64·5)	99 (10·6)	
Religion[c]			0·56
Muslim	430 (30·4)	48 (11·1)	
Christian and other	987 (69·5)	106 (10·0)	
Tribe			0·10
Chagga	739 (52·8)	74 (8·9)	
Other	678 (47·2)	80 (11·9)	
Circumcision			0·96
No	1066 (74·1)	116 (10·3)	
Yes	351 (25·9)	38 (10·4)	

[a]Unweighted sample size and weighted percentage.
[b]Pearson χ^2 test of difference between HIV-1+ and HIV-1 − women.
[c]Other includes non-religious (0·2%, $n=3$) and other (3·3%, $n=51$).

using the Pearson χ^2 test. Next, the association between indicators of gender inequality and risk behaviour was assessed using logistic regression with risk behaviour variables re-coded as dummy variables. Finally, univariate and multivariate logistic regression models were estimated to predict odds ratios (OR) of HIV infection and 95% confidence intervals (CIs) by indicators of gender inequality and risk behaviour. Using nested logistic regression models, the main effects of indicators of gender inequality were estimated by adding background characteristics and risk behaviour factors sequentially. Missing indicator variables were used to maintain the full sample in logistic regression models (no model had more than 20 missing cases). The cluster sampling design was taken into account using STATA version 8 (StataCorp, 2003).

The analysis was replicated on all women interviewed to assess whether the findings for women with HIV data were representative. In this analysis it was assumed that women with no HIV data were HIV negative based on findings from previous analyses on this data (Kapiga *et al.*, 2006).

Results

Sample characteristics

The population under study is characterized by a high prevalence of HIV infection (10·3%) (Table 1). A majority of the women were married or living with a partner, while 13% were either divorced/separated or widowed and the remaining quarter were never in a union. Women's educational attainment was generally low; only 21% had more than a primary education. About two-thirds of the women earned cash income. Almost 70% were Christian and the remainder were Muslim; 53% were Chagga, the rest belonged to the Pare or other ethnic groups. More than a quarter of the women were circumcised. HIV was higher for women aged 25–44 years compared with women aged 20–24 years. About 22% of divorced/separated women had HIV infection compared with below 10% among women in union. HIV infection did not vary by education, cash income, religion or circumcision at the $p \leq 0·10$ level of significance.

Women's current relationship was characterized by a large age gap with her partner; more than half of the women had a partner 1–9 years older and about 15% had a partner more than 10 years older (Table 2). About a quarter of the women reported that their partners made low contributions to children's expenses. Table 2 highlights an overall high prevalence of coerced first sex and intimate partner violence. Almost one in four women reported having experienced coerced first sex (25·8%) or intimate partner violence (24·7%). Thirteen per cent of the women reported the experience of coerced first sex before age 18. About 10% of the women reported having had problems conceiving. In terms of risk behaviour, almost 25% of the women reported that their partners had concurrent partnerships, and about 10% reported that they had multiple sexual partners in the last three years. The prevalence of condom use was insufficient; 19% reported using condoms in the last 12 months. More than one-third of the women reported alcohol use at least once a week in the last 12 months. The prevalence of HIV varied markedly by indicators of gender inequality and risk behaviour. HIV infection exceeded 17% for women who had a partner more than 10 years older, experienced coerced first sex before age 18, ever had problems conceiving, and had multiple partners in the last three years.

Associations between gender inequality and risk behaviour

As expected, indicators of gender inequality were strongly associated with HIV risk behaviour factors among sexually experienced women (Table 3). Partner's low contributions to children's expenses were significantly related to a woman's own (OR=3·27) and her partner's multiple sexual relationships (OR=4·05). Women who reported coerced first sex before age 18 had significantly higher odds of multiple partnerships in the last three years (OR=3·21). Women who experienced coerced first

Table 2. Percentage distribution of indicators of gender inequality and risk behaviour among women aged 20–44, and by HIV-1 infection, Moshi, Tanzania, 2002–2003 (*N*=1418)

