THE EFFECT OF GENDER INEQUALITY ON HIV RISKS AMONG COUPLES IN NORTH INDIA

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ABSTRACT

ALPNA AGRAWAL: The effect of gender inequality on HIV risks among couples in North India
(Under the direction of Shelah S. Bloom ScD)

Background: India ranks third in the world in the number of HIV/AIDS cases. Gender-based power factors are believed to contribute significantly to disease spread in the country, where few studies have examined this. **Purpose:** This dissertation's overarching aim was to examine the impact of unequal gender relations on proximal, distant, and programmatic HIV risks among couples in North India. **Methods:** Population-based data from 2003 were collected among 3,385 married couples living in Uttar Pradesh and Uttaranchal, North India. Outcomes examined were sexual HIV risks, HIV/STI awareness, condom access, HIV stigma, and HIV facility testing awareness. Two major predictors were tested: men's expression of inequitable gender norms and women's autonomy. Estimated models used structural equation modeling controlling for socio-demographic effects. **Results:** Men expressing inequitable gender norms were more likely to report risky sexual behavior, STI symptoms, HIV stigma, and lack of HIV facility testing awareness ($p<.05$). Women with high levels of autonomy were less likely to have husbands who engaged in risky sex and reported STI symptoms ($p<.05$). Autonomous women were also more likely to be aware of HIV and other STIs and have access to condoms ($p<0.05$). **Conclusions:** Programs that screen and target men who ascribe to dominant gender norms and women with low autonomy may be more effective in reducing HIV risk in India's general population.

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Shelah S. Bloom: You seldom get a teacher that understands both life and knowledge. I am greatful for having Dr. Bloom as a teacher in both these areas for the last four years.

Nitin A. Kapur: My husband is my best friend. He has supported me throughout this process.

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CHAPTER 1

INTRODUCTION

Overview

Since the International Conference on Population and Development in 1994, gender inequity is a recognized barrier to women's health, particularly with respect to family planning and pregnancy. Research shows that women's low education and low autonomy decrease their likelihood of accessing reproductive health services, using contraception, and delivering safely (Blanc 2001). Relatively fewer studies though have examined the effect of gender inequity on emerging health threats such as the HIV/AIDS epidemic.

Globally, women are increasingly affected by HIV. India ranks third in the number of people living with HIV/AIDS (PLHA) and 38% of PLHA are women. Agencies and researchers argue that gender inequality plays a critical role in driving HIV spread worldwide.[1, 2] However, the impact of gender-based power on HIV risks in India has not been extensively examined. Given the dearth of work in this area and magnitude of India's HIV epidemic, further research on the relationship between gender-based power and HIV risks in the subcontinent is critical. The papers of my dissertation address this gap in the literature by examining the impact of gender-based power on varied HIV risks – proximal, distant, and programmatic in nature – among married men and women in North India. The specific aims and hypotheses of these papers are:

Paper 1: Examine the relationship between gender-based power and men's risky sexual behavior and STI symptoms.

Hypotheses: Husbands' support of inequitable gender norms will be positively associated with their reported risky sexual behavior and STI symptoms. More autonomous women will be less likely to have husbands who report risky sexual behavior and STI symptoms.

Paper 2: Analyze the effect of gender-based power on women's HIV/STI awareness and access to condoms.

Hypotheses: Women reporting higher levels of autonomy will be more likely to report awareness of HIV and other STIs. These women will also be more likely to report access to condoms. Men who endorse inequitable gender norms will be less likely to have wives who report HIV/STI awareness or access to condoms.

Paper 3: Explore the effect of gender-based power on men's and women's HIV stigma and facility testing awareness.

Hypotheses: Men expressing inequitable gender norms will be more likely to report HIV stigma and not know where to get a HIV test. Wives of men reporting with these attitudes will also be more likely to report HIV stigma and not know where to get a HIV test.

Theoretical basis

Wingood and DiClemente's evidence-based theory of gender and power describes the complex relationships between dimensions of gender-based power and women's HIV risks.[3] The theory suggests that different facets of the broad concept gender-based power may uniquely influence different HIV risks. The research questions for my dissertation papers were informed by this theory. We examined the effect of multiple measures of gender inequity reported by men and women that captured gender equity norms and behaviors on HIV risks.

This project was also guided by Syme and Berkman's social determinants theory. The authors suggest that optimal public health programs for achieving population-level disease prevention lie in identifying factors that affect individuals' general susceptibility to disease and intervening on these factors.[4]

Background

Epidemiology of HIV/AIDS in India

The AIDS epidemic arrived later in India than in other places, but the spread has been rapid, particularly in the South, where it was first detected in 1986.[5] Pockets of rising HIV/AIDS prevalence have now emerged in the North.[6, 7] In May 2007, the Head of India's National AIDS Control Organization announced that urgent measures were needed in Uttar Pradesh (UP) to "stem the epidemic."[8] Over 1% of pregnant women were reported infected with the virus in three of UP's districts. UP is India's most populous state, with over 166 million inhabitants[9], but is also one of the least developed.[10] Fertility and mortality rates are higher relative to most other states[6]; health and socio-economic indicators are lower[3]; and the health service infrastructure is poor.[11] Of all Indian states, UP ranks second lowest on the United Nations Development Programme's Gender Disparity Index[12] and correct HIV/STI knowledge is extremely low.[13] The combination of poor HIV/STI knowledge, low status of women, and adverse socioeconomic climate in UP may have a profound effect on further HIV/AIDS spread in the state, as elsewhere.[14]

Proximal HIV risks: risky sexual behavior and STIs

Heterosexual sex is the primary mode of HIV transmission in India except in the north-eastern states. Therefore, limiting the impact of HIV/AIDS depends on determining and

modifying risky sexual behavior wherever appropriate and possible in the Indian context [15]. Risky sexual behavior is often measured with respect to extramarital sex, condom use, and paid sex. Because of strong social norms related to marriage and monogamy in Indian society, it was assumed until recently that little to no extramarital sexual activity took place except among marginalized populations such as truck drivers and sex workers. However, research over the last ten years has shown that a substantial portion of men in India report extramarital sexual experience, often pay for sex, and seldom use condoms [16].

Prevalence of extramarital sex varies widely in different contexts, but studies indicate that non-negligible levels occur in the population. Most population-based and community-based studies examining extramarital sex have been conducted in urban areas and a few in rural areas. Though the BSS-1 provides a national estimate of non-regular partnership in the Indian population, extramarital and premarital sex are not distinguished. Among married and unmarried men, the BSS-1 survey indicates non-regular partnership (including commercial sex partners) in 11% of men and 2% of women; and in 8.3% of men and 0.4% of women in Uttar Pradesh in the past year [7]. According to a population-based survey in married men residing in Uttar Pradesh, 1.8% reported ever having extramarital sex, specifically. Of men reporting extramarital sex, over half had relations with more than one woman, almost a third stated that they paid for extramarital sex, and one in ten reported he had ever used a condom during extramarital sex [17]. A community-based study in Mumbai (South India) found that over 20% of husbands reported they had ever had extramarital sex and a little over 10% reported that had extramarital sex in the last year. On average, these men had more than one partner, approximately one-third of their extramarital partners were female sex workers, and only 40% of men reported condom use in their last extramarital sex encounter [18]. In rural districts of five Indian states, an ethnographic study found that between 6.3% and 37.4% of men reported extramarital sex [19].

Studies on men engaging in other types of risky sexual behavior such as sex with other men (MSM) are limited. One study across 13 districts in Andra Pradesh (South India) found that over 30% of MSM reported never having used a condom with other men; and 38% of MSM reported having sex with their wife in the last 3 months. The majority of MSM reported not using a condom during their marital sexual encounters [20].

Though prevalence of extramarital risky sex is relatively low in India, the impact on HIV transmission is potentially significant when coupled with cultural silence regarding discussion of sexual matters; and wives' little knowledge of husbands' extramarital liaisons and limited sexual relationship power in marriage. In Indian society, sex is understood as a private act that can occur only within a legitimate marital relationship. Even in marriage though, the sexual dimension of marriage remains unacknowledged. Furthermore social norms upholding women as chaste constrain them from discussing sex with their husbands. Private conversations about sex are often euphemistic and initiated by husbands [21]. Consequently, married women are unlikely to perceive themselves at risk of HIV, because they are monogamous and believe their husbands are too. And even if they do perceive themselves at risk of HIV, they are unlikely to be able to negotiate condom use because women in relationships with men engaging in extramarital sex often have little power in the relationship already. A study found that husbands' domestic violence and attempts to engage in coercive sex with wives were significantly associated with greater likelihood of men engaging in extramarital sex [18].

In addition to the growing spread of HIV/AIDS in India, a rise in other STI prevalence (i.e., syphilis, gonorrhea, and herpes) has been observed [22, 23]. This is especially important within the context of India's HIV/AIDS epidemic as STIs increase transmissibility of HIV by 3 to 5 times after controlling for sexual behavior [24-26]. In India, approximately 175 STI surveillance sites track HIV infection rates among STI clinic patients. The prevalence of HIV/AIDS is 5.7% in

the STI population. And over the course of a year (2004-2005), the contribution of HIV infection from the STI population increased from 1.3 million to 1.7 million [27]. Like the diffusion of HIV/AIDS in India, STI transmission patterns conform to unequal gender-based power relations among Indian men and women [28-31].

While STIs are a documented risk factor of HIV, few studies in India have analyzed the prevalence of different types of STIs (e.g., chlamydia, gonorrhea, hepatitis b, hepatitis c, herpes, human papillomavirus, pelvic inflammatory disease, syphilis, and trichomoniasis) or other reproductive tract infections (RTI) (e.g., bacterial vaginosis, candidiasis) in the general population. Most research, to date, is clinic-based and community-based, not population-based; and has typically focused on women, not men; and is conducted in urban populations, not rural areas.

STI clinic-based studies in India indicate that STI incidence is high and associated with increased risk of HIV infection. Conducted from 1993 to 2000, a prospective cohort study of male and female patients seeking treatment for RTIs in Pune (South India) found that the incidence of herpes simplex virus type 2 (HSV-2) was 11.4 cases per 100 person-years and that the adjusted hazard ratio of HIV-1 acquisition from recent, incident exposure to HSV-2 infection was 3.81 [23]. Incidence of syphilis in the study population was observed to be high as well at 5.4 per 100 person-years, and recent HIV-1 infection was a significant predictor of syphilis acquisition based on the Cox proportional hazards model [32].

Compared to STI clinic-based studies, community-based and population-based studies indicate that STI prevalence is more modest and endogenous RTIs such as bacterial vaginosis are more prevalent, as expected in lower risk groups. While endogenous RTIs are not a direct risk factor of HIV, studies suggest they can increase risk of STI contraction. In a predominantly rural, community-based sample of married women from Karnataka (South India), STI infections

comprised 10.3% of the sample and endogenous infections, 53.9% of the sample [33]. In Tamil Nadu (South India), a community-based study of married women found that 15% of the sample had STIs and 28% had endogenous infections [34]. Similarly in a population-based study of mostly married women in Goa (South India), endogenous infections were more common between 8.5% and 17.8%, while the prevalence of STIs was 4.2% [35].

Another common measure of STI prevalence has been based on self-report, rather than clinical testing. Given that few community-based and population-based studies examine STIs among men, studies on self-report of STI symptoms describe potential STI occurrence among men. While self-reported STIs are weakly associated with clinical presentation of STIs among women, the data are more accurate among men. The BSS-1 found that 1.5% of men in India, in general, and 1.5% of men in Uttar Pradesh reported genital discharge in the past 12 months. The proportion of men that reported genital ulcer/sore in the last 12 months was 1.9% in India and 1.4% in Uttar Pradesh [7]. Among men, genital discharge is associated with STIs such as chlamydia and gonorrhea and genital ulcers/sores, herpes and syphilis.

Distant HIV risks: HIV/STI awareness and condom access

Knowledge of HIV/AIDS is a prerequisite for individuals to potentially adopt safe sex behaviors to prevent HIV infection [36, 37]. Since 1992, a major component of India's NACO program has been an "Information, Education, Communication" (IEC) campaign to promote HIV/AIDS awareness and knowledge. While HIV/AIDS studies globally demonstrate that knowledge is not enough to prevent transmission of HIV, a basic level of awareness and knowledge is the first step towards prevention. Knowledge about HIV/AIDS facilitates individuals' abilities to protect themselves from the virus and reduces stigma and discrimination, also crucial in preventing disease spread.

Despite the potential domino effect of HIV/AIDS in India though, insufficient progress has been made in raising awareness and knowledge about the disease, especially compared to African nations [38]. Almost twenty years after the first HIV cases were reported in both India and Nigeria, 86% of women and 97% of men in Nigeria versus 57% of women and 80% of men in India had ever heard of the disease [6]. Among North Indian women, knowledge and awareness of HIV/STIs are especially low [6].

HIV/AIDS awareness is not universal in India based on the NFHS-3. Women's awareness in UP is markedly lower than the national mean level by 17%. The gender gap in HIV/AIDS awareness is also larger in UP as compared to national figures. The percent difference between women's and men's HIV/AIDS awareness was 34% in UP and 23% nationally. Among those who had heard of HIV/AIDS, awareness could not be equated with knowledge of disease transmission and prevention. Less than 52% of respondents in India and UP understood that consistent condom use prevented HIV. Gender differences in knowledge also persisted in India and UP [6]. BSS-1 results also indicated that Uttar Pradesh was one of seven Indian states where the disparities between urban and rural knowledge levels were most significant [39].

Studies analyzing correlates of HIV/AIDS awareness and knowledge among women using NFHS-2 data found that indicators of women's empowerment such as educational status and autonomy were significant predictors. In Uttar Pradesh, women with some education as compared to women with no education were more likely to demonstrate awareness of HIV and knowledge that the disease was preventable (Pall 2005). In addition, women in Uttar Pradesh with a high permissive index score indicating that they were permitted to go to the market, or to visit relatives and friends were more likely to be aware of HIV/AIDS [16].

Finally other research has demonstrated low HIV/AIDS knowledge is not only associated with women's low status and rural residence, but stigmatizing and discriminatory beliefs and attitudes. Based on a convenience sample of college students in Tamil Nadu and Andra Pradesh (South India), higher levels of knowledge of HIV/AIDS among students was associated with decreased hostility towards people living with HIV/AIDS [40].

Since STIs increase risk of HIV infection and are prevalent in the Indian context, STI awareness, knowledge, and treatment are essential strategies for HIV prevention programs. Awareness and knowledge of other STIs is low in the Indian population. According to the BSS-1, the proportion of Indian men and women that have heard of other STIs is 32.4% and 31.8%, respectively. The same is true in UP where gender differences are more evident, 22.2% of men and 17.4% of women reported ever hearing of other STIs. Even fewer were aware of the linkage between STIs and HIV/AIDS – 22.8% of males and 18.5% of females in India; and 13.5% of males and 7.8% of females in UP [27]. An in-depth population-based study in UP and Uttaranchal, revealed that less than 30% of men knew that a person with an STI could be asymptomatic and that syphilis could be treated with antibiotics [17].

Related to low STI awareness and knowledge in India, few men and women reporting STI symptoms seek treatment. Among men and women reporting STI symptoms in BSS-1, 28.6% of males and 19.6% of females in India versus 8.6% of males and 13.6% of females in Uttar Pradesh sought treatment in a government hospital during their last episode [7]. Given that a low percentage of women reporting STI symptoms seek health care, the likelihood that asymptomatic women will be detected for STIs in a health care setting is even lower. Women's lack of autonomy and lower levels of education in Indian society negatively impact their STI awareness, knowledge, and treatment seeking behavior. In Uttar Pradesh, women's health care decisions are mostly made by their husbands and/or in-laws and their mobility to health care

facilities is restricted. Women are also less likely to discuss STI related symptoms out of fear of stigma and discrimination. Hence, rising rates of STIs among women are potentially associated with the feminization of the HIV/AIDS epidemic in India.

