

## **Gender Inequality and HIV-1 Infection among Women in Moshi, Tanzania**

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## 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 1,418 women aged 20 to 44 in Moshi, Tanzania. In addition, we explored the extent to which gender inequality elevates women's risk for HIV directly, or indirectly through risk behaviour factors. Gender inequality was measured by coerced first sex, intimate partner violence, age difference between partners, partner's contributions to children's expenses and ever had problems conceiving. Risk behavior factors included number of sexual partners for women in last three years, partner had other wives or girlfriends, non-use of condom and alcohol use at least once a week in last 12 months. Multivariate analysis showed that HIV infection was associated with all the indicators of gender inequality, with the exception of intimate partner violence, after controlling for background characteristics. After adjustment for risk behaviour factors and background characteristics, experience of coerced first sex before age 18 years, having a partner more than 10 years older and partner's low financial contributions to children retained their relationship with HIV infection, while ever had problems conceiving became non-significant. Thus, risk behaviour factors had a modest mediating effect on the relationship between gender inequality and HIV. The findings suggested that multiple dimensions of gender inequality in heterosexual relationships fuel women's higher risk for HIV infection directly and indirectly through risk behaviour, providing further evidence for extending current HIV interventions to incorporate women's empowerment and promotion of behavioural change 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 to 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 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.

Although different dimensions of gender inequality are increasingly cited as important determinants of women's vulnerability to HIV infection in sub-Saharan Africa, the empirical research remains limited. A majority of the studies on gender inequality and HIV risk examines the associations between various dimensions of gender power imbalance, particularly gender-based violence, and HIV risk factors (Maman et al., 2000; Garcia-Moreno & Watts, 2000; Jewkes et al., 2003). 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 examine the direct association between gender inequality and HIV (van der Straten et al., 1998; Gregson et al., 2002; Maman et al., 2002; Dunkle et al., 2004). 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, and 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 influences women's risk for HIV, 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 independent effect of multiple dimensions of gender inequality on women's risk for HIV. However, the findings are based on women who attended antenatal care. Extended investigations on the relationship between gender inequality, risk behaviour, and HIV risk using representative data are in order to obtain findings that are representative of the general population. An enhanced understanding of this issue is essential for the development of strategies for effective HIV interventions.

The aim of this study was to assess the relationship between multiple dimensions of gender inequality, risk behaviour and HIV infection, using a population-based sample of women aged 20 to 44 in Moshi, Tanzania. Our main interest was to examine the association between different manifestations of gender inequality and HIV infection, and investigate whether gender inequality elevates women's risk for HIV directly, or indirectly through sexual risk behaviour factors.

## **Conceptual framework**

According to Connell's (1987) theory of gender and power, the sexual division of labor, 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. Drawing on the theory of gender and power, Wingood and DiClemente (2000) conceptualize women's heightened HIV risk as a function of the three structural gender inequalities that generate different exposures to HIV.

The sexual division of labor limits women's equal access to education and paid employment 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). For example, research on sub-Saharan Africa suggests that economic constraints restrict women's ability to leave risky relationships and to negotiate HIV protection, while they reinforce some women's reliance on sexual networking to sustain their families (Orubuloye et al., 1991, 1993; Heise & Elias, 1995; Wojcicki & Malala, 2001; Zulu et al., 2002).

Closely related to the sexual division of labor 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 labor, increases women's "physical exposures" to HIV infection, particularly through physical and sexual violence. Maman et al. (2000) argue that violence increases women's vulnerability to HIV in three ways. For one, sexual violence by an infected partner can directly result in HIV infection. Young girls may be more susceptible to HIV infection due to the immature anatomy of the cervix (Greenberg et al.,

1992). Second, violence may increase a woman's risk for HIV 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 Stratten et al., 1998; Koenig et al., 2004a). Third, experiences of sexual violence, particularly sexual initiation and child sexual abuse, have been associated with high-risk sexual behaviour later in life (Dunkle et al., 2004; Erulkar, 2004; Koenig et al., 2004b).

The structure of affective attachments and social norms refer 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 instances, 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; Wingood & DiClemente, 2000). In some sub-Saharan countries, the social stigma attached to childlessness may put women at risk for HIV infection because women who have problem conceiving seek multiple partnerships (Larsen & Hollos, 2007).

