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Relationship Gender Equality and HIV Self-Testing Among Heterosexual Couples Expecting a Child in Central Kenya and South-Central Uganda

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ABSTRACT:

Gender equality refers to equal rights, responsibilities and opportunities for women and men. Equality between women and men is both a human rights issue and is necessary for sustainable societal development. However, in most sub-Saharan African societies, men have substantial power over women, and many national advancements in reproductive health, empowerment, and labor market participation have been impeded by gender inequality. Gender inequality has been correlated with intimate partner violence (IPV), which is in turn positively correlated with risk of HIV, and has also been associated with higher risk of HIV infection independent of IPV. Thus, factors that diminish gender inequality may decrease IPV and risk of HIV infection. Moreover, there is a lack of studies assessing factors predictive of gender equality in a pregnancy context.

Compared to current blood-based methods of clinical HIV testing, HIV self-testing kits are a relatively new technology, and hold great potential to increase testing rates and HIV awareness, maintain patient privacy, and lead to both prevention of HIV and improved treatment. However, no studies have queried the correlation between relationship gender equality and HIV self-testing behavior. This dissertation research examined the relationships between individual social and economic factors related to decision-making power and personal attitudes towards IPV within heterosexual couples expecting a child. In addition, the work explored the correlation between relationship gender equality and HIV self-testing uptake. This study addressed these questions in four specific aims:

1. Identify social and economic predictors of low decision-making power and high acceptance of IPV within heterosexual couples expecting a child in central Kenya.

2. Determine the association between high gender equality (measured by high decision-making power and low acceptance of IPV) and couples' uptake of HIV self-testing kits in central Kenya.
3. Identify social and economic predictors of low decision-making power and high acceptance of IPV within heterosexual couples expecting a child in south-central Uganda.
4. Determine the association between high gender equality (measured by high decision-making power and low acceptance of IPV) and male partners' uptake of HIV self-testing kits in south-central Uganda.

This study used data collected from two randomized controlled trials (RCTs) assessing the effectiveness of HIV self-testing kits to increase HIV testing for male partners of pregnant women in Kenya and Uganda (n=1,410 and n=1,618, respectively). We found, through Aims 1 and 3, that there are potential targets to improve specific social and economic variables associated with lower gender equality (e.g., to increase men and women's education levels, equality in earnings between partners, and reduce HIV prevalence). Furthermore, interventions could be created for specific populations (e.g., targeted towards different religions or wealth status and married couples) to improve gender equality in heterosexual couples expecting a child in Kenya and Uganda. We found, through Aims 2 and 4, that there was no association between decision-making power and uptake of HIV self-testing, either as a couple (in Aim 2), or the male partner alone (Aim 4). There was also no association between male partner's attitudes towards IPV and uptake of HIV self-testing from the male partner alone (Aim 4), but men with low acceptance of IPV were 2.5 times more likely to use the HIV self-testing kits as part of a couple compared to men with high acceptance of IPV (Aim 2), and in couples where the female partner had medium or low acceptance of IPV, the male partners were 1.76 and 1.82 times more likely to

use the HIV self-testing kits than in couples where the female partner had high acceptance of IPV.

Overall, this dissertation fills a gap in research on sociodemographic predictors of gender equality within a pregnancy context in Kenya and Uganda, and in research regarding the associations between gender equality and HIV self-testing uptake. Fighting the AIDS epidemic needs to involve efforts at all levels of the HIV continuum of care, as underscored by the 90:90:90 goal set forth by UNAIDS, in which 90% of all individuals living with HIV around the world should know their HIV status. This present work showing the importance of low acceptance of IPV in increasing HIV self-testing (both as a couple and the male partner alone) and discovering additional influences of HIV self-testing uptake are vitally important as we work towards achieving the first 90% of the tripartite goal.

ABBREVIATIONS USED:

AIDS: Acquired Immune Deficiency Syndrome

ELISA: Enzyme Linked Immunosorbent Assay

FDA: United States Food and Drug Administration

HIV: Human Immunodeficiency Virus

HST: HIV self-testing

IPV: Intimate Partner Violence

PMTCT: prevention of mother-to-child transmission

RCT: Randomized Controlled Trial

REDCap: Research Electronic Data Capture

STI: Sexually Transmitted Infection

WHO: World Health Organization

CHAPTER 1: INTRODUCTION

Since the identification of HIV in 1981, 77.3 million people have been infected and 35.4 million people have died from AIDS-related illnesses.[1] The Joint United Nations Programme on HIV/AIDS (UNAIDS) estimates that by the end of 2017, there were 36.9 million people living with HIV/AIDS, and approximately 70% of those living with HIV are in sub-Saharan Africa.[2] Not only do African societies have a high burden of HIV, the power dynamic within heterosexual couples is shifted towards males over females, and this imbalance is associated with a negative impact on many aspects of health.[3] It has been shown that national achievements in reproductive health, empowerment, and labor market participation have been diminished by gender inequality.[4,5] In this present context, gender inequality is defined as a situation with unequal rights, responsibilities and opportunities for women and men.

The balance of power in sexual relationships is linked to sexual and reproductive health including directly through its relationship with violence between partners, and through its influence on the use of health services.[6] Research has demonstrated that societies that have more gender inequality in both political and social norms have a higher prevalence of IPV,[7,8] and IPV is positively correlated with risk of HIV infection or sexually transmitted infection (STI).[9] Gender inequality has also been associated with higher risk of HIV infection independent of IPV.[10] Blood-based testing at a clinic is the primary method for HIV testing, and is the basis for the national testing algorithms in Kenya and Uganda (rather than oral testing or self-testing). However, HIV self-testing is a new technology that holds great potential to increase testing rates, increase HIV awareness, maintain patient privacy and lead to both prevention of HIV and improved treatment with the overarching goal of combating the HIV/AIDS epidemic.[11–13] Gender equality may be an important factor influencing the use and utility of oral HIV self-

testing; for example, if a woman brings a kit home intended for the male partner, a couple's skewed gender power balance or the acceptance of IPV may influence the the woman's willingness to approach the man regarding testing or the decision of the male partner to submit to HIV testing. Thus, factors that improve gender equality within relationships may decrease IPV and risk of HIV infection by increasing the proportion of individuals willing to be tested for HIV. Therefore, understanding gender equality as it relates to HIV self-testing, and understanding the predictors of gender inequality is an important avenue for research. Our long-term goal for this research project was to define the role of gender equality in HIV prevention, specifically through HIV self-testing. This study hereby addressed these four specific aims:

Specific Research Aims:

1. **Identify social and economic predictors of low decision-making power and high acceptance of IPV within heterosexual couples expecting a child in central Kenya.**

   Hypothesis 1: Lower wealth index, lower education, food insecurity, large age discrepancy, religion, presence of plural marriage, and marital status of cohabitation will predict low decision-making power and high acceptance of IPV.
2. **Determine the association between high gender equality (measured by high decision-making power and low acceptance of IPV) and couples' uptake of HIV self-testing kits in central Kenya.**

   Hypothesis 2: Higher decision-making power and low acceptance of IPV will be associated with higher couples' uptake of the HIV self-testing kits.
3. **Identify social and economic predictors of low decision-making power and high acceptance of IPV within heterosexual couples expecting a child in south-central Uganda.**

Hypothesis 3: Lower education, food insecurity, large age discrepancy, religion, presence of plural marriage, and marital status of cohabitation will predict low decision-making power and high acceptance of IPV.

5. **Determine the association between high gender equality (measured by high decision-making power and low acceptance of IPV) and male partners' uptake of HIV self-testing kits in south-central Uganda.**

   Hypothesis 4: Higher decision-making power and low acceptance of IPV will be associated with higher male partners' uptake of the HIV self-testing kits.

Literature Review:

Epidemiology of HIV

HIV (Human Immunodeficiency Virus) is a retrovirus that destroys the human immune system, primarily $CD4^+$ cells. $CD4^+$ cells are immune white blood cells that express the $CD4^+$ surface antigen, and are responsible for coordinating the immune response by stimulating other immune cells.[14] There are seven stages to the HIV life cycle: viral binding, viral fusing, reverse transcription of the RNA genome, integration, replication, assembly, and budding.[15] First, HIV binds to receptors on a $CD4^+$ cell (binding), then the HIV envelope and the $CD4^+$ cell membrane fuse together (fusion).[15] Once inside the $CD4^+$ cell, HIV uses a viral enzyme known as reverse transcriptase to convert its RNA genome into HIV DNA (reverse transcription), and this DNA is then integrated into the DNA of $CD4^+$ cells (integration).[15] HIV then uses the $CD4^+$ cell's machinery to replicate viral components (replication), then HIV proteins are assembled into mature non-infectious HIV (assembly).[15] The non-infectious HIV is then extruded from the $CD4^+$ host cell, an HIV enzyme is released, which then assists in forming mature, infectious HIV (budding).[15]

There are two types of HIV – HIV-1 and HIV-2. While they are very similar in many ways, HIV-2 is much less common, has lower transmissibility, and reduced likelihood of progressing to AIDS as compared to HIV-1.[16,17] This difference is largely explained by the lower viral load and higher levels of CD4 cells in HIV-2 patients compared to HIV-1 patients, and this translates to reduced transmission and reduced infectivity.[16] HIV-2 is largely restricted to Western Africa and communities in Europe with socioeconomic ties to West Africa, while HIV-1 is vastly more prevalent worldwide.[16,17] More than 80% of adults who become infected with HIV-1 are exposed via mucosal surfaces (primarily the genital and rectal mucosa), while the other 20% are infected from percutaneous or intravenous exposures.[18,19] Within HIV-1, there are four sub-groups (M,N,O, and P), each of which arose from a separate transmission of simian immunodeficiency viruses from non-human primates to humans.[20] Subgroup M was the first to be discovered, is the most common among the four subgroups of HIV-1, is responsible for the majority of the infections in the worldwide HIV-1 pandemic, and is found in virtually every country in the world.[17,21] Group O was discovered in 1990, represents less than 1% of global HIV infections, and is primarily restricted to western Africa (Cameroon, Gabon, and neighboring countries).[17] Group N was identified in 1998, and has only been documented in 13 cases in Cameroon, while Group P was discovered in 2009 and has only been documented in 2 women from Cameroon.[17] Among subgroup M, there are ten distinct subtypes based on genetic variations, A-K, although the most prevalent subtypes are subtypes A, B, and C. Subtype A is the most common in central and eastern Africa (Kenya, Uganda, Tanzania, and Rwanda), and in eastern European countries.[21] Subtype B is the main genetic form in western and central Europe, the Americas, and Australia, and several countries of Southeast Asia, northern Africa, the Middle East, and among South African and Russian homosexual men, while Subtype C viruses are

predominant in those countries with >80% of all global HIV-1 infections, such as southern Africa and India.[21]

There are 3 stages of HIV infection. The first is acute HIV infection, which can develop two to four weeks after infection. This stage is very infectious, and is characterized by a large amount of virus (a high titer) in the blood, although a fourth-generation antibody/antigen test or a nucleic acid test is necessary to detect the virus in the blood.[22] The second is chronic HIV infection (also known as clinical latency or asymptomatic HIV infection), where HIV is still active and will multiply, but at a very low level.[22] Without taking any antiretroviral medication to treat HIV, this stage can last for ten years or longer, but with medication, this stage can last several decades.[22] Finally, the third stage is AIDS (Acquired Immunodeficiency Syndrome). This is characterized by a $CD4^+$ count of less than 200 cells per milliliter of blood, and/or the presence of an opportunistic infection.[22] Without antiretroviral medication, people in this stage will normally only survive for three years.[22]

This virus was first reported on June 5th, 1981 when the Morbidity and Mortality Weekly Report from the Centers for Disease Control and Prevention published a report of five previously healthy gay men in Los Angeles, CA who were diagnosed with a rare lung infection (Pneumocystis carinii pneumonia).[23] However, it was not until 1984 that the cause of AIDS was officially isolated jointly between the Pasteur Institute in France under the direction of Dr. Luc Montagnier and Dr. Robert Gallo's laboratory at the National Institutes of Health in the United States.[24,25]