HIV program barriers: HIV stigma and HIV testing

In the last twenty-five years, stigma and discrimination have emerged as major factors associated with the continued spread of HIV/AIDS and suffering among individuals with the disease. In India, as elsewhere, HIV/AIDS is perceived as a disease of "others" – of those living in society's margins whose lifestyles are "perverted" and "sinful" (UNAIDS). Such stigmatizing perceptions perpetuate a vicious cycle of discriminatory practices towards people living HIV/AIDS, silence about the disease, and barriers to prevention. While current research on HIV/AIDS stigma and discrimination in India has provided insight regarding attitudes and behaviors in the general population and the lived experiences of people living with HIV/AIDS, no study is population-based.

To analyze the prevalence of HIV/AIDS-related stigma and discrimination in India, local studies have examined both attitudes among uninfected individuals and documented the experiences of those who are HIV+. In the late 1990s, a study of educated, uninfected Indian college students reported strong negative attitudes towards people living with HIV/AIDS – 34% felt it would be better if infected individuals killed themselves and 34% believed infected people deserved their fate [40]. In a study of people living with HIV/AIDS in India, self-disclosure of seropositive status and manifestation of stigma and discrimination was examined. The study reported that 65% of HIV+ subjects revealed their status versus 35% of HIV+ subjects who had not. Among those that disclosed their HIV status, 78% reported they were infected to family members while only 7% and 15% had reported their status to friends and health

professionals, respectively. The reasons individuals did not disclose their status included fear of discrimination, disgrace to family and self, and futility [41]. Hence due to stigma and discrimination, people living with HIV/AIDS in the study were less likely to receive treatment and address risk factors associated with transmission.

Another local study among married women in India demonstrated that non-disclosure of one's infection status was not only associated with HIV/AIDS-related stigma and discrimination, but other forms of prejudice such as gender discrimination. In Mumbai and Sumerpur (South India) a study found that among 52 HIV+ pregnant women who disclosed their status to family, 23% were beaten or abused by their in-laws and 35% were no longer allowed to do household activities [42]. With regards to care and support of infected individuals, Bharat and Aggleton (1999) found similar evidence of gender discrimination. According to qualitative interviews with Indian families, household responses to HIV+ men were generally supportive – men tended to be cared for by their mothers, wives, and extended female relatives. On other hand, HIV+ women were found to receive little care and be spread thin caring for their male counterparts [43].

Gender-based power and HIV

Research in Africa and America shows that gender-based power is associated with HIV risks. In these studies, measures of gender-based power such as men's inequitable gender norms and women's low sexual relationship power are associated with high risk sex, infrequent condom use, STI symptoms, and sexual violence.[44-46] In select areas in South and North India, one study found that men expressing inequitable gender norms were associated with HIV risks such as multiple sexual partners, less condom use, poor sexual health, and partner violence.[47] A qualitative study in Chennai, South India showed that gender inequities perpetuate married

women's experience of sexual violence from their husbands resulting in their inability to adopt HIV-related preventive behaviors.[30, 48] Given that married, monogamous women are increasingly vulnerable to contracting HIV/AIDS in India and their primary risk factor is sex with their high-risk husbands, it is imperative to identify aspects of gender inequity that enhance men's and women's HIV risks.

Study design

The data were collected in 2003 from a probability sample of 3,385 married couples residing in UP and Uttaranchal (the former Hill district of UP), North India. The data are a part of a larger NIH-funded study that was based at the University of North Carolina – Chapel Hill. The aim of the study was to explore the potential for the spread of HIV in UP and Uttaranchal. UP and Uttaranchal together comprise at least 17% of the total Indian population, at approximately 175 million people.[9] The health status and socioeconomic levels of people living in this area of India are among the worst in the country. Fertility and mortality rates are higher relative to most other states and the health service infrastructure is poor.[6, 11] The fieldwork for the survey was conducted by the Center of Population Studies at Banaras Hindu University (Varanasi, India). The data are representative of major cities and rural areas in UP and Uttaranchal. A multistage cluster sampling design was used to draw the sample of eligible couples. Further details are reported elsewhere [49].

Survey sample and study eligibility

UP is currently divided into four geographic regions eastern, western, central, and Bundelkhand. Uttaranchal formerly the fifth region of UP (called the hill region) later became its own state in 1999. Data were collected from couples living in a randomly selected rural district in

each of the four regions of UP and from Uttaranchal. A multistage cluster sampling design was used to draw the probability sample of eligible participants. Households were the primary sampling units for both the rural and urban samples. In rural districts, two villages were selected from five randomly drawn community development blocks. A sample of 22 households from each of the selected villages was drawn, using census tracts as the sampling frame. In urban areas, 10 wards in each city were randomly selected, with 22 households selected per ward, again based on census tracts.

All women in selected households were eligible for participation if they were married, living with their spouse, and between the ages of 15-49. All eligible women and men in the household were interviewed. As a result of the sampling frame, the sample is strictly representative of married women and men living in rural areas of the five regions comprising UP and Uttaranchal, and of the largest urban areas within these regions.

By design, two-thirds of the 3,385 couples interviewed resided in urban areas, while the remaining third resided in rural places.

Given the urban focus of the sample, the demographic characteristics including age, education, and a standard of living index, were as expected for this region of India. About a fifth of the men and almost half of the women had never attended school, while a fifth of the men and only 12% of the women had completed 12 or more years of schooling. The sample of wives was generally younger than that of husbands, 8% of men, and 22% of women were in the youngest age group (15-24 years). Thirty-seven percent of men and 18% of women in the oldest age group (40 years and above). A standard of living index based on household ownership (land as well as possessions) and modeled after a similar index used for the National Family Health Survey 1998-1999 (NFHS-2)[13] was developed by the research team. Most households (52%) were in the middle category, with 21% and 27% in the low and high categories, respectively.

Data collection

The data were collected from January to July 2003. All men were interviewed by male interviewers, while all women were interviewed by female interviewers. The household refusal rate was 4%. Three questionnaires were administered in the study: a household form, a form for women and one for men. Individual questionnaires probed issues related to HIV/STI-related knowledge, perception of risk, and determinants of married women's and men's treatment-seeking behavior for STI symptoms. Questions developed from the survey were adopted from previous related studies, and focus groups conducted in the preliminary stages of the larger NIH study entitled "Behavioral Dynamics of HIV/AIDS in Uttar Pradesh, India."

Women's Questionnaire

The woman's interview consisted of six sections: (1) Socio-demographic information; (2) female autonomy and spousal communication; (3) treatment-seeking behavior for STI symptoms; (4) knowledge of reproductive health matters, (5) knowledge of HIV/AIDS, and (6) attitudes about HIV/AIDS, perceptions of risk, and sexual behavior/negotiation.

Men's Questionnaire

A large portion of the man's interview was identical to the woman's. Major differences were regarding section (1) on socio-demographic information, and section (2) on female autonomy and spousal communication. Section (1) included additional questions pertaining to occupation, absences from home, and alcohol and drug use. Section (2) pertained to gender relations regarding support for wives, attitudes towards a wife's role, and spousal communication.

Measures

Dependent variables

The effect of gender-based power on three types of HIV risks – proximal, distant, and programmatic – were assessed. Proximal HIV risk factors examined were men's premarital sex, recent extramarital sex, and recent self-reported STI symptoms. Distal HIV risk factors analyzed were women's HIV/STI awareness and perceived access to condoms. Programmatic barriers to HIV prevention that were explored were men's and women's stigma towards PLHA and awareness of a facility that provide a HIV test.

Proximal HIV risks

Men were asked whether they ever had premarital sex with someone else or their wife (no=0, yes=1), extramarital sex in the past year (no=0, yes=1), or experienced any STI symptoms, specifically discharge from the penis or a genital ulcer, in the past year (no=0, yes=1).

Distant HIV risks

Condom accessibility among women was measured by the question, "If you wanted to, could you get yourself a condom?" (0=no, 1=yes). To assess HIV awareness, women were asked, "Have you ever heard of a virus called HIV or an illness called AIDS?" (0=no, 1=yes). Women's awareness of other STIs was based on whether they had heard of syphilis (0=no, 1=yes).

Programmatic HIV risks

Respondents were asked if they knew a hospital or clinic where they could get an HIV test (0=yes, 1=no or don't know). Responses of "don't know" were counted as not knowing where to get a HIV test. HIV facility testing awareness was examined because testing services are under-utilized in India. Therefore, we wanted to assess factors that influence basic awareness of testing services as an initial step to identifying barriers of VCT uptake in India.

HIV stigma was assessed with two questions used in the Demographic Health Surveys and in UNAIDS surveys [50]. The question item used to indicate general HIV stigma asked if respondents were willing to buy food from an HIV-positive food seller/shopkeeper. The question item used to indicate family HIV stigma asked if respondents would keep an HIV-positive family member's status secret (1=yes, 0=no). Responses of "don't know" were recoded as missing. Responses indicating one would not buy food from an HIV-positive food seller or would want to keep a HIV-positive family member's status secret were considered expressions of HIV stigma.

Independent variables

Gender-based power measures

Measures for gender-based power were constructed to indicate women's autonomy and men's inequitable gender norms. Women's autonomy refers to women's level of interpersonal control. Men's inequitable gender norms describe men's attitudes that constrict wives from expressing themselves freely or acting independently.

In the literature, the construct women's autonomy has been operationalized into multiple dimensions and extensively examined with respect to effects on women's reproductive health outcomes [51]. Dimensions of autonomy examined in this study are (1) women's control over financial resources (5 items), (2) women's decision-making authority (6 items), (3) women's

mobility (7 items), and (4) leniency afforded women (5 items). Questions were answered on a three or four point Likert scale. To test the effect of women's autonomy on our outcomes of interest, confirmatory factor modeling was used. The dimensions of women's autonomy were combined in a second-order confirmatory factor model to create a single composite variable. The composite variable preserved the integrity of the individual autonomy dimensions but also modeled their inter-relationships. This is important given extensive research indicating the distinct yet potentially correlated features of these dimensions. Further details regarding construction of the second-order women's autonomy factor are discussed elsewhere [52].

Confirmatory factor modeling was also used to quantify men's inequitable gender norms. These norms were measured by three observed indicators in a first-order factor model. Men were asked their level of agreement with the statements: (1) there is no harm if a wife sometimes disobeys her husband; (2) a wife should always consult her husband before making decisions, large or small; and (3) there is no harm if a wife goes out alone to a nearby friend/relative's house. The question items were answered on a four point scale (1=strongly agree, 2=agree, 3=disagree, 4=strongly disagree) but were examined as binary variables (1=strongly agree and agree, 0=strongly disagree and disagree). For items 1 and 3, responses were recoded so that on all items a score of 1 indicated men supported inequitable gender norms and a score of 0 meant they did not.

Covariates

Age was categorized into four 10-year age groups. Level of education was categorized 0 years, up to 8 years, 8 to 12 years, and over 12 years of schooling. The standard of living index was modeled after the National Family Health Survey. Levels of standard of living were categorized as low, medium, and high based on summed scores and thresholds established in the

DHS. Type of residence was either urban or rural. Region was categorized into five areas: western, central, bundelkhand, eastern, and present day Uttaranchal.

Analysis Plan

Chi-square tests were conducted to assess differences in gender-based power by each HIV risk outcome. To run the chi-square tests, a single item was examined from each dimension of the women's autonomy factor, and a single item was selected from the men's inequitable gender norms factor. Since response options for the women's autonomy questions were ordinal, they were dichotomized to make interpretation of the chi-square results easier. Women who reported "always", "often", or "sometimes" having control over financial resources or decision-making authority were compared to women who reported "never". For the mobility dimension, women who reported they could move outside of their home "alone" were compared to women who "never" could or had to be accompanied by "someone". For the leniency dimension, women who had to seek permission to engage in certain activities "sometimes" or "never" were compared to women who had to seek permission "often" or "always". Analyses were conducted in STATA version 9.0.

SEM analyses followed a two-step process. Confirmatory factor analyses were conducted to estimate the composite variable for gender-based power, men's inequitable norms. We determined if the three observed indicators demonstrated adequate construct validity on this composite factor based on the magnitude and significance of their factor loadings. Second, a structural equation model was specified to test whether the hypothesized relationships shown in Figure 1 adequately represented the variables' covariance structure. The relative strength, sign, and statistical significance of the standardized parameter estimates were assessed.

The default estimation method in most structural equation modeling programs is

maximum likelihood. An underlying assumption of this method is multivariate normality of observed variables. However, our data violates this assumption, since all of our observed variables were binary. Therefore, parameters were estimated by weighted least squares using robust standard errors and mean- and variance-adjusted chi square test statistics (WLSMV). Previous work has shown WLSMV can be used with categorical outcomes [53]. Missing data was relatively small and list-wise deletion was used.

Three fit indices were used to evaluate model fit: comparative fit index (CFI), Tucker Lewis index (TLI), and the root mean square error of approximation (RMSEA). General standards in the literature indicating adequate model fit are if the CFI and TLI are greater than 0.90 and the RMSEA is less than 0.06 [53]. Analyses were conducted in Mplus version 5.0.

Results

The papers' findings indicate that men's inequitable gender attitudes increased men's HIV risks, while women's autonomy decreased women's HIV risks. Men who endorsed inequitable gender attitudes were more likely to engage in risky sex and report STI symptoms. They were also more likely to report HIV stigma and less likely to know where to get an HIV test. On the other hand, more autonomous women were less likely to have husbands who reported risky sexual behavior. They were also more likely to be aware of HIV and other STIs and feel they could get condoms for themselves, if needed.

There was evidence in these dissertation papers that these measures of gender-based power are distinct, since they differentially influenced specific HIV risks. For example, inequitable gender norms expressed by men were not associated with their wives' awareness of HIV and other STIs, access to condoms, HIV stigma, and facility testing awareness.

Overall, these findings support both Wingood and DiClemente's theory on gender-based power and Syme and Berkman's theory on social determinants of health. They demonstrate that gender-based power is multi-dimensional and has a broad effect on population health impacting multiple HIV risks.

Study limitations

Since the data were cross sectional, meaning collected at one point in time, causality of the reported associations cannot be determined. There are also potential measurement issues posed by the men's inequitable gender norms factor, sexual HIV risk variables, and HIV stigma items. The women's autonomy factor was based on over twenty question items while the men's inequitable gender norms factor consisted of three items, which may limit the factor's accuracy of what it was intended to measure. Second, married men may have been less likely to report premarital and extramarital sex due to social desirability bias resulting in an underestimate of the observed effects. Third, men's self-reported STI symptoms may have led to misspecification errors, because their symptoms were not confirmed by clinical testing. Finally, the HIV stigma question items were hypothetical, may suffer from social desirability bias, can be ambiguous, and may not measure the underlying cause of HIV stigma resulting in misspecification errors [50, 54].

These study limitations may be overcome in future studies by applying longitudinal study designs that measure gender inequities and HIV risks over time; utilizing tested scales; and including clinical assessment of STIs.[55]

Programmatic implications

This dissertation project illustrates the importance of reducing HIV risks in prevention programs by addressing social constructions of gender roles among men and women in India.

To date, the majority of HIV-related programs are focused on behavior change at the individual-level and are gender-blind or gender-neutral.[56]

In the United States, Brazil, and India, the few HIV-based programs that have aimed to transform inequitable gender beliefs among men and women have been effective and feasible in their target communites.[44, 47, 57-61] In these interventions, men were more likely to use condoms, less likely to commit sexual violence, indicated less paid sex, and reported fewer sexual partners.[44, 47, 61] Women were more likely to report condom use self-efficacy, have protected sex, and communicate about their sexual needs.[59, 60]

My dissertation project highlights the importance of reducing men's and women's HIV risks by addressing men's inequitable gender attitudes early in the life course and improving women's autonomy. These factors may be addressed in condom promotion programs, IEC campaigns, sex education, family planning clinics, VCT sites, and stigma-reduction interventions in order to impact the outcomes I found associations with in this research project.

Future areas of research

In the SRH field, the influence of gender-based power on HIV risks is a rapidly growing area of research and programming. The Millennium Development Goals cite gender equity as a necessary component for eliminating poverty worldwide. The U.S. President's Emergency Plan for AIDS recent legislation highlights gender equity as a critical piece in reducing men's and women's susceptibility to HIV. In order to inform these global initiatives, we must work towards building sufficient evidence that address current methodological and knowledge gaps in the literature on gender inequality and HIV risk.