As such an individual women's risk for HIV is shaped by multiple systems of gender inequality that translate into a sexual power imbalance favoring men. 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, cultural norms, and the gender power imbalance 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 in sexual interactions in Tanzania: economic exposures (age difference between partners and whether partner makes financial contributions 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 sub-Saharan African countries, Tanzania is no exception. Tanzania women occupy subordinate positions in economic spheres and sexual decision-making relative to men. Underpinning the gender inequality is a patriarchal system that deprives women of land ownership and limits their access to education and formal employment (Omari, 1994). Women's limited access to and control over resources exacerbate their social and economic dependence on men. Despite the dramatic changes in marriage and sexual norms (Larsen & Hollos, 2003; McCloskey et al., 2005; Wight et al., 2006), marriage and sexual practices continue to be governed by strong patriarchal traditions and institutions. Polygamy has been replaced by widespread, socially sanctioned extramarital relationships for men (Lugalla et al., 1999). While the practice of widow inheritance is obsolete and bride-price is declining, sex is largely viewed as a form of reciprocity and exchange (Lugalla et al., 1999; Wight et al., 2006). With the faltering economy and intensifying poverty, it is normative for a man to provide a woman with money or material gifts in exchange for sex; sexual networking is

commonly used by poor women, as a survival strategy to provide material security for themselves and their children (Lugalla et al., 1999). Decision-making in matters related to sex and contraception is dominated by men. Suggesting condom use with a male partner implies a woman's own promiscuity or mistrust of the partner. In addition, a strong mandate for fertility contradicts the notion of fidelity and condom use (Lugalla et al., 1999).

#### *Age difference between partners*

It is well recognized by studies of sub-Saharan Africa that relationships with great age and economic asymmetries pose a high risk for HIV for young girls (Meekers & Calves, 1997; Gregson et al., 2002; Kelly et al., 2003; Luke, 2003; Longfield et al., 2004). Female adolescents resort to sexual relationships with older men, mainly for economic reasons (Meekers & Calves, 1997). Men in these relationships provide young girls with school fees or other resources. Recent studies (Longfield et al., 2004; Luke, 2005) challenge this stereotype showing partnerships with older men increase all women's HIV risk, not only that of female adolescents. But partnerships with the largest age and economic asymmetries are associated with the highest risk of HIV for women. Young women's ignorance about sex and their emotional attachment to older men create barriers for risk perception. In addition, economic dependency on older men limit young women's women's ability to leave risky relationships and to negotiate protection such as condom use (Longfield et al., 2004; Luke, 2003, 2005). Maintaining sexual relationships with older men is a common practice among Tanzanian women (Haram, 2005). In the face of declining parental support for education due to economic hardship, many female



adolescents enter into such sexual relationships (Lugalla et al., 1999). We expect that the sexual mixing of older men and younger women increases women's risk for HIV.

#### *Partner's financial support*

A traditional gendered division of labor persists in Tanzania. It is considered men's responsibility to provide for the family and men's breadwinning role is an important part of manhood (Silberschmidt, 2001). Economic decline has left many unemployed. Men have increasingly withdrawn from their expected male roles and responsibilities, as head of household and breadwinner and women have been left with more responsibilities. When men's bread-earning role is threatened and their dominant position within the family is challenged, many resort to aggression, violence and extramarital relationships as a means of demonstrating their masculinity (Silberschmidt, 2001). Women with financially unstable partners may experience a greater need to exploit sexual networks to fulfill daily needs of the household. Therefore, we hypothesize that women whose partners made low financial contributions to children will have higher risk for HIV infection.

