

Multilevel Factors Associated with Uptake of Biomedical HIV Prevention Strategies in the Muslim World:
a Study of Central Asia, India, and Mali

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ABSTRACT

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Countries with substantial Muslim populations are experiencing rapid changes in HIV prevalence. HIV testing and circumcision, as biomedical interventions, are the focus of this dissertation since biomedical strategies are among the most efficacious HIV interventions. This dissertation examines the relationship of multilevel effects to HIV stigma, HIV risk behavior, and HIV status with two evidence-based HIV prevention intervention strategies (HIV testing and male circumcision) and a third HIV prevention intervention strategy (female circumcision) that is highly disputed, via three separate and distinct papers. This study is theoretically guided by the Ecological Perspective and the Social Network Conceptual Model. The sample for the first paper on Central Asia includes Kazakhstan (n=14,310), Kyrgyzstan (n=6,493), Uzbekistan (n=13,404), and Tajikistan (n=4,677), for a total n=38,884. The second paper sample is drawn from India: 65,356 men between the ages of 15 and 54. The third paper sample is drawn from Mali: 14,583; all of these participants are ever-married women of reproductive age (15-49 years old). Multilevel modeling was used in all three papers. This innovative methodology produced empirical evidence for the association of context with the behavior of the individual. A finding consistent in all three papers is that: context does matter. This dissertation examines context in terms of family and community membership. Specifically, the context of different levels of stigma and family/community membership impacts individuals' HIV testing and circumcision. In Central Asia, HIV stigma at the individual, family, and community levels is significantly associated with decreased HIV testing uptake and receipt of HIV test results. HIV stigma is associated with male circumcision status (i.e., whether a male is circumcised or uncircumcised) on individual, family, and community levels in India. In Mali, female circumcision was significantly associated with increased odds of HIV positive status, and circumcision status was not associated with HIV risk behavior. Family and community membership was also associated with HIV status and HIV risk behavior in Mali. The findings of the dissertation have important implications for practice, policy, and research.

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DEDICATION

To the sacrifices made by my family while I completed this PhD.

Introduction

Countries with substantial Muslim populations are experiencing rapid changes in HIV prevalence, particularly in Central Asia, India, and Mali. Central Asia (i.e., Kazakhstan [adult prevalence rate: 0.1], Kyrgyzstan [adult prevalence rate: 0.1], Uzbekistan [adult prevalence rate: 0.1], and Tajikistan [adult prevalence rate: 0.3] is experiencing one of the fastest growing HIV epidemics in the world, with some areas seeing infection rates doubling yearly since 2000 (WHO, 2006). The increasing infection rates in this region are primarily driven by injection drug use. In India, the adult prevalence rate is estimate at 0.9, and the epidemic is rapidly increasing. The estimated HIV prevalence in 1990 was approximately 200,000 people. By 2003, the prevalence was estimated at 5.1 million (WHO, 2010). Heterosexual transmission is the primary mode of transmission in India. In Mali, it is estimated that 140,000 people are living with HIV/AIDS and the adult prevalence rate is 1.9. Despite this prevalence being low compared to other African countries, it is the second highest among African Muslim majority countries (Mali is 90% Muslim), following Djibouti (adult prevalence rate: 3.1 and 96% Muslim [UNICEF, 2010]) for which there is limited data. The majority of individuals are infected by heterosexual contact in Mali.

HIV testing and circumcision, as biomedical interventions, are the focus of this dissertation since biomedical strategies are the among the most efficacious HIV interventions. This dissertation examines the relationship of multilevel effects to HIV stigma, HIV risk behavior, and HIV status with two evidence-based HIV prevention intervention strategies (HIV testing and male circumcision) and a third HIV prevention intervention strategy (female circumcision) that is highly disputed, via three separate and distinct papers. The strategies that will be examined are selected due to their estimated importance for decreasing HIV, and are therefore different for each of the regions/countries.

Two of the three papers focus on multilevel HIV stigma (the third paper focused wholly on the impact of a highly disputed biomedical intervention). Stigma is a far reaching factor impacting HIV as it does not highlight one high risk behavior, but is germane to the whole of HIV risk and prevention. For example, individuals may be embarrassed to get tested and miss opportunities to get treatment. PLWHIV may be ashamed to be seen taking medication and suffer poor levels of adherence to treatment. HIV prevention is hindered by stigma as individuals may fear taking HIV risk reduction measures for fear of

being associated with PLWHIV. The third paper focuses on female circumcision as this topic has been underexplored and is potentially more impactful for Mali.

The focus of this dissertation is the relationship between multilevel factors and the use of biomedical HIV prevention strategies in the Muslim world. Muslim populations in Central Asia, Mali, and India, are experiencing rapid changes in HIV. Despite high or increasing rates of HIV, research focusing specifically on this population, and how best to implement prevention, are limited. Strategies that incorporate a better understanding of culture and context will increase the ability of prevention interventions to be successful. This dissertation focuses on utilizing available efficacious biomedical technologies of HIV testing and circumcision to reduce the spread of AIDS, and to explore cultural beliefs around these issues.

In order to have these prevention efforts adopted or altered, a better understanding of the aspects related to context (such as, religion and culture) is needed. Adopting these aforementioned biomedical interventions within Central Asia, India, and Mali can also be influenced by these societies being primarily collectivist cultures. Factors such as family and community membership and multilevel stigma are crucial to better understanding and prevention of HIV in these areas.

This introduction section will present information about the countries and population used in this dissertation, information about the three distinct papers that constitute the dissertation, and a summary of the scientific contribution to the literature. This papers examine the relationship of multilevel effects to HIV stigma, HIV risk behavior, and HIV status with two evidence-based HIV prevention intervention strategies (HIV testing and male circumcision) and a third highly disputed HIV prevention intervention strategy (female circumcision).

Theoretical and Conceptual Framework

This study is theoretically guided by the Ecological Perspective and the Social Network Conceptual Model and will explore uptake of HIV testing, receipt of HIV test results, and circumcision. This theoretical framework holds that behavior is not only regulated at the individual level but also at the family and community level via contextual and demographic factors. The analysis plan for this study will allow for family and community level effects on individual decision making to be uncovered and measured. These two theories were chosen in combination to guide this dissertation, as the

dissertation's focus is multilevel effects, specifically the impact of an individual's family and community membership on their behavior. The integration of these two theories are valuable for better understanding collectivist cultures, such as Central Asia, India, and Mali as individualism can be frowned upon and social network are generally given more importance than in individualistic cultures such as the West. The ecological perspective provides the theoretical overview (i.e., that the environment that contextualizes an individual may impact their behavior) and the social network conceptual model provides a more detailed lens to examine the interaction between individual, family, and community. Specifically, paper 1 examines the association of HIV stigma at the individual, family, and community level with an individual's HIV testing uptake. Paper 2 examines the association of HIV stigma at the individual, family, and community level with whether an individual is uncircumcised or circumcised. Paper 3 examines the association of circumcision and family and community membership with HIV status and HIV risk behavior at the individual level. The theoretical model for each paper is outlined in more detail in each respective section of this dissertation.

Region and Country Information

Central Asia, as defined by the World Health Organization (WHO), consists of the Republics of Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, and Turkmenistan. Turkmenistan is omitted from study in this dissertation because it is politically closed and data are not accessible. Muslims form the majority of the population in all the countries of Central Asia. This part of the dissertation focuses on ever-married women since the HIV epidemic is feminizing and women are at an elevated risk of HIV infection due to biological and sociocultural factors (Wingood & DiClemente, 2000). In this dissertation, Central Asian women's uptake of HIV testing and receipt of test results was examined for association with HIV stigma on the individual, family, and community levels.

For many years it was argued that India's conservative social norms would prevent HIV from taking root in the country. This was not the case. HIV is affecting various populations in the country. Islam is the country's second most commonly practiced religion, after Hinduism. Muslims in India tend to be circumcised due to religious mandate; whereas, Hindus tend not to be circumcised. However, other factors such as multilevel stigma may play a significant role in the disparity in circumcision, and were examined in this study.

Mali is a West African country with a population that is 90% Muslim. Mali's HIV prevalence is increasing, particularly among women. Due to this feminization of HIV in Mali, an examination of female circumcision, which has a 90% prevalence in the country, is particularly relevant since it is empirically unknown whether the practice is protective or a risk factor for HIV. Despite this lack of empirical evidence, female circumcision is often championed as an HIV intervention prevention strategy in Mali and other regions where it is practiced by the local population (Omar & Mohamed, 2006). The association of female circumcision with HIV status and HIV risk behavior was examined in this paper. Table 1 displays the HIV prevalence for each country.

Table 1. HIV/AIDS Estimates and Ranges for Central Asia, India, and Mali

Country	Number of people living with HIV	Adults aged 15 to 49 prevalence rate
Central Asia		
Kazakhstan	12,000 [7,000 – 29,000]	0.1% [0.1% - 0.3%]
Kyrgyzstan	4,200 [2,300 – 7,700]	0.1% [0.1% - 0.3%]
Tajikistan	10,000 [5,000 – 23,000]	0.3% [0.1% - 0.6%]
Uzbekistan	16,000 [8,100 – 45,000]	0.1% [0.1% - 0.3%]
India	5,100,000 [2,500,000– 8,500,000]	0.9 % [0.5% - 1.5%]
Mali	140,000 [44,000 – 420,000]	1.9% [0.6% - 5.9%]

UNAIDS 2008. Epidemiological fact sheet on HIV and AIDS. Geneva: UNAIDS.

Linkage of the Three Studies that Comprise the Dissertation

The papers are linked in three major ways: 1) a conceptual theoretical framework emphasizing the impact of environment on an individual's behavior, 2) an emphasis on biomedical strategies for HIV prevention intervention, 3) addressing three distinct areas of the Muslim world that are significantly burdened by HIV. Conceptual Framework: This conceptual framework is an integration of the Ecological Perspective (Bronfenbrenner, 1977; McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1996) and the Social Network Conceptual Model (Heaney & Israel, 2002). The framework holds that individual behavior is not simply regulated at the individual level, but that environment and social networks also impact the individual's behavior. Within this framework, a quantitative data analysis plan was used to quantify the effect of context and social networks. Biomedical Strategies: The emphasis of this research is on biomedical strategies, (e.g., HIV testing and circumcision), as we are over 25 years into the HIV pandemic, and among the more efficacious interventions are biomedical strategies. However, the strategies depend on behavioral factors for implementation, adherence, and ultimately, success. Muslim

World: Central Asia is a Muslim majority region. Mali is a Muslim majority country. India is the second most populated Muslim country in the world and Muslims are the second largest population group after Hindus. HIV research in the Muslim world is not as well developed as other regions of the world, despite prevalence and/or rate of infection being higher than more researched developing countries. Reasons for this may include lack of funding, lack of expertise, reluctance of Muslim governments to address HIV, and high levels of stigma associated with HIV. Overall, there have been no large-scale studies addressing HIV testing and receipt of test results, female circumcision, and male circumcision using multilevel modeling in these respective region and countries. This dissertation provides new data that is important to future interventions, policies, and research.

Aims of Dissertation

This dissertation is organized in a three-paper format. Paper 1 examines the association of multilevel stigma with HIV testing and receipt of HIV testing results in Central Asia. HIV testing is a widely accepted HIV prevention intervention strategy that has been underutilized in Central Asia, and little research has explored this problem. HIV stigma has been identified as a barrier to HIV testing in low resource settings (Chesney & Smith, 1999; Ford, Wirawan, Sumantera, Sawitri, & Stahre, 2004; Herek, Capitano, & Widaman, 2003; Kalichman & Simbayi, 2003; Koku, 2010; Obermeyer & Osborn, 2007; Pool, Nyanzi, & Whitworth, 2001), but has been under researched in Central Asia. This paper contributes to the knowledge base of multilevel stigma and HIV testing uptake. The findings could guide interventions to increase testing, which is a gateway to treatment and prevention of further infections.

Paper 2 examines the association of multilevel stigma with male circumcision in India. Male circumcision may drastically reduce HIV transmission, but only a minority of Indian men are circumcised, and factors associated with this phenomenon are underexplored. The rapid growth of the HIV epidemic in India coupled with the lack of uptake of male circumcision prioritizes this topic's importance in HIV prevention intervention for the country. This paper contributes to the knowledge base of multilevel stigma and male circumcision uptake. The findings could guide interventions to increase circumcision uptake.

Paper 3 explores the association of female circumcision and family and community membership with HIV status and HIV risk behavior in Mali. Female circumcision is widely practiced in Mali, where it is also believed to be a protective against HIV; however, there is little empirical evidence validating or

disproving this belief. Furthermore, HIV has been feminized in Mali, with females accounting for 60% of HIV cases (WHO, 2010). Since HIV has feminized in Mali, a study of female circumcision is particularly relevant. This paper contributes to the knowledge base of multilevel factors and female circumcision, and HIV status and HIV risk. The findings could guide policies toward more effective strategies.

This dissertation aims to contribute research that will address both significant barriers and promising interventions for each of these region/countries or in the case of female circumcision in Mali, to examine the effect of a widely promoted intervention. The following examples illustrate the uniquely tailored approach to each region/country. Central Asia has nearly universal male circumcision, but has no cultural or historic foundation for female circumcision which is not practiced, but HIV testing is underutilized and has potential for wide acceptance. India has large campaigns to promote HIV testing and is making headway, again female circumcision has no precedence in the country, but male circumcision is already practiced by a portion of the population and could be a valuable intervention if it were increasingly adopted among the remainder of the population. Mali also has successful campaigns to promote HIV testing; male circumcision is nearly universal, as is female circumcision. However, female circumcision may be a misdirection for HIV prevention intervention efforts since its effectiveness has been understudied. Female circumcision is also known as female genital mutilation and female genital cutting. The term “female circumcision” is used in this proposal since it is the terminology used by the populations that engage in the practice. This is an attempt to avoid the biased language of female genital mutilation and female genital cutting, for which the West is commonly criticized by female circumcising cultures. Female circumcision has been identified as an intrusive practice and violation of women’s human rights and it has not been studied extensively in HIV research.

Data Source and Sampling Scheme

The data used for this study was collected by the Multiple Indicator Cluster Surveys (MICS) and Demographic and Health Survey (DHS). MICS is a standardized survey conducted in 101 developing countries. MICS was initiated by the United Nations Children's Fund (UNICEF). DHS is also a standardized survey conducted in 75 developing countries. DHS was initiated by the Center of Disease Control (CDC) in partnership with Bloomberg School of Public Health at John Hopkins University and implemented with the joint support of National Ministries of Health, USAID, and UN agencies in respective

countries. The MICS and DHS surveys cover such topics as socio-demographic characteristics, family planning, and HIV/AIDS among others. The datasets are accessible from www.childinfo.org and www.measuredhs.com with written permission from UNICEF and Macro International.

The Multiple Indicator Cluster Surveys (MICS) and Demographic and Health Survey (DHS) are nationally representative surveys of randomly selected respondents using stratified multistage sampling strategy based on regional clusters. Using the most recent national census, the participating countries were split into regional clusters and samples were drawn separately for urban and rural areas. After randomly selecting a number of regional clusters, households were selected within each cluster using a probability proportionate to size sampling procedure; meaning that more populated clusters had a higher probability of being selected. By using a probability proportional to size selection during the first sampling stage, an implicit stratification and proportional allocation was achieved at each of the lower population levels. The clusters were sorted within each sampling stratum, according to the population levels and then by their socio-economic characteristics. The sample for the first paper on Central Asia includes Kazakhstan (2006: n=14,310), Kyrgyzstan (2006: n=6,493), Uzbekistan (2006: n=13,404), and Tajikistan (2005: n=4,677), for a total n=38,884. The second paper sample is drawn from India in 2006: 65,356 men between the ages of 15 and 54. The third paper sample is drawn from Mali in 2006: 14583; all of these participants are ever-married women of reproductive age (15-49 years old). Sample weights calculated by the MICS and DHS teams will be utilized to obtain accurate nationally representative numbers.

Overview of the Three Papers

Paper 1: In Central Asia, HIV is rapidly growing and HIV testing remains low. Individual level stigma as a barrier to seeking HIV testing and follow up care has been researched; however, multilevel stigma has rarely been examined. To more adequately address HIV stigma it is essential to better understand its multidimensionality. Guided by the ecosystems perspective, this study provides new data on multilevel HIV stigma by utilizing an innovative methodology that allows for contextual effects to be quantified. Multilevel modeling (MLM) was used to assess the relationship between HIV testing uptake and receipt of HIV test results with stigma at the individual, family, and community levels while adjusting for confounding factors, such as age, wealth, and education, as these factors may affect societal norms

on the individual (e.g. higher education may afford public health awareness which overrides societal stigma). HIV stigma operates on individual, family, and community levels to hinder HIV testing uptake and the receipt of HIV testing results. Specifically, the first paper tests three hypotheses:

Hypothesis 1: HIV stigma at the individual level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics, household, and community effects.

Hypothesis 2: HIV stigma at the household level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics and community effects.

Hypothesis 3: HIV stigma at the community level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics and household effects.

Paper 2: India contains the world's third-largest population suffering from HIV/AIDS (UNAIDS, 2009). Male circumcision can substantially reduce HIV transmission by 51-60% (Auvert et al., 2005; Bailey et al., 2007; Gray et al., 2007; Potdar & Mmari, 2011; Schneider et al., 2010; Steward, Bharat, Ramakrishna, Heylen, & Ekstrand, 2012); however, only 13.6% of males in India are circumcised (DHS, 2006). HIV stigma may influence low rates of circumcision in this population, and thus guided by the ecosystems perspective, this study examined multilevel HIV stigma and its association with circumcision. With six MLM, HIV stigma variables at the individual, family, and community levels were tested to assess the significance of differences in circumcision among participants, adjusting for possible confounding factors, such as wealth, education, region, and age. Specifically, three hypotheses were tested:

Hypothesis 1. HIV stigma at the individual level is associated with male circumcision, after adjusting for age, education, wealth status, and region.

Hypothesis 2. HIV stigma at the family level is associated with male circumcision, after adjusting for age, education, wealth status, and region.

Hypothesis 3. HIV stigma at the community level is associated with male circumcision, after adjusting for age, education, wealth status, and region.

Paper 3: HIV prevalence in Mali is 1.5% [1.2-1.8%] (USAID, 2006) with females accounting for 60% of HIV cases (USAID, 2006). In Mali, 92% of women are circumcised and 80.3% of the population supports the practice; moreover, FC is often justified as a protective against HIV by circumcising populations (WHO, 2010). The link between HIV and FC has rarely been empirically evaluated. This

research examines the association between FC and sexual risk behavior. MLM was used to assess the significance of difference in HIV status and sexual behavior with FC. MLM was also used 1) to measure and correct for the intra-class correlation, as some participants were from the same household and communities; and 2) to adjust for age, education, ethnicity, wealth, religion, and region. Three hypotheses are tested:

Hypothesis 1. Women who have been circumcised will more likely test positive for HIV than will uncircumcised women, after adjusting for socio-demographic factors (e.g., age, education, ethnicity, wealth, religion, and region.) and effects of membership in specific households and communities.

Hypothesis 2. Women who have been circumcised will report no significant difference in number of partners or sexual debut in comparison to uncircumcised women, after adjusting for socio-demographic factors (e.g., age, education, wealth, child want, religion, ethnicity, region, and knowledge of testing location) and effects of membership in specific households and communities.

Hypothesis 3. Membership in specific households and communities with higher HIV prevalence and higher risk sexual behavior will predict HIV positive status and greater participation in higher risk sexual behavior.

Scientific Contributions

The scientific contribution of this dissertation is centered on it quantifying the association of multilevel factors, such as stigma, and family and community membership with various aspects of biomedical HIV prevention in the Muslim world. Each paper provides a unique scientific contribution. The scientific contribution of each of the three papers is both issue-orientated and methodological. Paper 1: The paper contributes to the HIV stigma literature through exploring stigma at the family and community levels. The paper's methodological contribution is in using multilevel modeling in a field where it is rarely utilized by quantitatively testing family and community effects. The findings integrate into the current biomedical advances that show the efficaciousness of testing and treating in HIV prevention by examining a barrier to the test and treat approach. Specifically, research has shown that people receiving antiretroviral therapy (ART) are less likely to pass on the infection (Gardner, McLees, Steiner, Del Rio, & Burman, 2011; Granich, Gilks, Dye, De Cock, & Williams, 2009). The test and treat approach has two primary goals: 1) improve the health outcome of people who do not yet know their serostatus; and 2)

reduce transmission. To achieve these goals, the first step is to test and identify PLWHIV as quickly as possible, so they may be started on ART. Paper 2: This paper brings attention to the impact of multilevel stigma on male circumcision uptake, as multilevel stigma is associated with circumcision status on the individual, family, and community level. The methodological contribution is again by using multilevel modeling in a field where it is rarely utilized by quantitatively testing the effects of family and community membership on stigma and circumcision status. The findings integrate into the current biomedical advances that show the efficaciousness of male circumcision for HIV prevention (Auvert et al., 2005; Bailey et al., 2007; Gray et al., 2007; Potdar & Mmari, 2011; Schneider et al., 2010b; Steward, Bharat, Ramakrishna, Heylen, & Ekstrand, 2012). The findings indicate a specific barrier, multilevel HIV stigma, to greater circumcision uptake in the Indian context. Paper 3: This paper directs attention to the impact of female circumcision and family and community membership on HIV status and HIV risk behavior. Female circumcision was associated with being HIV positive. Moreover, women with female circumcision did not engage in sexual risk behavior that was significantly different from women who were uncircumcised. The findings are timely given the current prominence of male circumcision as a promising HIV prevention intervention. However, the association here is negative. In other words, female circumcision is associated with HIV positive status. The methodological contribution is by using multilevel modeling to quantitatively measure the interaction of HIV status and HIV risk behavior with female circumcision while adjusting for the effect of family and community membership.