Methodological limitations in research to date include lack of assessment of gender-based power from multiple perspectives and limited use of validated scales. Future HIV studies

should integrate measures of gender inequality from men's and women's perspectives. These measures should assess gender inequality with respect to norms and behaviors. Statistical methods such as structural equation modeling could be more widely applied in order to assess whether varied measures of gender-based power are capturing the intended construct of interest. In addition, systematic reviews must be conducted on related studies and interventions in order to determine the field's progress in addressing gender-based power and HIV risk. Knowledge gaps related to gender inequity and HIV risk include understanding the multi-level context of gender inequality and its influence on HIV transmission. Gender inequality is determined at the individual and societal levels. These levels interact with one another and may operate in separate silos. For example, laws are passed that are not always carried out at the community level. Families discontinue practices that are not always widely adopted by society, at large. Often, paradigm shifts that occur at the local and/or societal level translate upstream and downstream differently which may influence their impact on HIV risks differentially. Qualitative studies and sophisticated quantitative research that examine these pathways would facilitate development of more effective HIV prevention programs that address gender inequity.

CHAPTER 2

THE EFFECT OF GENDER-BASED POWER ON SEXUAL HIV RISKS AMONG MARRIED MEN AND WOMEN IN NORTH INDIA

Introduction

Globally, India ranks third in the number of people living with HIV/AIDS followed by South Africa and Nigeria.[7] Men's risky sexual behavior contributes to HIV spread in the country.[62] Premarital and extramarital sex among Indian men are often unprotected, include paid sex, and result in acquisition of other STIs.[17, 18, 22, 63-66] These factors increase Indian men's susceptibility to HIV as well as their partners' risk of infection.[23, 25, 32, 67, 68]

International agencies and researchers argue that social determinants such as gender inequality play a critical role in driving HIV spread worldwide.[1, 2] However, the impact of gender-based power on sexual HIV risks in India has not been extensively examined. Research in Africa and America shows that measures of gender-based power such as men's inequitable gender norms and women's low sexual relationship power are associated with high risk sex, infrequent condom use, STI symptoms, and sexual violence.[44-46] In select areas in South and North India, one study found that men's endorsement of inequitable gender norms were associated with HIV risks such as multiple sexual partners, less condom use, poor sexual health, and partner violence.[47] A qualitative study in Chennai, South India showed that gender inequities perpetuate married women's experience of sexual violence from their husbands resulting in their inability to adopt HIV-related preventive

behaviors.[30, 48] Given the dearth of work in this area and magnitude of India's HIV epidemic, further research on the relationship between gender-based power and sexual HIV risk behaviors in the subcontinent is critical, particularly among bridging men, who drive the epidemic by spreading the disease to low-risk women.[62]

The current study addresses this gap in the literature by investigating the relationship between gender-based power and HIV risk factors using couples-based data from North India (Figure 1). Two measures of gender-based power used in this study were men's inequitable gender norms and women's autonomy. The HIV risks examined were men's premarital sex, extramarital sex, and self-reported STI symptoms. We tested the effect of men's inequitable gender norms on these three outcomes. The effect of women's autonomy on their husband's extramarital sex and STI symptoms was also assessed. Structural equation modeling was used to create factors which measured gender-based power and simultaneously assess associations in a single model.[69]

The study site was Uttar Pradesh, North India where over 0.1 million people are living with HIV/AIDS and increased disease spread has been detected among bridging men.[7, 8] UP's HIV prevalence is low, but its poor performance on health and social indicators position the state for potentially rapid HIV spread. Since UP is India's most populous state and only five countries in the world are greater in size, a small increase in its HIV infection rate can profoundly affect the national and global epidemic.[9] Therefore, determinants of proximal HIV risk factors in this region of India are important to identify, particularly those related to gender inequality which UN agencies argue is an underpinning cause of the epidemic.

Study Population

The data were collected in 2003 from a probability sample of 3,385 married couples residing in UP and Uttaranchal (the former Hill district of UP), North India. The data are a part of a larger NIH-funded study that was based at the University of North Carolina – Chapel Hill. The aim of the study was to explore the potential for the spread of HIV in UP and Uttaranchal. The fieldwork for the survey was conducted by the Center of Population Studies at Banaras Hindu University (Varanasi, India). The data are representative of major cities and rural areas in UP and Uttaranchal. A multistage cluster sampling design was used to draw the sample of eligible couples. Further details are reported elsewhere [49]. The study sample included the total analytic sample of these data.

Measures

HIV risks

Men were asked whether they ever had premarital sex with their current wife or someone else (no=0, yes=1), extramarital sex in the past year (no=0, yes=1), and experienced any STI symptoms, specifically discharge from penis or ulcer, in the past year (no=0, yes=1).

Gender-based power

Gender-based power was measured according to women's autonomy and men's inequitable gender norms. Women's autonomy refers to women's level of interpersonal control. Men's inequitable gender norms describe men's support of attitudes that constrict wives from expressing themselves freely or acting independently.

In the literature, women's autonomy has been operationalized into multiple dimensions and extensively examined with respect to women's reproductive health.[51, 70-72] Dimensions of autonomy examined in this study are (1) women's control over financial resources (5 items), (2)

women's decision-making authority (6 items), (3) women's mobility (7 items), and (4) leniency afforded women (5 items). Questions were answered on a three or four point Likert scale. Responses for the leniency items were recoded so that high scores on all questions indicated higher levels of autonomy and lower scores, lower levels of autonomy. To test the effect of women's autonomy on our outcomes of interest, confirmatory factor modeling was used. The dimensions of women's autonomy were combined in a second-order confirmatory factor model to create a single composite variable. The composite variable preserved the integrity of the individual autonomy dimensions but also modeled their inter-relationships. This is important given extensive research indicating the distinct yet potentially correlated features of these dimensions. Further details regarding construction of the second-order women's autonomy factor are discussed elsewhere.[52]

Confirmatory factor modeling was also used to quantify the men's inequitable gender norms factor. Three observed indicators in a first-order factor model measured these norms. Men were asked their level of agreement with the statements: (1) there is no harm if a wife sometimes disobeys her husband; (2) a wife should always consult her husband before making decisions, large or small; and (3) there is no harm if a wife goes out alone to a nearby friend/relative's house. The question items were answered on a four-point scale (1=strongly agree, 2=agree, 3=disagree, 4=strongly disagree) but were examined as binary variables (1=strongly agree and agree, 0=strongly disagree and disagree). For items 1 and 3, responses were recoded so that on all items a score of 1 indicated men supported inequitable gender norms and a score of 0 meant they did not.

Socio-demographics

Socio-demographic factors included in the study were age, educational level, economic status, area of residence, and region. Age was categorized into four 10-year age groups. Levels of education used were 0 years, up to 8 years, 8 to 12 years, and over 12 years of schooling. The standard of living index created was modeled after that measured by population-based surveys conducted in India known as the Demographic Health Surveys (DHS). Levels of standard of living were categorized as low, middle, and high based on summed scores and thresholds established in DHS. Type of residence was either urban or rural. Region was divided into five areas: western, central, bundelkhand, eastern, and hill (present day Uttaranchal).

Statistical Analyses

Bivariate analyses

Chi-square tests were conducted to assess differences in gender-based power by risky sexual behaviors and STI symptoms. To run the chi-square tests, a single item was examined from each dimension of the women's autonomy factor, and a single item was selected from the men's inequitable gender norms factor. Since response options for the women's autonomy questions were ordinal, they were dichotomized to make interpretation of the chi-square results easier. Women who reported "always", "often", or "sometimes" having control over financial resources or decision-making authority were compared to women who reported "never". For the mobility dimension, women who reported they could move outside of their home "alone" were compared to women who "never" could or had to be accompanied by "someone". For the leniency dimension, women who had to seek permission to engage in certain activities "sometimes" or "never" were compared to women who had to seek permission "often" or "always". Analyses were conducted in STATA version 9.0.

Multivariate structural equation modeling analyses

SEM analyses followed a two-step process. First confirmatory factor analyses were conducted to estimate the validity and reliability of the two composite factors measuring gender-based power, women's autonomy and men's inequitable gender norms. Since women's autonomy was treated as a second-order factor, we first determined if the question items for each dimension loaded well on that dimension and demonstrated adequate model fit. Then the shared covariance of all four dimensions on the second-order autonomy factor was evaluated according to their factor loadings along with model fit. To estimate the men's inequitable gender norms factor, the factor loadings of its observed indicators were examined.

Second, a structural equation model was specified to test the hypothesized relationships shown in Figure 1. Standardized parameter estimates for all direct and indirect relationships posited in our analytic model were examined with respect to their relative strength, sign, and statistical significance. Direct effects are coefficients measuring the association two variables unmediated by any other variables. Indirect effects are the product of all coefficients between two variables with one or more intervening variables.

The default estimation method in most structural equation modeling programs is maximum likelihood. An underlying assumption of this method is multivariate normality of observed variables. However, our data violates this assumption, since all of our observed variables were ordinal or binary. Therefore, parameters were estimated by weighted least squares using robust standard errors and mean- and variance-adjusted chi square test statistics (WLSMV). Previous work has shown WLSMV can be used with categorical outcomes [53]. Missing data were relatively small and list-wise deletion was used.

Three fit indices were used to evaluate model fit: comparative fit index (CFI), Tucker Lewis index (TLI), and the root mean square error of approximation (RMSEA). General

standards in the literature indicating adequate model fit are if the CFI and TLI are greater than 0.90 and the RMSEA is less than 0.06 [53]. Analyses were conducted in Mplus version 5.0.

Results

Description of study population

Compared to men in the study sample, a larger percentage of women were younger than 24 and a smaller percentage were 40 or older (Table 1). Over 45% of women versus 22% of men had no education. Over half of couples were in middle standard of living households.

A little over 24%, 7%, and 2% of men reported premarital sex, extramarital sex in the past year, and paid sex in the past year, respectively. Over 30% of men reporting extramarital sex had two or more non-regular sexual partners. Over 70% stated they had not used a condom in their last non-regular sexual encounter. Almost 6% of married men indicated recently experiencing STI symptoms.

As compared to men, a consistently smaller percentage of women said their husbands had engaged in premarital sex (11.9% vs. 24.2%), extramarital sex in the past year (2.9% vs. 7.1%), or ever paid for sex (2.0% vs. 6.1%). On average, almost 80% of men's wives were unaware their husbands had engaged in these sexual behaviors (results not shown)

Between 48% and 83% of men reported an inequitable gender norm. Among men's wives, selected items illustrated variations in women's autonomy by dimension. Women's responses to a decision-making authority question showed that up to 77% participate in buying pots and pans for their homes. A measure of women's control over financial resources indicated that 67% could spend money on small presents. According to a mobility dimension item, 54% of women could go alone to nearby friend or relative's home. While a little over a third of

women seldom needed permission to go to the bazaar based on a decision-making authority item.

Bivariate associations between gender-based power and sexual HIV risks

Men who had premarital sex were more likely to support an inequitable gender norm (64.5% vs. 56%, p<0.001). Similarly, men who had extramarital sex in the past year were more likely to endorse an inequitable gender norm (65.3% vs. 57.5%, p=0.02) (Table 2). While a marginally significant relationship was observed between men who supported an inequitable gender norm and their STI symptoms in the past year (64.6% vs. 57.7%, p=0.06).

Wives of men reporting recent extramarital sex were less likely to report control over a financial resource (61.1% vs. 67.7%, p=0.04), mobility (48.1% vs. 54.8%, p=0.046), and decision-making authority (69.0% vs. 77.9%, p=0.002). Similarly, wives of men reporting recent STI symptoms were less likely to report control over a financial resource (58.2% vs. 67.8%, p=0.006), mobility (45.5% vs. 54.8%, p=0.013), and decision-making authority (69.8% vs. 77.7%, p=0.01). Women's leniency was not associated with men's extramarital sex (31.8% vs. 31.9, p=0.979) and STI symptoms in the past year (26.5% vs. 32.1, p=0.103).

Confirmatory factor analysis and multivariate structural equation models

For the men's inequitable gender norms factor, the standardized factor loadings for the three observed indictors ranged from 0.3 to 0.9 (p<0.001) (Table 2). For the women's autonomy second-order factor, the standardized factor loadings of each dimension ranged from 0.5 to 0.8 (p<0.001) and the overall model fit was adequate (RMSEA=0.01, CFI=0.97, TLI=0.96). For each dimension, the standardized factor loadings of its respective indictors ranged from 0.4 to

0.9 ($p<0.001$) and demonstrated adequate model fit (results not shown). The confirmatory factors analysis results show that the indicator variables used to construct these gender-based power composite factors reliably measured men's inequitable gender norms and women's autonomy. The second-order factor model also validates grouping question items on women's autonomy by dimension then estimating the covariation among dimensions rather than lumping all the observed indicators on a single factor.

The fit indices of the structural equation model indicated good fit (RMSEA=0.04, CFI=0.95, TLI=0.95). Standardized parameter estimates for effect of socio-demographics on the gender-based power composite variables and outcomes of interest are reported in Table 3. The associations between measures of gender-based power and sexual HIV risks are reported in Table 4.

Direct effects of socio-demographics on gender-based power and sexual HIV risks

Men's age, education, and standard of living were not associated with their endorsement of inequitable gender norms (Table 3). Married women between the ages 25-29, 30-39 and over 40 years of age were more likely report autonomy compared to women between the ages 15-24. Women with 8-12 and over 12 years of education were more likely to report autonomy than women with no education.

Older men over 40 years of age were more likely to report premarital sex versus men 15-24 years of age. Men with a medium and high standard of living were also more likely to report premarital sex than men with a low standard of living. Men with 8-12 years of education were more likely to report extramarital sex compared to men with no education. Older men 30-39 years of age were more likely to report STI symptoms in the past year versus men 15-24 years of age.

Direct and indirect effects of gender-based power and sexual HIV risks

The sexual HIV risk factors men's premarital sex, extramarital sex, and STI symptoms were significantly and positively associated with each other. Men stating they had premarital sex were more likely to report extramarital sex in the past year (B=0.633, $p<0.001$). Men who had recent extramarital sex were more likely to experience STI symptoms in the past year (B=0.403, $p<0.001$) (Table 4).

Men's inequitable gender norms were positively associated with these sexual HIV risks. Directly, men reporting inequitable norms were more likely to report premarital sex (B=0.136, $p<0.01$). Men who endorsed inequitable gender attitudes were more likely to report recent extramarital sex, because they were more likely to report premarital sexual behavior (B=0.080, $p<0.01$). In addition, men's inequitable gender norms were associated with their recent STI symptoms due to their increased likelihood of reporting both premarital and recent extramarital sex (B=0.032, $p<0.01$).

On the other hand, women's autonomy was associated with decreased sexual HIV risks. Women with more autonomy were less likely to have husbands who reported extramarital sex in the past year (B=-0.122, $p<0.05$). More autonomous women were also less likely to have husbands who reported recent STI symptoms, given their spouses decreased likelihood of engaging in recent extramarital sex (B=-0.049, $p<0.05$).

Discussion

The study findings demonstrate that gender-based power is associated with sexual HIV risks among married men and women in North India. Men who endorse inequitable gender attitudes were more likely to be at increased risk of HIV infection along with their partners.

More autonomous women though were at decreased risk of HIV infection due to their husband's low risk sexual behavior.

The reason men's inequitable gender norms were associated with their premarital sex in this study may be because this type of sexual behavior is often high risk in India and therefore not necessarily predicated on respect for women. Research in Africa and America reports that men ascribing to gender-based power imbalances are more likely to engage in high risk sex and have negative perceptions of safe sexual behaviors.[44, 55, 73-75] Studies in India indicate that men's premarital sex includes paid sex, men who have sex with men, multiple sexual partners, and low condom use.[64, 65, 76-78] Our findings show that men reporting premarital sex were more likely to engage in extramarital sex and, in turn, experience STI symptoms in the past year which may indicate that their premarital sexual behavior was high risk though specific studies are needed in this area.

Our finding that women's autonomy is negatively associated with their husband's extramarital sex and STI symptoms in the past year is significant, because autonomy is one of the most extensively studied indicators of women's empowerment in reproductive health research, but has been largely ignored in HIV-based studies. The measure is associated with women's antenatal care uptake, family planning access, and contraceptive use.[70, 71, 79-82] Though woman's autonomy is dependent upon multiple individual and social factors, its presence points to a level of acceptance or negotiation between her and her husband regarding her interpersonal control. Therefore, the reason for our result may be that women afforded more financial control, mobility, leniency, and decision-making authority have more respectful and meaningful marital relations, which thereby decrease their husbands' likelihood of seeking sex outside of marriage.