	Sample size[a] *n* (%)	HIV-1+[a] *n* (%)
Gender inequality		
Age difference between partners (years)[b]		
Same age or partner is younger	87 (6·6)	14 (14·6)
Partner is 1–9 years older	707 (50·8)	59 (7·8)
Partner is 10+ years older	210 (14·6)	36 (17·1)
No partner, unknown or missing	292 (20·1)	42 (13·5)
Never had sex	122 (7·9)	3 (2·3)
Partner's financial support to children		
Low	330 (24·2)	47 (14·0)
High	598 (42·9)	56 (8·8)
na	176 (12·2)	22 (12·3)
No partner, unknown or missing	192 (12·9)	26 (11·7)
Coerced first sex		
No	935 (66·0)	98 (9·7)
Yes		
First sex <18 years	176 (13·0)	35 (19·5)
First sex ≥18 years	180 (12·8)	17 (9·3)
Intimate partner violence[c]		
No	735 (51·9)	80 (10·6)
Yes	340 (24·7)	38 (10·7)
Missing	221 (15·5)	33 (12·8)
Ever had problem conceiving		
No	1159 (82·1)	126 (10·3)
Yes	133 (9·8)	25 (17·8)
Risk behaviour		
Number of sexual partners in last 3 years		
0	193 (12·6)	12 (5·6)
1	1093 (77·6)	112 (9·5)
2+	130 (9·6)	30 (23·4)
Type of partnership[d]		
Monogamous	760 (54·5)	72 (9·4)
Partner has other wives or girlfriends	344 (24·8)	53 (14·3)
Condom use in last 12 months		
Never	1024 (73·1)	116 (10·7)
Sometimes/always	271 (18·9)	35 (12·4)
Alcohol use in last 12 months		
Less than once a week	810 (57·0)	79 (9·4)
At least once a week	475 (34·4)	70 (13·8)

[a] Unweighted sample size and weighted percentage.
[b] Category 'never had sex' is shown for the variable 'age difference between partners', while it is not shown for other variables.
[c] Lifetime physical violence and sexual violence after first intercourse.
[d] Category 'no partner, unknown or missing' is not shown. It has the same *n* as the category for the variable 'partner's financial support to children', but it is different from the category in the variable 'age difference between partners' due to reporting error.

Table 3. Crude odds ratios (OR) and 95% confidence intervals (CIs) from logistic regression analyses examining the association between indicators of gender inequality and risk behaviour among women aged 20–44, Moshi, Tanzania, 2002–2003 ($N=1296$)[a]

Gender inequality variable	Multiple sexual partners in last 3 years	Partner has other wives or girlfriends	Used condom in last 12 months	Used alcohol at least once a week in last 12 months
Age difference between partners (years)				
Same age or partner is younger	1·98 (1·03–3·79)	0·64 (0·36–1·12)	0·81 (0·37–1·76)	1·54 (0·97–2·44)
Partner is 1–9 years older	1·00	1·00	1·00	1·00
Partner is 10+ years older	0·89 (0·46–1·72)	1·28 (0·90–1·83)	0·87 (0·56–1·35)	1·23 (0·83–1·83)
No partner, unknown or missing	1·68 (1·09–2·60)	0·86 (0·60–1·24)	1·63 (1·17–2·27)	1·35 (1·04–1·75)
Partner's financial support to children				
Low	3·27 (1·93–5·52)	4·05 (3·02–5·42)	1·69 (1·21–2·36)	0·87 (0·64–1·17)
High	1·00	1·00	1·00	1·00
na	4·51 (2·38–8·55)	2·15 (1·45–3·17)	1·31 (0·86–2·00)	0·64 (0·43–0·94)
No partner, unknown or missing[b]	2·31 (1·17–4·56)		1·83 (1·23–2·74)	0·96 (0·64–1·44)
Coerced first sex				
No	1·00	1·00	1·00	1·00
Yes				
First sex <18 years	3·21 (1·97–5·24)	1·90 (1·30–2·79)	1·99 (1·33–2·97)	1·59 (1·15–2·19)
First sex ≥18 years	1·25 (0·68–2·28)	1·48 (1·03–2·13)	1·53 (0·98–2·40)	1·50 (1·07–2·10)
Intimate partner violence[c]				
No	1·00	1·00	1·00	1·00
Yes	1·61 (0·99–2·63)	1·99 (1·48–2·67)	1·47 (1·03–2·09)	1·85 (1·40–2·46)
Missing	1·25 (0·68–2·29)	0·95 (0·63–1·42)	1·48 (1·00–2·18)	1·25 (0·88–1·77)
Ever had problems conceiving				
No	1·00	1·00	1·00	1·00
Yes	2·48 (1·47–4·19)	1·15 (0·78–1·68)	0·82 (0·47–1·41)	1·09 (0·68–1·75)