#### *Violence against women*

In Tanzania, sexual norms are culturally defined as men's sexual 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., 2004). The passive gender ideology limits women's ability to refusing sex and insisting on condom use because women fear that men might respond violently against them (Lugalla et al., 1999). While most women believe that

wife-beating is justified (Garcia-Moreno et al., 2005), masculinity is often expressed as infidelity and sexual violence against women (Lary et al., 2004). Suspected infidelity of women is considered sufficient ground for punishment, but women have no right to question men's multiple partnerships (Lary et al., 2004; Wight et al., 2006). Men often use force to compel women to engage in sex in response to women's challenge of their infidelity or rejections of their sexual advances. Women's social and economic dependency on men restricts their ability to leave an abusive relationship. In the Tanzanian context of pervasive violence against women, we anticipate that physical and sexual violence are 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, success and virility (Lugalla et al., 1999; Larsen & Hollos, 2006). Infertility is stigmatized and it is mainly the women who are blamed for the condition. In the case of childlessness many men take another wife or a girlfriend and have children. In many African societies, the birth of the first child is considered an essential step in the marriage process, and an inability to have children may result in divorce or separation (Lugalla et al., 1999). Some women bear children before marriage in order to prove their fertility to future husbands (Meekers, 1994). Hattori and Larsen (2007)'s study in Moshi shows that women who have spent less than a year in single motherhood are more likely to enter into a union than childless women. Similarly, women who have problems conceiving may seek multiple partners (Larsen & Hollos, 2007). Due to women and their partner's seeking for multiple partnerships associated

with childlessness, we predict that women who ever had problems conceiving 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, 18 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 experience of intimate partner violence of the women. This research project was approved by the institutional review board of the University of Maryland; by the Harvard School of Public Health; by the Kilimanjaro Christian Medical Centre Research and Ethical Clearance Committee; and by the National Institute for Medical Research, the United Republic of Tanzania.

After the interview, free voluntary HIV pre-test counseling was offered along with free testing for HIV-1 (For brevity we will refer to HIV-1 as HIV in the rest of the paper). Written consent was obtained for the HIV testing. To assure confidentiality, post-test results and counseling were given individually by the interviewer who administered

pre-test counseling and collected the blood sample. Anti-retroviral therapy for HIV infection was not available in this community at the time of the survey.

Serology testing was done weekly. HIV infection was determined by using two HIV enzyme-linked immunosorbent assay (ELISA) tests. 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, England, 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 2,192 women who were invited to participate in the survey, 2,019 women (92.1% of eligible women) completed the interview, and 1,418 (65% of eligible women) provided blood samples and were tested for HIV infection. The analyses were based on the 1,418 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.

Prior studies based on this data set shows 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 to 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; Williams 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 common measures of economic exposures to HIV in

the U.S. literature include education, employment status, and poverty (Wingood & DiClemente, 2000). However, the same measures of socioeconomic status may not translate into differential risks of HIV in a sub-Saharan African context as are found in developed countries (Wojcicki, 2005). In this analysis, we used age difference between partners and partner's contributions to children's expenses as proxies of relative socioeconomic position between the woman and her partner. As noted earlier, we believe these two measures better capture economic and power asymmetries between men and women than the conventional measures in the Tanzanian context of generalized poverty, declining education and employment. Based on existing studies on sexual mixing in sub-Saharan Africa (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. 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. We recoded this variable 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 the husband or partner 1) threatened to hurt the woman 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.

Social exposure to HIV was measured by whether the woman ever had problems conceiving.

### *Risk behaviour*

Risk behaviour was measured by four variables. Number of sexual partners in the last three years and type of current partnership, i.e., monogamous, partner has other wives or girlfriends, and no partner, unknown or missing. We expect that women with multiple partners or in a polygamous union would have 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 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 multivariate 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 source of women's empowerment. The relationship between education and HIV appears to be context-specific (Wojcicki, 2005). Women who had cash income may be more empowered economically, but access to economic resources potentially increases the risk of intimate partner violence.