Organization of Dissertation Chapters

This dissertation is organized around the unique findings in each of its three papers and the major contribution that overarches all three papers: context at various levels in the form of family and community membership and multilevel stigma is associated with individual behavior. Following this introduction is the chapter on Central Asia (paper 1), which examines the association of multilevel HIV stigma with the uptake of HIV testing and receipt of test result among Central Asian women. The second chapter (paper 2) examines the association of multilevel HIV stigma and male circumcision in India. The third chapter (paper 3) examines both the association of both female circumcision and family and community membership with HIV status and HIV risk behavior. Lastly, a summary of findings and implications closes this dissertation.

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Paper 1: Central Asia

Multilevel HIV Stigma as a Barrier to HIV Testing Uptake and Receipt of HIV Test Results:

A Context Quantified

Summary

Background and Purpose: Central Asia is experiencing one of the fastest growing HIV epidemics in the world, with some areas' infection rates doubling yearly since 2000 (WHO, 2010). The majority of people globally are unaware of their HIV status, though knowledge of HIV status has been found to be a preventative measure against further disease HIV transmission (Obermeyer & Osborn, 2007). HIV testing remains low in Central Asia, which may have significant implications on HIV transmission. Though public and social health researchers have devoted significant attention to individual's stigma as a barrier to her or him seeking HIV testing and follow up care, little work has been done on the complicated area of multi-level stigma which may better define the true psychosocial dilemma. An individual's fear of testing directly relates to family and community norms and pressures. Ideally the individual's family provides the support nucleus for an individual, but in many circumstances, anticipation of being ostracized due to HIV positive status undermines this (Pai et al., 2009). Family coda in turn are directly impacted by societal rules—these may reflect dominant religious views in a region, which associate sexually transmitted illnesses (STI) to immoral and socially unacceptable behavior. To address the problem of HIV stigma it is imperative to understand how these strata of pressure interact and exponentiate one another to prevent widespread HIV testing and result counseling. This study examines the impact of multi level stigma at individual, family, and community levels on uptake of HIV testing among ever-married women in Central Asia.

Guided by the Ecosystems Perspective, this study aims to provide new data on multilevel HIV stigma by utilizing an innovative methodology that allows for contextual effects to be quantified. Specifically, the study tests if HIV stigma at individual, family, and community levels is a barrier to HIV testing uptake and receipt of HIV test results

Methods: The UNICEF sponsored Multiple Indicator Cluster Survey (MICS) datasets for Central Asia were used in this study of cross-sectional survey data. The MICS is a nationally representative survey of randomly selected respondents using a stratified multistage sampling strategy. The sample consists of female participants from Kazakhstan (2006: n=14,310), Kyrgyzstan (2006: n=6,493), Uzbekistan (2006: n=13,404), and Tajikistan (2005: n=4,677), for a total n=38,884. All participants are ever-married women of reproductive age (15-49 years old). Multilevel modeling (MLM) was used to assess the relationship

between HIV testing uptake and receipt of HIV test results with stigma at the individual, family, and community levels while adjusting for confounding factors, such as age, wealth, and education, as these factors may affect societal norms on the individual level (e.g. higher education may afford public health awareness which overrides societal stigma).

Results: Multilevel HIV stigma is significantly associated with decreased HIV testing uptake and receipt of HIV test results among ever-married women in Central Asia. Compounding effects of stigma were found at individual, family and community levels. After adjusting for community level affects and family level affects, a one SD (standard deviation) increase in composite stigma score was associated with a 49% ($p < 0.001$) decrease in the odds of having been tested for HIV at the individual level. After adjusting for the characteristics of individuals and the differences between communities, a one SD increase in composite stigma score was associated with a 59% ($p < 0.001$) decrease in the odds of having been tested for HIV at the household level. After adjusting for the characteristics of individuals and the differences between households, a one SD increase in composite stigma score was associated with a 94% ($p < 0.001$) decrease in the odds of having been tested for HIV and a 99% ($p < 0.001$) decrease in the odds of picking-up their test results at the community level.

Conclusions and Implications: The findings of the study enhance our understanding of the role of stigma in preventing the uptake of HIV testing among married women. HIV stigma operates on individual, family, and community levels to hinder HIV testing uptake and the receipt of HIV testing results. These findings have important interventions implications to improve and increase uptake of HIV testing and receipt of HIV test results, particularly within the context of testing as a gateway to treatment.

Literature Review

Central Asia, most commonly defined as including the countries of Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, and Turkmenistan, is experiencing a rapid increase in HIV prevalence. HIV testing in the general population of Central Asia is estimated at less than 5% (UNAIDS, 2008), which is less than the 10%-12% of men and women in the highest burdened countries of sub-Saharan Africa (WHO, 2007). Recent acceleration of HIV infection among women in Central Asia, who are not members of high risk groups, indicates that the epidemic may be spreading from injection drug users (IDUs) to their

female partners who are abstinent of drugs (Thorne, Ferencic, Malyuta, Mimica, & Niemiec, 2010). Furthermore, the population of Central Asia is highly migratory, mainly due to the current economic crisis in the region initiated by the dissolution of the Soviet Union in 1991. Migrating workers have the potential to increase transmission of HIV to other regions, further making this an issue of global health concern (El-Bassel et al., 2011). Women from Central Asia are also migrating for work within the region and also to Europe. Pointedly for HIV transmission, some women from Central Asia migrate to Western Europe to work as sex workers (Scambler, 2007). The magnitude and continued spread of HIV in Central Asia suggest a scientific and ethical imperative for research. Between 2000 and 2009, HIV incidence increased by more than 25% in Kazakhstan, Kyrgyzstan, and Tajikistan (UNAIDS, 2010). Incidence in Uzbekistan remains lower; however, in 2009, a total of 4,152 new infections were detected. Data for Turkmenistan were not accessible for this study due to the politically closed nature of the country. Table 2 displays the estimated prevalence of HIV in Central Asia.

Table 2. HIV/AIDS Estimates for Central Asia

Country	Number of people living with HIV	Adults aged 15 to 49 prevalence rate
Kazakhstan	12,000 [7,000 – 29,000]	0.1% [0.1% - 0.3%]
Kyrgyzstan	4,200 [2,300 – 7,700]	0.1% [0.1% - 0.3%]
Tajikistan	10,000 [5,000 – 23,000]	0.3% [0.1% - 0.6%]
Turkmenistan	Data not available	Data not available
Uzbekistan	16,000 [8,100 – 45,000]	0.1% [0.1% - 0.3%]

UNAIDS 2010. Epidemiological fact sheet on HIV and AIDS. Geneva: UNAIDS.

HIV testing, an important element of HIV intervention and prevention has been underutilized in Central Asia, and little research has examined this problem, despite the region having one of the fastest growing HIV epidemics in the world. HIV testing provides an opportunity for those who are HIV positive to access treatment, such as antiretroviral therapy (ART), which can reduce HIV viral count to undetectable levels and therefore reduce transmission (Quinn et al., 2000). The benefits of connecting people to testing and treatment (test and treat approach) have been found to be an important step in reducing HIV transmission. The randomized controlled trial “HPTN 052,” which took place in 13 international sites and demonstrated that ART offers prevention and treatment benefits by finding a relative reduction of 96% in the number of linked transmission events (Cohen et al., 2011; Cohen, McCauley, & Gamble, 2012).

Mathematical modeling has further supported the potential of this approach to decrease HIV transmission (El-Sadr, Coburn, & Blower, 2011; Granich, Gilks, Dye, De Cock, & Williams, 2009). This effect may have further benefits when treatment is started in the early stages of infection, when viral loads are highest and transmission most likely to occur (Dodd, Garnett, & Hallett, 2010; Miller, Rosenberg, Rutstein, & Powers, 2010; Powers et al., 2011). A substantial barrier to the test and treat approach is that individuals do not seek testing despite it being made available to them. Further using the MICs dataset, this study found that only 42% of ever-married women receiving antenatal care in Central Asia were tested, and of these women, only 85% picked up their test results despite being within the context of antenatal care, which may have made testing and receipt of results less burdensome. One of the major factor found in the literature that prevents people to get tested is stigma (Chesney & Smith, 1999; Ford, Wirawan, Sumantera, Sawitri, & Stahre, 2004; Herek, Capitano, & Widaman, 2003; Kalichman & Simbayi, 2003; Koku, 2010; Obermeyer & Osborn, 2007; Pool, Nyanzi, & Whitworth, 2001; Sasaki, Arifin, Ali, & Kakimoto, 2011; Solomon, Venkatesh, Srikrishnan, & Mayer, 2008), which is the major emphasis of this study.

HIV-related stigma is a multidimensional concept that has pervasive effects on the lives of people living with HIV, as well as serious consequences for the management of HIV/AIDS. HIV stigma has been identified as a barrier to HIV testing in low resource settings (Obermeyer & Osborn, 2007). HIV stigma is particularly important to study in light of the recent data regarding the effectiveness of antiretroviral therapy (ART) and the test and treat approach to HIV prevention (Dieffenbach, 2012; Duerr, 2012). Stigma may be a substantial barrier to getting individuals tested for HIV, and then into treatment. As the MICs dataset illustrates, even when many obstacles are removed (by offering the service as part of well utilized primary health care), HIV testing and result receipt remain less than 100%.

HIV testing behavior occurs within a context, of which an individual is one part. Contextual factors interact with one another and influence that individual's behavior. HIV stigma is a construct of the ecological context of the individual, and concurrently a product of social networks. An example of a contextual factor interacting with HIV stigma in this study is the majority religion of the Central Asian region, Islam. Individual behavior can be influenced by Islamic norms and recommendations, which can manifest in various forms, e.g. getting tested in order to adhere to the Islamic recommendation to safeguard one's health versus fearing community suspicion of behavior against Islam (injection drug use

or sex outside of marriage) if testing was witnessed by community members. Conservative gender norms may also have more impact on women than men, who may view sexually transmitted diseases as a sign of promiscuity which further impacts women's willingness to seek testing and follow through on result receipt. In addition to individual behavior change, other factors (such as social norms) also need to be addressed to sustain change, and may be prerequisites for an individual's behavioral change. Individual behavior change has been associated with social networks and social support (El-Bassel, Gilbert, Wu, & Chang, 2006; Rhodes, Singer, Bourgois, Friedman, & Strathdee, 2005a). The social networks of the individual are examined in this research; family and community are defined as social networks for purposes of this study. Social effects are therefore measured at these two network levels.

HIV prevention and risk occurs within a system and is only partially regulated at the individual level (Amaro, 1995; Coates, Richter, & Caceres, 2008; El-Bassel, Caldeira, Ruglass, & Gilbert, 2009; Friedman, 2009; Hogben & Leichter, 2008; Larios et al., 2009; Newmann et al., 2000; Parker & Aggleton, 2003; Voisin, DiClemente, Salazar, Crosby, & Yarber, 2006; Wingood & DiClemente, 2000b). This system includes, but is not limited to, the contextual factors of HIV stigma, sociodemographics, and social networks. These factors interact with one another, stimulating and limiting an individual's behavior. Through addressing the context of HIV testing, this research seeks to provide a foundation for more contextually grounded interventions that will move efforts away from solely focusing on persuading individuals to uptake testing, and toward facilitating an environment that facilitates preventive behaviors. Understanding multi-level stigma is essential to creating inroads to overcome these psychological obstacles. Failure to identify the interplay of community and family effects on the individual's stigma may undermine efforts to educate individuals about the rationale of testing and HIV health care.

The analytical approach, multilevel modeling, allows for multilevel variables to be tested, and then the Ecological Perspective and Social Network Theory will be used to frame the quantified results of the multilevel analysis. Essentially, theory and data analyses explain how family and community stigma are associated with an individual's testing uptake. To illustrate the details: First, the effect of individual level HIV stigma on the individual's testing was measured. Second, the level of HIV stigma within the individual's family was quantified by creating variables at the family level from the individual level, and then the effect of this family level stigma on the individual's testing was measured. Third, the level of HIV

stigma within the community was quantified by creating variables at the community level from the individual level, and then the effect of this community level stigma on the individual's testing was measured. Fourth, the interaction across these various levels on the individual's testing was measured and adjusted for in the MLM.

HIV Testing, Receipt of Test Results, and HIV Stigma

HIV testing is an important element of HIV intervention and prevention, and the first step to treatment. However, a recent systematic review concluded that global uptake and receipt of results is "very low" (Obermeyer & Osborn, 2007). In the United States, it is estimated that 20%-30% of seropositive individuals do not know their positive status (CDC, 2008). Even if individuals are tested, they may not make the effort to obtain the results. A comparative study of developing world countries found that approximately 60% of individuals return for their test results (Coovadia, 2000). In the United States, 34%-90% of individuals in various studies return for their test results from STI clinics (Hightow et al., 2003; Molitor, Bell, Truax, Ruiz, & Sun, 1999; Sullivan, Lansky, & Drake, 2004; Wiley, Frerichs, Ford, & Simon, 1998). A study with 448 female sex workers (FSW) in Tashkent, Uzbekistan reported 83.9% of the women had been tested and 10.9% of these women reported compulsory testing while detained by police (Todd et al., 2007). The uptake of testing in this FSW sample is substantially higher than the 42% among ever-married women in this study's sample. Reasons for this population difference could be further explored, as could the role of stigma in these two populations. USAID in Kyrgyzstan acknowledges stigma as a barrier to HIV testing in the region and is training health care providers to decrease stigma (USAID, 2011).

HIV-related stigma is a multidimensional concept that has pervasive effects on the lives of HIV-infected people as well as serious consequences for the management of HIV/AIDS. Stigma is considered to be a major barrier to HIV intervention and prevention (Mahajan et al., 2008). It has been associated with lack of uptake of testing, particularly in low-resource settings (Chesney & Smith, 1999; Ford, et al., 2004; Herek, et al., 2003; Kalichman & Simbayi, 2003; Koku, 2010; Obermeyer & Osborn, 2007; Pool, et al., 2001; Sasaki, et al., 2011; Solomon, et al., 2008). Stigma inhibits individuals from learning their serostatus, (Kalichman et al., 2005) accessing health services, adhering to medicines (Campbell, Foulis, Maimane, & Sibiyi, 2005; Liu et al., 2006), and taking preventive measures (Kalichman et al., 2006).

Several international studies have been conducted on the topic of HIV stigma. In Nigeria, social forms of HIV stigma were associated with reduced readiness of individuals to be tested for HIV (Babalola, 2007). In China, higher risk behavior was found in individuals with more stigmatized beliefs regarding HIV (Liu, H. et al., 2006; Chen, J. et al., 2005). In South Africa, people living with HIV/AIDS (PLWHA) were less likely to disclose their HIV status to their partners if they had experienced stigma or discrimination (Simbayi et al., 2007). Individuals in Zambia were reluctant to be tested in light of stigma (Jurgensen, Tuba, Fylkesnes, & Blystad, 2012). In Malawi, individuals were receptive to home-based testing despite holding a high level of HIV stigma (MacPherson et al., 2011), which supports the need for structural interventions. Furthermore, due to limitation in the lasting effects of individual level stigma interventions, community level and structural interventions have been called for to address this barrier (Parker & Aggleton, 2003). Multilevel analysis has been used to document the association between social networks, stigma and HIV status disclosure (Hutchinson, Mahlalela, & Yukich, 2007) and the association of community level stigma and HIV risk behaviors (Chen, Choe, Chen, & Zhang, 2005).

Given the ecological perspective of this study, it follows that this examination controlled for several contextual and demographic factors that have been associated with HIV testing uptake and the receipt of test results. These factors included: age (Fortenberry et al., 2002; Johnson & Way, 2006; Kelly et al., 1999) as younger individuals may not value preventative health care as much as older individuals, education (Johns, Bauermeister, & Zimmerman, 2010; MacPhail, Pettifor, Moyo, & Rees, 2009) as more educated individuals may have more exposure to preventative health messages; wealth (Gage & Ali, 2005; Johns, et al., 2010) individuals with more wealth may have greater access to health services; religion (Kelly, et al., 1999; Talukdar, Khandokar, Bandopadhyay, & Detels, 2007) individuals may fear stigma and assumptions that they are behaving in a manner against their religion; ethnicity (Kelly, et al., 1999) testing messages tend to have gained great traction with certain ethnicities and less so with others; marital status (Venkatesh et al., 2011) married individuals may fear negative interpretations of testing, such as infidelity, from their spouses; and region (Siziya, Muula, Rudatsikira, & Mataya, 2008) individuals from urban areas tend to have great access to HIV testing promotion all of which have been found to affect the uptake of HIV testing. Having adjusted the analysis for these variables, the results of this study have been teased out from other variables that could have been explanatory for testing behaviors.

This study focuses on ever-married women due to the feminization of the HIV epidemic and the elevated risk of HIV infection that women face as a result of biological and sociocultural factors (Wingood, 2003; Wingood & DiClemente, 2000a) particularly in the Muslim world (Dworkin, Kambou, Sutherland, Moalla, & Kapoor, 2009; Shawky, Soliman, & Sawires, 2009). Women may also be more susceptible to HIV because of hormonal changes, vaginal microbial ecology and physiology, and a higher prevalence of sexually transmitted diseases (Quinn & Overbaugh, 2005). Several studies explore the relationship of women and HIV testing. Women in Ghana who experienced community level stigma were less likely to have been tested for HIV (Koku, 2011). In Southern India, 85% of women expressed willingness to be tested; however, most were concerned about negative reactions from their husbands, parents, and community (Rogers et al., 2006). Gender based violence was reported to be a barrier to testing in South Africa (Adams et al., 2011; Weiser et al., 2006). The participants of this study are entirely ever-married women and the majority is Muslim (87%). This identity, in addition to the patriarchal context of Central Asia provides important factors to further consider. The women may be reluctant to be tested, independent of the result, for fear of gender-based violence or loss of financial support. A positive result may carry with it implications that could lead a women to be divorced or otherwise abandoned.

The Ecological Perspective (Bronfenbrenner, 1977; McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1996) and the Social Network Conceptual Model (Heaney & Israel, 2002) frameworks are used to examine the association of HIV testing uptake and receipt of test results with HIV stigma among ever-married women in Central Asia. Three hypotheses were tested: 1) HIV stigma at the individual level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics, household, and community affects. 2) HIV stigma at the household level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics and community affects. 3) HIV stigma at the community level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics and household affects. This study provides new data on the relationship between HIV testing and multilevel HIV stigma. Specifically, the study enhances understanding of barriers to HIV testing uptake and receipt of HIV test results by moving beyond individual risk factors to address the family and community levels of stigma.

This study focuses on multilevel HIV stigma and moves beyond individual risk characteristics. The multilevel factors this study examines have been found to be associated with low HIV testing uptake and receipt of HIV test results in other populations. Multilevel modeling (MLM), an innovative methodology, will be used to examine multilevel systematic predictors of HIV testing uptake and receipt of HIV test results, namely, individual level HIV stigma, family level social norm HIV stigma, and community level social norm HIV stigma. MLM is employed within a three-level framework. This study examines HIV testing among individuals, who are nested within families, which are nested within communities. The level 1 MLM models estimate an individual's testing behavior. At level 2, testing behaviors are modeled as functions of the individual's family stigma. At level 3, the model estimates the effects of community stigma on the individual's testing behavior.

Theory

This research was guided by the Ecological Perspective (Bronfenbrenner, 1977; McLeroy, et al., 1988; Stokols, 1996) and the Social Network Conceptual Model (Heaney & Israel, 2002). In this section, both theories will be outlined and the rationale for combining the theories will be provided. The variables of interest and outcomes for each paper will be connected via the mechanisms of the theoretical framework. This framework will provide the rationale for the multilevel approach.