[a]Category 'never had sex' is excluded from the analysis.
[b]This category includes no cases for the variable 'partner has other wives or girlfriends'.
[c]Lifetime physical violence and sexual violence after first intercourse.

sex, irrespective of age at first sex, had higher odds of a partner who had other wives or girlfriends, and alcohol use at least once a week in the last 12 months compared with women who consented to their first sex. Thus, women who experienced a coerced sexual debut may have a different life trajectory. Women's experience of intimate partner violence was significantly associated with partner's concurrent partnerships and own weekly alcohol use. Multiple partnerships in the past three years occurred significantly more among women who had problems conceiving. Also, the odds of using condoms in the last 12 months were significantly higher among women who experienced coerced first sex before age 18, lifetime intimate partner violence, or whose partners made low contributions to children's expenses. The latter findings suggest that condom use was more common among high-risk women. This proposition was supported further by the findings showing that condom use was significantly higher for the group of 'no partner, unknown or missing' for the variables age difference between partners and partner's contributions to children's expenses.

Gender inequality, risk behaviour and HIV infection

The first column of Table 4, presenting results from univariate logistic regression models, shows that all indicators of gender inequality and risk behaviour were significantly associated with HIV infection, with the exception of intimate partner violence and condom use in the last 12 months. The odds ratios of HIV infection by indicators of gender inequality were adjusted for background characteristics in Model 1; in Model 2 these variables were adjusted for background characteristics and risk behaviour factors (Table 4). Model 1 shows that the odd ratios associated with all indicators of gender inequality changed little after controlling for background characteristics. Adding risk behaviour factors in Model 2 did not change the odds ratios associated with age difference between partners and partner's financial contributions to children, while it reduced the odds ratios related to coerced first sex and the association between ever had problems conceiving and HIV became non-significant.

After adjustment for risk behaviour factors and background characteristics, a woman had significantly higher odds of HIV infection if she had a partner at least 10 years older (OR=2·51), the partner made low contributions to children's expenses (OR=1·69) and the woman experienced coerced first sex before age 18 (OR=1·97) relative to women whose partners were 1–9 years older, made high financial contributions to children, and who consented to first sex (Table 4). The findings suggested that the risk behaviour factors considered in this study are not likely to be the dominant mechanisms by which economic factors and sexual violence operate to increase women's risk for HIV infection. In contrast, the association between social exposures (i.e. ever had problems conceiving) and HIV was explained away by risk behaviour factors, particularly women's multiple partnerships in the past three years (results not shown).

Despite the modest mediating effects of behavioural risk factors in the association between gender inequality and HIV, two variables were significantly related to HIV (Table 4). Women who reported having multiple sexual partners in the last three years were more than twice as likely to be HIV positive (OR=2·13) than women who had

Table 4. Crude and adjusted odds ratios (OR) and 95% confidence intervals (CIs) from logistic regression analyses examining the risk of HIV-1 infection, by indicators of gender inequality and risk behaviour among women aged 20–44, Moshi, Tanzania, 2002–2003 ($N=1418$)