Since we used structural equation modeling in this analysis, our findings through mediating variables demonstrate additional pathways by which gender-based power may influence men's and their partners' risk of HIV infection. Men who report inequitable gender attitudes and premarital sex were more likely to report extramarital sex. This may increase their risk of HIV infection given that among men indicating recent extramarital sex, 30.1% paid for sex, 33.5% had multiple non-regular partners, and 71.1% did not use a condom in their last non-regular sexual encounter. Our finding that men's inequitable gender norms, premarital sex, and recent extramarital sex increase their likelihood of experiencing STI symptoms may also lead to heightened HIV risk. More autonomous women, on the other hand, were at decreased risk of contracting HIV, because their husbands were less likely to report STI symptoms given their low risk sexual behavior.

Study strengths are the theoretical basis of the research questions posed and methodology used to test these questions. In 1976, Syme and Berkman suggested that optimal public health analyses for achieving population-level disease prevention may be identifying factors that affect individuals' general susceptibility to disease and intervening on these factors.[4] They defined such a factor as one that influences numerous health risks and outcomes, rather than a single risk factor, thereby increasing individuals' susceptibility to disease. This study attempts to apply Syme and Berkman's theory on social determinants of health using SEM to assess the effect of the broad construct gender-based power on India's HIV epidemic. SEM enabled us to measure the effect of multiple measures of gender-based power on multiple sexual HIV risks by using composite variables to reduce measurement error; simultaneously estimating associations; and measuring direct and indirect effects of variables.

A study limitation was the cross-sectional design. Since all study variables were collected at one time point, the directionality of any of our reported direct and indirect associations

cannot be confirmed. For example, we found that men's inequitable gender norms were positively associated with their premarital sex. However, it is equally plausible that men's premarital sexual behavior influenced their current gender attitudes. Based on theory, we hypothesized that men's current gender norms took shape prior to their premarital sexual behavior, but this assumption cannot be verified in this study along with all other associations reported.[83] Therefore, our findings simply indicate that the good fit of our analytic model is consistent with the data, but other models and assumptions may fit the data as well.

Other study limitations are the potential measurement issues posed by the men's inequitable gender norms factor and sexual HIV risk variables. First unlike the women's autonomy factor which was based on over twenty question items, the men's inequitable gender norms factor consisted of three items. This may limit the factor's validity. Second married men may have been less likely to report premarital and extramarital sex due to social desirability bias resulting in an underestimate of the observed effects. Finally, men's self-reported STI symptoms may have led to misspecification errors, because their symptoms were not confirmed by clinical testing. These study limitations may be overcome in future studies by applying longitudinal study designs that measure gender inequities and sexual behavior over time; utilizing tested scales on gender attitudes such as the GEM scale; and including clinical assessment of STIs.[55]

Programmatic implications

This study illustrates the importance of reducing sexual HIV risks in prevention programs by addressing social constructions of gender roles among men and women in North India. To date, the majority of HIV-related programs on changing sexual behavior are gender-blind or gender-neutral and focus on individual-level solutions.[56] Even gender-specific programs do not address underlying causes of gender differences in HIV risks. For example, female

condom distribution campaigns and microbicide development trials aim to empower women, but do not address gender-based power norms and behaviors that make female-centered contraception for HIV prevention necessary.[84]

In the United States, Brazil, and India, the few HIV-based programs that have aimed to transform inequitable gender beliefs among men and women have been effective and feasible in their target communites.[44, 47, 57-61] As Syme and Berkman's social determinants theory suggests, these interventions upon the broad factor gender-based power resulted in the reduction of multiple sexual HIV risk factors. Men were more likely to use condoms, less likely to commit sexual violence, indicated less paid sex, and reported fewer sexual partners.[44, 47, 61] Women were more likely to report condom use self-efficacy, have protected sex, and communicate about their sexual needs.[59, 60]

The current study highlights the importance of reducing men's sexual HIV risks by addressing their inequitable gender attitudes early in the life course. The relationships we observed between men's inequitable gender attitudes and premarital sex and between their premarital and extramarital sexual behavior indicate that it is critical to discuss gender relations and sexual behavior among young, unmarried men. Plus, the need for HIV-related youth interventions in India are becoming increasingly important as marriage occurs at older ages and men's exposure to premarital sex increases. Preventive HIV interventions among youth that focus on gender roles and HIV prevention could facilitate healthy development of unmarried men's conceptions of women, sex, and marriage. Another forum for decreasing men's sexual HIV risks may be through school-based sex education programs that integrate themes of gender equity in their curriculum.

The study results also demonstrate that improvements in women's autonomy may reduce their sexual HIV risks. Women's autonomy is influenced by various factors from social

institutions to marital relations. Programs that enable women to participate in the work force, own land, and receive an education may indirectly decrease their sexual HIV risks by improving their autonomy. These women may be more likely have healthy and meaningful sexual partnerships as a result of having more control and a sense of personal agency in their lives. Studies show that women who participate in micro-credit programs and have rights to property are less likely to experience HIV risks such as sexual violence and forced sex[85, 86]. Other programs for decreasing women's risk of HIV infection with respect to their husbands are marital counseling interventions. Previous programs in India administered sessions on ways for women to achieve greater autonomy inside and outside of the home; and ways for men to internalize equitable attitudes and behaviors towards their wives.[51] Given India's extensive governmental family planning program, such counseling interventions could be offered in its numerous urban and rural clinics.

Finally, the study findings not only suggest better ways to craft HIV prevention programs for men and women in India's general population, but more efficient ways to target these individuals for such interventions. Measures of gender-based power may be viable screening tools for HIV prevention programs in India. For example, programs may be more effective at reducing HIV spread in India's general population if they screen and target (1) married men who ascribe to inequitable gender role norms and report premarital sexual behavior; and (2) married women who report low autonomy. In sum, future HIV-based programs in India that address gender inequities as laid out here will likely be more effective in realizing large population-level risk-reductions that perpetuate the disease.

Figure 2.1: Analytic model

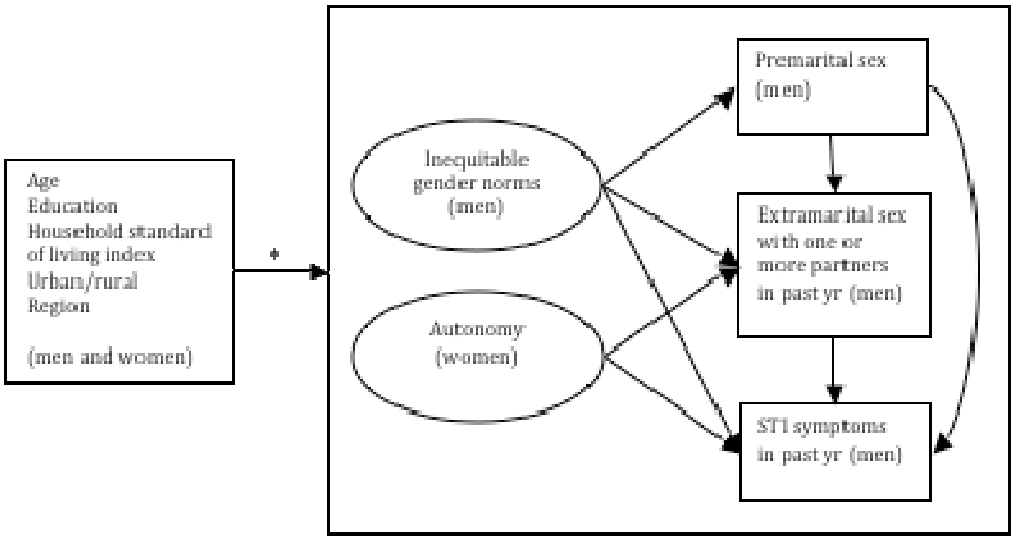


Table 2.1: Descriptive statistics on study sample, North India 2003

	Women n=3385 %	Men n=3385 %
Socio-demographics		
Age		
15-24	21.8	8.2
25-29	27.9	21.6
30-39	36.4	39.2
40+	13.9	31.1
Years of education		
0	45.9	22.0
Up to 8	24.6	25.9
8 to 12	17.6	32.2
12+	11.9	20.0
Economic level		
Low	20.8	20.8
Middle	51.9	51.9
High	27.4	27.4
Gender-based power		
Men's inequitable gender norms[1]		
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions	-	58.1
Agree, wife should always consult husband on any decision, large or small	-	82.7
Disagree, there is no harm if a wife goes out alone to go to a nearby friend or relative's home	-	48.1
Women's autonomy[2]		
Control over financial resources: Can spend money on small presents	67.3	-
Mobility: Can go alone to nearby friend or relative's home	54.3	-
Leniency: Seldom needs permission to go to the bazaar	31.9	-
Decision-making authority: Participates in buying pots and pans for the house	77.3	-
Sexual HIV risks		
Premarital sex	11.9	24.2
Extramarital sex in past year	2.9	7.1
No condom use during last extramarital sex in past year	-	71.1[3]
Two or more extramarital partners	-	33.5[3]
Paid sex in past year	-	2.2
Ever paid for sex	2.0	6.1
STI symptoms in past year	-	5.6

[1]reported by men only
[2]reported by men's wives only
[3] among men reporting extramarital sex (n=239)

Table 2.2: Standardized factor loadings for women's autonomy second-order factor and men's inequitable gender norms first-order factor, North India, 2003

	Factor loadings n=3385
Men's inequitable gender norms (first order factor)[1]	
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions	0.67***
Agree, wife should consult husband on any decision large or small	0.33***
Disagree, there is no harm if a wife goes out alone to go to a nearby friend or relative's house	0.91***
Women's Autonomy (second order factor)[2]	
Control over financial resources (first order factor)	0.80***
Mobility (first order factor)	0.67***
Leniency (first order factor)	0.55***
Decision-making authority (first order factor)	0.51***

*** p<0.001, ** p<0.01, * p<0.05
[1]reported by men
[2]reported by men's wives

Table 2.3: Proportions and chi-square p values for gender-based power and sexual HIV risks among married men, North India, 2003

	Sexual HIV Risks								
	Premarital sex			Extramarital sex in past year			STI symptoms in past year		
	yes %	no %	χ^2 p value	yes %	no %	χ^2 p value	yes %	no %	χ^2 p value
Gender-based power									
Men's inequitable gender norms (selected item)[1]									
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions	64.5	56.0	p<0.001	65.3	57.5	p = 0.02	64.6	57.7	p = 0.06
Women's autonomy (selected items)[2]									
Control over financial resources: Can spend money on small presents	-	-	-	61.1	67.7	p = 0.04	58.2	67.8	p = 0.006
Mobility: Can go alone to nearby friend or relative's home	-	-	-	48.1	54.8	p = 0.046	45.5	54.8	p = 0.013
Leniency: Seldom needs permission to go to the bazaar	-	-	-	31.8	31.9	p = 0.979	26.5	32.1	p = 0.103
Decision-making authority: Participates in buying pots and pans for the house	-	-	-	69.0	77.9	p = 0.002	69.8	77.7	p = 0.01
Sexual HIV risks									
Premarital sex	-	-	-	78.2	20.1	p<0.001	44.4	22.9	p<0.001
Extramarital sex in past year	-	-	-	-	-	-	26.5	5.9	p<0.001

*** p<0.001, ** p<0.01, * p<0.05

[1]reported by men

[2]reported by men's wives

Table 2.4: Standardized coefficients for socio-demographic factors associated with gender-based power and sexual HIV risks among married men and women, North India 2003

	Gender-based power		Sexual HIV risks		
	Men's inequitable gender norms[1]	Women's autonomy[2]	Premarital sex	Extramarital sex in past year	STI symptoms in past year
Age					
15-24	Ref	Ref	Ref	Ref	Ref
25-29	0.002	**0.191*** **	-0.024	-0.001	-0.041
30-39	-0.058	**0.306*** **	0.050	0.050	**-0.140***
40+	-0.055	**0.316*** **	**0.094*** **	-0.097	-0.096
Education					
0	Ref	Ref	Ref	Ref	Ref
Up to 8	0.023	0.023	-0.026	-0.051	-0.034
8 to 12	-0.022	**0.089*** **	-0.050	**-0.082***	-0.068
12+	-0.066	**0.149*** **	**-0.121*** **	-0.076	-0.153
Standard of living index					
Low	Ref	Ref	Ref	Ref	Ref
Middle	-0.006	**-0.047***	**-0.126*** **	0.093	-0.005
High	-0.005	-0.011	**-0.183*** **	0.091	0.043

*** p<0.001, ** p<0.01, * p<0.05 ; ns = not significant
[1]reported by men
[2]reported by men's wives

Table 2.5: Standardized coefficients for associations between gender-based power and sexual HIV risks among married men and women, North India 2003

	Sexual HIV risks				
	Premarital sex	Extramarital sex in past year		STI symptoms in past year	
	Direct	Direct	Indirect	Direct	Indirect
Gender-based power					
Men's inequitable gender norms[1]	**0.136****	ns	**0.080****	ns	**0.032****
Women's autonomy[2]	-	**-0.122***	-	ns	**-0.049***
Sexual HIV risks					
Premarital sex	-	**0.633*****	-	ns	**0.235*****
Extramarital sex in past year	-	-	-	**0.403*****	-

*** p<0.001, ** pequal to<0.01, * p<0.05 ; ns = not significant
Note: RMSEA=0.04; CFI=0.95; TLI=0.95
[1]reported by men
[2]reported by men's wives

CHAPTER 3

THE EFFECT OF GENDER-BASED POWER ON MARRIED WOMEN'S HIV/STI AWARENESS AND ACCESS TO CONDOMS IN NORTH INDIA

Introduction

Globally, women represent nearly half of all adults living with HIV. Thirty-eight percent of HIV cases in India are women [87]. The majority of these women is married, monogamous, and become infected from their husbands who are engaging in extra-marital high-risk sex. HIV infection rates range from 13% to 24% among married, monogamous women attending STI clinics in South India [25, 68, 88-90]. These women's primary risk factor is sex with their husbands who are engaging in extra-marital high-risk sex.

In North India, HIV prevalence is low but socio-economic factors position the region for potentially rapid HIV spread. Fertility and mortality rates are high; health and development indicators are low; and the health service infrastructure is poor in this region [11, 76]. Recently, North Indian districts with prevalence levels greater than 1% have emerged due to increasing rates of infection among bridging men. Over 1% of pregnant women were HIV-positive in three districts in Uttar Pradesh, North India, the country's most populous state and the site of this study [7, 9]. Married women's increasing risk of HIV infection in North India highlights the importance of identifying determinants that increase their susceptibility to HIV.

In India, fundamental factors that hinder married women from protecting themselves from HIV are their lack of awareness of STIs and low access to condoms. Though India has the

third largest HIV epidemic globally after South Africa and Nigeria,
women's HIV/STI awareness remains unacceptably low. Eighty-six percent of women in Nigeria compared to 57% of women in India have heard of HIV. Over 50% of Nigerian women versus 32% of Indian women have heard of syphilis or gonorrhea. Even lower than national estimates is North Indian women's awareness of HIV and other STIs. In UP, 40% of women have heard of HIV and 17% have heard of other STIs [76, 91].

While awareness of HIV and other STIs is not enough to prevent HIV transmission among women, it is a prerequisite. Lack of HIV awareness prohibits women from learning more about the disease, assessing their disease risk, engaging in risk-reduction behaviors, and preventing mother-to-child transmission. Lack of STI awareness hinders women from recognizing associated symptoms and receiving treatment to decrease their heightened risk of HIV infection. Studies show that STIs increase transmissibility of HIV by 3 to 5 times after controlling for sexual behavior [26]. Previous research on determinants of Indian women's awareness of HIV report the influential role of socio-demographic factors such as age and education, family planning use, and media access [92, 93]. Few studies in India have examined the effect of underlying social factors such as gender inequity on women's awareness of HIV and no study has examined its effect on women's awareness of other STIs [94].