The Ecological Perspective focuses on the transactions of individuals with their physical and sociocultural surroundings, examining the person within his or her environment. The Ecological Perspective can be divided into four main levels: the ontogenetic/personal level, (i.e., developmental factors), 2) the micro-level (i.e., factors of immediate context), 3) the exo-level (i.e., factors that affect the immediate context), and 4) the macro-cultural level, (i.e., the broad cultural values and belief systems). This research focuses on the latter three levels since ontogenetic/personal level variables are absent from the dataset. Micro-level variables will be variables that are characteristics of the individual including HIV stigma beliefs held by the individual, individual circumcision, and confounding demographic variables such as individual wealth. Exo-level variables will be the norms and social networks that are characteristics of the family, including HIV stigma beliefs held by the family, and confounding demographic variables such as family wealth. Macro-cultural variables will be the norms and social networks that are characteristics of the community, including HIV stigma beliefs held by the community.

My research utilizing the Ecological Perspective is enriched with the Social Network Conceptual Model because it provides a detailed framework to understand the effects of social networks and social networks on health behavior, specifically HIV prevention intervention uptake. The social networks' effects on the individual will be examined in this research. Specifically, family and community effects will be measured. Figure 1 details the theoretical framework.

Figure 1. Stigma as nested barrier to HIV testing and receipt of HIV test results

Outcomes of Interest:

D1= HIV Testing Uptake

D2= Receipt of HIV Test Results

Exposures of Interest:

E1= Individual HIV Stigma

E2= Family HIV Stigma

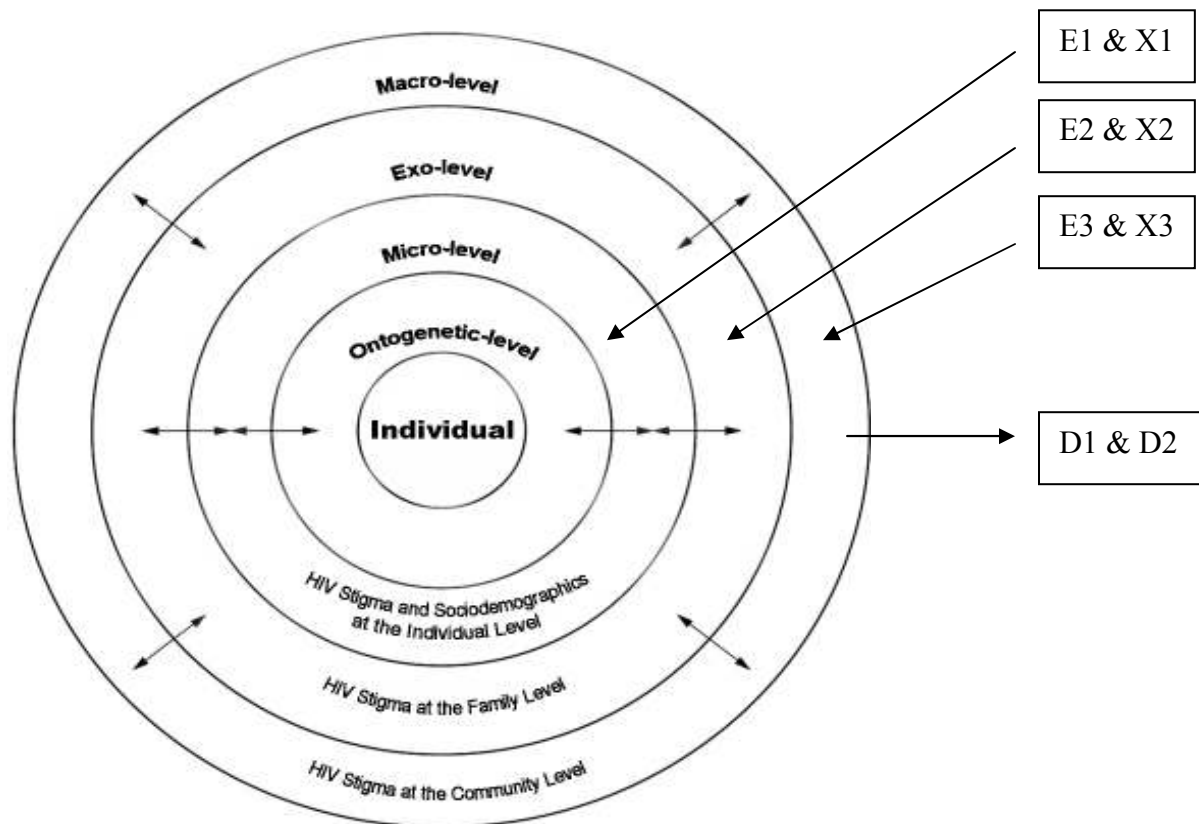
E3= Community HIV Stigma

Confounders:

X1= Individual Sociodemographics

X2= Family Effects

X3= Community Effects



The Social Network Conceptual Model (Heaney & Israel, 2002) maintains that there is a relationship between an individual's social network and social support, and that person's health behavior. The Social Network Conceptual Model follows four main principles when applied to HIV prevention intervention: 1) the importance of social networks in communities, 2) the attitudes of the social network toward HIV prevention, 3) the support given by social networks to change behavior, and 4) whether people in the social networks are at high level of risk. For my research, each of the four principles of the Social Network Conceptual Model will be utilized. This study models the effect of the family and community level social networks.

Methods

The UNICEF sponsored Multiple Indicator Cluster Surveys (MICS) datasets for Central Asia were used in this study. The sample consists of female participants from Kazakhstan (2006: n=14,310), Kyrgyzstan (2006: n=6,493), Uzbekistan (2006: n=13,404), and Tajikistan (2005: n=4,677), for a total n=38,884. All these participants are ever-married women of reproductive age (15-49 years old). In multilevel analysis, HIV stigma variables will be used to assess the significance of difference in HIV testing and receipt of HIV test results among participants, families, and communities, and the interaction between these levels. Confounding factors, such as wealth, educations, and age, were adjusted for use in the multilevel models.

Design

The study is based on secondary data collected by the Multiple Indicator Cluster Surveys (MICS). MICS is a standardized survey conducted in 75 developing countries. MICS was initiated by UNICEF and implemented with the joint support of National Ministries of Health, USAID, and UN agencies in the respective countries in this study. The MICS survey covers such topics as socio-demographic characteristics, women's status, family planning, and HIV/AIDS.

Sampling

MICS datasets are nationally representative surveys. The respondents are randomly selected using stratified multistage sampling strategy based on regional clusters. Regional clusters are selected, and then households are selected from these clusters using a probability proportionate to size sampling

procedure. Probability proportional to size selection allows for representative numbers of respondents at each of the lower population levels. Sample weights calculated by the MICS team at individual and household level were utilized to obtain nationally representative numbers.

Assessment

Dependent Variables.

The binary variables “ever been tested for HIV” and “received results of HIV test” were used in this analysis.

Independent Variables.

HIV Stigma.

Stigmatizing attitudes toward people living with or suspected of having HIV are measured using four survey questions on HIV stigma that cover a range of stigma-related issues. The survey items selected for the survey is ground in a framework developed by Link and Phelan (2006). Four binary questions were used for this study and they are referred to as “S” along with the question’s respective number (e.g. S1 for the first question) from this point forward. 1) “In your opinion, if a female teacher who has the AIDS virus is not sick, should she be allowed to continue teaching in the school?” 2) “Would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had the AIDS virus?” 2) “If a member of your close family got infected with the AIDS virus, would you want it to remain a secret or not?” and 4) “If a member of your close family became sick with AIDS, would you be willing to care for her or him in your own household?” The reliability of this four question scale was measured with Cronbach’s alpha (Cronbach, 1951) and yielded 0.457. Despite this not being the strongest alpha, the scale is widely utilized, as it is the standard scale used by UNICEF. Moreover, the scale is composed of only four questions. Scales with fewer questions can yield lower alphas (Cortina, 1993). Individual level measures of stigma were aggregated to the family and community levels in order to calculate second and third level effects in the multilevel models.

Confounding Variables.

Several confounding variables were adjusted for in the models. Age: measured in four categories: “15 to 19,” “20 to 29,” “30 to 39,” and “40 to 49”; Education: measured in three categories “less than secondary,” “completed secondary,” and “higher education;” Wealth: measured in three

categories “lower,” “middle,” and, “higher;” Ethnicity: measured using language as a proxy and in three categories “national,” “Russian,” and “other;” Country: measured in four categories “Kazakhstan,” “Kyrgyzstan,” “Tajikistan,” and “Uzbekistan” Region: measured in two categories “urban” and “rural;” and Marital status: measure in three categories “married,” “cohabitating,” and “none.” These confounders are commonly associated with variation in testing uptake. The mother tongue of the household was used as a proxy for ethnicity and religion, since in Central Asia mother tongue, ethnicity, and religion are likely to be highly correlated. The role of the confounders was further explained in the literature review section.

Data Quality

The quality of MICS data is assured by several processes: 1) questionnaires are checked when they first arrive from the field, for the correct numbers of questionnaires and selection of eligible respondents; 2) all questionnaires are checked after data entry to ensure that all expected data were in fact entered; 3) all questionnaires are entered twice and verified by comparing both data sets, and all discrepancies are resolved; 4) the entered data are checked for inconsistencies, and where possible, they are resolved; and 5) a set of quality control tables is generated on a regular basis. Additionally, the MICS program has adopted a policy of editing and imputation that results in a data file that accurately reflects the population studied; that may readily be used for analysis; and that may include missing values, sample weights, and median calculations (Childinfo, 2012).

Data Analysis

Multilevel modeling was used to examine multilevel systematic predictors of biomedical intervention uptake. MLM is most often used for education research because it allows for measuring the outcomes of students nested within classrooms and classrooms nested within schools. MLM has been underutilized in HIV research.

Descriptive Analyses.

Descriptive analyses were conducted and included means, standard deviations, and the frequency distribution of all measures.

Multilevel Analysis.

Multilevel analysis (or Hierarchical Linear Modeling [HLM]) was the primary method of analysis, and HLM 6.0 Statistical software was used to conduct multi-level analysis. HLM permits individual and community/contextual level predictors, and their interactions, to be examined in order to compute attributable risk projections and identify paths to intervention (Satcher, Pamies, & Woelfl, 2006).

Individual level variables (such as age, education, and wealth) were used as level 1 variables. Individuals residing in the same household had their data aggregated into level 2 variables (family level). Individuals residing in the same community had their data aggregated as level 3 (community level). Observations at level 1 were adjusted with individual sampling weights, and observations at level 2 were adjusted with household weights. Multi-level modeling was used to account for intra-class correlation due to household and community clustering and control for confounders. Confounding factors, such as age, education, wealth, country, region, relationship status, and language/ethnicity were adjusted for in the model.

Adjusted odds ratios and 95% confidence intervals were calculated to identify statistically significant stigma variables associated with HIV testing and receipt of results. Twelve models were run in total: six models for testing uptake and six models for receipt of results (Table 5). Each of these two outcomes was modeled at individual, household, and community levels. Due to significant correlations at 0.01 level, ranging from 0.420 to 0.628 between the composite stigma score and the individual stigma variables, separate models were run for the individual measures and the composite measure.

Human Subjects

This study uses Multiple Indicator Cluster Surveys 3 (MICS3) datasets, which are de-identified data. The study utilizes a secondary dataset that does not include any identifying information and therefore does not qualify as human subject research. The datasets are used with the written permission of UNICEF.

Results

Descriptive Analyses

The total sample consisted of 38,884 women: Kazakhstan n= 14,310, Kyrgyzstan n= 6,493, Uzbekistan n= 13,404 and Tajikistan n= 4,677. More details regarding the characteristics of participants are displayed in Table 3.

Table 3. Characteristics of Participants (n= 38,884)

Variable	n	%
Age		
15 to19	7,208	19
20 to 29	12,346	32
30 to 39	10,091	26
40 to 49	9,239	24
Education		
Less than Secondary	6,073	16
Completed Secondary	25,440	65
Completed Higher	7,371	19
Wealth		
Lowest	6,735	17
Middle	22,081	57
Highest	10,068	26
Language		
National	27,879	72
Russian	5,248	14
Other	5,740	15
Country		
Kazakhstan	14,310	37
Kyrgyzstan	6,493	18
Tajikistan	4,677	12
Uzbekistan	13,404	35
Region		
Urban	18,992	49
Rural	19,892	51
Union		
Married	23,277	60
Cohabiting	633	2
None	14,974	39
HIV Testing		
Tested	16,321	42
Obtained Result	13,929	85

HIV stigma was widely prevalent among the participants. Eighty-three percent of the participants were not willing to care for a close family sick with HIV/AIDS in their households. Ninety-two percent would want it to remain a secret if a close family member had HIV/AIDS. Sixty-one percent would not buy fresh vegetables from a vendor who has HIV/AIDS. Sixty-seven percent held the opinion that a female teacher who has HIV/AIDS but is not sick should not be allowed to continue teaching. The overall sample had a composite stigma score of 1.7 on a scale that ranged from one to two. Frequency of stigma at individual, household, and community level is displayed in Table 4.

Table 4. Frequency of Stigma

Measure¹	Level 1: Individual (n= 38,884)	Level 2: Household (n= 27,035)	Level 3: Community (n= 1,689)
(S1) Disapproval of HIV positive teachers	32,263 (83%)	21,346 (79%)	314 (19%)
(S2) Disapproval of HIV positive fresh produce seller	35,866 (92%)	24,386 (90%)	658 (61%)
(S3) Disapproval of disclosure of HIV positive family member	26,163 (67%)	16,973 (63%)	172 (10%)
(S4) Unwilling to care for HIV positive family member	15,094 (39%)	9,050 (34%)	57 (3%)
Composite Score ²	1.700 (0.212)	1.700 (0.201)	1.700 (0.106)

¹ Title of stigma measure is a paraphrasing of the original stigma question asked participants.

² Provided in mean and standard deviation.

Multilevel Analysis

This study seeks to address the hypothesis that HIV stigma at the individual, family, and community levels act as a barrier to HIV testing uptake and receipt of HIV test results.

Multi-level HIV stigma is associated with HIV testing uptake and receipt of HIV test results. Table 5 displays the results for testing uptake and receipt of test result. Estimates for a unit-specific model are given since this research focuses on the effect of stigma on individual women. Table 5 presents the level 1 participant characteristic estimates for the composite stigma variable model. There was no difference in significant findings between this model and the level 1 participant characteristic estimates for the four stigma variables. The tables allow for an examination of the results of this study by outcomes; whereas, the following in-text presentation organizes the results by levels. This is done to further illustrate the multidimensionality of these outcomes.

Table 5. MLM estimates for HIV testing uptake and receipt of test results

<u>Variable</u>	<u>B</u>		<u>SE</u>		<u>p</u>		<u>Odds Ratio</u>		<u>95% CI</u>	
	Uptake	Receipt	Uptake	Receipt	Uptake	Receipt	Uptake	Receipt	Uptake	Receipt
Individual Level										
Age										
15 to19	-0.723	-0.560	0.122	0.562	<0.001	0.320	0.485	0.571	0.382, 0.617	0.189, 1.724
20 to 29	1.065	0.188	0.078	0.385	<0.001	0.626	2.900	1.206	2.488, 3.379	0.567, 2.567
30 to 39	0.741	-0.006	0.069	0.416	<0.001	0.989	2.100	0.994	1.834, 2.400	0.439, 2.250
Education										
Less than Secondary	-0.874	-0.642	0.127	0.640	<0.001	0.316	0.417	0.526	0.325, 0.535	0.150, 1.849
Completed Secondary	-0.196	0.207	0.083	0.388	0.018	0.593	0.822	1.230	0.698, 0.967	0.574, 2.636
Wealth										
Middle	-0.271	-0.994	0.084	0.207	0.001	<0.001	0.763	0.370	0.647, 0.899	0.247, 0.556
Poor	-0.586	-1.377	0.114	0.297	<0.001	<0.001	0.557	0.252	0.445, 0.696	0.141, 0.452
Language										
National	-0.608	-0.552	0.083	0.199	<0.001	0.006	0.544	0.576	0.463, 0.640	0.390, 0.852
Other	-0.740	-0.521	0.116	0.300	<0.001	0.082	0.477	0.594	0.380, 0.599	0.330, 1.070
Country										
Kyrgyzstan	-1.77	-1.723	0.169	0.342	<0.001	<0.001	0.170	0.179	0.122, 0.236	0.091, 0.349
Tajikistan	-4.89	-0.238	0.152	0.441	<0.001	0.589	0.007	0.788	0.006, 0.010	0.331, 1.874
Uzbekistan	-2.067	1.002	0.120	0.255	<0.001	<0.001	0.127	2.724	0.100, 0.160	1.652, 4.493
Region										
Rural	-0.552	-0.667	0.120	0.234	<0.001	0.005	0.576	0.513	0.459, 0.722	0.324, 0.813
Union										
Cohabiting	-0.298	0.518	0.202	0.231	0.139	0.025	0.742	1.680	0.500, 1.102	1.067, 2.646
None	-1.99	-0.010	0.082	0.441	<0.001	0.982	0.137	0.990	0.117, 0.161	0.416, 2.356
Stigma										
S1	0.056	-0.350	0.010	0.507	0.572	0.490	1.058	0.704	0.870, 1.286	0.260, 1.908
S2	0.572	0.024	0.148	0.628	<0.001	0.969	1.773	1.025	1.327, 2.368	0.299, 3.517
S3	-0.023	0.141	0.076	0.400	0.766	0.725	0.978	1.151	0.842, 1.135	0.525, 2.527
S4	0.165	0.055	0.077	0.376	0.031	0.883	1.179	1.057	1.015, 1.371	0.505, 2.211
Composite Score	-0.672	0.193	0.159	0.164	<0.001	0.240	0.512	1.213	0.374, 0.698	0.879, 1.673
Household Level										
S1	0.155	0.335	0.070	0.070	0.026	<0.001	1.168	1.397	1.018, 1.340	1.218, 1.604
S2	0.299	0.191	0.089	0.095	<0.001	0.043	1.348	1.211	1.130, 1.607	1.006, 1.459
S3	0.027	-0.089	0.060	0.067	0.653	0.184	1.028	0.914	0.912, 1.158	0.801, 1.043
S4	0.158	-0.028	0.067	0.078	0.018	0.715	1.172	0.972	1.028, 1.337	0.835, 1.132
Composite Score	-0.887	-0.636	0.152	0.370	<0.001	0.086	0.412	0.529	0.306, 0.555	0.256, 1.094
Community Level										
S1	0.235	0.328	0.184	0.339	0.202	0.334	1.265	1.389	0.882, 1.815	0.713, 2.703
S2	0.056	0.422	0.122	0.224	0.642	0.060	1.058	1.525	0.834, 1.343	0.982, 2.369

S3	0.279	-0.686	0.200	0.340	0.163	0.044	1.322	0.504	0.893, 1.957	0.258, 0.981
S4	0.496	1.177	0.354	0.367	0.161	0.001	1.641	3.246	0.820, 3.286	1.579, 6.676
Composite Score	-2.823	-4.482	0.561	1.079	<0.001	<0.001	0.059	0.011	0.020, 0.179	0.001, 0.094

Level 1 – Individual.

Hypothesis: HIV stigma at the individual level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics, household, and community affects.

The results at this level address differences among individuals. After taking into account the differences between communities and households, a one SD (standard deviation) increase in composite stigma score was associated with a 49% ($p < .001$) decrease in the odds of having been tested for HIV. Two unique stigma variables significantly affected testing uptake. Individual who reported less S2 and S4 were at a 77% ($p < 0.001$) and 18% ($p = 0.031$) increase in odds to have been tested than those with higher levels of stigma. Stigma on the individual level did not significantly impact the receipt of test results.

Level 2 – Household.

Hypothesis: HIV stigma at the household level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics and community affects.

The results at this level address differences among households. After adjusting for the characteristics of individuals and differences among communities, a one SD increase in composite stigma score was associated with a 59% ($p < 0.001$) decrease in the odds of having been tested for HIV. Three individual stigma variables were significant. Individuals who reported less S1, S2, and S4 were at a 17% ($p = 0.026$), 35% ($p < 0.001$), and 17% ($p = 0.018$), respectively, increase in odds to be tested than those with higher levels of stigma. Two individual stigma variables were significantly associated with receipt of test results. Individuals who reported less S1 and S2 were at a 40% ($p < 0.001$) and 21% ($p = 0.043$), respectively, increase in odds of pick-up their test results.

Level 3 – Community.

Hypothesis: HIV stigma at the community level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics and household affects.

The results at this level address differences among communities. After adjusting for the characteristics of individuals and differences among households, a one SD increase in composite stigma

score was associated with a 94% ($p < 0.001$) decrease in the odds of having been tested for HIV and a 99% ($p < 0.001$) decrease in the odds of picking-up one's test results. Two individual stigma variables pertaining to receipt of test results were significant. Individuals who reported less S3 were at a 50% ($p = 0.044$) decrease in odds to pick-up their test results than those from communities with more stigma. This is the only significant result that goes against any of the hypotheses of this study. Individuals who reported less S4 were at a 225% ($p = 0.001$) increased odds to pick-up their test results than those from communities with more stigma; however, the confidence interval for this estimate is wider than the other confidence intervals (1.579, 6.676) most likely due to only 3% of communities being unwilling to care for an HIV positive family member.