	Crude OR (95% CI)	Adjusted OR (95% CI)[a]	
		Model 1	Model 2
Gender inequality			
Age difference between partners (years)[b]			
Same age or partner is younger	2·02 (1·03–3·94)	1·52 (0·77–3·01)	1·37 (0·66–2·82)
Partner is 1–9 years older	1·00	1·00	1·00
Partner is 10+ years older	2·42 (1·42–4·12)	2·50 (1·45–4·30)	2·51 (1·47–4·30)
No partner, unknown or missing	1·84 (1·24–2·75)	1·64 (0·80–3·39)	1·54 (0·74–3·22)
Never had sex	0·22 (0·07–0·73)	0·56 (0·13–2·40)	0·83 (0·13–5·25)
Partner's financial support to children			
Low	1·69 (1·11–2·58)	1·68 (0·99–2·85)	1·69 (1·03–2·77)
High	1·00	1·00	1·00
na	1·46 (0·77–2·78)	1·79 (0·91–3·50)	1·66 (0·84–3·26)
No partner, unknown or missing	1·28 (0·79–2·07)		1·83 (0·60–5·59)
Coerced first sex			
No	1·00	1·00	1·00
Yes			
First sex <18 years	2·27 (1·44–3·58)	2·16 (1·32–3·54)	1·97 (1·16–3·32)
First sex ≥18 years	0·96 (0·55–1·67)	0·92 (0·51–1·67)	0·92 (0·51–1·68)
Intimate partner violence[c]			
No	1·00	1·00	1·00
Yes	1·01 (0·64–1·59)	0·72 (0·43–1·23)	0·72 (0·43–1·22)
Missing	1·24 (0·77–2·00)	0·70 (0·32–1·54)	0·77 (0·36–1·66)
Ever had problems conceiving			
No	1·00	1·00	1·00
Yes	1·90 (1·18–3·07)	1·91 (1·13–3·24)	1·66 (0·94–2·93)
Risk behaviour			
Number of sexual partners in last 3 years			
0	0·56 (0·30–1·07)		0·81 (0·33–2·03)
1	1·00		1·00
2+	2·91 (1·79–4·74)		2·13 (1·24–3·67)
Type of partnership[d]			
Monogamous	1·00		1·00
Partner has other wives or girlfriends	1·60 (1·07–2·40)		0·96 (0·58–1·60)
Condom use in last 12 months			
Never	1·00		1·00
Sometimes/always	1·19 (0·73–1·92)		0·83 (0·47–1·45)
Alcohol use in last 12 months			
Less than once a week	1·00		1·00
At least once a week	1·55 (1·12–2·14)		1·44 (1·00–2·08)

[a]Age, union status, education, earn cash income and tribe are controlled in Model 1 and Model 2.
[b]Category 'never had sex' is shown for the variable 'age difference between partners', while it is not shown for other variables.
[c]Lifetime physical violence and sexual violence after first intercourse.
[d]Category 'no partner, unknown or missing ' is not shown. It has the same n as the category for the variable 'partner's financial support to children', but it is different from the category in the variable 'age difference between partners' due to reporting error.

only one partner. Women who used alcohol at least once a week in the last year had a slightly higher risk of HIV infection (OR = 1·44).

The replicated analysis on all women interviewed showed similar associations between indicators of gender inequality and HIV. The same variables were significantly associated with HIV and the adjusted effects estimates fell within a range of about 10% of those from the analysis based on the sub-sample with HIV data (results not shown). Findings from the entire sample interviewed were not substantively different from findings based on the sub-sample with HIV data, suggesting that the presented findings may be generalized to the whole population.

Discussion and Conclusion

Despite the national campaign against HIV/AIDS, the HIV epidemic has not been under control in Tanzania. HIV affects women more than men, especially in urban areas, where the prevalence reached 12·0% among women compared with 9·6% among men in 2003–2004 (TACAIDS, NBS & ORC Macro, 2005). The multi-faceted gender inequality is increasingly cited as an influence on the feminization of HIV infection, but there is a paucity of empirical evidence. The association between various manifestations of gender inequality, risk behaviour and women's HIV risk was explored using a population-based sample of women aged 20–44 in Moshi. The findings lend support to the study's hypotheses showing strong associations between economic exposures, sexual violence and women's heightened risk for HIV, even after taking into account the effects of risk behaviour factors. The association between social exposures (i.e. ever had problem conceiving) and HIV infection was mediated by sexual risk behaviour. Specifically, women who had a partner at least 10 years older were more than two times more likely to be HIV positive compared with women whose partners were 1–9 years older. Among women whose partners made low contributions to children's expenses, the odds of HIV infection were 1·7 times as high as were those for women whose partners made high financial contributions. Women who experienced coerced first sex before age 18 were about twice as likely to be HIV positive relative to women who consented to first sex. Ever had problems conceiving, however, was not significantly associated with HIV infection after controlling for the effects of risk behaviours. The findings suggested that the risk behaviour factors studied played a minor role in explaining the linkage between economic and physical exposures of HIV and women's elevated risk for HIV.