In India, apart from women's low awareness of HIV and other STIs, women's limited access to condoms prevent them from protecting themselves from HIV. Though a majority of married Indian women are aware of what condoms are and where to get them, they are unable to get condoms for themselves due to social norms and negative perceptions of condoms use in

India [31]. Though by 2005 the Indian government distributed up to 1 billion condoms in its public and private sectors, ever condom use among married women remains low (13.9%) [95]. Among these women, over a third stated that they depend on their husbands to obtain them because they themselves do not [76]. Studies on condom use barriers among married women in India have primarily focused on condom negotiation with respect to husbands' condom attitudes and behaviors. However factors that hinder women's accessibility to condoms, which can also prevent condom negotiation between women and their husbands, have not been examined extensively in the subcontinent or elsewhere. Research on condom negotiation highlights the instrumental role of gender inequity in limiting women's condom bargaining power due to gender role norms and women's limited personal agency, or autonomy. However, the extent to which gender-based power influences women's ability to obtain condoms due to similar factors is not as well understood.

The current study aims to measure the effect of gender-based power on women's HIV/STI awareness and condom access by using multiple measures and employing structural equation modeling to minimize measurement error. The effect of two gender-based power measures that examined in this study were women's autonomy and men's inequitable gender norms. As shown in Figure 1, we investigated whether women's autonomy was positively associated with women's HIV/STI awareness and access to condoms. We also examined whether inequitable gender norms reported by women's husbands were negatively associated with these outcomes. The reported findings will ideally inform programs on HIV prevention including HIV risk awareness and condom distribution.

Methods

Study Population

The data were collected in 2003 from a probability sample of 3,385 married couples residing in UP and Uttaranchal (the former Hill district of UP), North India. The data are a part of a larger NIH-funded study that was based at the University of North Carolina – Chapel Hill. The aim of the study was to explore the potential for the spread of HIV in UP and Uttaranchal. The fieldwork for the survey was conducted by the Center of Population Studies at Banaras Hindu University (Varanasi, India). The data are representative of major cities and rural areas in UP and Uttaranchal. A multistage cluster sampling design was used to draw the sample of eligible couples. Further details are reported elsewhere [49]. The study sample included the total analytic sample of these data.

Outcomes Measures

Condom accessibility among women was measured by the question, "If you wanted to, could you get yourself a condom?" (0=no, 1=yes). To assess HIV awareness, women were asked, "Have you ever heard of a virus called HIV or an illness called AIDS?" (0=no, 1=yes). Women's awareness of other STIs was based on whether they had heard of syphilis (0=no, 1=yes).

Independent Measures

Gender-based power

Measures for gender-based power were constructed to indicate women's autonomy and men's inequitable gender norms. Women's autonomy refers to women's level of interpersonal control. Men's inequitable gender norms describe men's attitudes that constrict wives from expressing themselves freely or acting independently.

In the literature, women's autonomy has been operationalized by using variables for its multiple dimensions and extensively examined with respect to women's reproductive health [51]. Dimensions of autonomy examined in this study are (1) women's control over financial resources (5 items), (2) women's decision-making authority (6 items), (3) women's mobility (7 items), and (4) leniency afforded women (5 items). Questions were answered on a three or four point Likert scale. To test the effect of women's autonomy on our outcomes of interest, confirmatory factor modeling was used. The dimensions of women's autonomy were combined in a second-order confirmatory factor model to create a single composite variable. The composite variable preserved the integrity of the individual autonomy dimensions but also modeled their inter-relationships. This is important given extensive research indicating the distinct yet potentially correlated features of these dimensions. Further details regarding construction of the second-order women's autonomy factor are discussed elsewhere [52].

Confirmatory factor modeling was also used to quantify men's inequitable gender norms. These norms were measured by three observed indicators in a first-order factor model. Men were asked their level of agreement with the statements: (1) there is no harm if a wife sometimes disobeys her husband; (2) a wife should always consult her husband before making decisions, large or small; and (3) there is no harm if a wife goes out alone to a nearby friend/relative's house. The question items were answered on a four point scale (1=strongly agree, 2=agree, 3=disagree, 4=strongly disagree) but were examined as binary variables (1=strongly agree and agree, 0=strongly disagree and disagree). For items 1 and 3, responses were recoded so that on all items a score of 1 indicated men supported inequitable gender norms and a score of 0 meant they did not.

Socio-demographics

Socio-demographic factors included in the study were age, educational level, economic status, area of residence, and region. Age was categorized into four 10-year age groups. Levels of education used were 0 years, up to 8 years, 8 to 12 years, and over 12 years of schooling. The standard of living index created was modeled after that measured by population-based surveys conducted in India known as the Demographic Health Surveys (DHS). Levels of standard of living were categorized as low, middle, and high based on summed scores and thresholds established in DHS. Type of residence was either urban or rural. Region was divided into five areas: western, central, bundelkhand, eastern, and hill (present day Uttaranchal).

Bivariate analyses

Chi-square tests were conducted to assess differences in gender-based power by women's HIV/STI awareness and access to condoms. To run the chi-square tests, a single item was examined from each dimension of the women's autonomy factor, and a single item was selected from the men's inequitable gender norms factor. Since response options for the women's autonomy questions were ordinal, they were dichotomized to make interpretation of the chi-square results easier. Women who reported "always", "often", or "sometimes" having control over financial resources or decision-making authority were compared to women who reported "never". For the mobility dimension, women who reported they could move outside of their home "alone" were compared to women who "never" could or had to be accompanied by "someone". For the leniency dimension, women who had to seek permission to engage in certain activities "sometimes" or "never" were compared to women who had to seek permission "often" or "always". Analyses were conducted in STATA version 9.0.

Multivariate structural equation modeling analyses

SEM analyses followed a two-step process. First confirmatory factor analyses were

conducted to estimate the validity and reliability of the two composite factors measuring gender-based power, women's autonomy and men's inequitable gender norms. Since women's autonomy was treated as a second-order factor, we first determined if the question items for each dimension loaded well on that dimension and demonstrated adequate model fit. Then the shared covariance of all four dimensions on the second-order autonomy factor was evaluated according to their factor loadings along with model fit. To estimate the men's inequitable gender norms factor, the factor loadings of its observed indicators were examined.

Second, a structural equation model was specified to test the hypothesized relationships shown in Figure 1. The relative strength, sign, and statistical significance of the standardized parameter estimates were assessed. The default estimation method in most structural equation modeling programs is maximum likelihood. An underlying assumption of this method is multivariate normality of observed variables. However, our data violates this assumption, since all of our observed variables were ordinal or binary. Therefore, parameters were estimated by weighted least squares using robust standard errors and mean- and variance-adjusted chi square test statistics (WLSMV). Previous work has shown WLSMV can be used with categorical outcomes [53]. Missing data were relatively small and list-wise deletion was used.

Three fit indices were used to evaluate model fit: comparative fit index (CFI), Tucker Lewis index (TLI), and the root mean square error of approximation (RMSEA). General standards in the literature indicating adequate model fit are if the CFI and TLI are greater than 0.90 and the RMSEA is less than 0.06 [53]. Analyses were conducted in Mplus version 5.0.

Results

Description of study population

A larger percentage of women were younger than 24 and a smaller percentage were 40 or older compared to men in the study sample (Table 1). Over 45% of women versus 22% of men had no education. Over half of couples were in middle standard of living households.

Substantially, fewer women had heard of HIV (57.8%) and syphilis (14.4%) compared to men. Among women and men that had heard of condoms, almost 94% of women and 99% of men knew where to get a condom. However only 4.4% of women reported they could get a condom for themselves.

Selected items illustrate marked variations in married women's autonomy by dimension. With respect to women's control over financial resources, only 7.1% could spend money on large household purchases without asking anyone. A question item from the mobility dimension indicated that 11% of women could go alone to a market in another village. According to a leniency item, a little over 20% of women seldom needed permission to visit an acquaintance in another village. A decision-making authority item showed that up to 77% of women could participate in buying pots and pans for the house. Between 48% and 83% of men reported an inequitable gender norm.

Bivariate associations between gender-based power and women's HIV/STI awareness and condom access

As shown in Table 2, most of the selected items from the women's autonomy dimensions were positively associated with women's HIV/STI awareness and condom access. Women's husbands who reported an inequitable gender norm, however, was not consistently associated with all outcomes. Women aware of HIV were more likely to report control over a financial resource (10.0% vs. 3.1%, $p < 0.001$), greater mobility (13.1% vs. 8.1%, $p < 0.001$), and decision-making authority (80.7% vs. 72.7%, $p < 0.001$). Women who had heard of syphilis were more likely to report control over a financial resource (12.7% vs. 6.2%, $p < 0.001$) and decision-

making authority (85.2% vs. 76.0%, $p < 0.001$). Condom access among women was positively associated with control over a financial resource (13.6% vs. 7.3%, p=0.009), leniency (36.0% vs. 19.2%, $p < 0.001$), and decision-making authority (85.6% vs. 77.3%, p=0.03). Husbands of women aware of HIV were less likely to report an inequitable gender norm (56.5% vs. 60.3%, p=0.03).

Mobility was not associated with STI awareness among women (13.2% vs. 10.6%, p=0.10) and condom access (15.2% vs. 11.4%, p=0.20). Leniency was not associated with HIV awareness (20.7% vs. 20.0%, p=0.61) and STI awareness (24.1% vs. 19.8%, p=0.06). No relationship was observed between women's husbands who reported an inequitable gender norm and women's awareness of syphilis (58.9% vs. 58.0%, p=0.71) and access to condoms (51.2% vs. 58.5%, p=0.11).

Confirmatory factor analyses and multivariate structural equation models

The confirmatory factors analysis results show that the indicator variables used to construct these gender-based power composite factors reliably measured women's autonomy and men's inequitable gender norms (Table 3). The standardized factor loadings of the dimensions on the second-order women's autonomy factor ranged from 0.5 to 0.8 ($p<0.001$) and the overall model fit was adequate (RMSEA=0.01, CFI=0.97, TLI=0.96). For each of the four women's autonomy dimensions, the standardized factor loadings of their respective indictors ranged from 0.4 to 0.9 ($p<0.001$) and demonstrated adequate model fit (results not shown). For the men's inequitable gender norms factor, the standardized factor loadings for the three observed indictors ranged from 0.3 to 0.9 ($p<0.001$). The confirmatory factors analysis results show that the indicator variables used to construct these gender-based power composite factors reliably measured women's autonomy and men's inequitable gender norms. The second-

order factor model also validates grouping question items on women's autonomy by dimension then estimating the covariation among dimensions rather than lumping all the observed indicators on a single factor.

The fit indices of the structural equation model indicated good fit (RMSEA=0.01, CFI=0.97, TLI=0.96). Standardized parameter estimates for effect of socio-demographics on the gender-based power composite variables and outcomes of interest are reported in Table 4. The associations between measures of gender-based power and women's HIV/STI awareness and condom access are reported in Table 5.

Associations between selected socio-demographics and gender-based power, women's HIV/STI awareness, and women's condom access

Married women between the ages 25-29, 30-39 and over 40 years of age were more likely report autonomy compared to women between the ages 15-24 (Table 4). Women with 8-12 and over 12 years of education were more likely to report autonomy than women with no education. Men's age, education, and standard of living were not associated with their endorsement of inequitable gender norms.

Married women's age, educational level, and standard of living was associated with their awareness of HIV. Awareness of syphilis was associated with women's educational level and standard of living. Older women between the ages 25-29, 30-39 and over 40 years of age were less likely to have heard of HIV compared to women between the ages 15-24. Women with at least 8, between 8-12, and over 12 years of education were more likely have heard of HIV and syphilis than women with no education. Women with a medium and high standard of living were also more likely to have heard of HIV and syphilis as compared to women with a low standard of living.

Associations between gender-based power and condom access, and HIV/STI awareness

Women with more autonomy were more likely to have heard of HIV (Beta=0.143, $p<0.001$), heard of syphilis (Beta=0.144, $p<0.001$), and report condom access (Beta=0.256, $p<0.001$) after controlling for socio-demographic factors (Table 5). Women's husbands who reported inequitable gender norms did not influence women's HIV/STI awareness or access to condoms.

Discussion

This study moves beyond analyses that examine the influence of single item measures of gender-based power on proximal HIV risk factors (e.g., sexual behavior). Rather our research on determinants of HIV/STI awareness and condom access among married Indian women shed light on the impact of multi-dimensional measures of gender inequity on distant HIV risk factors, which act as a gateway to exposing women to a host of other HIV-related risks. Numerous studies and newspaper headlines in India have highlighted the unexpected spread of HIV among married, monogamous women and the role of gender-based power in fueling their HIV risk [48, 68, 96]. However, little research has comprehensively examined the impact of gender-based power on Indian women's susceptibility to HIV.

Our finding that women's autonomy is associated with their awareness of HIV and other STIs in India extends research demonstrating that individual items from dimensions of women's autonomy are associated with women's HIV-related knowledge [94, 97]. The results show that women's autonomy not only influences women's understanding of HIV transmission, but also their basic awareness of the disease. This study is also the first to illustrate that women's level of autonomy influences their awareness of other STIs such as syphilis. More autonomous women

are more likely to be aware of HIV and other STIs, because they are more likely to have increased access to health-related information. These findings are important because Indian's women's levels of HIV/STI awareness are among the lowest in the world, and the country has the third largest epidemic globally [76]. Women's lack of HIV/STI awareness prevents them from conceptualizing their own HIV risk, adopting appropriate risk-reduction behaviors, and seeking treatment. While the impact of India's HIV IEC campaign is insufficient to date, NACO's recent budget increase from US$460 million (2000-2006) to US$2.5 billion (2007-2011) holds promise in improving HIV/STI awareness in the country [95]. As shown in this study, factors such as women's autonomy that robustly increase women's probability of being aware of HIV and other STIs need to be addressed in programs moving forward, especially in low prevalence but potentially high risk settings such as North India.

The positive relationship we found between women's autonomy and condom access reinforces the critical role of gender-based power in broader issues related to condom negotiation among married women in India. More autonomous women may be more likely to access condoms, because they feel entitled, less embarrassed, and undeterred by negative societal perceptions regarding condom use. On the other hand women with lower autonomy may feel they cannot obtain condoms, because of societal perceptions that condom use and sexual matters in general are men's purview, not women's [31]. Though our findings relate to women's access to male condoms, they may also be applicable to their access to female condoms for the same reasons noted above. A recent explosion of studies and program funding for female condoms has occurred globally as well as in India, but again little attention has been given to women's potential access barriers to female condoms [98, 99]. While female condoms can empower married women by enabling them to protect themselves from HIV without needing to consult their husbands, our results suggest that women must be empowered from the outset to even

obtain these condoms. Therefore, programs aimed at distributing male or female condoms among married women may be most effective if they also addressed gender inequity in order to improve condom uptake. Condom advertisements can actively integrate gender-empowerment messages that destigmatize condom use in Indian society and promote women's decision-making in sexual matters. Condom promotion campaigns can overcome barriers for less autonomous women by providing condoms for free and in private, accessible locales.

Sex education and family planning programs in India are other possible arenas in which to address women's autonomy in order to increase HIV/STI awareness and condom access. Recently, India's family planning program has sought to integrate HIV awareness and prevention efforts with its activities [100]. Attention to women's autonomy in this context would go hand in hand promoting not only HIV/STI awareness and condom access but reproductive health in general. In addition since sex education in Indian schools has been in place for adolescent girls and boys since the 1990s, it is another viable venue to promote gender equitable themes and improve HIV/STI awareness and condom accessibility in India.