Summary and Conclusion

Stigma was found to be associated with uptake of HIV testing and whether a participant picks up her test results. Stigma at the community and household levels was found to be significantly associated with individual's chance of having HIV testing and follow up on their results. The Ecological Perspective (Bronfenbrenner, 1977; McLeroy, et al., 1988; Stokols, 1996) and the Social Network Conceptual Model (Heaney & Israel, 2002) guided this research. The following discussion of results is explained within of frame of these theories.

The Ecological Perspective maintains that HIV risk behavior occurs within a context in which an individual is one part. This perspective is increasingly being utilized to examine HIV prevention among marginalized populations with higher HIV risk, for example African American females (El-Bassel, et al., 2009). Contextual factors (e.g., individual level HIV stigma, family level HIV stigma, and community level HIV stigma) interact with one another and influence an individual's behavior. Each level of these factors interacts with the others and can amplify each one individually. In the case of multilevel HIV stigma, individuals often adopt beliefs regarding acceptable versus unsavory behaviors from their families and communities (Alonzo & Reynolds, 1995; Kang, Rapkin, Remien, Mellins, & Oh, 2005; Parker & Aggleton, 2003; Witte, Batsukh, & Chang, 2010). Moreover, families strive to maintain social acceptability within communities. Given the cultural taboo of HIV, individuals can be reluctant to utilize HIV prevention strategies, such as testing for fear of stigmatization. In addition to individual behavior change, interventions need to target factors such as the multilevel HIV stigma to sustain change and may even be

prerequisites for individual behavioral change since these influences may hinder change on the individual level.

Within this research, the Ecological Perspective is enriched with the Social Network Conceptual Model (Heaney & Israel, 2002) because it provides a detailed framework to understand the effects of social networks and social support on health behavior, specifically HIV prevention intervention uptake. For the purpose of this study, social networks are defined as the individuals' families and communities, and social support as the interactions between the social network and the individual that pertain to HIV testing and HIV stigma. The social networks' effects on the individual were examined in this research. Figure 1 details the theoretical framework. The Social Network Conceptual Model maintains that there is a relationship between an individual's social network and social support, and that person's health behavior. Multilevel HIV stigma is a characteristic of social networks. The results of this study associate social networks, in the form of the stigma operating at the household and community level, with the testing behavior of participants. These results are aligned with other studies addressing how social support and social structure may affect HIV transmission (Friedman, Cooper, & Osborne, 2009a; Parker, Easton, & Klein, 2000; Rhodes, Singer, Bourgois, Friedman, & Strathdee, 2005b). Certain community level characteristics may increase HIV risk, for example, in impoverished African American neighborhoods, if the HIV prevalence is already high in that social network (Friedman, Cooper, & Osborne, 2009b). Social networks may decrease high risk behavior when the network's norms support safer practices, for example, encouraging condom use (El-Bassel, et al., 2006).

Islam and Central Asia

The results of this study associate multilevel stigma, as a product of context, to testing uptake and receipt of results. A key contextual variable in Central Asia is Islam, as it can influence behavior. The countries of Central Asia are 60% to 90% Muslim, and this provides another element that is important to consider when examining HIV stigma. In the Muslim world, and even among Muslims in the West, HIV is often linked to immoral behavior. An article published in the Journal of the Islamic Medical Association of North America states, "overall, promiscuous sexual behavior is the predominant mode of HIV transmission" (Misha'l, 2009, p. 77). Whether the mode of transmission is immoral by Islamic standards or not may impact HIV prevention. Even the act of getting tested may be equated to admission of

engaging in behavior that Islam considers immoral (injection drug use, sex outside of marriage, and homosexuality). Through social stigma, the commonplace emphasis on immorality may aid transmission through hindering dissemination of accurate HIV transmission knowledge, seeking of treatment, and decreasing testing.

Limitations

The study has a number of limitations that need to be addressed in future research. A limitation of this study is that only women who had a child in the last two years and who received antenatal care were asked about HIV testing, which limits generalizability of the findings to all women who have received antenatal care in Central Asia. A second limitation is this dataset's reliance on face-to-face interview data. Topics such as HIV risk behavior may come with a significant burden of stigma and may discourage some individuals from revealing related issues. Despite this limitation, interviews are a solid approach to collecting data on such a large scale, particularly with the aid of standardized instruments and trained interviewers. Casual inference is also a limitation of this study due to the cross-sectional design of the datasets and the resulting inability to distinguish temporal order. One of the four main levels of the Ecological Perspective, the ontogenetic/personal level, is not addressed due to developmental variables being absent for the dataset. The variables available in the dataset to examine HIV stigma are limited to the standard four stigma variables selected by UNICEF. Additional variables, such as distance to HIV testing center, availability of child care, the gender of the testing center staff could have provided useful information.

Implications for HIV Prevention

Working toward stigma-reduction may link to topics and behaviors that are often silenced such as sexuality, drug use, sex work, gender inequality, poverty, and race. Preparation of those involved in implementing interventions to address these issues may benefit interventions to reduce stigma. Possible interventions that could address multilevel HIV stigma are community level stigma awareness programs, HIV awareness programs in women's health and primary care clinics, and promotion of testing via various forms of media. Social marketing campaigns and peer norms intervention targeting women could be initiated to reduce stigma. Respected community members and local celebrities could be recruited to be publically tested. Opportunities could be provided for women to talk frankly with one another about HIV

and HIV testing, such as home visits by peer educators. An incentive system could be implemented to further encourage testing, and then HIV education that is aimed to reduce stigma could be incorporated to encourage regular testing. Partnership with faith based organizations and local mosques has been suggested as a tactic for HIV prevention (Kamarulzaman & Saifuddeen, 2010), in this case, such partnership may help reduce stigma.

Multilevel stigma reduction interventions also could be evaluated. Interventions that are partnered with faith-based organizations need to be examined, as they could lead to more culturally relevant policies and programs. More broadly, behavioral interventions that are informed by the contextual issues influencing HIV risk behavior need to be developed and evaluated. Increasing prevalence among women who are not in typical at-risk groups, highlights the need for strategies to increase prevention in this population, which is alarmingly serving as the viral reservoir. Methods of incorporating testing in routine health services such as antenatal care are currently available yet underutilized. Understanding the concept of multi-level stigma may help in devising strategies to break through these barriers to testing among women. The multilevel approach to stigma reduction should focus on primary prevention (reducing stigma in order to prevent HIV infection) and secondary prevention (reducing stigma to prevent PLWHIV from developing illness by, e.g., inadequate adherence to ARV) targeting individuals, couples, small groups, communities, and at a social policy/structural level. More broadly, the social determinates of health that are beyond the individual level, those that occur at various levels of the individuals social network whether that be household level or community can be further researched.

Implications for Policy

Policy changes could be made to facilitate greater uptake of test results and receipt of results by addressing multilevel stigma. Examples of policy changes that could be enacted are stigma reduction trainings could be included in mandatory health care provider training to reduce HIV stigma perpetuated by health care providers. Primary care providers could be required to offer testing to all patients. Policies to ensure confidentiality, and procedures to inform individuals of these policies could be put into place. Policies to provide home-based testing may work around some HIV stigma, as home-based testing can avoid the concern of being seen by others in the act of being tested. International HIV prevention

funding could be made more accessible via targeted recruitment programs to mosques in order to institute HIV testing promotion campaigns. Current policies in the region could be reviewed to eliminate any non-voluntary forms of testing, since these policies may contribute to stigma and run counter to a human rights framework. Programs to decrease multilevel stigma and expand access to HIV testing could be monitored and evaluated.

Implications for Research

The gaps in knowledge regarding HIV intervention prevention in Central Asia are significant. Further investigation regarding the barriers to uptake of testing and receipt of test results is needed. However, the findings of this research contribute to the body of scientific literature that addresses multilevel stigma. Measurement of stigma could be better refined. The behavioral and experienced measures of HIV stigma rather than perceived measures need to be quantified. Furthermore, behavioral and experienced measurement needs to be undertaken on individual, household, and community level. The reliability and construct validity of stigma scales needs to be further tested. The association of structural factors, such as laws, to the various levels of stigma needs to be quantified. The rapid changing context of social movements in Central Asia, whether secular or the Islamic revival, and their impact on stigma could be better understood. The interaction of gender inequalities, intimate partner violence, low risk perception, moral values, and lack of HIV transmission knowledge and multilevel stigma could be explored.

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Paper 2: India

The Relationship between Individual, Family, and Community Stigma
and Male Circumcision in India:
Implications for HIV Social Work Practice and Policy

Summary

Background and Purpose: India is home to the world's third-largest population suffering from HIV/AIDS, with the number of people living with HIV estimated between 2,100,000 and 2,800,000 (UNAIDS, 2009). The prevalence rate among 15-49 year olds is 0.3% [0.3% - 0.4%]. Research demonstrated that male circumcision can substantially reduce HIV transmission by 51-60% (Auvert et al., 2005; Bailey et al., 2007; Gray et al., 2007; Potdar & Mmari, 2011; Schneider et al., 2010b; Steward, Bharat, Ramakrishna, Heylen, & Ekstrand, 2012); however, only 13.6% of males in India are circumcised (DHS, 2006). Cultural and religious stigma directed toward HIV was associated with circumcision status in this population. Guided by the Ecological Perspective (Bronfenbrenner, 1977; McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1996) and the Social Network Conceptual Model (Heaney & Israel, 2002), this study examined multilevel HIV stigma and its association with circumcision among men in India. HIV stigma is examined at three levels within this research. First is the stigma held by the individual. Second is the stigma held by the family as a whole. Third is the stigma held by a community as a whole. At each of these levels, stigma is explored within the realms of social rejection, prejudiced attitudes, and disclosure concerns. The stigma measures were grounded in a framework developed by Link and Phelan (2006). This paper's major aim is to test the hypothesis that HIV stigma at the individual, family, and community levels is associated with males being uncircumcised.

Methods: The sample consisted of 65,356 men aged 15 to 54 years. The sample was drawn from the USAIDS sponsored Demographic and Health Survey (DHS) from India. The DHS is a cross-sectional nationally representative survey of randomly selected respondents using a stratified multistage sampling strategy. HIV stigma was measured in five variables. With six multilevel models (MLM), HIV stigma variables at the individual, family, and community levels were tested to assess the significance of differences in circumcision among participants, adjusting for possible confounding factors, such as wealth, education, region, and age.

Results: HIV stigma is associated with circumcision on individual, family, and community levels; however, not exactly as hypothesized. Specifically, stigma on the individual level is associated with less

circumcision; however, stigma on the family and community levels is associated with more circumcision. Statistically significant findings include: 1) the odds of being circumcised among men who reported greater HIV stigma were 13% times lower (95% CI: 0.847, 0.890; $p < 0.001$) than among men who reported less stigma; 2) the odds of being circumcised among men whose families reported higher HIV stigma were 16% times greater (95% CI: 1.097, 1.228; $p < 0.001$) than among families reporting less stigma; 3) the odds of being circumcised among men who reside in communities with greater HIV stigma were 134% times more (95% CI: 1.864, 2.937; $p < 0.001$) than among communities with less stigma.

Conclusions and Implications: Male circumcision, a key element of HIV prevention intervention, is negatively influenced by stigma at the individual level though positively influenced by stigma at the family and community levels. In other words, if an individual had stigma the odds are less that he will be circumcised. Conversely, if a family or community holds high levels of stigma the odds are higher that their members will be circumcised. Limitations of the research: The participant's age at circumcision was not available. This prevented greater insight into family and community level affects in comparison to individual level affects as it was unknown whether the participant was circumcised under the direction of parents or of his own accord. Additionally, most of the circumcised men in India are Muslim. More circumcised men who are not Muslim would have helped provide information into this unique group that could be models of how circumcision could be promoted to non-Muslims. Implication for social work intervention and HIV prevention intervention: Social workers, being liaisons between individuals and their environments, could be the professionals of choice to address stigma in India, as the multilevel approach is inherent to social work practice. Moreover, the study enhances understanding of contextual predictors by moving beyond individual risk factors to address the contextual factors that are central to social work HIV practice and policy. Implications for policy: Policies that improve education regarding HIV transmission and that provide education on the benefits of circumcision could help decrease multilevel stigma and may be key and preliminary to any large scale nationally mediated public health initiative. Implication for research: Individual level stigma barriers to circumcision uptake need to be further assessed, and in more detail. The family level stigma, specifically how stigma may impact parents for getting sons circumcised needs to be assessed. Qualitative research with community leaders to gain insight into the function of stigma on the community level is also needed.

Literature Review

The HIV epidemic has grown rapidly in India, from a 1990 estimated prevalence of approximately 200,000 people (WHO, 2010) to a 2008 estimation of 2.4 million people infected with HIV, with an adult prevalence rate of 0.3% (UNAIDS, 2010). This study examines the relationship of multilevel HIV stigma and male circumcision. Though male circumcision may drastically reduce HIV transmission, only a minority of Indian men are circumcised (13.6%), and factors associated with this phenomenon have been underexplored. The rapid growth of HIV in India paired with modest uptake of male circumcision prioritizes this topic for HIV prevention science.

HIV in India

Approximately 80% of infections are reported to occur through heterosexual sex (UNAIDS, 2010). There are concentrated epidemics among high risk groups, such as sex workers, men who have sex with men (MSM), and injection drug users, as well as truck drivers and migrant workers. For many years public opinion held that India's conservative social norms would prevent HIV from taking root in the country. This has not been the case. HIV is affecting various populations in the country. Nation-wide prevention campaigns have faced challenges related to the diverse populations. Several major languages and hundreds of dialects are spoken in India, necessitating prevention efforts to focus on specific communities. Recently, the Indian government, in cooperation with USAID, has worked to overcome cultural barriers that limit conversation about sex and hinder HIV prevention. Over 11,000 condom vending machines have been installed in colleges, road-side restaurants, gas stations, and hospitals, along with a "Condom Bindas Bol!" (condom - just say it!) media campaign. Other challenges include limited coverage of antiretroviral drugs (ARVs). Though India is a major provider of low-cost ARVs for the developing world, these drugs are not reaching the Indian population; only 1 in 4 people living with HIV (PLWHIV) in India are estimated to be receiving ARVs. Conversely, the Indian government has large campaigns to promote HIV testing and is making headway. Male circumcision is already practiced by a portion of the population and could be a valuable intervention for the country with more widespread adoption. Islam is the country's second most commonly practiced religion, after Hinduism. Muslims in India tend to be circumcised due to religious mandate, whereas, Hindus tend not

to be circumcised. Not only religion but other demographic and contextual factors, such as stigma, may play a significant role in the disparity in circumcision, and are examined in this study.

HIV Stigma

HIV related stigma refers to prejudice, negative attitudes, abuse, and maltreatment directed at people living with HIV and AIDS. Stigma is a major barrier to HIV prevention (Mahajan et al., 2008) as it has been associated with lack of uptake of HIV testing (Chesney & Smith, 1999; Ford, Wirawan, Sumantera, Sawitri, & Stahre, 2004; Herek, Capitanio, & Widaman, 2003; Kalichman & Simbayi, 2003; Koku, 2010; Obermeyer & Osborn, 2007; Pool, Nyanzi, & Whitworth, 2001), barriers to accessing health services and adhering to medicines (Campbell, Foulis, Maimane, & Sibiyi, 2005; Liu et al., 2006), and hindering preventive measures (Kalichman et al., 2006). Fear of contagion paired with negative assumptions about people living with HIV (PLWHIV) often result in HIV stigma.

HIV stigma has been the focus of several international studies. Delays in seeking care after testing HIV positive were associated with stigma in India (Steward, et al., 2012). Social forms of HIV stigma were associated with limited HIV testing uptake in Nigeria (Babalola, 2007). Individuals with more stigmatic beliefs regarding HIV engaged in higher risk behavior in China (Liu, H. et al., 2006; Chen, J. et al., 2005). PLWHIV in South Africa were less likely to disclose their HIV status to their partners if they had experienced stigma or discrimination (Simbayi et al., 2007). Community level and structural interventions have been suggested to address this HIV stigma (Parker & Aggleton, 2003) as individual level interventions may be limited by the “glass ceiling” of family and community, and by structural factors. More specifically, individuals could risk being rejected by their family or community if their views regarding HIV differed from their family or community. Within the context of a collectivist culture, this type of rejection may be avoided, even to the extent of changing one’s individual views in order to maintain alignment with the group. New data regarding family and community level stigma are emphasized in this study.

HIV Stigma in India

Despite HIV having become a generalized epidemic in India, it remains the source of stigma among the Indian public. PLWHIV have faced violent attacks, rejection by family and community, refusal of medical treatment, and denial of burial rites (HRW, 2011). In addition to adding to the suffering of

PLWHIV, such stigma also increases the burden of HIV prevention. The negative emotions and ideas that fuel HIV stigma can hinder the open communication that is needed for effective HIV prevention. Stigma is also active in health care settings, and limits the uptake of services (UNAIDS, 2001). Twenty-five percent of PLWHIV in India report having been refused medical treatment due to their HIV positive status (UNDP, 2006).

Male Circumcision and HIV

Male circumcision can reduce HIV transmission by 51-60% (Potdar & Mmari, 2011; Schneider, et al., 2010b; Steward, et al., 2012). Circumcision has been associated with reduced HIV incidence in men in sub-Saharan Africa (Golden & Wasserheit, 2009; Shaffer et al., 2007; Vardi, Sadeghi-Nejad, Pollack, Aisuodionoe-Shadrach, & Sharlip, 2007) as well as a decrease in other STIs, including HPV, HSV-2, and syphilis (Golden & Wasserheit, 2009; Tobian et al., 2009). Circumcision confers protection by removing the foreskin, which unresolved, increases the risk of infection due to the high density of HIV target cells and lack of keratinization of the inner mucosal surface (Weiss, 2007). There is growing support of circumcision programs in sub-Saharan African due to the cultural acceptability of circumcision and its protective effect against HIV infection (Westercamp & Bailey, 2007). This acceptance seems to be growing along side support for there being no loss of sexual satisfaction and function (Kigozi et al., 2008). Additionally, this protective effect is conferred to the female partners of circumcised men (Turner et al., 2007), as the highest vehicle of transmission is from infected male to female partners (UNAIDS, 2010).

Though a small body of research has emerged from India, the major research on male circumcision and HIV is primarily being conducted in Africa. This research offers a contextual connection to HIV risk behavior and will be used to illustrate potentially relevant issues. Africa and India share several important similarities that allow research from the former to offer insight on the latter. Both Africa and India have high HIV prevalence with heterosexual behavior forming a major transmission route. The research from Africa utilized for this paper includes studies conducted in countries with Muslim majorities and those with significant Muslim populations. Moreover, as in Africa, economic and political conditions in India are often fueling the context of HIV transmission. Nonetheless, the parallels drawn between Africa and India are not without limitations since there are notable cultural differences related to HIV, such as the greater frequency of reported transmission via male to male transmission in India.

Circumcision in India

Research in circumcision in India is in its infancy. According to DHS (2006), only 13.6% of males in India have been circumcised. Talukdar, Khandokar, Bandopadhyay, and Detels (2007) found that uncircumcised men in Kolkata, India, had higher odds of being HIV positive, and (Schneider et al., 2012b) found that uncircumcised men in South India were more likely to harbor bacterial pathogens in the coronal sulcus than their circumcised counterparts. Another study found that male circumcision had the greatest impact on reducing the odds of HIV infection among men when compared with other behavioral factors (Dandona et al., 2008). A study of Indian MSM found that the odds of HIV infection amongst circumcised men were less than one fifth that of uncircumcised men (Schneider et al., 2012a). In Mysore, India, mothers of male children regarded circumcision as highly acceptable, after being informed of the health risks and benefits (Madhivanan et al., 2008).

Aim and Hypotheses

Aim. To test the association between HIV stigma at individual, family, and community levels with male circumcision.

Hypothesis 1. HIV stigma at the individual level is associated with male circumcision, after adjusting for age, education, wealth status, region, family membership, and community membership.

Hypothesis 2. HIV stigma at the family level is associated with male circumcision, after adjusting for age, education, wealth status, region, and community membership.

Hypothesis 3. HIV stigma at the community level is associated with male circumcision, after adjusting for age, education, wealth status, region, and family membership.

Theory

The Ecological Perspective (Bronfenbrenner, 1977; McLeroy, et al., 1988; Stokols, 1996) and the Social Network Conceptual Model (Heaney & Israel, 2002) guided this research. These two frameworks provide the rationale for the multilevel approach used in this paper to examine HIV stigma and circumcision. The Ecological Perspective examines the transactions of individuals and their surroundings. This research utilized three levels described in the Ecological Perspective: 1) the micro-level (circumcision status, age, education, wealth, region, and individual HIV stigma), 2) the exo-level

(family membership and family level HIV stigma), and 3) the macro-cultural level (community membership and community level HIV stigma).