Consistent with the Gender and Power framework, the findings for economic exposures were robust. The persistent association between sexual mixing between younger women and older men and women's elevated risk for HIV confirmed findings from previous studies in sub-Saharan Africa (Gregson *et al.*, 2002; Kelly *et al.*, 2003). Extant literature in this area shows that risk factors of sexual mixing between younger women and older men include women's early age at first sex, low condom use, men's concurrent partnerships, and men's material assistance to women (Gregson *et al.*, 2002; Longfield *et al.*, 2004; Luke, 2003). In this study, women who had a partner more than 10 years their senior were more likely to have sexual debut before age 18 (results not shown). Additional analysis indicated that early age at first sex was significantly related to women's HIV infection, but it did not account for the

association between age difference of partners and HIV. The interactions between partner's age difference and age at first sex or partner's financial contributions to children were analysed, but they were not significant. Similar to Luke (2005), the findings suggested that sexual mixing between older men and younger women increased all women's, not only young women's risk for HIV. Given women's economic motivation behind partnerships with older men, the transactional relationship may explain the higher risk of HIV for women in such relationships, and partnerships with large age gaps need to be analysed in more detail.

Similarly, the association between partner's low financial support to children and HIV suggests that women's economic vulnerability, as a result of men's withdrawal from family responsibilities, enhanced women's risk for HIV infection, probably through the exploitation of sexual networks. Although both a woman's and her partner's multiple partnerships stand in the causal pathways in the association between partner's low financial contribution and women's HIV infection, neither of these factors explained the association in the current study. Further studies with direct measures of household's, women's or partners' socioeconomic status may better address the relationship between women's economic constraint and their elevated risk for HIV.

The findings on the association between coerced early sexual debut and women's vulnerability to HIV provided important empirical evidence for the Gender and Power framework on women's HIV risk. Although sexual coercion can magnify young girls' biological susceptibility to HIV, the social mechanisms involved in coerced sex of young women may play an important role in HIV transmission. It was found that coerced early sexual debut was associated with women's own and their partner's multiple partnerships and women's alcohol use, suggesting coerced early sexual debut has negative effects across the life course. However, the association between coerced first sex before age 18 and HIV was only modestly mediated by negative life trajectories, probably due to unmeasured risk factors over the life course or measurement error. For example, gender-based norms about sex and violence that put women at risk for forced sex may enhance the transmission of HIV infection among women (Lary et al., 2004).

The association between ever had problems conceiving and HIV was explained away by women's multiple partnerships, suggesting that traditional social norms of fertility may increase women's HIV risk through sexual risk behaviours. Childbearing is an important path for women in traditional societies to acquire economic security and status within family and kin networks. To secure a husband, some women try to become pregnant before marriage. An inability to have children enhances the chance that women and their partners seek extramarital partners (Meekers, 1994; Hollos & Larsen, 2007). In this study, the variable 'ever had problems conceiving' was associated with women's but not their partners' multiple partnerships. It should be noted that the association between ever had problems conceiving and HIV may be subject to reverse causation, because clinical studies have shown that HIV causes fetal loss (Gray et al., 1998).

The level of condom use in this sample is insufficient to stop the spread of STIs and HIV. Condom use was not related to HIV infection in this study, which may suggest that only consistent condom use is an effective means of HIV prevention, or

some current condom users were infected with HIV before they started using condoms. Similar to other studies (Kapiga & Lugalla, 2002; Koenig *et al.*, 2004a), condom use was more common among high-risk groups. Further investigations of the relationship among gender inequality, risk negotiation and HIV infection are in order.

This study had some limitations. First, the data are cross-sectional and the causal path between indicators of gender inequality or risk behaviour and HIV infection cannot be determined. For example, it is possible that intimate partner violence and partner's low financial contributions to children are consequences of male partner's detection or suspicion of women's HIV serostatus. However, the vast majority of women did not know their HIV serostatus at the time of survey, reducing the chance of reverse causation.

Second, the economic and social dimensions of gender inequality were measured by proxies due to lack of data on direct measures of multi-faceted gender power imbalance. Thus, the association between gender inequality and HIV infection should be interpreted with caution. Further studies using direct measures of multiple domains of gender inequality – for example, the Sexual Relationship Power Scale developed by Pulerwitz *et al.* (2000) – are needed.

Third, some important risk behaviour factors such as transactional sex and sexual risk behaviour reported by male partners were not included in the analyses. Thus, it was possible to investigate the contribution of only a subset of sexual risk behaviours to the association between gender inequality and HIV. Another limitation is that risk factors measured over a short period – for instance, condom use over the last year – cannot fully capture HIV exposure over the life course. Further, the analysed sexual risk behaviours are measured with error. The lack of data and measurement errors associated with sexual risk behaviours make it impossible to eliminate the explanatory role of behavioural pathways.