Since the discovery of HIV, 77.3 million people have been infected with HIV, and 35.4 million people have died from AIDS-related illnesses.[1] This disease inflicts a significant economic burden. Between 2000 and 2015, over $562 billion was spent on HIV/AIDS

worldwide, with 19% of 2015 HIV/AIDS financing spent on prevention (including testing), and 56% spent on care and treatment.[26] However, only 10% of HIV spending came from out-of-pocket spending, showing that international and domestic government efforts surrounding HIV/AIDS have a large role in mitigating financial hardships associated with this disease.[26] UNAIDS estimates that by the end of 2017, there were 36.9 million people living with HIV/AIDS, and approximately 70% of those living with HIV are in sub-Saharan Africa.[2] Women are disproportionately affected in this region, as 58% of the total number of people living with HIV in sub-Saharan Africa are women and girls,[27] and 75% of the new infections among adolescents aged 15-19 are in girls.[1] Furthermore, in Kenya, as of 2017, 6.2% of women aged 15-49 were living with HIV compared to 3.5% of men aged 15-49.[28] In Uganda, as of 2017, 7.3% of women aged 15-49 were living with HIV compared to 4.5% of men aged 15-49.[29]

In order to end the AIDS epidemic by 2030, UNAIDS established an ambitious target called the 90-90-90 target. This target has three parts: "by 2020, 90% of all people living with HIV will know their HIV status, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy, and 90% of all people receiving antiretroviral therapy will have viral suppression".[30] The world is making strides towards this lofty goal. By the end of 2017 (the last complete data available), 75% of people living with HIV knew their status, 79% of those with diagnosed HIV infection were accessing antiretroviral treatment, and 81% of those accessing treatment were virally suppressed.[1]

Economic, Social, and Occupational Disadvantages are Related to Low Gender Equality

The World Health Organization (WHO) defines gender as the "socially constructed characteristics of women and men – such as norms, roles, and relationships of and between groups of women and men".[31] Gender inequality results from an imbalance in those norms, roles,

and relationships. Within this dissertation, gender equality was defined in terms of equality within the specific context of heterosexual pregnant couples. Globally, there are multiple social and economic variables that are related to low gender equality within the context of HIV prevention. A cross-sectional study assessing female African-American adolescents in Maryland found that higher adherence to traditional gender norms (i.e. more power to men) decreased when educational and occupational opportunity increased, showing that equitable gender norms are associated with sociodemographic variables.[32] In South Africa and Botswana, there were social and economic predictors that were associated with lower female gender equality (measured by the woman's decreased ability to suggest condom use to their partners), which included the partner being at least 10 years older than the woman, partners who abused the women, and women who are economically dependent on their partners.[33] Higher education was positively associated with more equitable gender norms among both men and women in a study of people living with HIV in South Africa.[34] In a separate study of women in South Africa, researchers found that when both partners had higher education, they were more likely to discuss HIV (a measure of high gender equality); however, an age difference of more than 5 years between the partners was associated with few discussions of HIV.[35] Furthermore, when the woman had higher education, she was more likely to suggest condom use to her partner.[35] Respondents in South Sudan who reported no education were more likely to agree with gender inequitable practices compared to those who reported any education.[36] In Nepal, women in severely food insecure households were less likely to report condom use and consistent condom use (a measure of high gender equality).[37] In a husband and wife dyad study in India, IPV perpetration prevalence (a measure of gender inequality) by the husband was inversely associated with educational attainment and household wealth, and IPV victimization prevalence

among the wives was inversely associated with educational attainment and household wealth.[38] Among women in seven sub-Saharan African countries, women living in wealthier households were consistently less likely to justify wife-beating than poorer households.[39] A study from a nationally representative sample in Ghana found that those who were more likely to approve of IPV were younger women, women with lower education, women who were Muslim or Traditional believers, and women who were in the poorest wealth category.[40] A household survey of women with infants in Uganda found that higher education of women was associated with lower risk of IPV from her partner, while the husband having another sexual partner was associated with higher risk of IPV.[41]

Pregnant women are a very important group to study in the context of gender inequality. The United Nations Human Rights Commission reported that "maternal mortality and morbidity is a consequence of gender inequality, discrimination, health inequity and a failure to guarantee women's human rights".[42] Furthermore, studies have shown a high prevalence of IPV during pregnancy throughout Africa (overall 15.2%, ranging from 2 to 57% depending on the country).[43] There have been studies assessing gender equality and maternal health, and they have shown that the presence of restrictive gender norms negatively affects the use of maternal health services in four sub-Saharan African countries,[44] women with low decision-making autonomy were more likely to be exposed to maternal health risk,[45] empowered women are more likely to have better reproductive health outcomes,[46] and high household decision-making and low acceptance of IPV were associated with better maternal and child health outcomes.[47] However, there is a lack of studies on the upstream sociodemographic predictors of gender equality among pregnant women.

Overall, these studies show that increasing educational opportunities, occupation and economic opportunities, decreasing food insecurity, reducing extramarital partnerships, and counseling women on the potential inequality that results from a large age gap in the relationship could help increase gender equality. This dissertation seeks to explore these findings within the context of a partnership between a pregnant woman and her male partner in Kenya and Uganda.

HIV self-testing has the potential to improve HIV testing rates and HIV preventive behaviors.