In these data, inequitable gender norms as reported by women's husbands were not associated with women's HIV/STI awareness or condom access. This is most likely due to the outcomes' close relationship with women's personal agency. For example, women's access to HIV/STI awareness information and condoms would more directly depend on women's mobility, a dimension of women's autonomy, than their husband's attitudes regarding gender inequity. Rather married men's inequitable gender norms may be more closely associated with their own HIV risks which would indirectly influence their wives' risk of infection. Interestingly, these two domains, women's autonomy and men's inequitable gender norms, were uncorrelated between each other (results not shown). These findings support Wingood and DiClemente's theory on gender-based power and the HIV epidemic. The authors state that gender inequities

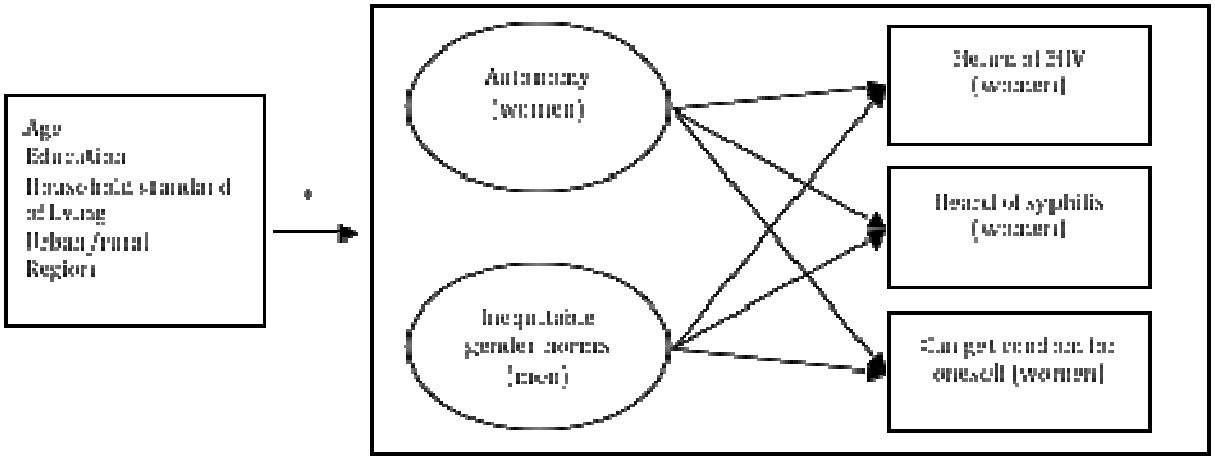
regarding control and expected norms independently and uniquely determine HIV risks and exposures, because they capture different facets of the complex risk factor "gender-based power" [83]. This is important to consider in HIV-related programs and research tackling gender inequities, because most programs fail to acknowledge that different aspects of gender-based power alternately influence different HIV risk factors. Programs aware of these nuances can improve their impact by targeting each facet of gender-based power specifically and comprehensively.

A major strength of the present study is the use of multiple measures of gender-based power to assess its broad effect on women's HIV/STI awareness and condom access. It is standard in public health to measure the effect of social determinants such as socio-economic status (SES) with respect to income, education, and occupation, not by just one of these indicators. Similarly as done in this study, analyses on the influence of gender-based power on sexual and reproductive health (SRH) should utilize diverse measures from the perspective of men and women in order to better understand the complex effect of gender inequities on SRH outcomes such as HIV. Another strength of our study was the use of structural equation modeling to simultaneously assess the effect of women's autonomy and men's inequitable gender norms on our outcomes of interest. Studies using other types of multivariate analyses such as logistic regression to test the effect of gender-based power on SRH typically must run separate models for each measure of gender-based power or, compose scales lumping related items together in a single measure. The downside of running separate models for different indicators is that studies are unable to isolate the effect of a given indicator by controlling for all others. Also a disadvantage of aggregating related items together in one scale is that this may introduce measurement error. Structural equation modeling overcomes both these limitations by allowing different measures to be tested in one model without running separate models. The

method also permits the construction of factors to estimate covariance among related items which reduces measurement error. In our study, we composed two factors and controlled for the effect of one while testing for the effect of the other. This gave us a more accurate picture of the effect of gender-based power on HIV/STI awareness and condom access.

Study limitations are the cross-sectional study design and limited questions for measuring men's inequitable gender norms. The women's autonomy factor was constructed from question items that have been applied in the field of reproductive health since the 1980s [70, 71, 101]. The items used for the men's inequitable gender norms factor though were conceived of from previous research in UP before any scales were developed in the field. Recently, Pulerwitz and colleagues constructed the GEM scale to measure men's inequitable gender norms and tested its internal and external validity in HIV-based studies and programs [55]. While in this study the men's inequitable gender norms factors was not associated with women's HIV/STI awareness and condom access, in future studies application of the GEM scale may help verify these associations.

Figure 3.1: Analytic Model



*Regression associations tested between each socio-demographic factor and each study variable. Both men's and women's socio-demographics were included and related to the appropriate men's and women's study variables.

Table 3.1: Descriptive statistics of study population, North India 2003

	Women n=3385 %	Men n=3385 %
Socio-demographics		
Age		
15-24	21.8	8.2
25-29	27.9	21.6
30-39	36.4	39.2
40+	13.9	31.1
Years of education		
0	45.9	22.0
Up to 8	24.6	25.9
8 to 12	17.6	32.2
12+	11.9	20.0
Economic level		
Low	20.8	20.8
Middle	51.9	51.9
High	27.4	27.4
Gender-based power		
Women's autonomy[1]		
Control over financial resources: Can spend money on almari, bed, or fan	7.1	-
Mobility: Can go alone to bazaar in another village	11.0	-
Leniency: Seldom need permission to go to friend or relative's home in another village	20.4	-
Decision-making authority: Participates in buying pots and pans	77.3	-
Men's inequitable gender norms[2]		
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions	-	58.1
Agree, wife should always consult husband on any decision, large or small	-	82.7
Disagree, there is no harm if a wife goes out alone to go to a nearby friend or relative's home	-	48.1
HIV/STI awareness		
Heard of HIV	57.8	81.2
Heard of syphilis	14.4	31.7
Access to condoms		
Know where to get condom	93.8[3]	99.0[3]
If wanted to, could get condom for yourself	4.4[3]	-

[1]reported by women

[2]reported by women's husbands

[3]among respondents who had heard of condoms (n=2848 women, n=3328 men)

Table 3.2: Standardized factor loadings for women's autonomy second-order factor and men's inequitable gender norms first-order factor, North India, 2003

	Factor loadings n=3385
Women's Autonomy (second order factor)	
Control over financial resources (first order factor)[1]	0.80***
Mobility (first order factor)[1]	0.67***
Leniency (first order factor)[1]	0.55***
Decision-making authority (first order factor)[1]	0.51***
Men's inequitable gender norms (first order factor)	
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions[2]	0.67***
Agree, wife should consult husband on any decision large or small[2]	0.33***
Disagree, there is no harm if a wife goes out alone to go to a nearby friend or relative's house[2]	0.91***

*** p<0.001, ** p<0.01, * p<0.05
[1]reported by women
[2]reported by women's husbands

Table 3.3: Proportions and chi-square p values for gender-based power by HIV/STI awareness and condom access among married women, North India, 2003

	HIV/STI awareness						Condom access		
	Heard of HIV			Heard of other STIs			Can get condom for oneself		
	yes %	no %	χ^2 p value	yes %	no %	χ^2 p value	yes %	no %	χ^2 p value
Gender-based power									
Women's autonomy (selected items)									
Control over financial resources: Can spend money on almari, bed, or fan[1]	10.0	3.1	p < 0.001	12.7	6.2	p < 0.001	13.6	7.3	p = 0.009
Mobility: Can go alone to bazaar in another village[1]	13.1	8.1	p < 0.001	13.2	10.6	p = 0.097	15.2	11.4	p = 0.197
Leniency: Seldom need permission to go to friend or relative's home in another village[1]	20.7	20.0	p = 0.610	24.1	19.8	p = 0.057	36.0	19.2	p < 0.001
Decision-making authority: Participates in buying pots and pans for the house[1]	80.7	72.7	p < 0.001	85.2	76.0	p < 0.001	85.6	77.3	p = 0.029
Men's inequitable gender norms (selected item)									
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions[2]	56.5	60.3	p = 0.027	58.9	58.0	p = 0.711	51.2	58.5	p = 0.106

*** p<0.001, ** p<0.01, * p<0.05
[1]reported by women
[2]reported by women's husbands

Table 3.4: Standardized coefficients for socio-demographic factors associated with gender-based power, HIV/STI awareness, and condom access among married men and women, North India 2003

	Gender-based power		HIV/STI awareness		Condom access
	Women's autonomy[1]	Men's inequitable gender norms[2]	Heard of HIV	Heard of syphilis	Can get condom for oneself
Age					
15-24	Ref	Ref	Ref	Ref	Ref
25-29	**0.190*** **	0.019	**-0.061** **	-0.001	0.054
30-39	**0.305*** **	-0.038	**-0.109** **	-0.008	0.069
40+	**0.314*** **	-0.044	**-0.145*** **	-0.016	0.00
Education					
0	Ref	Ref	Ref	Ref	Ref
Up to 8	0.023	0.034	**0.155*** **	**0.106*** **	0.034
8 to 12	**0.088*** **	-0.015	**0.292*** **	**0.127*** **	0.073
12+	**0.148*** **	-0.057	**0.364*** **	**0.146*** **	0.032
Standard of living index					
Low	Ref	Ref	Ref	Ref	Ref
Middle	-0.047	-0.008	**0.193*** **	**0.151** **	-0.048
High	-0.011	-0.007	**0.269*** **	**0.168*** **	-0.092

*** p<0.001, ** p<0.01, * p<0.05 ; ns = not significant
[1]reported by women
[2]reported by women's husbands

Table 3.5: Standardized coefficients for associations between gender-based power, HIV/STI awareness, and condom access among married women, North India 2003

	HIV/STI awareness		Condom access
	Heard of HIV	Heard of syphilis	Can get condom for oneself
Gender-based power			
Women's autonomy[1]	0.143***	0.144**	0.256***
Men's inequitable gender norms[2]	ns	ns	ns

*** p<0.001, ** p<0.01, * p<0.05 ; ns = not significant
Note: RMSEA=0.06, CFI=0.97, TLI=0.96
[1]reported by women
[2]reported by women's husbands

CHAPTER 4

THE EFFECT OF GENDER-BASED POWER ON HIV STIGMA AND HIV FACILITY TESTING AWARENESS AMONG MARRIED MEN AND WOMEN IN NORTH INDIA

Introduction

India ranks third in the number of people living with HIV/AIDS followed by South Africa and Nigeria [7]. In 2005, UNAIDS Director Peter Piot stated that HIV-related stigma and discrimination is India's foremost barrier to carrying out effective HIV prevention and treatment efforts [102]. Little research has examined factors associated with HIV stigma and its potential impact on HIV programs in the subcontinent such as volunteer counseling and testing (VCT).

The primary purpose of the current study was to examine the effect of gender-based power on HIV stigma and facility testing awareness among men and women in North India. In addition, the inter-relationships among gender-based power, HIV knowledge, HIV stigma, and HIV facility testing awareness were examined. The study utilizes structural equation modeling and a couples-based study design to strengthen the reported findings. The study setting is Uttar Pradesh (UP), North India, where over 0.1 million people are living with HIV/AIDS (PLHA) and increased disease spread has occurred [7, 8]. Since UP is India's most populous state and only five countries in the world are greater in size, a small increase in its HIV prevalence rate can profoundly affect the national and global epidemic [9]. We hope the study findings will inform information, education, communication (IEC) campaigns, stigma-reduction interventions, and VCT programs among men and women in the general population of North India.

Background

HIV stigma

HIV stigma has detrimental consequences on HIV prevention and treatment efforts. In India, many PLHA do not disclose their status, seek treatment, or have access to information on risk-reduction behaviors due to HIV stigma [41, 95, 103]. HIV stigma is defined by perceived stigma, which captures PLHA's fear of being discriminated against, and enacted stigma, which measures PLHA's discriminatory experiences. Among PLHA in India, levels of perceived and enacted stigma are high. One study reported that 97% of PLHA feared being stigmatized and 26% had experienced stigma [104]. Enacted stigma towards PLHA can be severe, occur in various contexts, and differ by gender [43]. A study in India found that 20% of HIV-positive men and women were refused care from a health care worker, lost their job, and felt discriminated against by family members. In addition, ten percent of HIV-positive Indian women were coerced to abort their babies or be sterilized [105]. Another study reported that 23% of pregnant HIV-positive women were beaten or abused by their in-laws while their HIV-positive husbands were not subjected to this treatment [42].

Studies on HIV stigma in India's general population corroborate PLHA's experiences. One study reported that 34% of college students in South India felt HIV-positive individuals should kill themselves [40]. A study in North India found that over 30% of respondents would not have dinner with or continue to work with an HIV-positive individual and 50% believed all PLHA should be quarantined [106]. India's most recent nationally representative survey, the National Family Health Survey (NFHS 2005-2006), reported that up to 60% of men and women expressed stigmatizing attitudes towards PLHA [76]. A major factor associated with HIV stigma is HIV knowledge. A number of small-scale studies indicate that misconceptions regarding HIV transmission are associated with HIV stigma [40, 106-109]. However few population-based studies in

India have systematically analyzed potential determinants of HIV stigma such as gender-based power and HIV knowledge; and programmatic barriers HIV stigma poses with respect to HIV testing.

HIV testing

Another major barrier in preventing HIV spread globally is the large number of PLHA unaware of their status. PLHA's knowledge of their status is associated with decreased high-risk sexual behaviors and increased treatment-seeking [110, 111].

In India just 13% of PLHA are aware of their status. VCTCs were accessed by 2.1 million clients compared to 24 million clients in Nigeria [112, 113]. Consistent with research in Africa, small-scale studies in India indicate that barriers to HIV testing are HIV stigma and low knowledge of HIV. A study reported that 13.2% of women not tested compared to 46.2% of women tested for HIV had correct knowledge of the disease [114]. Another study found in a sample of South Indian women, that a majority feared stigma and discrimination following testing. If HIV-positive, 60.3% felt their husbands would take their children away from them and over 43.9% felt their husbands would leave them or kick them out of their home [115].

While India's VCTC program has expanded since 2000, most individuals remain unaware of facilities that provide HIV testing services [29, 76]. In UP, the number of VCTCs increased 15 fold between 2000 and 2006 yet only 25% of men and women were aware of a facility that provided HIV testing [116]. While awareness of HIV testing services does not guarantee an individual will get tested, it is a necessary prerequisite. In South India, Sinha *et al.* found that 80% of antenatal women were unaware of a HIV testing facility as compared to women that had been tested [114]. It is unclear if HIV stigma impairs HIV facility testing awareness to the extent that it impairs HIV testing behavior. Therefore in India, further research examining factors associated

with HIV facility testing awareness is needed as a first step to increase utilization of HIV testing services.

Gender-based power

Gender-based power imbalance is recognized as an underlying cause of the HIV epidemic globally [51, 83, 117]. Though such imbalances are culturally defined, they commonly result in the unequal provision of control and decision-making between men and women. Substantial research has focused on the effect of gender-based power measured with respect to women on their HIV risk, attitudes, knowledge, and behaviors [118-122]. Studies in India report that gender inequity is associated with women's low HIV knowledge, inability to negotiate condom use, low perceived risk of contracting HIV, and increased sexual violence [30, 94, 96, 123, 124]. Fewer HIV-based studies have measured gender-based power as expressed by men. In addition, most focus on the relationship between gender-based power and men's sexual behavior, not men's HIV-related attitudes or knowledge [125-127].

No study in India or elsewhere has examined the affect of gender-based power on broader HIV-related programmatic barriers such as HIV stigma and testing among either men or women. Theoretical papers by Link and Phelan (2001) and Parker and Aggleton (2003) suggest that HIV stigma is more broadly associated with power [128, 129]. Inequitable gender attitudes may be associated with other prejudicial attitudes such as HIV stigma. In addition just as gender inequity is associated with low HIV knowledge, it may also be associated with low awareness of HIV testing services. The current study investigates these relationships.

Study population

The data were collected in 2003 from a probability sample of 3,385 married couples residing in UP and Uttaranchal (the former Hill district of UP), North India. The data are a part of a larger NIH-funded study that was based at the University of North Carolina – Chapel Hill. The aim of the study was to explore the potential for the spread of HIV in UP and Uttaranchal. The fieldwork for the survey was conducted by the Center of Population Studies at Banaras Hindu University (Varanasi, India). The data are representative of major cities and rural areas in UP and Uttaranchal. A multistage cluster sampling design was used to draw the sample of eligible couples. Further details are reported elsewhere [49].