### *Statistical analysis*

First, we presented the distribution of all women and women with HIV infection by background characteristics, indicators of gender inequality and risk behaviour. The association between background characteristics and HIV infection was estimated using the Pearson  $\chi^2$  test. Next, we assessed the association between indicators of gender inequality and risk behaviour using logistic regression with risk behaviour variables recoded as dummy variables. Then, logistic regression models were estimated to predict the crude odds ratios (OR) of HIV infection and 95% confidence intervals (CI) by indicators of gender inequality and risk behaviour. Finally, we estimated multivariate logistic regression models including indicators of gender inequality, risk behaviour, and control variables. 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 we 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 high prevalence of HIV infection (10.3%) (Table 1). A majority of the women was married or living with a partner, while about one quarter were never in union and the remaining 13.2% were either divorced/separated or widowed. More than two-thirds was Christian and the remainder were Muslim; 52.8% were Chagga, the rest belonged to the Pare or other ethnic groups. A quarter of the women were circumcised. HIV was higher for women aged 25 to 44 years compared to women aged 20 to 24 years. More than 21% of divorced/separated women had HIV infection relative to below 10% among women in union. HIV infection did not vary significantly by education, cash income, religion, tribe or circumcision.

Table 1 about here

Women's current relationship was characterized by a large age gap with the 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 had a partner who 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 a coerced first sex (25.8%). A quarter experienced intimate partner violence (24.7%). 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 with 18.9% reporting 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, for women who experienced coerced first sex before age 18, for women who ever had problems conceiving, and for women who had multiple partners in the last three years.

Table 2 about here

#### *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 sex, irrespective of age at first sex, had higher odds of a partner with other wives or girlfriends, and alcohol use at least once a week in the last 12 months compared to women who consented

to their first sex. Thus, women who experienced 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 were significantly more likely to occur to women who had problems conceiving. The odds of using condoms in the last 12 months were significantly higher among women who experienced a coerced first sex before age 18, intimate partner violence, or the partner's 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 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, respectively.

Table 3 about here

#### *Gender inequality, risk behaviour, and HIV infection*

The first column in 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 last 12 months. We then presented two nested multivariate logistic regression models to examine the association between indicators of gender inequality and HIV with and without the effects of risk behaviour factors, after controlling for background characteristics. Model 1 shows that the odd ratios associated with all indicators of gender inequality remained virtually unchanged after controlling for

background characteristics. Inclusion of risk behaviour factors in model 2 showed slight changes in the odds ratios associated with age difference between partners, partner's financial support to children, and experience of coerced first sex, while the odd ratios associated with the variable ever had problems conceiving became non-significant. The findings suggested that risk behaviour factors had a modest mediating effect on the relationship between gender inequality and HIV. 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), or the woman experienced a 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, or who consented to their first sex.

Table 4 about here

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 the findings based on the sub-sample with HIV data suggesting that the presented findings are representative of the general 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 reaches 12.0% among women compared to 9.6% among men in 2003-2004 (TACAIDS/NBS/ORC Macro, 2005). The feminization of HIV infection is increasingly recognized as a consequence of gender power imbalance, but there is a paucity of empirical evidence. We explored the relationship between various manifestations of gender inequality, risk behaviour and women's HIV risk in Moshi. The findings supported our hypothesis showing women's heightened risk for HIV was associated with three major dimensions of gender inequality directly and indirectly through risk behaviour. The results suggested that gender inequality and risk behaviour may put women at risk for HIV through largely distinct yet intricately related mechanisms.

Consistent with the gender and power framework, economic exposure appeared to be an important determinant of women's HIV risk in Moshi, Tanzania. Women with a partner more than 10 years older were at elevated risk for HIV, as is found in other sub-Saharan African countries (Gregson et al., 2002; Kelly et al., 2003). Extant literature in sub-Saharan Africa shows that the risk factors of sexual mixing between older men and younger women 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, 2005). In this study, age difference between partners over 10 years was not significantly associated with condom use, sexual networking of the woman or her partner, but women in this kind of partnership were more likely to have sexual debut before age 18 years (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 couple's age difference and age at first sex or partner's financial contributions to children were analyzed, 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 risk for HIV, irrespective of age, may be because older men have had more sexual partners and were more likely to be infected.

In addition, partner's low financial contributions to children were related to women's increased risk for HIV. In Tanzania, women's increasing access to economic resources and men's deteriorating economic conditions may be a source of spousal conflicts. Women may challenge men's expression of traditional privileges (e.g. taking multiple wives or sexual partners) that use household resources. This possibly results in men's subsequent use of violence or seeking of multiple partnerships to reinforce their authority (Silberschmidt, 2001). In either case, women may end up with limited access to partner's income and have an elevated need to exploit sexual networking, as suggested in this study. The association between partner's low financial support to children persisted after controlling for men and women's multiple partnerships and intimate partner violence. Further studies with direct measures of women and their partners' relative socioeconomic status may elucidate the mechanism through which partners' financial contributions to the household affect women's risk for HIV.