As previously discussed, the burden of HIV in both Kenya and Uganda is very high. Around the world, of those living with HIV, only 75% of people living with HIV are aware of their HIV status.[1] Once people test for HIV and know their status, they can then begin antiretroviral treatment, decrease their viral load, and thereby reduce the risk of transmitting HIV to others; thus, interventions to increase testing rates are essential. However, there is a relatively large discrepancy in HIV testing by gender. 70% of all adult testing services in low- and middle-income countries were conducted for women, most likely due to the integration of HIV testing into reproductive health services, but not consistently in other clinic settings.[48] Furthermore, in 2013, 92% of pregnant women in Kenya and 93% of pregnant women in Uganda were tested for HIV during their pregnancy.[49,50] Evidence shows that male involvement in prevention of mother-to-child transmission (PMTCT) of HIV and other family planning activities can reduce the risk of transmission and infant mortality by more than 40%, which is why it is imperative for both males and females in a partnership to test for HIV.[50] However, in 2014, only 4.5% of male partners of pregnant women attending antenatal care (ANC) participated in PMTCT in Kenya (i.e., testing for HIV in the last 12 months), and as of 2017, 31% of male partners in Uganda participated in PMTCT (i.e., tested for HIV as a couple at the ANC clinic with their partner),

revealing the need for more HIV testing among male partners.[51,52] Furthermore, a couple's testing is critical as it has been shown to decrease HIV transmission, yet only 31.5% of women and men in a relationship in the national Kenyan AIDS Indicator Survey had ever tested for HIV together.[53]

HIV testing in Kenya and Uganda is traditionally accomplished by use of rapid blood tests in health clinics, as it is the gold standard. Recently, HIV self-testing kits have been established as a potential alternative to, or preliminary method before, clinic-based testing. In 2012, the United States Food and Drug Administration (FDA) approved the OraQuick In-Home HIV Test as the original rapid HIV self-test to be purchased over-the-counter in the United States,[54,55] and this test kit and other brands are now in use. As shown in Figure 1, oral HIV self-testing detects antibodies for HIV-1 and HIV-2 in oral mucosal transudate (a substance that collects between teeth and gums).[56] Once the fluid is collected on the swab, it is inserted into the buffer solution provided with the test kit.[56] After 20 minutes in the buffer solution, the results can be read, with a red indicator only at the C-line indicating an HIV negative result, or a red line at both the C-lines and T-lines indicating an HIV positive result.[56] Any other result (i.e., no lines at all, more than 2 lines, etc.) indicate an invalid test.

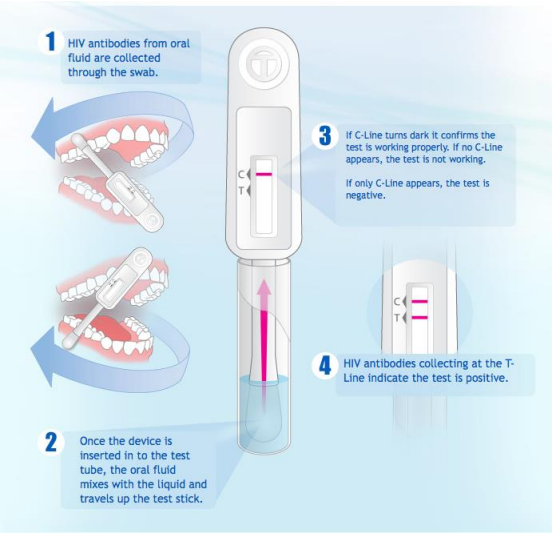

Figure 1: Diagram of proper use of OraQuick oral HIV self-test. Obtained from http://www.oraquick.com/What-is-OraQuick/How-Oral-Testing-Works

The first guidelines addressing the new technology of HIV self-testing were released by the WHO in December of 2016.[48] The recommendation from the WHO is that there is moderate

quality evidence for HIV self-testing, and they put forth a strong recommendation that HIV self-testing should be offered as an additional approach to HIV testing services.[48] Due to this recommendation, and results from randomized controlled trials regarding the HIV self-testing kits, the Kenyan Ministry of Health made HIV self-test kits available to public and private health facilities, and some pharmacies, starting in May of 2017.[57] There is currently a comprehensive operational manual for the delivery of HIV self-testing services in Kenya put forth in 2017 by the National AIDS & STI Control Program.[58] The Ugandan Ministry of Health has implemented HIV self-testing as an additional approach for delivering HIV testing services in Uganda as of May 2018,[59] and it is now legal for pharmacies to sell HIV self-testing kits.[60] As of mid-2018, there are 59 countries that have adopted HIV self-testing policies, and 53 other countries are currently developing policies.[61,62]

Several studies have documented benefits that HIV self-testing offers as an addition to clinic-based testing. In our 2017 systematic literature review, eleven studies found that the acceptability of HIV self-testing (HST) was high (between 81-100%), and participants preferred HST over conventional testing 81-91% of the time.[11] A recent meta-analysis comparing HIV self-testing to standard HIV testing found that HST is associated with both increased uptake of testing and higher frequency of testing in randomized controlled trials.[12] A recent review of HIV self-testing in sub-Saharan Africa found that there is high interest in HST among the general population, couples, high-risk populations, healthcare providers, and policy stakeholders, and readiness to self-test among men, young people, serodiscordant couples, and sex workers and their partners.[63] The benefits of self-testing include that the process of testing was easy, painless, convenient, private, saves time, promotes access to testing services, and increases autonomy and empowerment, while the concerns of self-testing were accuracy of the results, lack of HIV

counseling, linkage to care, and cost of the test kit.[11,58,63,64] HIV self-testing has also been shown to facilitate couples and partner testing, which can be a very effective testing approach, but often underutilized.[48,62] Clinical studies have shown that the OraQuick test has an expected performance of 92% for test sensitivity, an expected performance of 99.98% for test specificity, and only 1.1% of the study subjects failed to obtain a test result from the self-test kit.[56,65] All studies (in our aforementioned literature review) that used the OraQuick test found a median sensitivity of 93.6% and a median specificity of 99.9%,[11] and in the literature review from sub-Saharan Africa, the sensitivities of oral fluid-based self-tests ranged from 93.6-100% and specificities from 99.1-100% when supervised, and sensitivities of 66.7-90% and specificities of 95.2-100% when unsupervised.[63] This sensitivity is lower than the blood-based enzyme-linked immunosorbent assay (ELISA) used in many countries (sensitivity- 99.7%, specificity- 98.5%), but in Kenya and Uganda, blood-based rapid HIV test kits that detect HIV antibodies only are used for HIV testing at clinics, so these kits are closer in specifications to the oral HIV self-testing kits.[66–68] However, like at-home pregnancy tests, HIV self-testing kits do not provide a confirmed HIV positive result, so if the HIV self-test is positive, those results need to be confirmed using the national HIV testing algorithm in a clinic or healthcare setting. These HST kits are a very important first screening test for HIV, and have a wider reach for testing than blood-based clinic testing, especially if used by people who would not otherwise have tested for HIV due to barriers to testing (e.g., stigma, fear, and time constraints). The WHO states that good linkage to treatment and prevention services following HIV self-testing can also be achieved, especially when HIV self-testing is integrated into community-based systems.[69]