The Social Network Conceptual Model (Heaney & Israel, 2002) describes the relationship between an individual's social network and social support, and that person's health behavior. The chief components of the Social Network Conceptual Model are incorporated into this research: 1) the importance of social networks in communities, 2) the attitudes of the social network toward HIV prevention, 3) the support given by social networks to change behavior, and 4) whether people in the social networks are at high level of risk, for example, if the social network contains a high percentage of HIV positive individuals. The social networks' effects on the individual are examined in this research. Specifically family and community affects are measured. Figure 2 details the theoretical framework.

Contextual Variables and Possible Confounders within the Theoretical Framework

This study adjusts for several contextual variables, including age, education, wealth, region (urban versus rural), family membership, and community membership as these are conceptually linked to the relationship between the predictor variables (stigma) and the outcome variable (circumcision). Age, education, wealth, region, family membership, and community membership are key elements that can shape the environment and social network of an individual, and influence the individuals' relationship with stigma and circumcision. Figure 2 further details these interactions. These possible confounders have been associated with various HIV risks in previous studies conducted in India and other low resource settings. Poverty has been associated with HIV risk in India (UNAIDS, 2008) which may relate to high risk behavior in this group and/or barriers to treatment. In Burkina Faso and Kenya, young age (16-24 years) is a risk factor for HIV (Irungu et al., 2012). Participants aged 13-39 accounted for 39% of all new infections in 2009 in the U.S. (CDC, 2010). UNICEF (2004) maintains that education is crucially important to stopping the HIV pandemic. HIV risk also varies with geographical region, as urban populations were found to be at great HIV risk in Tanzania (Mnyika et al., 1994). The influence of social norms and social structure, such as membership in the same household and community can produce similarities in risk behavior and may affect HIV transmission (Friedman, Cooper, & Osborne, 2009; Parker, Easton, & Klein, 2000; Rhodes, Singer, Bourgois, Friedman, & Strathdee, 2005). More specifically, social networks may

decrease high risk behavior when the network's norms support safer practices, for example, encouraging condom use (El-Bassel, Gilbert, Wu, & Chang, 2006).

A study in India found that family level domains, such as a two-parent versus single-parent households, levels of parental supervision, experiencing violence in the home impact the age of sexual debut and the subsequent number of lifetime partners (Potdar & Mmari, 2011). Fear of family rejection has been associated with disclosure concerns (Nachege et al., 2012). Family level HIV stigma, marked by avoidance, exaggerated kindness, and being told to conceal one's status, was a predictor of psychological distress among PLWHIV (Stutterheim et al., 2009). Pressure to conceal status may result in infecting other partners of PLWHIV. In Vietnam, PLWHIV study participants expressed the emotional burden and the consequences of HIV stigma that extended to family, and subsequently engaged in self-isolating behaviors to minimize secondary stigma (Salter et al., 2010). These isolating defensive mechanisms prevent PLWHIV from seeking HIV counseling and treatment. Conversely, in Thailand, functional family units who do not stigmatize HIV positive members were associated with better adherence to ARVs (Rotheram-Borus et al., 2010). Community level stigma can result in verbal and physical abuse, rejection, and ostracism. Examples of community level stigma are present in popular media, such as antipathy towards MSM by perceived association PLWHIV, but scientific research on the topic is scant.

Figure 2. Multilevel stigma and circumcision

Outcomes of Interest:

D1= Circumcision

Exposures of Interest:

E1= Individual Stigma

E2= Family Stigma

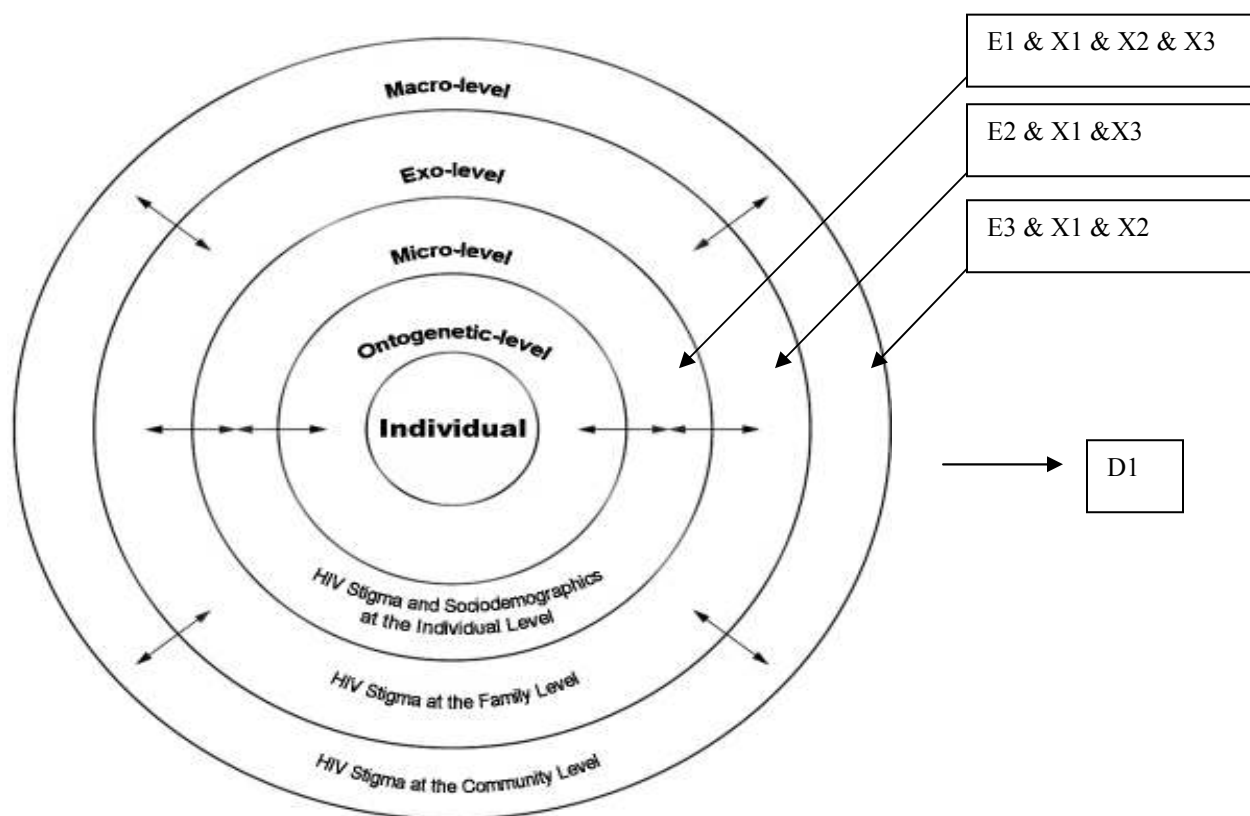
E3= Community Stigma

Confounders:

X1= Individual Sociodemographics

X2= Family Effects

X3= Community Effects



In this following section, each of the hypotheses are contextualized within the previously presented theoretical framework.

Hypothesis 1. HIV stigma at the individual level is associated with male circumcision, after adjusting for age, education, wealth status, region, family membership, and community membership.

While the primary outcome of interest is individual circumcision status, several aspects of the environment are also factored into the analysis. Micro-level variables include circumcision, age, and education. Exo-level variables will be membership in the participant's household and affect of family stigma on the individual. Macro-cultural variables will be membership in the participant's community and the affect of community stigma on the individual. Social norms and social support are analyzed as household and community membership.

Hypothesis 2. HIV stigma at the family level is associated with male circumcision, after adjusting for age, education, wealth status, region, and community membership.

This hypothesis examines exo-level, social norms and social support analyzed as HIV stigma at the family level. While holding other influences on the individual constant, the influence of family level HIV stigma is examined for its association with an individual's circumcision status. Several micro and macro aspects are also factored into the analysis. Micro-level variables include age and education. Macro-level variables will be membership in the participant's community. Social norms and social support are analyzed as household and community membership.

Hypothesis 3. HIV stigma at the community level is associated with male circumcision, after adjusting for age, education, wealth status, region, and family membership.

This hypothesis examines macro-level social norms and social support, which are analyzed as HIV stigma at the community level, while adjusting for stigma at the family level. Concurrently other influences on the individual are held as constant, the influence of HIV stigma held by the community is examined for its association with individuals' circumcision status.

Methods

Data

The data used in this study were part of the Demographic and Health Survey (DHS). The Center of Disease Control (CDC)--in partnership with Bloomberg School of Public Health at John Hopkins

University, with the joint support of National Ministries of Health, USAID, and UN agencies implemented the DHS. The DHS is a standardized survey conducted in 75 developing countries, and it covers such topics as socio-demographic characteristics, family planning, and HIV/AIDS. The datasets are accessible from www.measuredhs.com with the written permission of Macro International.

Data Source and Sampling Scheme

The respondents for the DHS were randomly selected using stratified multistage sampling strategy based on regional clusters, which produces a nationally representative sample. By using the most recent national census, India was divided into regional clusters. Samples were drawn separately for urban and rural areas. Within the multilevel models, first, regional clusters were randomly selected. Then, households within each cluster were selected using a probability proportionate to size sampling procedure, which allows for an implicit stratification and proportional allocation at each of the lower population levels. Population levels and socio-economic characteristics permit sorting within the sampling stratum. The sample for this study consists of 65,356 Indian men between the ages of 15 and 54 years who reported having heard of HIV/AIDS. Men who had not heard of HIV/AIDS were excluded from this study as they were not queried about HIV stigma. Nationally representative results at both the individual and household levels were made possible by utilizing sample weights calculated by DHS.

Assessment

Dependent Variables.

The binary variable “respondent circumcised” was used in this analysis.

Independent Variables.

HIV stigma at the individual, family, and community levels was the predictor of interest. HIV stigma was measured in five variables at each of the three levels. The first four asked the respondent for a binary response to the following questions: 1) “If a member of your close family became sick with AIDS, would you be willing to care for her or him in your own household;” 2) “If a member of your close family got infected with the AIDS virus, would you want it to remain a secret or not;” 3) “Would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had the AIDS virus;” and 4) “In your opinion, if a female teacher who has the AIDS virus is not sick, should she be allowed to continue

teaching in the school?" The fifth variable was calculated from the previous four, and allowed for creation of a global stigma score from 1-4.

Confounding Variables.

Several potentially confounding sociodemographic variables were adjusted for in the models: Age: measured in four categories: "15 to 19," "20 to 29," "30 to 39," and "40 and over"; Education: measured in three categories "primary or less," "completed secondary," and "higher than secondary;" Wealth: measured in three categories "lower," "middle," and, "higher;" and Region: measured in two categories "urban" and "rural." The role of these confounders was further explained in the literature review section.

Data Analysis

MLM was employed within a three-level framework. At level 1, the level of an individual's stigma was tested for association with his circumcision status, while adjusting for the effects of sociodemographics, family, and community. At level 2, the individual's family level stigma was tested for association with his circumcision status, while adjusting for the effects of sociodemographics and community membership. Family level stigma was defined as the average level of HIV related stigma held by all family members. At level 3, the effects of community level stigma on the individual's circumcision status was tested, while adjusting for the effects of sociodemographics and family membership. Community level stigma will be defined as the average level of HIV related stigma held by all community members.

Descriptive Analysis

Descriptive analyses included means, standard deviations, and the frequency distribution of the measures.

Multilevel Analysis

Six separate models were used to answer the hypotheses of this study. To test hypothesis 1: Two models were used to avoid correlation of the four stigma variables with the global stigma score variable. Thus, the first model included the four unique stigma variables, and the second model included only the global stigma score variable. Variables in this model were: circumcision status as the outcome,

individual level HIV stigma as the predictor of interest, and four confounders for which the model was adjusted: age, education, wealth, and region. Household affects were adjusted for at level two. Community affects were adjusted for at level three. Weights were used at the individual and household levels to compensate for oversampling in more populated areas. To test hypothesis 2: Again, two models were used to avoid correlation of the four stigma variables with the global stigma score variable. Thus, the first model included the four unique stigma variables, and the second model included only the global stigma score variable. Variables in this model were: circumcision status as the outcome, family level HIV stigma as the predictor of interest, and four confounders for which the model was adjusted: age, education, wealth, and region. Sociodemographics were adjusted for at level one. Community affects were adjusted for at level three. Weights were used at the individual and household levels to compensate for oversampling in more populated areas. To test hypothesis 3: Again, two models were used in order to avoid correlation of the four stigma variables with the global stigma score variable. Thus, the first model included the four unique stigma variables, and the second model included only the global stigma score variable. Variables in this model were: circumcision status as the outcome, community level HIV stigma as the predictor of interest, and four confounders for which the model was adjusted: age, education, wealth, and region. Sociodemographics were adjusted for at level one. Family affects were adjusted for at level two. Weights were used at the individual and household levels to compensate for oversampling in more populated areas.

Human Subjects

This study did not qualify as human subject research since it utilized a secondary dataset that did not include any identifying information.

Results

Descriptive Analysis

The sample included: 65,356 men from 46,149 households and 3,825 communities. Characteristics of participants are displayed in Table 6.

Table 6. Characteristics of Participants (n= 65,356)

Variable	n	%
Age		
15 to19	11,594	18
20 to 29	21,618	33
30 to 39	16,551	25
40 and older	15,593	24
Education		
Primary or None	15,451	24
Secondary	38,714	59
Higher	11,191	17
Wealth		
Lowest	3,967	6
Middle	39,576	60
Highest	21,813	34
Religion		
Muslim	8,498	13
Hindu	48,235	73
Other	8,623	14
Region		
Urban	35,953	55
Rural	29,403	45
Circumcised		
Yes	8,905	14
No	56,451	86

HIV stigma was reported by 23-35% of participants. Twenty-three percent of the participants were not willing to care for a close family sick with HIV/AIDS in their households. Thirty-five percent would want it to remain a secret if a close family member had HIV/AIDS. Thirty-five percent would not buy fresh vegetables from a vendor who has HIV/AIDS. Twenty-seven percent held the opinion that a female teacher who has HIV/AIDS but is not sick should not be allowed to continue teaching. The overall sample had a composite stigma score of 1.1 on a scale that ranged from zero to four. Each unit score had direct measurable effects on odds of being circumcised as further noted. Frequency of stigma at individual, household, and community levels is displayed in Table 7. Individual level stigma is presented in frequencies as number of individuals that hold stigmatizing beliefs. Household level is presented as means of individuals within household that hold stigmatizing beliefs. Community level is presented as means of households within communities that hold stigmatizing beliefs.

Table 7. Frequency of Stigma

Measure¹	Level 1: Individual (n= 65,356)	Level 2: Household (n= 46,149)	Level 3: Community (n= 3,825)
(S1) Disapproval of HIV positive teachers	17,811 (27%)	0.270 (0.395) ³	0.270 (0.199) ³
(S2) Disapproval of HIV positive fresh produce seller	22,832 (35%)	0.346 (0.422) ³	0.346 (0.217) ³
(S3) Disapproval of disclosure of HIV positive family member	22,910 (35%)	0.347 (0.428) ³	0.347 (0.270) ³
(S4) Unwilling to care for HIV positive family member	15,035 (23%)	0.228 (0.374) ³	0.228 (0.201) ³
Composite Score	1.192 (1.222) ²	1.192 (1.101) ²	1.192 (0.633) ²

¹ Title of stigma measure is a paraphrasing of the original stigma question asked participants.

² Provided in mean and standard deviation for a 0 to 4 scale.

³ Provided in mean and standard deviation for a 0 to 1 scale.

Table 8. MLM estimates for circumcision

Variable	B	SE	p	Odds Ratio	95% CI
Individual Level					
Age					
15 to19	-0.418	0.034	<0.001	0.658	0.615,0.704
20 to 29	-0.010	0.032	0.743	0.989	0.928,1.054
30 to 39	0.275	0.040	<0.001	1.317	1.218,1.425
40 and older	*	*	*	*	*
Education					
Primary or None	0.284	0.048	<0.001	1.328	1.209,1.460
Secondary	-0.094	0.037	0.011	0.909	0.846,0.978
Higher	*	*	*	*	*
Wealth					
Lowest	0.363	0.168	0.031	1.438	1.035,1.999
Middle	0.468	0.086	<0.001	1.598	1.350,1.892
Highest	*	*	*	*	*
Region			<0.001		
Rural	-1.077	0.155	<0.001	0.340	0.251,0.462
Urban	*	*	*	*	*
Stigma					
S1	-0.276	0.036	<0.001	0.758	0.706,0.814
S2	-0.058	0.034	0.096	0.943	0.881,1.010
S3	-0.013	0.029	<0.001	0.986	0.930,1.045
S4	-0.203	0.036	<0.001	0.815	0.760,0.876
Composite Score	-0.141	0.012	<0.001	0.868	0.847,0.890
Household Level					
S1 779	0.089	0.090	0.321	1.093	0.916,1.306
S2 825	0.191	0.089	0.010	1.240	1.052,1.463
S3 777	-0.089	0.060	0.003	1.255	1.079,1.461
S4 778	-0.028	0.067	0.390	1.078	0.908,1.279
Composite Score	0.148	0.028	<0.001	1.160	1.097,1.228
Community Level					
S1 779	-0.533	0.495	0.282	0.586	0.222,1.550
S2 825	1.325	0.180	<0.001	3.764	2.641,5.368
S3 777	-0.608	0.287	0.035	0.544	0.310,0.957
S4 778	1.330	0.392	<0.001	3.781	1.753,8.157
Composite Score	0.850	0.560	<0.001	2.340	1.864,2.937

* reference category

Multilevel Analysis

As displayed in Table 8, multilevel HIV stigma is associated with males being uncircumcised, even after adjusting for sociodemographic confounders. Estimates for a unit-specific model are given since this research focuses on the affect of stigma on individual men. Only level 1 participant characteristic estimates for the composite stigma variable model are presented in Table 8, as there was no difference in significant findings between this model and the level 1 participant characteristic estimates for the four stigma variables. The tables in this results section allow for an examination of the results of this study by outcomes. To illustrate the multidimensionality of the findings, the in-text description below is organized by levels.

Level 1 – Individual.

Level 1 results pertain to the differences among individuals. After taking into account the differences between communities and households, a one standard deviation (SD) increase in composite stigma score was associated with a 13% (95% CI: 0.847, 0.890; $p < 0.001$) decrease in the odds of being circumcised. Three unique stigma variables were significantly associated with circumcision. Individuals who reported more S1, S2, and S4 were at 24% (95% CI: 0.706, 0.814; $p < 0.001$), 1% (95% CI: 0.930, 1.045; $p < 0.001$), and 19% (95% CI: 0.760, 0.876; $p < 0.001$) decreased odds of being circumcised, respectively.

Level 2 – Household.

Level 2 results pertain to the differences among households. After adjusting for the characteristics of individuals and differences among communities, a one SD increase in composite stigma score was associated with a 16% (95% CI: 1.097, 1.228; $p < 0.001$) increase in the odds of being circumcised. Two individual stigma variables were significant. Individuals who reported more S2 and S3 at the family level were at 24% (95% CI: 1.052, 1.463; $p = 0.010$) and 26% (95% CI: 1.079, 1.461; $p = 0.003$) greater odds of being circumcised.

Level 3 – Community.

Level 3 results pertain to the differences among communities. After adjusting for the characteristics of individuals and differences among households, a one SD increase in composite stigma score was associated with a 134% (95% CI: 1.864, 2.937; $p < 0.001$) increase in the odds of being circumcised. Three unique stigma variables were significantly associated with circumcision. Individuals who reported more S2 and S4 at the community level were at 276% (95% CI: 2.641, 5.368; $p < 0.001$) and 278% (95% CI: 0.760, 0.876; $p < 0.001$), respectively greater odds of being circumcised. Conversely, individuals who reported more S3 (disapproval of disclosure of HIV positive family member) at the community level were at 46% (95% CI: 1.753, 8.157; $p = 0.035$) less odds of being circumcised.

Summary and Implications

Multilevel HIV stigma significantly predicts a male's circumcision status. Stigma at the individual level increases the odds of being uncircumcised. Conversely, stigma at the family and community levels increases the odds of a participant being circumcised. Two implications are outstanding: the significant association of stigma and circumcision, and the archetypical illustration of the ecological fallacy (Piantadosi, Byar, & Green, 1988; Robinson, 1950; Te Grotenhuis, Eisinga, & Subramanian, 2011).

Stigma at the individual level may prevent an individual from participating in HIV prevention for fear of being associated with being at risk for HIV. Stigma at the family and community levels may encourage circumcision, particularly if the decision to circumcise is made by the parents of a young child, since the child is not thought to be engaged in high risk behavior that may be deemed immoral; instead, the circumcision may be understood as a preventive health measure. In this way, families and communities having more experience with stigma may be more willing to agree with (or to) circumcision. Alternatively, circumcision may be conducted in families for various reasons (e.g. religious dictates), independent of and without having HIV positive family members. These same families may harbor stigma against PLWHIV, and thus circumcision among these groups is a co-phenomenon of their HIV stigma. How family level stigma influences the development of individual stigma and may act as a negative influence on circumcision practice later in life, should be studied. Family beliefs affect young family members, and they help shape an individual's belief system, which forms his identify later in life. This

may include stigma as a result of family (and community) influences. Families may have their male children circumcised, but once an adult, an individual may be less likely to voluntarily seek circumcision due to fear of association of this practice with high risk behavior, and being subsequently stigmatized by family and community.