The findings lent support to the hypothesis of physical exposures by showing that coerced early sexual debut increased women's vulnerability to HIV. Although sexual coercion can magnify young girls' biological susceptibility to HIV, the social mechanisms involved in coerced sex of young women may play a predominant role in HIV transmission. We 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 an effect across the life course. Williams et al. (2006) show from these data that the effects of forced first sex on women's STIs condition are mediated by negative life trajectories. In this case, however, coerced first sex before age 18 years was a significant risk factor for women's HIV infection even after controlling for recent risk behaviour, suggesting that there might be other factors at work for young women's risk for HIV. For example, the myth that sex with a virgin can cleanse a man of HIV infection (Longfield et al., 2004) may encourage older infected men to force sex with young girls. However, we do not have detailed data to explore the context within which coerced early sexual debut occurred.

The association between ever had problems conceiving and HIV was explained away by risk behaviour factors, suggesting that ever had problems conceiving, a measure of normative social exposures, increased women's HIV risk indirectly through risk behaviour. In Tanzania, as elsewhere in sub-Saharan Africa, women's sexual behaviour is shaped by reproductive norms. Women are anxious to acquire the socioeconomic security and status associated with marriage and motherhood. To secure a husband, some women try to become pregnant before marriage. Inability to have children is socially stigmatized and enhances the chance that women as well as their male partners seek extramarital partners (Meekers, 1994; Larsen & Hollos, 2006). In this study, women who ever had problems conceiving were more likely to have multiple partners in the past three years. Contrary to our expectation, women who ever had problems conceiving were not more likely to have a partner who had concurrent sexual partners, at least not according to the women's reports. Women who have ever had problems conceiving may be less likely to

have a regular partner, and they may not know if their causal partners had concurrent partners. 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 our sample is insufficient to stop the spread of STIs and HIV, as it is in Tanzania. There were about 19% of women who reported using a condom in the last 12 months, but condom use was not related to HIV infection. This finding 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 (Jewkes et al., 2003; Koenig et al., 2004a), this study indicated that condom use was more common among high-risk groups. Further investigations on the relationship among risk negotiation, gender inequality, 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 men's detection or suspicion of their female partner's HIV serostatus. However, the vast majority of women did not know their HIV serostatus at the survey time reducing the chance of reverse causation. Second, there were about 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, we cannot rule out the possible bias of the data 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). Third, underreporting of violence may bias findings about the association between intimate partner violence and HIV infection towards the null. In this study, lifetime intimate partner violence was not significantly higher than the 12-month rate suggesting that the majority of women with an abuse history were still with their violent partner. Thus, women's fear of subsequent violence by their current partner may prevent them from reporting. 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 (Lary et al., 2004; Garcia-Moreno et al., 2005). Fourth, incompleteness of risk behaviour measures and underreporting of sexual risk behaviour may also bias the findings. For example, we do not have information on exchange relationships. Lastly, we do not have adequate information about men's characteristics and sexual behaviours. Further studies are needed to collect data on men and conduct analyses on the effects of gender power dynamics and HIV infection.

Overall, this population-based study in Moshi in Tanzania was one of the first to show that multiple dimensions of gender inequality in heterosexual relationships fuel women's risk for HIV infection directly and indirectly through risk behaviour. Current HIV intervention programs in sub-Saharan Africa mainly use the ABC approach which promotes "Abstain, Be faithful and Use condoms". This behavioural approach has been criticized for its lack of sensitivity to gender issues. The present study provides further



evidence for extending HIV prevention programs, beyond the ABC approach, to incorporate gender perspectives. HIV prevention programs should aim to empower women through increased education, 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 local community of adverse consequences of coerced sex, developing policies to eliminate gender-based violence, and lobby for new laws enforcing these policies. Critically important, preventive programs should focus on fostering gender equitable attitudes and behaviours among men and changing men's risk-taking sexual behaviours.

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