Higher gender equality leads to increased HIV preventive behaviors, and may lead to increased use of HIV self-testing methods

There are many types of HIV preventive behaviors, including condom use, HIV testing, reduced partner concurrency, use of pre-exposure prophylaxis, use of HIV antiretroviral treatment, and decreased involvement in other sexually risky behaviors.

Female-led HIV preventive behaviors

A literature review, assessing gender equality and sexual and reproductive health, found that women who face violence within their relationship are less likely to access HIV testing services.[70] A study focusing on married women in Kenya, Zimbabwe, and Zambia found that education (a key element of gender equality) was positively associated with married women testing for HIV, and found that the belief that gender-based violence is never acceptable (a key gender equality measure) was positively associated with older married women testing for HIV, and high financial decision-making (another key gender equality measure) was positively associated with HIV testing for older married women in Zimbabwe.[71] A study in Zambia found those who perceived a high tolerance of gender-based violence in the household were more likely to not test for HIV.[72] A study of HIV-positive women in rural Uganda found that higher relationship power was significantly associated with lower odds of recent forced sex.[73] In the same study, higher relationship control by the woman (a subset of relationship power) was significantly associated with a lower risk of both recent forced sex and transactional sex.[73] A cross-sectional study of women from three South African provinces primarily undertaken as a study of IPV found that a poor relationship between the man and the woman was associated with less discussion of HIV, and was associated with the women suggesting condom use less.[35] However, in this same study, the researchers found that domestic violence towards the women in the past year and financial abuse (i.e., taking earnings, preventing the woman from earning money, or not providing for household expenses) was positively associated with the woman

suggesting condom use.[35] This is a conflicting finding, and shows the need for additional research in the area of gender equality and sociodemographics. Also in South Africa, a follow-up survey of female students enrolled in an HIV prevention trial found that IPV and lower relationship power decreased HIV preventive behaviors through nonuse of condoms, but girls with higher relationship power (i.e., higher gender equality) were less likely to have multiple partners.[9] For female university students in South Africa, both positive attitude towards condoms and high self-efficacy were positively related to condom use, showing that gender power imbalance and low self-efficacy in females can decrease their condom use.[74] A study of sexually active adults living with HIV in South Africa found that women younger than 26 years with more equitable gender norms were significantly more likely to have used a condom the last time they had sex than women in their same age group who reported inequitable gender norms.[34]

Male-led HIV preventive behaviors

A meta-analysis focused on African studies found that gender inequality measured by attitudes towards wife-beating and higher level of decision making by men in three African countries (Nigeria, Uganda, and Zimbabwe) was associated with elevated measures of male sexual risk-taking and extramarital risk taking.[75] A cross-sectional study performed in South Africa found that men who had perpetrated IPV were more likely to have engaged in risky sexual behaviors, as well as to have raped and been raped.[76] In the same study, it was also found that men who had been physically violent to a partner on more than one occasion were significantly more likely to have HIV.[76] In a husband-wife dyad study in India, among men whose wives were not HIV infected, the odds of HIV infection for the husbands was significantly elevated based on IPV perpetration.[38] Baseline data from an HIV prevention behavioral intervention in South Africa found that men who perpetrated IPV were more likely to display decreased HIV

preventive behaviors, such as higher numbers of lifetime and past year sexual partners, greater likelihood of casual sexual partners, transactional sex, and substance use.[77] A community-level intervention trial in Uganda attempting to shift harmful social norms that promote gender inequality found that males in the intervention group, over a one year follow-up, were more likely to have taken an HIV test compared to controls.[78] A cross-sectional study in South Africa found that among male university students, positive attitudes towards condoms and subjective norms were positively related to condom use.[74] An analysis of the Demographic Health Survey in Haiti found that men who had high acceptance of IPV were less likely to use a condom than those with low acceptance of IPV.[79] In a follow-up survey of male students enrolled in an HIV prevention trial, males with higher levels of IPV towards women were more likely to have multiple partners.[9] In Zimbabwe, male students who had not been tested for HIV were less likely to agree with the statement that "When a woman says no to sexual advances she means no" as compared to males that tested for HIV.[80]

Summary

It is well established that there are many HIV preventive behaviors that increase when gender equality increases both among females and males, but sometimes there are HIV preventive behaviors that increase when gender equality decreases. This shows a need for additional research in the complicated field of gender equality and HIV. However, there has been no research on gender equality and the HIV preventive behavior of HIV self-testing. Relationship power balance and relationship gender equality are critical for a major HIV prevention strategy being rolled out across east Africa, in which ANC clients are taking HIV self-testing kits home to their husbands. Therefore, this dissertation fills the gap in understanding of how gender equality is related to factors surrounding HIV self-testing.

Significance:

HIV self-testing is a relatively new technology in the field of HIV testing, with the first self-testing kits being approved by the FDA in 2012 for over-the-counter use in the United States.[54] Since these self-testing kits are new, there have not been many studies examining HIV self-testing kits around the world. Our 2017 literature review found only 28 published articles assessing HIV self-testing overseas,[11] and a recent meta-analysis conducted through 2016 only found five randomized controlled trials comparing HIV self-testing to standard HIV testing.[12] While many studies on the association between gender equality and HIV prevention behaviors have been performed (including HIV testing), gender equality and use of HIV self-testing kits have been understudied, particularly among couples' uptake and male partners' uptake of HIV self-testing kits. As of March 2019, there have been no published articles detailing the association between gender equality and HIV self-testing. As HIV self-testing holds great promise for the future of testing for HIV, it will be extremely important to determine how gender equality affects willingness to use HIV self-testing, and thereby inform targeted interventions to increase HIV self-testing among couples with different levels of gender equality. Therefore, this study was innovative by addressing this new technology, and adds to the body of literature surrounding gender equality as it relates to HIV prevention.