On the other hand, one stigma variable stands out: Communities with greater disapproval of disclosure of HIV positive family member were found to be associated with less circumcision. Further research is needed to examine this result. Family level stigma and individual stigma likely have a complex correlation; identifying ways to enhance beneficial family practices, such as circumcision for male children, without permitting heightened stigma, may be necessary. The impact of multilevel stigma must be examined for other HIV prevention strategies, as circumcision is only one part of a combined prevention strategy that may include antiretroviral therapy (ART), condoms, voluntary counseling and testing (VCT), and others. However, the single protective effect of circumcision on HIV prevention is substantial (Auvert, et al., 2005; Bailey, et al., 2007; Gray, et al., 2007). Only ART nears the efficacy of male circumcision; however, effectiveness may be greater with circumcision since adherence would not be a limiting factor. Compared to other prevention options, such as condom promotion and behavior change, circumcision is a one-time intervention that requires some aftercare. On-going adherence or sustained behavior change, often problematic for other strategies, are not applicable with circumcision.

The findings of this analysis on multilevel stigma and circumcision exemplify the ecological fallacy and illustrate the complexity of HIV stigma, as findings at the family and community levels do not correlate to the individual level. This relationship can be explained by the ecological fallacy (Piantadosi, Byar, & Green, 1988; Robinson, 1950; Te Grotenhuis, Eisinga, & Subramanian, 2011), which stipulates that individual members of families or communities do not need to have the average characteristics of the family or community. The mathematical explanation is that the variability of individuals is much greater than the variability of their mean. Population level outcomes may be erroneously assumed to apply at the individual level when they are in fact different; this is known as the ecological fallacy (Piantadosi, et al., 1988; Robinson, 1950). Mathematically, the variability of individuals is much greater than the variability of their mean. In the case of this study, at family and community levels, stigma is associated with

circumcision, though stigma at the individual level is not, demonstrating the complex manner in which stigma interacts at various levels.

Ecosystems

The ecosystem in which the individual is embedded, or the sociocultural context, was examined by adjusting for various sociodemographics and contextual factors in order to study the impact of stigma on the individual within his environment. Age, education, wealth, and region were all highly significant factors that impact the association of stigma and circumcision. Given the high impact these factors had on the results, it is worthwhile to examine the categories that were not significant in order to better understand the issue. The only category that was not significant in the entire list of characteristic variables was the 20 to 29 age group. This age group was not significantly different from the 40 and older group in terms of the association of stigma and circumcision. This group is different possibly due to exposure to HIV education or other factors. Stigma and circumcision interventions may need to be specifically tailored to this group.

Social Network

Social network could be an important determinant of circumcision uptake (Brooks et al., 2010). In this study, social networks were examined in the form of family and community stigma. The analysis adjusted for the impact of family and community members on the association of stigma and circumcision at the individual level in order to focus on the stigma held by the individual. Then the impact of family and community was explored while adjusting for individual level characteristics. The influence of family and community stigma was found to significantly impact circumcision status.

Religion

Stigma may pose a barrier to circumcision uptake by individuals concerned about being associated with a high risk group (Chandhiok & Gangakhedkar, 2007), or in the Indian context with another religious group (Madhivanan, et al., 2008; Schneider et al., 2010a). Circumcision may present an opportunity to engage with populations that consider religion as an important aspect of identity (Sawires et al., 2007). Religion is a key aspect of the human ecosystem and the social network in India. Religious identity may also be a significant barrier to circumcision uptake. Male circumcision is almost a proxy for religious identity in India. Within the Indian context, it is mostly practiced by Muslims. Muslims are

approximately 13% of India's population (DHS, 2006). With a population of 1,170,938,000, this percentage indicates that India contains within its borders the second highest Muslim population of all world countries. During the violent partitioning of British India into East and West Pakistan and India, Muslim identity was sometimes confirmed by circumcision status (Chandhiok & Gangakhedkar, 2007). During these religious conflicts, an estimated 200,000 to 1,000,000 people died (Hodson, 1997; Stephens, 1963; Wolpert, 1993). Given this history, circumcision faces significant barriers in India.

Limitations

Data indicating the participant's age at circumcision were not available. This data could have provided insight into family and community level affects in comparison to individual level affects. For example, stigma may encourage families to circumcise their young sons, but on the individual level, stigma may discourage grown men from getting circumcised for fear that others may suspect them of behavior that is perceived as immoral. More detailed data regarding HIV stigma may have provided further insight, such as differentiating stigma variables that are measures of behavioral experience rather than perceptions or opinions. An example of a research question that could have been explored with such data is: "Does number of times an individual witnesses PLWHIV being verbally assaulted impact their willingness to be circumcised?" Additionally, the extent to which the population is aware of the relationship of circumcision to HIV transmission has not been assessed in the dataset, but may have provided useful information if the variable could have been analyzed.

Most of the circumcised men in India are Muslim. Adjusting for being Muslim would have prohibited data analysis due to the high correlation with the outcome variable, circumcision. However, stigma and Muslim religion were not correlated, so Muslim religion did not confound the results. Nonetheless, when considering the generalizability of the results of this analysis, it is important to maintain cognizance of this demographic fact, that most circumcised men in India are Muslims. Circumcision and Muslim faith is highly correlated.

Implications for Social Work Intervention

The results of this research imply that interventions will be most useful if targeting stigma at various levels. Social work is keenly familiar with the ecosystems approach and the multilevel nature of social and health problems. As such, social work could lead the way toward testing and implementation

multilevel interventions. Interventions that reduce stigma at the individual level may include peer to peer HIV education. Home visits by public health or social workers that provide HIV education could address stigma on individual and family levels. These levels may have complex effects on stigma, as relationships at family and individual levels are already complex. Community level interventions could include partnerships with faith-based organizations to include HIV education in sermons. Social workers could provide counseling to overcome the various environmental barriers to circumcision in India, as social work counseling is grounded in the strengths perspective and could incorporate cultural strengths, such as collectivism and mutual care, which may increase rates of circumcision.

Implications for Policy

If circumcision is to be advocated in India, stigma will need to be addressed at its various levels. Current barriers that prevent circumcision, which may include religion, must be addressed, as these carry with them the weight of political and ideological enmity, further sensitizing the issue. This may prevent a widespread government promotion of circumcision as the secular Indian government may be concerned with inflaming religious tension in the diverse population. Policies that improve education regarding both HIV transmission and the benefits of circumcision will be key and preliminary to any large scale nationally mediated public health initiative. Apart from these ideological barriers, contextual barriers in India, such as poverty and isolation from health care, could be addressed through social services, such as subsidized circumcision procedures and rural circumcision programs (Schneider, et al., 2010a).

Implications for Research

The association of multilevel HIV stigma with male circumcision presents several integrating avenues for future research. Further inquiries into what men in India perceive to be barriers to male circumcision are needed to evaluate the feasibility of facilitating circumcision among individuals. Family level questions regarding HIV stigma asked of parents but in regard to circumcision of sons could provide valuable information as to the differing affects of stigma at the family level. Interviews with key informants and community leaders to explore more in-depth the relationship between community level stigma and circumcision could assist in further understanding community level stigma. Research is also needed pertaining to the other manifestations of HIV stigma—enacted (discrimination), vicarious (reports of others' experienced discrimination), felt normative (perceptions of stigma's prevalence), and internalized

(personal endorsement of stigma beliefs). Stigma experienced on various levels could be further explored, such as the immorality often associated with HIV transmission and the need to save face as a community. Geospatial research could identify the regions that were shown to be “hotspots” without male circumcision. Characterizing these areas to search for structural barriers, such as lack of doctors to perform circumcisions, could guide specific structural interventions, such as subsidized circumcision services. Determining the social barriers of an individual accepting male circumcision in this macro-level layer will also be important.

Conclusion

The association between multilevel HIV stigma and male circumcision was explored in this paper. The association was significant at all three levels: individual, family, and community. The first hypothesis was support, as individual level stigma decreased the odds of being circumcised. The second and third hypotheses were not supported, as family and community stigma increased the odds of being circumcised. The implications of these finding for interventions include highlighting interventions at the family and community levels. The implications of these findings for policy include placing greater emphasis on multilevel deterrents of circumcision uptake. The implications of these finding for further research include more in depth probing into the impact of stigma at the individual versus the family and community levels, and refining measurement of stigma.

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Paper 3: Mali

The Association of HIV Status and Sexual Behavior
with Female Circumcision in Mali

Summary

Background and Purpose: It has been estimated that 110,000 [83,000-140,000] Malians are living with HIV/AIDS, and the adult prevalence is 1.1% [0.8-1.5%] (UNAIDS, 2011). HIV has feminized in Mali, with females accounting for 60% of HIV cases. In Mali, 92% of women are circumcised and 80.3% of the population supports the practice; moreover, FC is often justified as a protective against HIV (WHO, 2010). A review of the literature reveals little empirical research linking HIV and FC. The purpose of this research is to examine the association between FC and sexual risk behavior. I hypothesize that female circumcision is associated with HIV positive status, but not with decreased sexual behavior.

Methods: This study is an analysis of data from the USAID sponsored Demographic and Health Survey, a nationally representative survey of randomly selected respondents using a stratified multistage sampling strategy. The sample consists of 13,015 Malian women of reproductive age (15-49 years old), collected in 2006. Measures included biospecimens for HIV antibody testing and survey results reporting: number of partners, sexual debut, premarital sex, and sociodemographics. Multiple imputation with 10 imputations corrected for 10% missing data. Multilevel modeling (MLM) was used to assess the significance of difference in HIV status and sexual behavior with FC. MLM was also used 1) to measure and correct for the intra-class correlation, as some participants were from the same household and communities; and 2) to adjust for age, education, ethnicity, wealth, religion, and region.

Results: Participants with FC were at 2.100 ($p < 0.001$; 95% CI: 1.844, 2.389) higher odds of being HIV positive. Women with FC did not significantly differ from women without FC in number of sexual partners ($p = 0.634$), age of sexual debut ($p = 0.888$), or odds of having premarital sex ($p = 0.575$). Membership in specific households and communities did affect the relationship of circumcision to HIV status and sexual behavior. All results were adjusted for the characteristics of individuals and the affects of membership in the participant's households and communities.

Conclusions and Implications: FC is associated with HIV positive status, but not with a decrease in sexual risk behavior. The higher rates of HIV among FC compared to non-FC women may be explained by a number of factors, such as transmission during the circumcision procedure or greater physiological

vulnerability post-procedure. These factors have not been studied and must be included in future research.

Literature Review

FC is widely practiced in Mali, where it is also believed to be a protective against HIV; however, there is little empirical evidence validating or disproving this belief. Furthermore, HIV has been feminized in Mali, with females accounting for 60% of HIV cases (WHO, 2010). Since HIV is feminized in Mali and local belief indicates that FC can protect against HIV, a study of FC is particularly relevant. Mali has scaled-up their response to HIV in recent years. A free antiretroviral therapy (ART) policy has been implemented, and it is estimated to have 85% coverage. However, concentrated epidemics exist among sex workers, with a prevalence of 35.3%, and street vendors, with a prevalence of 5.9% (UNAIDS, 2009).

In Mali, FC has a prevalence of 91.6% and a high societal endorsement (80.3%), where FC is often justified as a protective against HIV (WHO, 2010). It is at this intersection of HIV and FC where this study makes its contribution. This study empirically examines the association of FC with HIV status and sexual behavior. Specifically, sexual debut, number of partners, and premarital sex are tested for a relationship to FC, as FC is conceptualized as a mechanism to preserve chastity. In the following sections, the evidence to support early sexual debut and an increased number of sexual partners as risks for HIV is presented. Since there is little evidence that premarital sex in itself is a risk for HIV, this behavior is examined in light of it being culturally relevant to Mali, where one of the major justifications for the practice of FC is to prevent premarital sex among women.

FC is a controversial topic. FC is also known as female genital mutilation and female genital cutting. The term “female circumcision” is used in this dissertation since it is the terminology used by the populations that engage in the practice. This is an attempt to avoid the biased language of female genital mutilation and female genital cutting, for which the West is commonly criticized by those who support the practice.

Women are the focus of this study since women are disproportional affected by HIV in Mali, as they account for 60% of infections. A U.S. Centers for Disease Control and Prevention (CDC) surveillance study found that 4.5% of pregnant women in the Malian capital district of Bamako were HIV positive. A serious localized epidemic is revealed when this percent is compared to the 1.5% prevalence in the general adult population. Female sex workers (FSW) are the most at risk population in Mali (CDC,

2007). The prevalence has increased from 28.6 in 2000 to 35.6 in 2006 among sex workers.

Furthermore, FSW in the profession for six to 10 years had an HIV prevalence of 50%. Neither FC nor the biological vulnerabilities to HIV that may be associated with FC has been studied in the Malian FSW population.

Female Circumcision

Worldwide, it is estimated that between 100 million and 130 million females have undergone forms of FC (Abusharaf, 2006). WHO (2010) stated that the procedure has no health benefits and that it is a violation of human rights. WHO (2009) described female circumcision as any procedure involving the "partial or total removal of the external female genitalia or other injury to the female genital organs whether for cultural, religious or other non-therapeutic reasons" Furthermore, the WHO classifies the procedure into four categories: Type 1: removal of the clitoral hood and/or the clitoris. Type 2: partial or total removal of the clitoris and the labia. Type 3: reducing the vaginal opening by repositioning the labia; Type 4: all other procedures.

In countries where FC is practiced, it is referred to as circumcision (Utz-Billing & Kenterich, 2008). In the West, where the practice is not accepted, it is referred to as female genital mutilation (FGM) or female genital cutting. The term female genital mutilation is often offensive to circumcised women, who neither consider themselves mutilated nor their family members mutilators. Women from FC practicing countries have commented that FGM is a term often used to insult their culture by outsiders (Abusharaf, 2006; Rahman & Toubia, 2000). Current anthropology (in the post cultural relativist period) uses the FC terminology. After five years of fieldwork in Sudan, Gruenbaum (2001) concluded that outside criticism was often simplistic and failed to appreciate the complex meaning of FC, and, at the same time, could provoke a backlash, particularly because women from countries where FC is practiced are often supporters of FC (Upvall, Mohammed, & Dodge, 2009) and assign it cosmetic value, just as some women in the West assign cosmetic value to plastic surgeries such as breast augmentations, abdominoplasty, and, somewhat ironically, labiaplasty. Moreover, a search of the literature revealed no organized effort by African women to export or otherwise impose FC on Western women; however, the literature reports considerable efforts to defend cultures that support FC against Western efforts to prohibit the practice. When Gruenbaum noticed decreases in FC, she attributed the change to economic

and social developments, the influences of Islamic activists, the work of local health educators, and the efforts of African women.

WHO maintains that there is no therapeutic benefit from the practice. On the other hand, the intervention of the West in female circumcision has sparked accusations of cultural imperialism and fueled notable uprisings against colonial powers, as noted, for example, in the independence movement among the Kikuyu in Kenya (Natsoulas, 1998). Nonetheless, the West has maintained a consistent interest in FC. The Demographic and Health Survey ([DHS], 2001) has provided data on female circumcision since 1995, and this study utilizes DHS data. In Mali, the prevalence of female circumcision decreased from 93.7% in 1996 to 91.6% in 2006. However, support for female circumcision increased from 75.3% in 1996 to 80.3% in 2001.

In regions where FC is practiced, it is believed to preserve female chastity and prevent sexual behavior outside of marriage (Abusharaf, 2006; Gruenbaum, 2001; Hernlund & Shell-Duncan, 2007; Jones, Ehiri, & Anyanwu, 2004; Little, 2003). WHO (2010) commented:

FGM is often motivated by beliefs about what is considered proper sexual behavior, linking procedures to premarital virginity and marital fidelity. FGM is in many communities believed to reduce a woman's libido, and thereby is further believed to help her resist "illicit" sexual acts. When a vaginal opening is covered or narrowed (type 3 above), the fear of pain of opening it, and the fear that this will be found out, is expected to further discourage "illicit" sexual intercourse among women with this type of FGM." (p. 54)

Again, in regions where FC is practiced, heterosexual transmission of HIV is believed to be the main transmission route for HIV, so examining heterosexual behavior is in order. Local leaders in FC practicing countries commonly refer to FC as an HIV prevention strategy despite the international HIV prevention community's disagreement. Njiru (2004) summarized the attitude: "the proponents of the practice argue that it lowers sexual desire hence promiscuity, and with the upsurge of HIV, they are now aggressively 'fighting' the spread of HIV" (p. 11).

The link between female circumcision and HIV has been rarely examined quantitatively, and little or conflicting epidemiological data associating HIV and other sexually transmitted illnesses (STI) with female circumcision exist (Monjok, Essien, & Holmes, 2007). One Kenyan study demonstrated that

circumcised women have higher odds of being HIV positive (Maslovskaya, Brown, & Padmadas, 2009), and a Gambian study found a higher prevalence of herpes simplex virus among circumcised women (Morison et al., 2001). Genital ulcers and foul smelling white and yellow discharges were reported more often by circumcised women in Nigeria (Okonofu, Larsen, Oronsaye, Snow, & Slanger, 2002). A study examining the HIV risk of circumcision procedures in Kenya, Lesotho, and Tanzania found that both males and females who were virgins and circumcised had higher odds of being HIV positive, which was thought to be attributed to the use of unsterilized tools in the procedure (Brewer, Potterat, Roberts, & Brody, 2007). Additionally, there is a greater chance of vaginal tearing during defibulation and post-FC intercourse. Painful vaginal intercourse associated with FC may lead some women to engage in more frequent acts of anal sex, which carries a great risk of HIV transmission (Monjok, et al., 2007). Opposing these results, a study in Tanzania found no association between female circumcision and HIV status (Klouman, Manongi, & Klepp, 2005), and research on sex workers in West Africa found that FC was associated with negative HIV status (Kanki et al., 1992),

The published findings concerning FC and sexual behavior are also limited, though the prevailing cultural conception is that FC prevents promiscuity. A study in Guinea, where FC is nearly universally practiced, did not find FC to impact sexual behavior (Van Rossem & Gage, 2009). In Sudan, where the most extensive procedure (type 4) is common, a study of 300 women found that the women reported experiencing sexual desire despite having undergone the procedure (Lightfoot-Klein, 1989). Yet another study in Kenya found circumcised women to engage in more sexual risk behavior (Yount & Abraham, 2007). Klouman et al. (2005) conducted a study in Tanzania and found a discrepancy between self-reporting and examination results, in which one-fifth more women were circumcised than subjectively reported. This may be related to FC being viewed as desirable and a beautification of the female form.

Delay of Sexual Debut

Delay of sexual debut has been associated with a reduction in HIV infections (Collins, Coates, & Curran, 2008). Youth is often a higher risk time period due to both biological and psychological vulnerabilities. Decreasing sexual activity in these active years can reduce the risk of HIV infection. As Uganda's youth population reported delaying sexual debut, HIV prevalence also decreased (Kilian et al., 2007). In Zimbabwe, girls reported delaying sexual debut after a substantial decline in HIV prevalence

(Gregson et al., 2006). Dlamini et al (2009) found that social support and positive peer norms helped girls in South Africa delay sexual activity.

Partner Reduction

In Mali, one aspect of how FC is thought to prevent HIV is via sexual partner reduction, including decreasing both overall lifetime partners and number of multiple concurrent partnerships. Partner reduction is an important tool for decreasing the spread of HIV (Shelton et al., 2004; Wilson, 2004). Multiple and concurrent partnerships have been identified as a risk for HIV in Mali by UNAIDS (2006). Chen et al. (2007) examined 18 sub-Saharan countries and concluded that multiple partnerships are a risk factor for HIV. In Tanzania, having multiple partnerships was associated with HIV seropositivity (Landman et al., 2008). A steep decline in HIV prevalence in Zimbabwe was correlated with a reporting of partner reduction by both males and females (Gregson et al., 2006). Multiple partnerships fell in Kenya in the early 1990s, as did the HIV prevalence (Cheluget et al., 2006). As HIV prevalence declined in Thailand from 1991 to 1995, army conscripts reported less sex with commercial sex workers (Nelson et al., 1996). Partner reduction and condom promotion were concluded to be more effective than only condom promotion in Uganda (Kirby, 2008). However, some perceptions of masculinity may pose a challenge for partner reduction and delaying sexual debut since having multiple female partners is seen as an enhancement of masculinity (Hunter, 2005). It has been reported that men will use their economic position to draw women into multiple partnerships in the form of exchange sex (Desmond et al., 2005).