UP and Uttaranchal together comprise at least 17% of the total Indian population, at approximately 175 million people. UP is India's most populous state and only five countries (i.e., China, India, the United States, and Indonesia) have a population larger than the state. Though HIV prevalence is low, this area of North India is considered especially vulnerable to HIV spread because health outcomes and socioeconomic levels are among the worst in the country. Fertility and mortality rates are higher relative to most other states and the health service infrastructure is poor.

The study sample for our analysis was married men (n=2789) and women (n=1955) who had heard of HIV and their respective spouses.

Measures

HIV facility testing awareness

Respondents were asked if they knew a hospital or clinic where they could get an HIV test (0=yes, 1=no or don't know). Responses of "don't know" were counted as not knowing where to get a HIV test.

HIV facility testing awareness was examined because testing services are under-utilized in India. Therefore, we wanted to assess factors that influence basic awareness of testing services as an initial step to identifying barriers of VCT uptake in India.

HIV stigma

HIV stigma was assessed with two questions widely used in the Demographic Health Surveys and in surveys by UNAIDS [50]. The question item used to indicate general HIV stigma asked if respondents were willing to buy food from an HIV-positive food seller/shopkeeper (0=yes, 1=no). The question item used to indicate family HIV stigma asked if respondents would keep an HIV-positive family member's status secret (1=yes, 0=no). Responses of "don't know" were recoded as missing. Responses indicating one would not buy food from an HIV-positive food seller or would want to keep a HIV-positive family member's status secret were considered expressions of HIV stigma.

Both types of HIV stigma were examined to assess whether they were differentially or similarly associated with gender-based power, HIV knowledge, and HIV facility testing awareness. Stigma towards PLHA in the general population may be conceptualized as a mild form of HIV stigma while stigma towards a family member, an extreme form of HIV stigma.

With respect to don't know responses, men reporting don't know to the general HIV stigma question (n=264) and family HIV stigma question (n=213) were younger, less educated, and of lower socio-economic status than men who reported stigmatizing attitudes on these items. Women reporting don't know to the general HIV stigma question (n=251) and family HIV stigma question (n=179) were less educated and of lower socio-economic status than women who reported stigmatizing attitudes on these items (results not shown)

HIV knowledge

Correct HIV knowledge was based on the single question item: knowing a condom can prevent HIV infection if used correctly every time one has sex (0=no or don't know, 1=yes). Responses of "don't know" were counted as a wrong answer.

This single item was used to gauge HIV knowledge, because condoms play such a prominent role in HIV prevention programs. We also wanted to detect whether knowledge that HIV was associated with sexual transmission would increase the likelihood of HIV stigma.

Gender-based power

Gender-based power was defined by men's inequitable gender norms, which was measured as a composite factor by three observed indicators. The indicators described men's support of beliefs that constrict wives from expressing themselves freely or acting independently. Men were asked their level of agreement with the statements: (1) there is no harm if a wife sometimes disobeys her husband; (2) a wife should always consult her husband before making decisions, large or small; (3) there is no harm if a wife goes out alone to a nearby friend/relative's house. The question items were answered on a four point scale (1=strongly agree, 2=agree, 3=disagree, 4=strongly disagree) but were examined as binary variables (1=strongly agree and agree, 0=strongly disagree and disagree). For items 1 and 3, responses were recoded so that a score of 1 indicated men supported inequitable gender norms and a score of 0 meant they did not.

Gender-based power was measured according to men's attitudes as opposed to women's, because men's roles in Indian society may uniquely affect HIV stigma and testing efforts. Indian men typically inhabit positions of power and are primary decision-makers in families and the work place.

Socio-demographics

Five socio-demographic factors were selected, because they have been shown to be associated with HIV knowledge, gender-based power, HIV stigma, and HIV facility testing awareness. These were age, educational level, economic status, area of residence, and region.

Age was categorized into four 10-year age groups. Level of education was categorized 0 years, up to 8 years, 8 to 12 years, and over 12 years of schooling. A standard of living index modeled after what was used for the NFHS-2 was created. Levels of standard of living were categorized as low, medium, and high based on summed scores and thresholds established in the DHS. Type of residence was either urban or rural. Region was categorized into five areas: western, central, bundelkhand, eastern, and hill (present day Uttaranchal).

Analysis plan

Chi-square tests were conducted to test for (1) differences in gender-based power by HIV knowledge, HIV stigma, and HIV facility testing awareness; (2) differences in HIV knowledge by HIV stigma and HIV facility testing awareness; and (3) differences in HIV stigma by HIV facility testing awareness. One of the three items that defined the men's inequitable gender norms factor was used for the Chi-square tests described in (1). Analyses were conducted in STATA version 9.0.

SEM was preformed by a two-step process to test our analytic model integrating gender-based power, HIV knowledge, HIV stigma, and HIV facility testing awareness while controlling for socio-demographics (Figure 1). First confirmatory factor analyses were conducted to estimate the composite variable for gender-based power, men's inequitable norms. We determined if the three observed indicators demonstrated adequate construct validity on this

composite factor based on the magnitude and significance of their factor loadings. Second, a structural equation model was specified to test whether the hypothesized relationships shown in Figure 1 adequately represented the variables' covariance structure. The model shown in Figure 1 was tested separately for men and women. In the men's model, gender-based power expressed by men was examined with respect to men's HIV knowledge, stigma, and facility testing awareness. Only men's socio-demographics were included in this model. In the women's model, their husband's gender-based power was examined with respect to their own HIV knowledge, stigma, and facility testing awareness. Therefore both men's and women's socio-demographics were included in the women's model and related to the appropriate men's and women's variables. Direct and indirect effects of all variables in our analytic model were estimated. The relative strength, sign, and statistical significance of the standardized parameter estimates were assessed. Direct effects refer to coefficients measuring the association between two variables unmediated by any other variables. Indirect effects are the product of all coefficients between two variables with one or more intervening variables.

The default estimation method in most structural equation modeling programs is maximum likelihood. An underlying assumption of this method is multivariate normality of observed variables. However, our data violates this assumption, since all of our observed variables were binary. Therefore, parameters were estimated by weighted least squares using robust standard errors and mean- and variance-adjusted chi square test statistics (WLSMV). Previous work has shown WLSMV can be used with categorical outcomes [53]. Missing data was relatively small and list-wise deletion was used.

Three fit indices were used to evaluate model fit: comparative fit index (CFI), Tucker Lewis index (TLI), and the root mean square error of approximation (RMSEA). General

standards in the literature indicating adequate model fit are if the CFI and TLI are greater than 0.90 and the RMSEA is less than 0.06 [53]. Analyses were conducted in Mplus version 5.0.

We examined an analytic model integrating gender-based power, HIV stigma, and HIV facility testing awareness and included salient factors such as HIV knowledge and socio-demographics (Figure 1). We proposed that gender-based power was directly associated with HIV knowledge. HIV knowledge was directly associated with HIV stigma. HIV stigma was then directly associated with lack of HIV facility testing awareness. In addition, direct relationships were posited between gender-based power and HIV stigma; gender-based power and HIV facility testing awareness; and HIV knowledge and HIV facility testing awareness. Socio-demographic factors were directly associated with all variables. Two measures of HIV stigma were used in this study. As shown in figure 1, we refer to HIV stigma towards PLHA in the general population as "general HIV stigma" and HIV stigma towards a family member as "family HIV stigma".

The model described in Figure 1 was tested separately for men and women using couples-based data and structural equation modeling. In the men's model, gender-based power reported by men was examined with respect to men's HIV knowledge, stigma, and facility testing awareness. Therefore, only men's socio-demographics were included in the model. In the women's model, their husband's gender-based power was examined with respect to women's HIV knowledge, stigma, and facility testing awareness. Therefore both men's and women's socio-demographics were included in the women's model and related to the appropriate men's and women's variables.

Direct and indirect effects of all variables in our analytic model are reported. Direct effects refer to coefficients measuring the association two variables unmediated by any other variables. For example, the coefficient measuring the association between family HIV stigma and

lack of HIV facility testing awareness is a direct effect. Indirect effects are the product of all coefficients between two variables with one or more intervening variables. For example, the indirect effect of men's inequitable gender norms on family HIV stigma is found by multiplying the coefficient measuring the association between men's inequitable gender norms and HIV knowledge with the coefficient measuring the association between HIV knowledge and family HIV stigma.

Results

Description of study sample

As compared to women who had heard of HIV, a larger proportion of men who had heard of HIV were over 40 years of age and had 8 or more years of education (Table 1). Forty-three percent of women who had heard of HIV were of high economic status as compared to 33% of men who had heard of HIV.

Compared to women, more men knew consistent condom use prevents HIV transmission, expressed HIV stigma, and were unaware of a facility that tested for HIV. Almost 76% of men reported that consistent condom use prevents HIV versus 65% of women. Almost 46% of men stated they would not buy produce from a HIV-positive food seller compared to 24.5% of women. Over 26% of men indicated they would want to keep a HIV-positive family member's status secret compared to 7% of women. Forty percent of men versus 37% of women were unaware of a facility that tested for HIV.

Bivariate associations between inequitable gender norms, HIV knowledge, HIV stigma, and lack of HIV facility testing awareness

For women, there were no significant relationships between their husband's report of an inequitable gender norm and their HIV knowledge (55.9% vs. 57.5%, p=0.49), general HIV stigma (56.4% vs. 56.9%, p=0.85), family HIV stigma (57.3% vs. 56.8%, p=0.93), and their HIV facility testing awareness (58.1% vs. 55.5%, p=0.26) (Table 2). Additionally, family HIV stigma reported by women was not associated with women's HIV knowledge (66.1% vs. 77.2%, p=0.23).

Men with correct HIV knowledge were less likely to report an inequitable gender norm (53.9% vs. 68.5%, p<0.001). Men reporting general HIV stigma and family HIV stigma were more likely to express an inequitable gender norm (65.3% vs. 51.9%, p<0.001; 78.6% vs. 49.4%, p<0.001, respectively) and less likely to have correct HIV knowledge (67.2% vs. 91.3%, p<0.001; 65.8 vs. 84.6, p<0.001, respectively). Women reporting general HIV stigma were less likely to have correct knowledge of HIV (61.4% vs. 76.2%, p<0.001). Men unaware of a facility providing HIV testing services were more likely to express an inequitable gender norm (65.2% vs. 52.3, p<0.001), less likely to have correct HIV knowledge (52.2% vs. 91.5%, p<0.001), and more likely to report general HIV stigma (70.4% vs. 32.4%, p<0.001) and family HIV stigma (42.1% vs. 17.2%, p<0.001). Women unaware of a facility providing HIV testing services were less likely to have correct HIV knowledge (41.1% vs. 79.3%, p<0.001) and more likely to express general HIV stigma (31.2% vs. 21.3%, p<0.001) and family HIV stigma (11.3% vs. 4.9%, p<0.001).

Confirmatory factor analysis and multivariate structural equation models

As shown in Table 3 for all men in these data (n=3385), the standardized factor loadings for the three observed indicators on the composite factor inequitable gender norms ranged from 0.3 to 0.9 and were significant in the expected direction (p<0.001). For the study population

consisting only of those who had heard of HIV, factor loadings on the men's inequitable gender norms factor remained significant and in the expected direction ranging from 0.3 to 0.9 in the men's model (n=2749) and 0.4 to 0.9 in the women's model (n=1955). The results show that the observed indicators reliably measured the concept men's inequitable gender norms.

The fit indices of the men's and women's structural models indicated good fit (men: RMSEA=0.02, CFI=0.95, TLI=0.94; women: RMSEA=0.01, CFI=0.97, TLI=0.96). Standardized parameter estimates for the associations illustrated in Figure 1 are reported in the following sections.

Direct effects of socio-demographics

In Table 4, the associations between selected socio-demographic characteristics (i.e., age, educational level, and standard of living) and gender-based power, HIV knowledge, and HIV facility testing awareness are reported.

Men with over 12 years of education were less likely to report inequitable gender norms compared to men with no education. Women with over 12 years of education had husbands who were less likely to report inequitable gender norms compared to the husbands of women with no education. Older women between the ages 30-39 and over 40 years of age were less likely to have husband's who reported inequitable gender norms versus women between the ages 15-24.

Men and women with at least 8, between 8-12, and over 12 years of education were more likely to have correct HIV knowledge compared to those with no education. Men and women with a medium and high standard of living were also more likely to have correct HIV knowledge as compared to those with a low standard of living.

Older women 30-39 years of age were more likely to report general HIV stigma versus women 15-24 years of age. Women with at least 8, between 8-12, and over 12 years of education were less likely to report general HIV stigma compared to women with no education. Older men 30-39 years of age and 40-49 years of age were more likely to report general HIV stigma than men 15-24 years of age. Men with 8-12 and over 12 years of education were less likely to report general HIV stigma compared to men with no education. Only women with over 12 years of education were more likely to report family HIV stigma compared to women with no education. Among men, none of the selected socio-demographics was associated with men's reported family HIV stigma.

Older men between the ages 30-39 and 40-49 were less likely to report lack of HIV facility testing awareness compared to men 15-24 years of age. Men with 8-12 and over 12 years of education were less likely to lack HIV facility testing awareness. Men with a high standard of living were also less likely to report lack of HIV facility testing awareness than men with a low standard of living. None of the selected socio-demographics predicted women's HIV facility testing awareness.

Direct and indirect effects on HIV stigma

Among men, gender-based power imbalance positively influenced HIV stigma directly and indirectly (Table 5). Directly, men reporting inequitable gender norms were more likely to report family HIV stigma ($B=0.435$, $p<0.001$). Indirectly, men reporting inequitable gender norms were less likely to have correct HIV knowledge ($B=-0.171$, $p<0.001$) and therefore more likely to express general HIV stigma ($B=0.079$, $p<0.01$) and family HIV stigma ($B=0.057$, $p<0.01$). Inequitable gender norms reported by women's husbands did not influence women's HIV stigma.

Men and women reporting correct knowledge of HIV were less likely to report HIV stigma with respect to general HIV stigma (Men: B=-0.462, p<0.001; Women: B=-0.207, p<0.01) and family HIV stigma (Men: B=-0.333, p<0.001; Women: B=-0.183, p<0.01).

Direct and indirect effects on HIV facility testing awareness

Through indirect pathways, men reporting gender-based power imbalance were more likely to lack HIV facility testing awareness (B=0.159, p<0.001) (Table 5). In other words, men reporting inequitable gender norms were more likely to report HIV stigma and/or were less likely to report correct HIV knowledge resulting in lack of HIV facility testing awareness. Among women husbands' reports of oppressive gender norms did not influence their HIV facility testing awareness.

Among men and women, correct HIV knowledge was associated with HIV facility testing awareness through direct and indirect pathways. Directly, men and women reporting correct HIV knowledge were more likely to be aware of a facility providing HIV testing services (Men: B=-0.412, p<0.001; Women: B=-0.534, p<0.001). Indirectly, men and women reporting correct HIV knowledge were less likely to report HIV stigma and therefore more likely to know a HIV testing facility (Men: B=-0.127, p<0.01; Women: B=-0.053, p<0.001). For men, both family and general HIV stigma mediated this relationship and for women, family HIV stigma only.

Men and women reporting HIV stigma were more likely to lack HIV facility testing awareness. Men reporting general HIV stigma (B=0.164, p<0.01) or family HIV stigma (B=0.155, p<0.01) were more likely not to know a facility to get a HIV test. Women reporting family HIV stigma were more likely to lack HIV facility testing awareness (B=0.292, p<0.001).

Discussion

Social determinants of disease have become increasingly important in public health research and programming [130]. With respect to HIV, international agencies turned greater attention to the effect of gender-based power on the epidemic once behavioral interventions met with limited success [131]. To date, studies and programs addressing gender-based power and HIV prevention focus on women's empowerment, and less on men's attitudes that directly shape gender inequity [55, 84]. In addition most studies analyze the role of gender-based power on proximal HIV risk factors such as sexual behavior, not broader determinants of the epidemic [83]. Therefore, the current study aimed to extend examination of gender-based power and HIV research in two ways. First, we measured gender-based power with respect to men. Second, we assessed relationships between gender-based power and broader programmatic barriers such as HIV stigma and lack of HIV facility testing awareness.