Study Population and Preliminary Findings:

This study stemmed from data collected as part of my work with two randomized controlled trials (RCTs) in Kenya and Uganda in pregnant women and their male partners. The Kenyan RCT was a three-arm individually randomized trial conducted in 14 clinics in central and eastern Kenya, with study information collected at baseline and a three-month follow-up visit. This study randomized 1,410 women and their male partners (471 in Arm 1, 467 in Arm 2, and 472 in Arm 3), where 1,215 women and 1,133 male partners were successfully assessed at

the three-month follow-up. Women were eligible to participate in the study if they were pregnant, at least 18 years old, and were attending an antenatal clinic (ANC) for the first time for this pregnancy. Further inclusion criteria included reported social contact or communication with their male partner at least once per week, if their partner was either HIV negative or their status unknown at the time of the woman's recruitment, and that their male partner had not tested for HIV in the past three months. Women were excluded if they were concerned about the risk of violence from their male partner if they brought up the topic of HIV testing. After the women provided informed consent, they were randomized into one of three arms: Arm 1 – standard of care in Kenya; Arm 2 – Arm 1 plus a card stating the importance of male HIV testing to prevent mother-to-child transmission of HIV; and Arm 3 – Arm 2 plus two OraQuick HST kits with instructions for testing the male partner at home. Participants in three arms completed a baseline questionnaire. Three months after enrollment, the women were followed up to ascertain the primary outcome (whether or not their male partner tested for HIV, and the method of testing), as well as other variables. The male partners were also contacted at three months, and those providing informed consent were administered a questionnaire on socio-demographics and HIV testing history.

The Ugandan RCT was a two-arm cluster randomized controlled trial conducted in three clinics in central Uganda, with study information collected at baseline, a one-month follow-up visit, and a three-month follow-up visit. This study randomized 1,618 women (847 in the intervention arm, and 771 in the control arm), and 1,347 women and 1,198 men were successfully assessed at the one-month follow-up, while 1,299 women and 1,123 men were successfully assessed at the three-month follow-up. The cluster randomization of the Ugandan RCT was completed at the level of the clinic day, to minimize the likelihood of contamination

between study arms. Women were eligible for the Uganda study if they were pregnant, at least 14 years of age (as pregnant women between the ages of 14 and 18 are considered emancipated minors), and attending an antenatal clinic. Further inclusion criteria included reported contact with their male partner at least once per week, their partner was not known to be HIV positive at time of recruitment, the male partner was at least 18 years old and the male partner had not tested for HIV in the past six months. Women were able to refuse participation for any reason, including if they were concerned about the risk of violence from their male partner if they brought up the topic of HIV testing. However, this was not an exclusion criteria as it had been for the Kenya study. Once the women provided informed consent, they were randomized by clinic day to one of two arms: Arm 1 – standard of care; and Arm 2 – Arm 1 plus up to four HST kits to test all of the adult members of the household, and both arms completed a baseline questionnaire. One month and three months after enrollment, the women were followed up to ascertain the primary outcome (whether or not their male partner tested for HIV, and the method of testing) and other variables. If the male partner consented to participate and provided informed consent, follow-up questionnaires were administered at both one month and three months post-baseline.

In the Kenyan RCT, baseline characteristics did not differ significantly by study arm, and for the primary outcome, we found that 28% of the men in Arm 1 tested for HIV, 37% of the men in Arm 2 tested, and 79% of the men in the intervention group (Arm 3) tested for HIV ($p<0.001$ comparing group three and group two, and $p=0.01$ comparing group one and group two), and the HIV self-testing kits were deemed acceptable with a high uptake of the kits.[81] In the Ugandan RCT, baseline characteristics also did not differ significantly by study arm, and for the primary outcomes, we found that across both data time points (Month 1 and Month 3), 70.4%

of men in the intervention group tested for HIV, and 27.5% of men in the control group tested for HIV (RR of 2.57, 95% CI 2.26-2.91). There was also a high proportion of men who used the HIV self-testing kit in the intervention arm, showing high uptake and acceptability of the kits.

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CHAPTER 2: 'Social and Demographic Predictors of Gender Inequality among Heterosexual Couples Expecting a Child in central Kenya'

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Abstract

Imbalance of power and equality in sexual relationships is linked to health in various ways, including: 1) reduced ability to get information or take action, 2) increased violence between partners, and 3) influence on the reduced use of health services. While there has been research assessing multiple social and economic variables related to gender inequality, studies have used many different definitions of gender inequality, and there is a lack of this research within a pregnancy context. Here we attempt to identify social and economic predictors of gender inequality (measured by decision-making power and acceptance of intimate partner violence) within heterosexual couples expecting a child in central Kenya.

We ran a secondary data analysis using data from a three-arm individually randomized controlled HIV self-testing intervention trial conducted in 14 antenatal clinics in central and eastern Kenya among 1,410 women and their male partners. Analysis included Cochran Mantel-Haenzel, logistic regression, proportional odds models, and generalized linear mixed model (GLMM) framework to account for site-level clustering. Overall, we show that there are significant social and economic variables associated with acceptance of intimate partner violence including: higher age, being married, "Other" religion, lower partner education, higher wealth status, and variables associated with decision-making power including lower partner education and lack of equality in earnings. This study contributes to the literature on the influence of social and economic factors on gender inequality, especially in Kenya which has a high burden of HIV/AIDS. Our results show some areas to improve these specific factors (including education and employment opportunities) or create interventions to targeted populations to potentially improve gender equality in heterosexual pregnant couples in Kenya.