HIV in Mali

Overall, research specific to HIV in Mali is limited. Presented here is research conducted in Mali to provide a broader context of HIV in Mali. Boileau et al. (2008) found that youth in Mali tended to reject multiple partnering. Early sexual debut was reported as a HIV risk for urban Malian women (Boileau, Zunzunegui, & Rashed, 2009). Testing uptake was negatively impacted by doubts of the prevalence or even existence of HIV (Castle, 2003). In rural Mali, fatalism may play an important role in limiting HIV prevention (Hess & McKinney, 2007). Several relational factors, such as duration of partnership, were found to impact self-disclosure of HIV status (Ndiaye et al., 2008).

Contextual Variables

Several sociodemographic and contextual variables have been associated with HIV risk. Vulnerability to HIV infection in Mali is associated with poverty (UNAIDS, 2006). Poverty can lead to an increase in FSW, which is a risk for HIV. In Burkina Faso and Kenya, youth aged 16-24 were found to be at an elevated risk for HIV (Irungu et al., 2012). Youth aged 13-39 accounted for 39% of all new infections in 2009 in the U.S. (CDC, 2010). UNICEF (2004) maintains that education is key to curbing the HIV pandemic. A review of HIV studies from Africa revealed that Muslims tend to be at less risk for HIV than non-Muslims, possible protectives included fewer sexual partners, great prevalence of male circumcision, and less alcohol consumption (Gray, 2004). Urban populations were found to be at great HIV risk in Tanzania (Mnyika et al., 1994). Ethnicity is a relevant HIV risk in Africa for several reasons, most notably due to it being a proxy for male circumcision (Weiss, Quigley, & Hayes, 2000) and cultural norms that impact sexual behavior. Membership in the same household and community can produce similarities in risk behavior, via the influence of social norms. Social support and social structure may affect HIV transmission (Friedman, Cooper, & Osborne, 2009; Parker, Easton, & Klein, 2000; Rhodes, Singer, Bourgois, Friedman, & Strathdee, 2005). Social networks may decrease high risk behavior when the network's norms support safer practices, for example encouraging condom use (El-Bassel, Gilbert, Wu, & Chang, 2006).

Aim and Hypotheses

Aim. To test the relationship between FC with HIV status and sexual behavior while controlling for socio-demographic variables and the affects of membership in specific households and communities among women in Mali.

Hypothesis 1. Women who have been circumcised will more likely test positive for HIV than will uncircumcised women, after adjusting for socio-demographic factors (e.g., age, education, ethnicity, wealth, religion, and region.) and effects of membership in specific households and communities.

Hypothesis 2. Women who have been circumcised will report no significant difference in number of partners or sexual debut in comparison to uncircumcised women, after adjusting for socio-demographic factors (e.g., age, education, wealth, child want, religion, ethnicity, region, and knowledge of testing location) and affects of membership in specific households and communities.

Hypothesis 3. Membership in specific households and communities with higher HIV prevalence and higher risk sexual behavior will predict HIV positive status and greater participation in higher risk sexual behavior.

Theory

Two frameworks guided this research, the Ecological Perspective (Bronfenbrenner, 1977; McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1996) and the Social Network Conceptual Model (Heaney & Israel, 2002). The combining of these two frameworks provides the rationale for the multilevel approach. The specific mechanisms addressed by each hypotheses are grounded in these theories and outlined in the following sections. Now, each framework will be briefly described and then applied to the hypotheses of this study. The Ecological Perspective emphasizes transactions of individuals and surroundings. The perspective examines the person within his or her environment. Three levels described in the Ecological Perspective are examined in this research: 1) the micro-level (i.e., factors of immediate context), 2) the exo-level (i.e., factors that affect the immediate context), and 3) the macro-cultural level (i.e., broader cultural values and belief systems).

The Social Network Conceptual Model (Heaney & Israel, 2002) maintains that there is a relationship between an individual's social network and social support, and that person's health behavior. The Social Network Conceptual Model contains four main principles when applied to HIV prevention: 1) the importance of social networks in communities, 2) the attitudes of the social network toward HIV prevention, 3) the support given by social networks to change behavior, and 4) whether people in the social networks are at high level of risk; e.g., if the social network contains a larger amount of injection drug users. The social networks' effects on the individual are adjusted for in this research. Specifically family and community affects are measured. Figure 3 details the theoretical framework, and this theoretical framework is applied to each of this study's hypotheses below.

Hypothesis 1. Women who have been circumcised will more likely test positive for HIV than will uncircumcised women, after adjusting for socio-demographic factors (e.g., age, education, ethnicity, wealth, religion, and region.) and affects of membership in specific households and communities.

While the primary outcome of interest is individual HIV status, several aspects of the environment are factored into the analysis. Micro-level variables include circumcision and confounding demographic

variables such as individual wealth. Exo-level variables will be membership in the participant's household. Macro-cultural variables will be membership in the participant's community. Social norms and social support are analyzed as latent variables embedded within the household and community membership.

Hypothesis 2. Women who have been circumcised will report no significant difference in number of partners or sexual debut in comparison to uncircumcised women, after adjusting for socio-demographic factors (e.g., age, education, wealth, child want, religion, ethnicity, region, and knowledge of testing location) and affects of membership in specific households and communities. The primary outcome of interest is individual sexual behavior. Similarly to hypothesis one, several aspects of the environment are factored into the analysis. Micro-level variables include circumcision and confounding demographic variables such as individual wealth. Exo-level variables will be membership in the participant's household. Macro-cultural variables will be membership in the participant's community. Social norms and social support are analyzed as latent variables embedded within the household and community membership.

Hypothesis 3. Membership in specific households and communities with higher HIV prevalence and risky sexual behavior will predict HIV positive status and greater participation in risky sexual behavior. This hypothesis examines the exo-level, in terms of household influence, and macro-level, in terms of community influence. Again, social norms and social support are analyzed as latent variables embedded within the household and community membership.

Figure 3. Relationship of Female circumcision to HIV status and HIV risk

Outcomes of Interest:

D1= HIV Status

D2= HIV Risk

Exposures of Interest:

E1= Individual FC

E2= Family FC

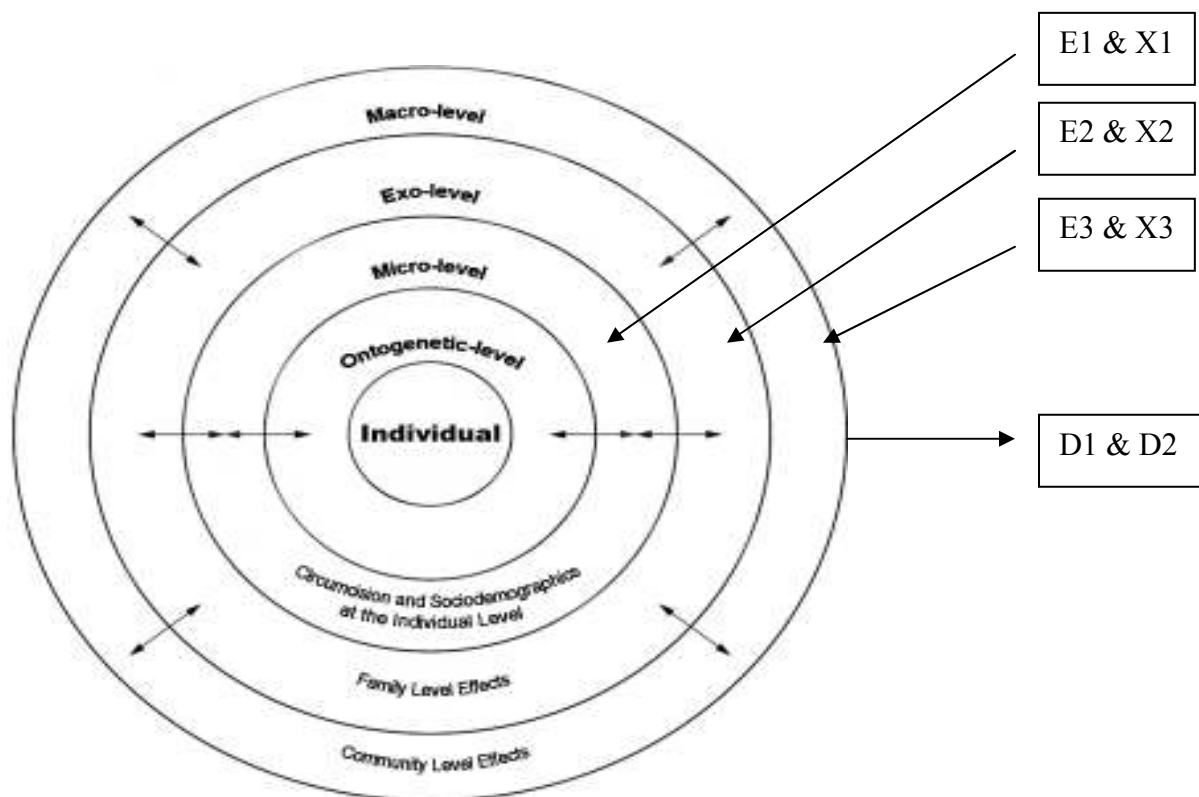
E3= Community FC

Confounders:

X1= Individual Sociodemographics

X2= Family Effects

X3= Community Effects



Methods

Data

This study is an analysis of data collected by the Demographic and Health Survey (DHS), which is a standardized survey conducted in 75 developing countries. DHS was initiated by the Center of Disease Control (CDC) in partnership with Bloomberg School of Public Health at John Hopkins University, and implemented with the joint support of National Ministries of Health, USAID, and UN agencies. The DHS surveys cover such topics as socio-demographic characteristics, family planning, and HIV/AIDS. The datasets are accessible from www.measuredhs.com with the written permission from Macro International.

Data Source and Sampling Scheme

The DHS are nationally representative surveys of randomly selected respondents using stratified multistage sampling strategy based on regional clusters. Using the most recent national census, Mali was split into regional clusters, and samples were drawn separately for urban and rural areas. After randomly selecting a number of regional clusters, households were selected within each cluster using a probability proportionate to size sampling procedure. By using a probability proportional to size selection during the first sampling stage, an implicit stratification and proportional allocation was achieved at each of the lower population levels. The clusters were sorted within each sampling stratum, first, according to the population levels and then by their socio-economic characteristics. The sample consists of 13,015 Malian women of reproductive age (15-49 years old). Sample weights calculated by the DHS teams were utilized to obtain accurate nationally representative numbers at the individual and household levels.

Assessment

Dependent Variables.

Variables used in this analysis include: The binary variables: "HIV test result," and "first intercourse at first union." The continuous variables: "age at first intercourse," and "number of persons had sex with in lifetime."

Independent Variables.

The binary variable “respondent circumcised” is the predictor of interest. “Household” is a continuous variable assigned to each household in the survey. Some households had multiple survey participants. “Community” was measured by cluster assignment based on geographic location and population. Communities were assigned an identifying number and were composed of individuals within households.

Confounding Variables.

Several potentially confounding variables were adjusted for in the models: Age: measured in four categories: “15 to 19,” “20 to 29,” “30 to 39,” and “40 to 49”; Education: measured in three categories “no formal education,” “completed primary,” and “secondary education or more;” Wealth: measured in three categories “lower,” “middle,” and “higher;” Ethnicity: measured as “Mande” or “Other;” (Mande are the majority ethnic group in Mali) and Region: measured in two categories “urban” and “rural;” The role of these confounders was further explained in the literature review section.

Data Analysis

Multilevel modeling (MLM) was used to examine the association of FC with HIV status and sexual behavior while accounting for the affects of households and communities. MLM allows for measuring and adjusting for the affects of some women being from the same household and/or community. MLM has been underutilized in HIV research, despite the growing attention to the effects of factors beyond the individual. Multiple imputation with 10 imputations was used to correct for 10% missing data in FC, number of partners, sexual debut, and premarital sex. All variables used in the MLM were used in the imputation.

Descriptive Analysis

Descriptive analyses include means, standard deviations, and the frequency distribution of measures.

Multilevel Analysis

Four separate models were used to answer the hypotheses of this study. To answer hypothesis 1: Of the entire 13,015 cohort, those women completing biospecimen testing for HIV are weighted to represent the entire population, resulting in 4,219 women, 3,261 households, and 407 communities.

Variance in HIV test results limited the analysis to six variables, as only 69 of 4,219 participants tested positive for HIV. Variables in this model included were: HIV status as the outcome, FC as the predictor of interest, and two confounders for which the model was adjusted: age and wealth. Age was measured in four categories and wealth in three. Due to dummy coding, one category of each of these variables was used as a reference, resulting in five variables and the predictor of interest, FC (total: six). These potential confounders were chosen as priority for the analysis based on a review of the literature. Household effects were adjusted for at level two. Community effects were adjusted for at level three. Weights were again used at the individual and household levels to compensate for oversampling in more populated areas.

To answer hypothesis 2: Three models were used, one for each measure of sexual behavior. The sample included 13,015 women, 10,203 households, and 407 communities. Sexual behavior outcome variables included number of partners, premarital sex, and age of sexual debut. The predictor of interest was FC. Individual level variables that were adjusted for included age, education, ethnicity, wealth, religion, and region. The affects of the household were adjusted for at level two. The affects of the community were adjusted for at level three. Weights were used at the individual and household levels to achieve nationally representative estimates.

To answer hypothesis 3: The four previously mentioned models were examined for intra class correlations (ICC) in terms of individuals within a household, households within a community, and differences between communities.

Human Subjects

This proposed study utilizes a secondary dataset that does not include any identifying information and does not qualify as human subject research.

Results

Descriptive Analysis

The total sample included 13,015 women from 10,203 households and 407 communities. Details regarding the characteristics of participants are displayed in Table 9.

Table 9. Characteristics of Participants (n= 13,015)

Variable	n	%
Age		
15 to19	1,709	13
20 to 29	5,071	39
30 to 39	3,702	28
40 to 49	2,533	20
Education		
No Formal Schooling	10,516	81
Primary	1,368	11
Secondary or Higher	1,131	9
Wealth		
Lowest	2,2236	17
Middle	8,023	62
Highest	2,756	21
Religion		
Muslim	11,938	92
Christian	415	3
Animist	197	2
None	387	3
Ethnicity		
Mande	4,712	36
Other	8,303	64
Region		
Urban	4,399	34
Rural	8,616	66
Circumcised		
Yes	10,886	83
No	2,128	17
HIV Status (n=4,219) ¹		
Positive	69	2
Negative	4,150	98
Premarital Sex		
Yes	7,987	61
No	5,028	39
Number of Lifetime Partners ²	1.36	0.830
Age of Sexual Debut ²	15.90	2.681

¹ Weighted sub-sample

² Means and standard deviations are provided since variable is continuous

Multilevel Analysis

Hypotheses 1 and 2 were tested with a total of four multilevel models. Detailed results are found in Tables 10, 11, 12, and 13.

Hypothesis 1: Circumcised Women were at 2.100 ($p < 0.001$; 95% CI: 1.844, 2.389) higher odds of being HIV positive than uncircumcised women, after adjusting for age, wealth, and affects of membership in the participant's specific household and community.

Hypothesis 2: After adjusting for sociodemographics and affects of membership in the participant's specific household and community, circumcised women did not significantly differ from uncircumcised women in number of lifetime sexual partners ($p=0.634$), age of sexual debut ($p=0.888$), or odds of having premarital sex ($p=0.575$).

Hypothesis 3: Depending on the outcome variable of interest, households and communities were both similar and different in their HIV status and sexual behavior associated with FC, even after adjusting for the sociodemographics of the individual. When testing HIV and FC, there was little variability within households (0%) or between communities (5%). However, the variability between households in the same community was substantial (93%). When testing premarital sex and FC, there was little variability within households (2%). However, there was variability between households in the same community (53%) and between communities (46%). When testing sexual debut and FC, there was variability within households (85%), but not between communities (7%) or households in the same community (8%). When testing number of partners and FC, there was some variability within households (19%), and households in the same community (22%) and between communities (59%).

Table 10. MLM estimates for FC associated HIV status

Variable	B	SE	p	Odds Ratio	95% CI
Age					
15 to19	-0.602	0.059	<0.001	0.548	0.488,0.615
20 to 29	0.085	0.040	0.036	1.088	1.005,1.178
30 to 39	-0.153	0.067	0.023	0.858	0.753,0.979
Wealth					
Middle	-0.336	0.043	<0.001	0.715	0.656,0.778
Lowest	-0.169	0.057	0.003	0.845	0.755,0.946
FC	0.742	0.066	<0.001	2.099	1.844,2.389

Table 11. MLM estimates for FC associated number of partners

Variable	B	SE	p
Age			
15 to19	-0.189	0.036	<0.001
20 to 29	-0.059	0.034	0.082
30 to 39	0.006	0.029	0.836
Education			
No Formal Education	-0.120	0.053	0.024
Completed Primary	-0.033	0.047	0.483
Wealth			
Middle	-0.062	0.042	0.138
Lowest	-0.071	0.046	0.120
Religion			
Muslim	-0.126	0.049	0.010
Region			
Rural	-0.264	0.065	0.046
Ethnicity			
Mande	-0.014	0.024	0.545
FC	-0.026	0.058	0.652

Table 12. MLM estimates for FC associated with age of sexual debut

Variable	B	SE	p
Age			
15 to19	-1.598	0.090	<0.001
20 to 29	-0.520	0.074	<0.001
30 to 39	-0.241	0.080	0.003
Education			
No Formal Education	-1.282	0.129	<0.001
Completed Primary	-1.099	0.133	<0.001
Wealth			
Middle	-0.405	0.151	0.007
Lowest	-0.440	0.163	0.007
Religion			
Muslim	-0.123	0.114	0.279
Region			
Rural	0.068	0.199	0.731
Ethnicity			
Mande	-0.104	0.066	0.117
FC	0.023	0.161	0.885

Table 13. MLM estimates for association of FC with premarital sex

Variable	B	SE	p	Odds Ratio	95% CI
Age					
15 to 19	-0.377	0.099	<0.001	0.685	0.564,0.832
20 to 29	-0.226	0.058	<0.001	0.798	0.711,0.895
30 to 39	-0.202	0.095	0.034	0.817	0.677,0.985
Education					
No Formal Education	0.441	0.078	<0.001	1.554	1.333,1.813
Completed Primary	0.214	0.084	<0.001	1.369	1.161,1.615
Wealth					
Middle	0.192	0.094	0.044	1.211	1.006,1.459
Lowest	0.166	0.114	0.148	1.181	0.942,1.480
Religion					
Muslim	0.000	0.010	0.998	1.000	0.830,1.206
Region					
Rural	0.130	0.135	0.338	1.138	0.873,1.484
Ethnicity					
Mande	-0.020	0.052	0.716	0.980	0.882,1.091
FC	0.118	0.210	0.575	1.125	0.745,1.698

Summary and Implications

FC is not associated with protecting women in Mali from becoming HIV positive. Furthermore, FC was not found to be associated with sexual risk behavior. Sexual behavior among circumcised and uncircumcised women is not significantly different. In other words, sexual risk for HIV is not associated with FC status. Thusly, the argument that FC can be associated with preventing HIV among Malian women was not supported.

Membership in households and communities was found to affect HIV status and risk in several ways. There were substantial differences in terms of HIV status and sexual behavior associated with FC when examining the affects of household and community membership. Depending on the variables being examined, variability of individuals within a household, households within a community, and communities themselves can either be nearly identical or close to completely different from one another. Specifically, membership in the same household and community did predict an association between HIV status and FC. Similarity of association between premarital sex and FC was strongest within the same household. Sexual debut and FC varied within households, but not within communities, thus pointing to a community protective effect. Number of partners and FC varied by community, again pointing to a protective affect from community membership.

Tables 10 through 13 include secondary findings that are statistically significant. These findings point to the influence of sociodemographics on the outcome variables. The Ecosystems Perspective predicts this type of influence as these factors affect behavior. The results from testing hypothesis 3 indicate that social networks in the form of households and communities impact the association of FC with HIV status and sexual behavior as predicted by the Social Network Conceptual Model.

The findings of this research contribute to the body of scientific literature that addresses the need for multilevel and culturally relevant interventions. As FC is deeply embedded within the culture of Mali, cultural relevance is particularly important if the issue of HIV and FC is to be approached. This research underlines the potential of partnering with faith-based and community-based organizations; as such partnerships could lead to more culturally relevant HIV prevention efforts.

One of the more striking characteristics of Mali is that the population is 90% Muslim. Female circumcision is most often promulgated as a traditional or religious procedure and is predominantly practiced in Northeast and Central Africa, parts of the Near East, and Southeast Asia. All of these regions have large Muslim populations; however, the Al-Azhar Supreme Council of Islamic Research, regarded by many as the highest religious authority on Islamic law, issued a statement that FC should not be practiced and has no basis in Islam. Furthermore, the Grand Mufti of Egypt (Egypt is the second most populated country in Africa with a population of 82,999,393 and 90% of women in Egypt are circumcised [WHO, 2009]) of Al-Azhar University, issued a fatwa stating that FC is against the values of Islam and is a punishable criminal offense (Utz-Billing & Kentenich, 2008). Moreover, three major sources of Islamic knowledge--the Quran, Hadith, and Sunnah--do not mention FC; however, there is a proscription against altering the body, with the exception of male circumcision.