Fourth, the majority of women who reported an abuse history were still with their violent partner. Hence, it is conjectured that women's fear of subsequent violence by their current partner may have resulted in under-reporting of abuse. Only 4·7% reported having experienced sexual violence after sexual debut. This low prevalence may be related to cultural norms considering it a woman's duty to have sex with her husband or regular partner (Garcia-Moreno *et al.*, 2005). The under-reporting of violence may bias the finding about the association between intimate partner violence and HIV infection towards the null. Further, social stigma about early first sex may have led some women to claim that their first intercourse was unwanted or forced, although they consented at the time. Reporting error may inflate estimates of the association between coerced early first sex and HIV infection.

Finally, there were 8% and 27% of the eligible women who did not participate in the interview and HIV testing, respectively. The non-participation rate is similar or lower than the rate in other population-based studies of sexual behaviour and HIV in Tanzania (Klouman *et al.*, 1997; TACAIDS, NBS & ORC Macro, 2005). Despite the similar findings from all women interviewed and those who consented to HIV testing, the possible bias of the data cannot be minimized since women who participated in HIV testing may have a higher risk for HIV infection than women who did not participate (Kapiga *et al.*, 2006).

Overall, this population-based study in Moshi, Tanzania, is one of the first to show that women's lack of economic resources and their experience of sexual violence increase their vulnerability to HIV infection, independent of individual behavioural risk factors. Current HIV intervention programmes in sub-Saharan Africa mainly rely on the ABC approach, which promotes 'Abstain, Be faithful and Use condoms'. While changing individual high-risk sexual behaviours remains a critically important priority for HIV preventions, the results of this study suggest that this behavioural approach may have limited impact on reducing heightened HIV risk among women. This study provides further evidence for extending HIV prevention programmes, beyond the ABC approach, to incorporate gender components. HIV prevention programmes should aim to empower women through increased education and economic resources, and educate women to make informed choices about their sexual and reproductive health, including the right to refuse sex. This study highlights the importance of raising consciousness in the community of the adverse consequences of coerced sex, developing policies to eliminate gender-based violence, and lobby for new laws enforcing these policies. Critically important, preventive programmes should focus on fostering gender-equitable attitudes and behaviours among men and changing men's risk-taking sexual behaviours.

Acknowledgments

References

Blanc, A. K., Wolf, B., Gage, A. J., Ezeh, A. C., Neema, S. & Ssekamaatte-Ssebuliba, J. (1996) *Negotiating Reproductive Outcomes in Uganda*. Macro-International and Institute of Statistics and Applied Economics.

Connell, R. W. (1987) *Gender and Power*. Stanford University Press, Stanford, CA.

Dunkle, K. L., Jewkes, R. K., Brown, H. C., Gray, G. E., McIntryre, J. A. & Harlow, S. D. (2004) Gender-based violence, relationship power, and risk of HIV infection in women attending antenatal clinics in South Africa. *Lancet* **363**, 1415–1421.

Erulkar, A. S. (2004) The experience of sexual coercion among young people in Kenya. *International Family Planning Perspectives* **30**, 182–189.

Garcia-Moreno, C., Jansen, H. A., Ellsberg, M., Heise, L. & Watts, C. (2005) *WHO Multi-Country Study on Women's Health and Domestic Violence against Women: Initial Results on Prevalence, Health Outcomes, and Women's Responses*. World Health Organization, Geneva.

Garcia-Moreno, C. & Watts, C. (2000) Violence against women: its importance for HIV/AIDS. *AIDS* **14**, S253–265.

Gray, R. H., Wawer, M. J., Serwadda, D., Sewankambo, N., Li, C., Wabwire-Mangen, F. *et al.* (1998) Population-based study of fertility in women with HIV-1 infection in Uganda. *Lancet* **351**, 98–103.

Greenberg, J., Magder, L. & Aral, S. (1992) Age at first coitus: a marker for risky sexual behavior in women. *Sexually Transmitted Diseases* **19**, 331–334.

Gregson, S., Nyamukapa, C. A., Garnett, G. P., Mason, P. R., Zhuwau, T., Carael, M., Chandiwana, S. K. & Anderson, R. M. (2002) Sexual mixing patterns and sex-differentials in teenage exposure to HIV infection in rural Zimbabwe. *Lancet* **359**, 1896–1903.