Keywords: Gender Equality, Antenatal Care, Sociodemographics, Heterosexual Couples, Pregnancy, HIV

Introduction

In most societies, including African societies, males have more power over females.[1] This imbalance is associated with violent and risky behaviors that can have a negative impact on many aspects of health.[2] The balance of power in sexual relationships is linked to sexual and reproductive health in various ways, including: directly through reduced ability to get information or take action, increased violence between partners, and through its influence on the reduced use of health services.[3] Low educational, occupational, and economic opportunities, and large age gaps in relationships have been associated with gender inequality, albeit with many different definitions of gender inequality. In South Africa and Botswana, there were a few social and economic predictors that were associated with lower female gender equality (measured by the woman's decreased ability to suggest condom use to their partners), which included the partner being at least 10 years older than the woman, partners who abused the women, and women who are economically dependent on their partners.[4] Higher education was positively associated with more equitable gender norms among both men and women in a study of people living with HIV in South Africa.[5] In a separate study of women in South Africa, researchers found that when both partners had higher education, they were more likely to discuss HIV (a marker of high gender equality), while there being an age difference of more than 5 years between the partners was associated with low discussion of HIV.[6] Furthermore, when the woman had higher education, she was more likely to suggest condom use to her partner.[6]

According to the United Nations Human Rights Commission (UNHRC) Report, "maternal mortality and morbidity is a consequence of gender inequality, discrimination, health

inequity and a failure to guarantee women's human rights".[7] Furthermore, a meta-analysis from studies in Africa found an overall prevalence of IPV during pregnancy of 15.2% (ranging from 2 to 57%).[8] Therefore, it is necessary to study the upstream sociodemographic predictors of gender equality among pregnant women, as a vulnerable population. Studies assessing gender equality and maternal health have shown that the presence of restrictive gender norms negatively affects the use of maternal health services in four sub-Saharan African countries,[9] and that women with low decision-making autonomy were more likely to be exposed to maternal health risk.[10] Another study found protective associations of gender equality (high household decision-making and low acceptance of IPV) on both maternal and child health outcomes.[11] However, there have not been many studies assessing sociodemographic variables associated with gender inequality within a pregnancy context.

In this study, we therefore sought to investigate the associations between sociodemographic variables and gender inequality (measured by positive attitudes towards intimate partner violence and lower decision-making power) within the unique context of heterosexual couples expecting a child in central Kenya.

Methods

Design and Study Population

These data stem from a three-arm individually randomized HIV self-testing intervention trial conducted in 14 clinics in central and eastern Kenya, with study information collected at baseline and a three-month follow-up visit.[12] Briefly, women were eligible to participate in the study if they were pregnant, at least 18 years old, and attending an antenatal clinic (ANC) for the first time for this pregnancy. Further inclusion criteria included reported contact with their male partner at least once per week, if their male partner was either HIV negative or their status

unknown at the time of the woman's recruitment, and that their male partner had not tested for HIV in the past three months. Women were excluded if they were concerned about the potential risk of violence from their male partner if they brought up the topic of HIV testing due to safety concerns, but very few women were excluded for this reason. After the women provided informed consent, they were randomized into one of three arms: Arm 1, the standard Kenyan Ministry of Health card inviting the male partner to come to the health clinic for a discussion on family health but nothing mentioning HIV; Arm 2: an improved invitation card describing the benefits of male HIV testing to prevent mother-to-child transmission of HIV; and Arm 3: the improved invitation card plus the delivery of two OraQuick HIV self-testing (HST) kits to the woman with instructions for testing the male partner at home. All three arms completed a baseline questionnaire. Three months after enrollment, the women were interviewed to ascertain whether or not their male partner tested for HIV, and the method of testing, as well as other variables. The male partners were also contacted at three months, and those consenting for an interview were administered a questionnaire on socio-demographics and HIV testing history.

Measurements

Social variables included age of both the man and woman (categorized from a continuous variable based on distributional balance), mother's education level, religion, mother's employment status, marital status, partner's education level, and partner's employment status. Economic variables included equality in earnings (the proportion of household expenses met by the woman's earnings: none, less than a third, a third to a half, and more than half), and wealth index (a composite measure of a household's cumulative living standard, separated into four wealth quartiles).[13] The wealth index consisted of the following variables: main source of drinking water, type of toilet facility, sharing of toilet, type of fuel used for cooking, presence of

modern appliances (electricity, solar panels, generator, radio, television, refrigerator, telephone), ownership of transportation (bicycle, motorcycle, car), material of the house floor and roof, ownership of land or a house, ownership of productive assets (e.g. cattle or a sewing machine), and cash savings. This wealth index was constructed by the International Demographic and Health Surveys Program, and has been used in research performed in Kenya.[13] Rasch modeling was performed in the original trial to create the wealth index, and then was separated into four quartiles (lowest, second lowest, second highest, and highest).[12]

The two primary outcome variables used in this study are measures of gender equality – namely attitudes towards IPV and decision-making power. Attitudes towards IPV was measured by the male's report for the validated Violence Domain of the Gender Equitable Scale, a 5 question scale regarding hypothetical violence towards women, with available answers on a 2-point scale, where 1=agree and 3=disagree. Scores across all questions were summed, and categorized into three levels: high acceptance of IPV (score of 5-11), medium acceptance of IPV (score of 13), and low acceptance of IPV (score of 15), where the higher the score, the lower acceptance of IPV (i.e. higher support for gender norms).[14] Decision-making power was measured by the woman's report on decision making for: major household purchases, daily household needs, and visiting family or relatives, with available answers of: 1) Myself, 2) My partner or others, or 3) Jointly. Each response to the three questions was dichotomized, with a value of 1 if the woman reports that a decision was made by either herself or jointly, and 0 if the decision was made by her male partner or someone else. We then created an index by summing the three dichotomized responses, with a value of 0 if the woman made no decisions (no decision-making power), 1 if she made one or two decisions by herself or jointly (low decision-

making power), and 2 if she made all three decisions by herself or jointly (high decision-making power).