The Islamic leadership of Mali has been open to working on HIV with international organizations. For example, USAID trained 100 Imams and numerous female Muslim community leaders in HIV prevention, education, and advocacy. Through the Imam Outreach program, USAID has worked with the Malian League of Imams and Scholars for Islamic Solidarity since 2003 to transmit prevention messages during Friday sermons in more than 140 mosques, reaching more than 450,000 people (USAID, 2010). More broadly, contextual factors that are associated with HIV status and risk behavior need to be evaluated.

Limitations

As the data do not include women in other countries where FC is practiced, generalizability of the findings is limited to Mali. Causal inference is limited due to the cross-sectional design of the datasets and the resulting inability to distinguish temporal order. More detailed sexual behavior questions, such as participation in anal sex and age of the first partner, are imperative in this type of research. Other important details of sexual risk are not accessible, such as exchange sex and the male partner's sexual network. There may be lurking variables such as level of religiosity, which could also be collinear to FC and act as protectives or risks for sexual behavior. Despite these limitations, analysis of the DHS, one of the largest FC and HIV dataset, provides important initial quantitative assessment of FC and HIV risk. Further research as outlined below is essential to halting the HIV epidemic in this region.

Implications for Policy

This study uncovers aspects of the relationship of FC to HIV. The findings underscore how HIV prevention for women in Mali does not require FC. In so doing, it helps contribute to a body of evidence that can guide policy changes to move away from FC as an HIV prevention strategy, as this research indicates that FC is not a protective against HIV. Specifically, the population in Mali could be better informed by learning of the lack of protective effects that FC has against HIV. With this information, the country's HIV prevention priorities could be more targeted.

Implications for Research

The gaps in knowledge regarding the relationship of HIV and FC are significant. Further investigation regarding how FC might increase HIV transmission is needed, as is biomedical research demonstrating whether altering the external female genitalia increases vulnerability to HIV infection. Whether FC increases rates of anal sex among women must also be addressed. Questions such as "what percent of your peers engage in anal sex?" could be asked in an effort to overcome self-report limitations on this sensitive topic. Specifically, this work sets a foundation for elucidating how female circumcision may increase HIV. Examination of birth rates and FC may also provide insight to levels of anal sex in the population. Research that partners with faith-based and community-based organizations needs to be tested, as this type of partnership could lead to more culturally relevant studies. Further measures of social networks, such as frequency of visits between families in communities and

interactions between communities, could aid in social network analysis. Measures of centrality could be used to better understand the influence of individuals on communities. More broadly, this study presents data illustrating the affects of family and community membership on HIV status and sexual behavior via the use of MLM. MLM has been underutilized in health research; however, the results presented here point to the significant findings that may be revealed through the use of this methodology

Implications for HIV Intervention/Prevention and Social Work

The findings of this research could be most helpful in terms of intervention by strengthening the evidence for better directed HIV prevention. Moreover, social support for sexual partner reduction is wide-spread due to Islamic norms, and harnessing this support may be useful for HIV prevention. Partnerships with faith-based organization may be a fruitful pathway to harnessing social support for HIV prevention, and the most potent pathway to address the lack of both Islamic support and empirical support for FC acting as a protective against HIV.

HIV prevention for women with FC is an important topic, since these women may be at a higher risk for HIV due to physiological factors such as compromised vaginal tissue. Interventions for this population could include the education regarding the importance of adequate lubrication in order to prevent tearing of tissue and alternatives to vaginal and anal sex. Prevention programs at schools and via community based organizations could be instrumental in reaching this population with a minimal amount of stigma. The HIV community could be mobilized against FC, thereby interweaving the human rights aspects of both HIV prevention and stopping FC.

These findings also provide an opportunity for social work to engage in a controversial issue that is embedded within differing cultural worldviews, in this case Western versus African. By engaging in dialogue on this topic, social work could practice its goals for being an inclusive and multicultural profession.

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Summary of Findings, Discussion, and Implications

The purpose of this summary is to expound on the links between the three papers that compose this dissertation. In so doing, this summary will provide an overview of the three papers which comprise the dissertation. The purpose of each paper will first be outlined along with the theoretical foundation of the dissertation. The first paper tests three hypotheses. *Hypothesis 1:* HIV stigma at the individual level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics, household, and community affects. *Hypothesis 2:* HIV stigma at the household level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics and community affects. *Hypothesis 3:* HIV stigma at the community level acts as a barrier to HIV testing uptake and receipt of HIV test results, even after adjusting for individual characteristics and household affects. The second paper also tests three hypotheses. *Hypothesis 1.* HIV stigma at the individual level is associated with MC, after adjusting for age, education, wealth status, and region. *Hypothesis 2.* HIV stigma at the family level is associated with MC, after adjusting for age, education, wealth status, and region. *Hypothesis 3.* HIV stigma at the community level is associated with MC, after adjusting for age, education, wealth status, and region. The third paper also tests three hypotheses. *Hypothesis 1.* Women who have been circumcised will more likely test positive for HIV than will uncircumcised women, after adjusting for socio-demographic factors (e.g., age, education, ethnicity, wealth, religion, and region.) and affects of membership in specific households and communities. *Hypothesis 2.* Women who have been circumcised will report no significant difference in number of partners or sexual debut in comparison to uncircumcised women, after adjusting for socio-demographic factors and affects of membership in specific households and communities. *Hypothesis 3.* Membership in specific households and communities with higher HIV prevalence and higher risk sexual behavior will predict HIV positive status and greater participation in higher risk sexual behavior.

The three papers are guided by the Ecological Perspective (Bronfenbrenner, 1977; McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1996) and the Social Network Conceptual Model (Heaney & Israel, 2002). These theoretical frameworks explore the factors that identify barriers and facilitators to uptake of HIV testing, receipt of HIV test results, and circumcision. This theoretical framework holds that

behavior is not only regulated at the individual level but also at the family and community level.

Contextual factors, such as age, education, and wealth are also considered in this dissertation as these factors may impact the outcomes. Social networks are examined as they are crucial components of an individual's ecosystem, and health behavior.

The analysis plan for this study will allow for family and community level effects on individual behavior to be quantified. There have been no large-scale studies addressing HIV testing and receipt of test results, female circumcision (FC), and male circumcision (MC) using multilevel modeling (MLM) in this respective region and countries. This dissertation will provide new data that is important to future interventions, policies, and research.

A finding consistent in all three papers is that: context does matter. This dissertation examines context in terms of family and community membership. Specifically, the context of different levels of stigma and family/community membership impacts individuals' HIV testing and circumcision. Family and community level stigma are associated with an individual's HIV testing behavior in Central Asia. Family and community level stigma is associated with, circumcision status in India. Family and community membership is associated with HIV status and HIV risk behavior in Mali.

Central Asia, India, and Mali are highly populated by Muslims. Muslim family and community systems are collectivistic. Thus, the impact of contextual factors such as family and community membership may be even more pronounced among Muslim populations. As HIV is increasing affecting the Muslim world, prevention interventions that take Muslim culture into account may have a greater chance to be effective in addressing the unique needs of the population affected by HIV. The results of these three papers indicate the HIV testing and receipt of test results, male circumcision, and HIV status, HIV risk behavior and female circumcision are embedded within family and community membership.

HIV testing and receipt of test results: In Central Asia, HIV stigma at the individual, family, and community levels is significantly associated with decreased HIV testing uptake and receipt of HIV test results. The Ecological Perspective and Social Network Conceptual Model were used to explain these results as stigma on the family and community levels are components of an individuals' ecosystem and social network. Even after adjusting for individual level characteristics, such as age, education, and wealth, HIV stigma remained a powerful factor in predicating HIV testing. Membership in a family and

also as an independent context, membership in a community with a higher level of HIV stigma were associated with individuals not being tested for HIV as well as not returning for the results if they were tested. Indicating that individual stigma and stigma at the family and community levels influences an individual's decision to get tested. In other words, families with stigma inhibit their members from getting tested and communities with stigma inhibit their members from getting tested.

Male circumcision: HIV stigma is associated with male circumcision status (i.e., whether a male is circumcised or uncircumcised) on individual, family, and community levels in India. The Ecological Perspective and Social Network Conceptual Model was used to understand and explain these results as stigma on the family and community levels are aspects of an individuals' ecosystem and social network. Even after adjusting for individual level characteristics, such as age, education, and wealth, men with less HIV stigma were more likely to be circumcised. Here the need for multilevel modeling is highlighted, as all group patterns do not follow the same relationship as the individual within the larger family-community context. Men who were members of families with a higher level of HIV stigma were more often circumcised. Men who were members of communities with a higher level of HIV stigma were also more often circumcised. Greater stigma at the family and community level could possibly contribute to a greater prevalence of circumcision by motivating families and communities to be circumcise their sons in order to avoid a stigmatized disease, HIV. Whereas, at the individual level, stigma may prevent an adult male from getting circumcise due to the association of immorality with HIV prevention.

Female circumcision: In Mali, female circumcision was significantly associated with increased odds of HIV positive status, and circumcision status was not associated with HIV risk behavior. The relationship of circumcision to HIV status and sexual behavior was marked by membership in different families and communities. The Ecological Perspective and Social Network Conceptual Model were used to explain these results as the family and community levels are crucial components of an individual's ecosystem and social network. All results were adjusted for the characteristics of individuals and the impact of membership in the participant's family and community. These results indicate three major points: 1) that women with FC had higher odds of being HIV positive; 2) women with FC did not have

lower odds of engaging in risky sexual behavior; 3) family and community membership matters in regarding to FC status, HIV status, and HIV risk behavior.

Limitations

The cross-sectional design of the datasets prevents casual inference from being made due to the inability to distinguish temporal order. The datasets do not provide ontogenetic variables, which are one of the four main levels of the Ecological Perspective; thus the perspective is not fully utilized. Additional limitations are outlined for each paper below.

Central Asia: A limitation of this study is that only women who had a child in the last two years and who received antenatal care were asked about HIV testing, which limits generalizability of the findings to all women who have received antenatal care in Central Asia. Additional HIV stigma variables such as distance to HIV testing center, availability of child care, the gender of the testing center staff, besides the standard four stigma variables selected by UNICEF may have provided useful information.

India: The participant's age at circumcision was not available. Family and community level affects in comparison to individual level affects could have been further examined with this data. Stigma variables that are measures of behavioral experience rather than perceptions or opinions could have also provided useful information. Most of the circumcised men in India are Muslim. More circumcised participants that are not Muslims are needed to further assess religious differences.

Mali: Additional questions addressing sexual behavior, such as participation in anal sex, age of the first partner, exchange sex, and the male partner's sexual network could have added to the analysis. There may be lurking variables such as level of religiosity, which could also be collinear to FC and act as protectives or risks for sexual behavior.

Implications

The findings of the dissertation have implications for practice, policy, and research. These findings are highly statistically significant and the implications are made stronger by the advanced data analysis techniques as well as the large sample size. The innovative methodology has produced empirical evidence for the impact of context on the behavior of the individual. The implications stemming from each of the three papers are outlined below.

Implications for Policy

Central Asia: The findings in this dissertation showed that multilevel stigma has significant implications for policy development. Policy changes that address multilevel stigma could facilitate greater uptake of test results and receipt of results. For example, stigma reduction trainings for health care providers could reduce HIV stigma perpetuated by health care providers. Wide spread offerings of HIV testing would reduce the perception of isolation of the testing experience among health seekers. Primary care providers could be required to offer testing to all patients, and home-based testing could also be made available. Policies to ensure confidentiality could be strengthened. Procedures to inform individuals, such as large-scale governmental advertising of these policies could be put into place. International HIV prevention funding could be made more accessible via targeted recruitment programs in community gathering venues such as mosques in order to institute HIV testing promotion campaigns. Current policies in the region could be reviewed to eliminate any non-voluntary forms of testing, since these policies may contribute to stigma and run counter to a human rights framework. Programs to decrease multilevel stigma and expand access to HIV testing could be monitored and evaluated. Policies that include family and couple based HIV prevention could be mandated during antenatal clinic visits.

India: Family and community level cultural barriers to circumcision, as these carry with them the weight of political and ideological enmity, further sensitizing the issue of circumcision in India. Specifically circumcision is seen as a marker of Muslim identity and as such refused by the Hindu majority. This may prevent a widespread government promotion of circumcision. Policies that improve education regarding HIV transmission and that provide education on the benefits of circumcision will be key and preliminary to any large scale nationally mediated public health initiative. Apart from these barriers, various demographic and contextual barriers in India, such as poverty and low education, could be addressed through services, such as free or low cost circumcision that is paired with HIV transmission education. Specifically, a portion of the population may not be able to afford the costs of circumcision and government or NGO financial assistance could make circumcision available to a larger portion of the population.

Mali: The findings on the relationship of FC and HIV status and HIV risk behavior underscore that HIV prevention for women in Mali does not require FC. In so doing, it helps contribute to a body of evidence that can guide policy changes to move away from FC as an HIV prevention strategy.

Specifically, the population in Mali could be better informed as to the lack of protective effects against HIV provided by FC. With this information, the country's HIV prevention priorities could be more targeted and incorporate more family and community based prevention, such as home visits, family counseling, and community organization integration. Nation-wide educational campaigns that inform the population about the possible increase in vulnerability to STIs and reduction in sexual pleasure resulting from FC could be implemented. Furthermore, nation-wide policies that address FC from a human rights perspective could be introduced in a culturally respectful way, possibly framed as alternatives to FC.

Implications for HIV Prevention Intervention and Social Work Practice

Central Asia: The preventive interventions that are mentioned below could be effectively delivered by social workers due to needed focus on the individual within environment. Interventions that could address multilevel HIV stigma are community level stigma awareness programs, HIV awareness programs in women's health and primary care clinics, and social marketing campaigns targeting women. Public testing of respected community members and local celebrities could be also be utilized. Home visits by peer educators could encourage women and families to talk more openly about testing. Partnership with faith-based organizations may also help reduce stigma.

Social workers could be involved on the individual, family, and community levels in order to address the relationship of HIV stigma and HIV testing. On the individual level, social workers could provide individual counseling related to HIV stigma, such as providing positive reinforcement to individuals facing pressure to avoid HIV testing as a result of stigma. On the family level, social workers could conduct home visits and lead family discussions pertaining to HIV stigma. Social workers could provide family counseling when individuals are wanting to be tested but fear the reaction of their family, if found out. On the community level, social workers could work with community-based organizations to initiate education campaigns. Social worker are often training in community work, and working at this level may allow for a trickle down effect to the family and individual levels. Social workers could also be involved in the assessment phase by developing and testing stigma measurement instruments. The role of social work in policy, advocacy, and research could include: educating policy makers, recruiting community-based organizations to work on HIV stigma, and developing stigma measurement instruments.

India: Peer to peer HIV education to reduce stigma could target the individual level. Home visits emphasizing HIV education by public health workers or social workers could address stigma on family levels. Partnerships with faith-based organizations could promote HIV education in sermons at local places of worship to address community level stigma. As social work counseling is grounded in the strengths perspective and could incorporate cultural strengths, social workers could provide counseling to overcome environmental barriers to circumcision in India.

Social workers could be involved on the individual, family, and community levels in order to address the relationship of HIV stigma and circumcision uptake. On the individual level, social workers could provide tailored education to men about HIV and circumcision. On the family level, social workers could conduct meetings with parents to discuss HIV and circumcision, emphasizing the health benefits while removing it from the religious context. On the community level, social workers could work meet with non-Muslim religious leaders to educate them about the positive benefit of circumcision on HIV prevention. Social workers could also be involved in the assessment phase by evaluating the various possible measures of enacted HIV stigma most commonly present in India. The role of social work in policy, advocacy, and research could include: introducing and promoting policies to decrease multilevel stigma, organizing HIV awareness events, and conducting studies to further determine the barriers to greater circumcision uptake.

Mali: The findings of this research provide evidence that could help direct HIV prevention away from FC. Partnerships with faith-based organization may be essential to addressing HIV prevention and FC in a Muslim majority country like Mali. Since women with FC may be at a higher risk for HIV due to physiological factors such as compromised vaginal tissue, interventions for this population could include education regarding the importance of adequate lubrication to prevention tearing of tissue and alternatives to vaginal and anal sex, such as oral sex. Primary prevention in schools and secondary prevention in different settings could be a viable route for prevention interventions. Specifically, prevention programs in schools and via community based health care organizations could be instrumental in reaching this population with a minimal amount of stigma. Mobilizing community organizations could combine the human rights aspects of both HIV prevention and stopping FC. Community organizations could provide alternatives to women who choose not to engage in FC, and provide information that FC

may increase vulnerability to sexually transmitted infections and reduce sexual enjoyment. Public policy and mass advocacy strategies are also needed to address FC. As a profession, social work's engagement in this issue, which often dichotomizes the Western perspective against FC versus the African perspective supporting FC, provides an opportunity for being a more inclusive and multicultural profession.

Social workers could be involved on the individual, family, and community levels in order to address the relationship of FC, HIV status, and HIV risk behavior. On the individual level, social workers could provide counseling to women that address the relationship of FC, HIV status, and HIV risk behavior, while being mindful of the cultural meanings of FC. In particular, individuals could be informed that FC may increase the risk of HIV transmission, and of the importance of using lubricates and the additional risks of unprotected anal sex. On the family level, social workers could conduct meetings with parents to discuss the possible increase risk for HIV associated with circumcision while again being mindful of the cultural meanings of FC. On the community level, social workers could work with Muslim religious leaders to educate them about the relationship of HIV and circumcision. Additionally, social workers could organize Muslim religious who are aware of the Islamic jurisprudence against FC to speak to other Muslim leaders, who are not aware of the rulings. Social workers could also be involved in the assessment phase by examining reasons behind the high prevalence of FC in Mali. The role of social work in policy, advocacy, and research could include: partnering with Muslim leaders to educate policy makers on the relationship of FC, HIV status, and HIV risk behavior; organizing public events that bring Muslim leaders and local celebrities together to educate the public about the relationship of FC, HIV status, and HIV risk behavior; and conducting studies to further determine the impact of FC on women's sexuality.

Implications for Research

Central Asia: The relationship of multilevel stigma and HIV testing could be further understood by including its interaction with gender inequalities, intimate partner violence, low risk perception, moral values, and lack of HIV transmission knowledge variables in the analysis. The behavioral and experienced measures of HIV stigma (as opposed to perceived measures used in this study) need to be quantified. Furthermore, behavioral and experienced stigma needs to be assessed on individual,

household, and community level. Stigma scales needs to be further tested for reliability and construct validity. The association of structural factors, such as laws, and multilevel stigma needs to be quantified. The impact of both secular and Islamic social movements on stigma could be better understood. Based on my findings, next research questions could include: 1) are stigma reduction interventions at the individual, family, community, or a combination most efficacious?; 2) do policies that mandate stigma reduction trainings for health care provider decrease stigma at the individual, family, and community levels?; 3) do peer led women's groups that address HIV stigma decrease stigma at the individual, family, and community levels?

India: Based on this research, further research is needed to better understand the other manifestations of HIV stigma—enacted (discrimination), vicarious (reports of others' experienced discrimination), felt normative (perceptions of stigma's prevalence), and internalized (personal endorsement of stigma beliefs). Other aspects of stigma could also be further explored, such as the immorality often stereotyped with HIV transmission and the need to save-face as a community. A variable indicating the age of circumcision would provide valuable information to future research with a goal of examining predictors of circumcision. Regions that were shown to be “hotspots” without male circumcision could be examined using geospatial research techniques. Specifically, global positioning system (GPS) data could be used to visualize household with less circumcision on maps. If these household tended to cluster, these communities could be the focus of door-to-door educational outreach campaigns. Based on my findings, next research questions could include: 1) are stigma reduction interventions targeting the immorality associated with HIV most efficacious at the individual, family, community, or a combination?; 2) do policies that mandate HIV education in public schools decrease stigma at the individual, family, and community levels?; 3) do peer led men's groups that are developed in cooperation with faith-based organization and address HIV stigma decrease stigma at the individual, family, and community levels?

Mali: Based on my findings, investigation regarding how FC might increase HIV transmission is needed, as is biomedical research demonstrating whether altering the external female genitalia increases vulnerability to HIV infection. Rates of anal sex and HIV transmission among women with FC must also be assessed. To improve cultural relevance, research that partners with faith-based and community-

based organizations needs to be tested. This study presents data illustrating the affects of family and community membership on HIV status and sexual behavior via the use of MLM, and the results presented here point to the potential findings that may be revealed through the use of this methodology in the future. Based on my findings, next research questions could include: 1) does education regarding the benefits and distribution of lubricant to women with FC decrease HIV transmission (by decreasing vaginal tearing during intercourse)?; 2) do policies that mandate education regarding the relationship of FC and HIV education in public schools decrease FC and HIV transmission?; 3) do peer led women's groups that are developed in cooperation with faith-based organization and address FC and HIV transmission decrease FC and HIV transmission?