Study findings demonstrating that men's inequitable gender norms predict HIV stigma among men are significant given men's roles in Indian society. Eight-six percent of men head Indian households and 80% of Indian physicians are men. Men in these roles who support inequitable gender norms may be less likely to provide care and support to PLHA due to stigmatizing attitudes.

Our findings also indicate that VCT uptake may be more difficult among men reporting inequitable gender norms through indirect pathways. These men have less knowledge of HIV transmission and more HIV stigma resulting in lack of HIV facility testing awareness. The finding is important because men expressing inequitable gender norms may themselves be at increased risk for HIV. Research shows that men ascribing to gender-based power imbalance are more likely to engage in unprotected sex and sex with multiple partners (Mason, 1995). Therefore it is critical for this group to be aware of facilities that provide HIV testing services.

Because men who report inequitable gender norms may include men who are at increased risk of HIV, multiple negative consequences result for HIV prevention programs. These men are more likely to lack HIV facility testing awareness due to lack of HIV knowledge and HIV stigma potentially barring them from getting tested for the disease. If positive and unaware of their status, they are then less likely to receive appropriate care, adopt preventive behaviors, and disclose their status to their sexual partners.

Results among men showing that inequitable gender norms were negatively associated with correct HIV knowledge support previous research indicating that gender inequity is associated with low HIV knowledge. Bloom and Griffiths (2006) found that across three north and south Indian states women reporting low autonomy were less likely to be knowledgeable of HIV/AIDS [94].

In general, the effect of inequitable gender norms on HIV stigma and HIV knowledge in this study may explain reports in the literature that men engaging in risky sexual behavior are more likely to express stigma and have low knowledge of HIV (Magee 2006, Gupta 2000). Men's risky sexual behavior may be indicative of their broader support for gender-based power imbalance, such as inequitable gender norms, that result in the expression of inequitable attitudes towards not only women but PLHA and distancing oneself from HIV prevention messages.

Overall given that the relationship between men's inequitable gender norms and their HIV stigma was mediated through HIV knowledge; and the relationship between men's inequitable gender norms and their HIV facility testing awareness was also mediated through HIV stigma and/or HIV knowledge demonstrates the importance of assessing the direct and indirect effects of distal factors. Otherwise, the role of determinants such as gender-based power would not be appropriately considered in HIV prevention programs.

In this study, correct HIV knowledge with respect to condom use had strong and consistent associations with HIV stigma and facility testing awareness for both men and women. The findings support previous research demonstrating that correct HIV knowledge reduces HIV stigma [106, 132]. These results do not support the alternative hypothesis that knowing HIV is transmitted sexually may increase HIV stigma. In India, PLHA are not more likely to be held responsible for their disease status due to perceptions they engaged in risky sexual behavior.

The study results build on research demonstrating that correct HIV knowledge is positively associated with HIV testing. An additional pathway by which HIV knowledge enhances HIV facility testing awareness is shown. Through HIV stigma, the indirect association between correct HIV knowledge and reduced lack of HIV facility testing awareness accounted for 23% and 9% of the total effect among men and women, respectively. Without consideration of this indirect effect, we would be underestimating the total effect of HIV knowledge on HIV facility testing awareness.

The study findings reinforce the potentially negative role of HIV stigma on VCT efforts illustrating that HIV stigma was associated with lack of HIV facility testing awareness for both men and women [133, 134]. Possible explanations for this finding are that stigmatizers may be more likely to socially distance themselves from disease prevention messages and to fear stigmatization themselves if they test positive. The study also highlights the differential effect of general and family HIV stigma on HIV facility testing awareness by gender. While for men both family and general HIV stigma are associated with HIV facility testing awareness, for women only family HIV stigma predicted HIV facility testing awareness. After controlling for the effect of family HIV stigma, the reason for this result may be that measures of general HIV stigma capture mild HIV stigma leading to weak effects on women's awareness of HIV testing services. Family HIV stigma, on the other hand may capture extreme HIV stigma levels among women considering

women's caretaker roles in Indian families. Therefore, this type of stigma may heavily influence women's ignorance of HIV programs. Among men no difference between each type of HIV stigma and HIV facility testing awareness was observed, possibly because these items measure men's level of HIV stigma equally. Interestingly, responses to family and general HIV stigma responses were correlated among men, not among women (results not shown).

A limitation of our study is the cross-sectional design, therefore, causal inferences could not be made. The reported direct and indirect effects do not imply causation, but associations. The good model fit of our analytic model means it is consistent with the data, but other models and assumptions may fit the data as well. Measurement issues raised by other researchers regarding HIV stigma items used in population-based surveys also apply to this study. The question items are hypothetical, may suffer from social desirability bias, can be ambiguous, and may not measure the underlying cause of HIV stigma [50, 54]. For example, the family HIV stigma question item is ambiguous, because individuals may want to keep a family member's status secret for privacy reasons, not out of shame that they have the disease. However, a systematic study examining the reasons individuals would not want to keep an HIV-positive family member's status secret suggested that these respondents have low HIV stigma. Over 60 percent stated they would want their family member's status open in order for them to receive care, support, and appropriate counseling.

Given these study limitations, future studies on this topic should consider utilizing more precise and diverse measures of HIV stigma. For example, Herek *et al.* measured HIV stigma in the United States with respect to individuals' support for coercive AIDS-related policies, negative feelings towards PLHA, and attributions of responsibility and blame towards PLHA [109]. Longitudinal study designs that capture changes over time in gender-based power beliefs, HIV

knowledge, HIV stigma, and HIV facility testing awareness would also be invaluable for confirming these variables' directional relationships with each other.

Programmatic implications

Overall, the study points to two limitations in current HIV programs related to stigma reduction and HIV testing. First, such programs have seldom been sensitive to differentially targeting men and women [135]. However, our research shows that men's inequitable gender norms are associated with their own, not their wives' HIV knowledge, stigma, and facility testing awareness. This suggests that in India, alternate programmatic approaches should be taken by gender to reduce HIV stigma and increase VCT utilization.

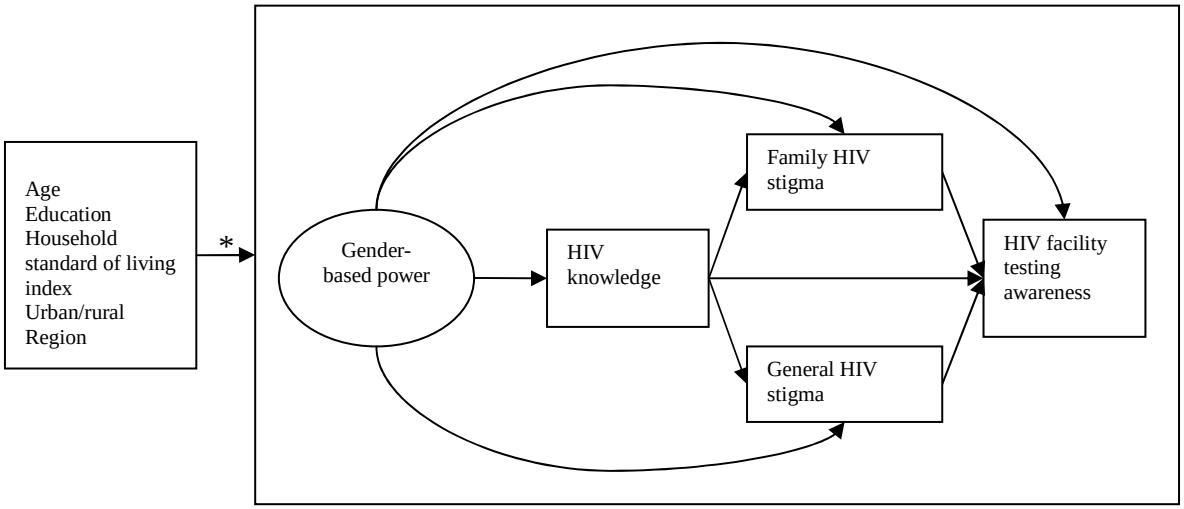
Second, most HIV programs are vertical in nature and do not consider the indirect effect of distal factors on program barriers. Through partial mediation, the results highlight the significant impact of a distal factor, gender-based power, on HIV stigma and facility testing awareness. If addressed, these distal determinants could further improve the impact of relevant HIV prevention programs.

Given current programs' limitations, we suggest that programs that aim to reduce HIV stigma among women by improving their HIV knowledge are very important. Among men, promoting equitable gender norms along with correct HIV knowledge is necessary to reduce their HIV stigma. Since HIV knowledge mediates the positive relationship between men's inequitable gender norms and their HIV stigma in our study, programs must address these issues simultaneously.

To increase VCT uptake, optimal programs may increase women's HIV knowledge and reduce their HIV stigma in order to increase women's HIV facility testing awareness. For men, a multi-pronged approach to increase VCT use should be implemented by promoting gender

equity, reducing their HIV stigma, increasing their HIV knowledge. The indirect effects of gender inequity and HIV knowledge on men's HIV facility testing awareness and the indirect effect of HIV knowledge on women's HIV facility testing awareness through HIV stigma, point to the importance of addressing these factors collectively in VCT programs.

Figure 4.1: Analytic model



*represents associations tested between each socio-demographic factor and each study variable

Table 4.1: Descriptive statistics of study population, North India 2003

	Women n=1955	Men n=2749
Socio-demographics		
Age	%	%
15-24	19.9	24.5
25-29	29.3	8.3
30-39	37.6	21.5
40+	13.2	39.2
Years of education		
0	24.0	13.8
Up to 8	27.8	25.0
8 to 12	27.7	36.7
12+	20.4	24.5
Economic level		
Low	5.1	13.4
Middle	51.6	53.5
High	43.3	33.1
Gender-based power		
Men's inequitable gender norms items		
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions	56.5[1]	57.5
Agree, wife should always consult husband on any decision, large or small	82.8[1]	82.6
Disagree, there is not harm if a wife goes out alone to go to a nearby friend or relative's house	47.6[1]	48.5
HIV knowledge		
Consistent condom use prevents HIV	65.1	75.7
HIV stigma		
General HIV stigma: Would not buy produce from HIV+ food seller	21.3	41.5
Family HIV stigma: Would keep HIV+ family member's status secret	6.3	24.2
HIV facility testing awareness		
Does not know a hospital/clinic where one can get tested for HIV	37.1	40.3

[1]Reported by these women's husbands. Inequitable gender norms questions were only asked to men

Table 4.2: Gender-based power, HIV knowledge, HIV stigma by HIV knowledge, HIV stigma, and HIV testing awareness and associated p-values from chi-square tests among men and women, North India 2003

	HIV knowledge			HIV stigma						HIV facility testing awareness		
	Consistent condom use prevents HIV			General HIV stigma			Family HIV stigma			Do not know facility to get HIV test		
	yes %	no %	χ^2 p value	yes %	no %	χ^2 p value	yes %	no %	χ^2 p value	yes %	no %	χ^2 p value
Men												
Gender-based power												
Men's inequitable gender norms (selected item):												
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions	53.9	68.5	p<0.001	65.3	51.9	p<0.001	78.6	49.4	p<0.001	65.2	52.3	p<0.001
HIV knowledge												
Consistent condom use prevents HIV	-	-	-	67.2	91.3	p<0.001	65.8	84.6	p<0.001	52.2	91.5	p<0.001
HIV stigma												
General HIV stigma	-	-	-	-	-	-	-	-	-	70.4	32.4	p<0.001
Family HIV stigma	-	-	-	-	-	-	-	-	-	42.1	17.2	p<0.001
Women												
Gender-based power												
Men's inequitable gender norms (selected item):												
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions[1]	55.9	57.5	0.49	56.4	56.9	0.85	57.3	56.8	0.93	58.1	55.5	0.26
HIV knowledge												
Consistent condom use prevents HIV	-	-	-	61.4	76.2	p<0.001	66.1	71.2	0.23	41.1	79.3	p<0.001
HIV stigma												
General HIV stigma	-	-	-	-	-	-	-	-	-	31.2	21.3	p<0.001
Family HIV stigma	-	-	-	-	-	-	-	-	-	11.3	4.9	p<0.001

*** p<0.001, ** p<0.01, * p<0.05

[1]Reported by these women's husbands. Inequitable gender norms questions were only asked to men

Table 4.3: Standardized factor loadings for the men's inequitable gender norms factor, North India 2003

Composite Factor	Men (entire sample)	Men (heard of HIV)	Women[1] (heard of HIV)
	n=3385	n=2749	n=1955
Men's inequitable gender norms	Loading	Loading	Loading
Disagree, there is no harm if a wife sometimes disobeys her husband's instructions	0.67***	0.86***	0.68***
Agree, wife should always consult husband on any decision, large or small	0.33***	0.27**	0.35***
Disagree, there is not harm if a wife goes out alone to go to a nearby friend or relative's house	0.91***	0.74***	0.91*

[1]Reported by these women's husbands. Inequitable gender norms questions were only asked to men.

*** p<0.001, ** p<0.01, * p<0.05

Table 4.4: Socio-demographic factors associated with gender-based power, HIV knowledge, HIV stigma, and HIV facility testing awareness among men and women, North India 2003

	Gender-based power		HIV knowledge		HIV stigma				HIV facility testing awareness	
	Men's inequitable gender norms		Consistent condom use prevents HIV		General HIV stigma		Family HIV stigma		Do not know facility to get HIV test	
	Women[1]	Men	Women	Men	Women	Men	Women	Men	Women	Men
Age										
15-24	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
25-29	0.006	0.013	0.001	0.015	0.046	0.050	-0.033	-0.052	-0.056	-0.052
30-39	-0.092*	-0.059	-0.032	0.013	0.091*	0.095*	0.001	-0.087	-0.046	-0.074*
40+	-0.142**	-0.127	-0.017	-0.045	0.042	0.090*	-0.040	-0.104	-0.010	-0.143*
Education										
0	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Up to 8	0.015	-0.042	0.182***	0.169***	-0.090**	-0.141	-0.051	-0.114	-0.076	-0.114
8 to 12	-0.015	-0.116	0.299***	0.379***	-0.134***	-0.180***	0.002	-0.367	-0.188	-0.141***
12+	-0.140*	-0.106*	0.387***	0.504***	-0.106*	-0.188***	0.131*	-0.547	-0.231	-0.246***
Standard of living index										
Low	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Middle	-0.119	0.010	0.228***	0.152***	-0.043	-0.112	-0.153	-0.099	0.032	-0.099
High	-0.118	0.002	0.245***	0.210***	-0.016	-0.089	-0.059	-0.218	0.003	-0.122***

*** p<0.001, ** p<0.01, * p<0.05

[1]Reported by these women's husbands. Inequitable gender norms questions were only asked to men.

Table 4.5: Standardized coefficients for associations among gender-based power, HIV knowledge, HIV stigma, and HIV facility testing awareness among men and women, North India 2003

	HIV knowledge	HIV stigma				HIV facility testing awareness	
	Consistent condom use prevents HIV	General HIV stigma		Family HIV stigma		Do not know facility to get HIV test	
	Direct	Direct	Indirect	Direct	Indirect	Direct	Indirect
Men							
Gender-based power							
Men's inequitable gender norms	-0.171***	ns	0.079**	0.435***	0.057**	ns	0.159***
HIV knowledge							
Consistent condom use prevents HIV	-	-0.462***	-	-0.333***	-	-0.412***	-0.127***
HIV stigma							
General HIV stigma	-	-	-	-	-	0.164**	-
Family HIV stigma	-	-	-	-	-	0.155**	-
Women							
Gender-based power							
Men's inequitable gender norms[1]	ns	ns	ns	ns	ns	ns	ns
HIV knowledge							
Consistent condom use prevent HIV	-	-0.207**	-	-0.183***	-	-0.534***	-0.053**
HIV stigma							
General HIV stigma	-	-	-	-	-	ns	-
Family HIV stigma	-	-	-	-	-	0.292***	-

*** p<0.001, ** p<0.01, * p<0.05 ; ns = not significant

Note: For the men's model, RMSEA=0.02; CFI=0.95; TLI=0.94. For the women's model, RMSEA=0.01; CFI=0.97; TLI=0.96

Controlling for age, educational level, standard of living, area of residence, region

[1]Reported by these women's husbands. Inequitable gender norms questions were only asked to men.

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