Hattori, M. K. & Dodoo, F. N. (2007) Cohabitation, marriage, and 'sexual monogamy' in Nairobi's slums. *Social Science and Medicine* **64**, 1067–1078.

Hattori, M. K. & Larsen, U. (2007) Motherhood status and union formation in Moshi, Tanzania. *Population Studies* **61**, 185–199.

Heise L. & Elias, C. (1995) Transforming AIDS prevention to meet women's needs: a focus on developing countries. *Social Science and Medicine* **40**, 931–943.

Hollos, M. & Larsen, U. (2007) Motherhood in sub-Saharan Africa: the social consequences of infertility in an urban population in Northern Tanzania. *Culture, Health and Sexuality* (in press).

Jewkes, R. K., Levin, B. L. & Penn-Kekana, L. A. (2003) Gender inequalities, intimate partner violence and HIV prevention practices: findings of a South African cross-sectional study. *Social Science and Medicine* **56**, 125–134.

Kapiga, S. H. & Lugalla, J. L. (2002) Sexual behaviours patterns and condom use in Tanzania: results from the 1996 Demographic and Health Survey. *AIDS Care* **14**, 455–469.

Kapiga, S. H., Sam, N. E., Mlay, J., Aboud, S., Ballard, R. C., Shao, J. F. & Larsen, U. (2006) The epidemiology of HIV-1 infection in northern Tanzania: results from a community-based study. *AIDS Care* **18**, 379–387.

Kelly, R. J., Gray, R. H., Sewankambo, N. K., Serwadda, D., Wabwire-Mangen, F., Lutalo, T. & Wawer, M. J. (2003) Age differences in sexual partners and risk of HIV-1 infection in rural Uganda. *Journal of Acquired Immune Deficiency Syndromes* **32**, 446–451.

Klouman, E., Masenga, E. J., Klepp, K. I., Sam, N. E., Nkya, W. & Nkya, C. (1997) HIV and reproductive tract infections in a total village population in rural Kilimanjaro, Tanzania: women at increased risk. *Journal of Acquired Immune Deficiency Syndromes* **14**, 163–168.

Koenig, M. A., Lutalo, T., Zhao F., Nalugoda F., Kiwanuka N., Wabwire-Mangen, F. *et al.* (2004a) Coercive sex in rural Uganda: prevalence and associated risk factors. *Social Science and Medicine* **58**, 787–798.

Koenig, M. A., Zablotska, I., Lutalo, T., Nalugoda, F., Wagman, J. & Gray, R. (2004b) Coerced first intercourse and reproductive health among adolescent women in Rakai, Uganda. *International Family Planning Perspectives* **30**, 156–163.

Koss, M. P. & Oros, C. J. (1982) Sexual Experiences Survey: a research instrument investigating sexual aggression and victimization. *Journal of Consulting and Clinical Psychology* **50**, 455–457.

Larsen, U. & Hollos, M. (2003) Women's empowerment and fertility decline among the Pare of Kilimanjaro region, Northern Tanzania. *Social Science and Medicine* **57**, 1099–1115.

Larsen, U., Mlay, J., Aboud, S., Ballard, R., Sam, N., Shao, J. & Kapiga, S. H. (2006) Design of a community-based study of sexually transmitted infections/HIV and infertility in an urban area of northern Tanzania. *Sexually Transmitted Diseases* **33**, 20–24.

Lary, H., Maman, S., Katebalila, M. & Mbwambo, J. (2004) Exploring the association between HIV and violence: young people's experiences with infidelity, violence and forced sex in Dar es Salaam, Tanzania. *International Family Planning Perspectives* **30**, 200–206.

Longfield, K., Glick, A., Waithaka, M. & Berman, J. (2004) Relationships between older men and younger women: implications for STIs/HIV in Kenya. *Studies in Family Planning* **35**, 125–134.

Lugalla, J. L., Emmelin, M. A., Mutembei, A. K., Comoro, C. J., Killewo, J. Z., Kwesigabo, G., Sandstrom, A. I. & Dahlgren, L. G. (1999) The social and cultural context of HIV/AIDS transmission in the Kagera region, Tanzania. *Journal of Asian and African Studies* **34**, 378–402.

Luke, N. (2003) Age and economic asymmetries in the sexual relationships of adolescent girls in sub-Saharan Africa. *Studies in Family Planning* **34**, 67–86.

Luke, N. (2005) Confronting the 'Sugar Daddy' stereotype: age and economic asymmetries and risky sexual behavior in urban Kenya. *International Family Planning Perspectives* **31**, 6–14.

McCloskey, L. A., Williams, C. & Larsen, U. (2005) Gender inequality and intimate partner violence among women in Moshi, Tanzania. *International Family Planning Perspectives* **31**, 124–130.

Maman, S., Campbell, J., Sweat, M. D. & Gielen, A. C. (2000) The interactions of HIV and violence: directions for future research and interventions. *Social Science and Medicine* **50**, 459–478.

Maman, S., Mbwambo, J. K., Hogan, N. M., Kilonzo, G. P., Campbell, J. C., Weiss, E. & Sweat, M. D. (2002) HIV-positive women report more lifetime partner violence: findings from a voluntary counseling and testing clinic in Dar es Salaam, Tanzania. *American Journal of Public Health* **92**, 1331–1337.

Meekers, D. (1994) Sexual initiation and premarital childbearing in sub-Saharan Africa. *Population Studies* **48**, 47–68.

Meekers, D. & Calves, A. E. (1997) 'Main' girlfriends, girlfriends, marriage, and money: the social context of HIV risk behavior in sub-Saharan Africa. *Health Transition Review* **7**, 361–375.

Mumtaz, Z., Slaymaker, E. & Salway, S. (2005) Condom use in Uganda and Zimbabwe: exploring the influence of gendered access to resources and couple-level dynamics. In Kishor, S. (ed.) *A Focus on Gender: Collected Papers on Gender Using DHS Data*. ORC Macro, Calverton, MD, pp. 117–146.

Omari, C. K. (1994) *Social and Cultural Factors Influencing Poverty in Tanzania*. REPOA Special Paper 8, Dar es Salaam.

Orubuloyte, I. O., Caldwell, J. C. & Caldwell, P. (1991) Sexual networking in the Ekiti District of Nigeria. *Studies in Family Planning* **22**, 61–73.

Pulerwitz, J., Gortmaker, S. L. & DeJong, W. (2000) Measuring sexual relationship power in HIV/STD research. *Sex Roles* **42**, 637–660.

Rao Gupta, G. (2000) *Gender, Sexuality and HIV/AIDS: The What, The Why and The How*. XIIIth International AIDS Conference, Durban, South Africa.

Schuler, S. R., Hashemi, S. M. & Badal, S. H. (1998) Men's violence against women in rural Bangladesh: undermined or exacerbated by microcredit programmes? *Development in Practice* **8**, 148–157.

Silberschmidt, M. (2001) Disempowerment of men in rural and urban East Africa: Implications for male identity and sexual behavior. *World Development* **29**, 657–671.

StataCorp (2003) *Stata Statistical Software: Release 8·0*. Stata Corporation, College Station, TX.

Tanzania Commission for AIDS (TACAIDS), National Bureau of Statistics (NBS) & ORC Macro (2005) *Tanzania HIV/AIDS Indicator Survey 2003–04*. TACAIDS, NBS & ORC Macro, Calverton, MD, USA.

UNAIDS/WHO (2005) *AIDS Epidemic Update: 2005*. Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), Geneva.

van der Straten, A., King, R., Grinstead, O., Vittinghoff, E., Serufilira, A. & Allen, S. (1998) Sexual coercion, physical violence, and HIV infection among women in steady relationships in Kigali, Rwanda. *AIDS and Behavior* **2**, 61–73.

Wight, D., Plummer, M., Mshana, G., Wamoyi, J., Shigongo, Z. S. & Ross, D. A. (2006) Contradictory sexual norms and expectations for young people in rural Northern Tanzania. *Social Science and Medicine* **62**, 987–997.

Wingood, G. M. & DiClemente, R. J. (2000) Application of the theory of gender and power to examine HIV-related exposures, risk factors, and effective interventions for women. *Health Education and Behavior* **27**, 539–565.

Wojcicki, J. M. (2005) Socioeconomic status as a risk factor for HIV infection in women in East, Central and Southern Africa: a systematic review. *Journal of Biosocial Science* **37**, 1–36.