Data Analysis

We summarized data using descriptive statistics where mean/SD were reported for continuous variables and proportions were reported for categorical variables. To make comparisons between groups, we used Cochran Mantel-Haenzel. Modeling was performed with a generalized linear mixed models (GLMMs) framework, accounting for site-level clustering.[15] We checked the proportional odds assumption using the score test for proportional odds given in logistic regression.[16] The first set of analyses was gender equality as measured by decision-making power from the woman's report, with a categorical nominal outcome (due to violation of the proportional odds assumption). We used logistic regression and GLMM to estimate odds ratio (OR) and corresponding 95% CI. The second was gender equality as measured by attitudes towards IPV from the man's report (with an ordinal outcome) and we used cumulative logit and GLMM to estimate the parameters of the model. The intraclass correlation coefficient (ICC) was calculated to determine variation by clinic site. We chose our final model for each analysis based on a combination of factors including conceptual plausibility, individual variable significance in the model, confounding effect (including multicollinearity concerns) and two measures of model fit (Akaike's Information Criterion and -2 Log Likelihood, when appropriate). A two-sided p-value of <0.05 for specific variables was used to assess significance of specific variables, as well as 95% CI not including 1. Proc GLIMMIX in SAS 9.4 (SAS Institute, Cary, NC) was used for all analyses.

Ethical Approval

The original trial was approved by the institutional review board of the Kenya Research Medical Institute (IRB no. 485). Written informed consent was obtained from all participants. The current data analysis was performed on completely de-identified data, and was deemed by the institutional review board of the Medical University of South Carolina as not human subjects research.

Results

Table 1 shows the demographic characteristics of the women and their male partners. Overall, 1,410 women were enrolled and randomized into the study, and 1,217 women were interviewed at the three three-month follow-up visit. The original study attempted to reach all 1,410 male partners, and 1,130 male partners were interviewed at the three-month follow-up visit. Male partners were on average older than the women (31.4 years versus 26.4 years, respectively), and in 84.7% of the relationships, the man was older than the woman. For women, the majority had a primary or lower education (56.1%), were mostly Protestant or other Christian besides Catholic (77.7%), were mostly self-employed (51.0%), were currently married (87.0%), had less than a third or none of the household expenses met by their earnings (65.5%), and the vast majority were HIV negative (96.2%). For the men, the majority had a secondary or higher education (60.1%), were mostly protestant or other Christian (67.0%), were either employed for wages or self-employed (43.8% and 48.8%, respectively), were currently married (88.8%), and the vast majority were HIV negative (98.5%). The variables that were significantly different between male and female partners were age, education, religion, and employment. Overall, 22.2% of the men showed high support for hypothetical IPV, 22.2% had moderate support for IPV, and 55.6% had low support for IPV. For decision-making power, 12.8% of the women had no decision-making power, 32.3% of the women had low decision-making power, and 54.9% had high decision-making power.

Regarding the bivariate analyses between the demographic characteristics and gender equality (Table 2, we found that lower scores on the Gender Equitable scale (i.e. high acceptance of IPV) were significantly associated with the following sociodemographics: the man being 11+ years older than the woman, primary or lower for women's education, primary or lower for man's education, man's employment of out of work or self-employed, currently married, woman's HIV status of positive or didn't receive results, and higher wealth status. Lower decision-making power was significantly associated with lower women's age, lower men's age, lower men's education, women out of work, man's employment as self-employed, unmarried couples, low wealth status, and woman's HIV status as didn't receive results.

Table 3 shows the modeling of attitudes towards intimate partner violence by sociodemographics. The significant sociodemographic variables for this model were partner age, marital status, partner religion, partner education, wealth status, and woman's HIV status. Specifically, compared to partners who were 18-28 years old, those who were 32-35 years old were more likely to indicate higher acceptance of IPV (OR 1.81, 95% CI 1.19-2.75). Unmarried persons had lower odds of increasing acceptance of IPV compared to married persons (OR 0.59, 95% CI 0.35-0.97). Partners who reported "Other" religion were much more likely to have higher acceptance of IPV compared to those who were Protestant/Other Christian (OR 4.75, 95% CI 2.14-10.53). Partners with a secondary or higher education had lower odds of acceptance of IPV compared to primary or lower education (OR 0.42, 95% CI 0.31-0.59). Those with the second highest or highest wealth status were more likely to have higher acceptance for IPV compared to the lowest wealth status (OR 1.89, 95% CI 1.20-2.99 and OR 1.70, 95% CI 1.02-2.82, respectively). Partners were more likely to have higher acceptance of IPV if the woman did

not receive her last HIV test result compared to a negative test result (OR 6.39, 95% CI 1.90-21.42).

Table 4 shows the modeling of decision-making power by sociodemographics. The significant sociodemographics include partner education and equality in earnings. Compared to a primary or lower education, partners who had a secondary or higher education were associated with lower odds of the woman having low decision-making power compared to high decision-making power (OR 0.66, 0.46-0.93). Compared to women who met none of the household expenses with their earnings, women who met a third to a half of their household expenses by their earnings were less likely to have low decision-making power compared to high decision-making power. (OR 0.60, 0.37-0.95).

Discussion

This study was conducted in order to identify social and economic predictors of gender inequality (measured by gender power imbalance and positive attitudes towards IPV) among heterosexual couples expecting a child in central Kenya within the context of a HIV self-testing randomized controlled trial. Overall, we found higher acceptance of intimate partner violence among a) partners with lower education, b) married, c) religion other than Christian, d) partner's with higher age, e) higher wealth status, and f) woman not receiving HIV test results. In addition, we found lower decision-making power among a) partners with lower education, and b) those with a lack of equality in earnings.

We found that partners with secondary education or higher were less likely to have higher acceptance of intimate partner violence compared to those with primary education or lower, as well as less likely to have a woman with low decision-making power. This is consistent with studies showing that secondary or higher education is consistently associated with high support for gender equality in men[17–19] and associated with reduced IPV.[20–22] Those who self-identified

as “Other” religion were much more likely to have higher acceptance of IPV compared to Protestant/Other Christian. A study in Bangladesh that found women who were Muslim were more likely to think that IPV was justified compared to any other religion,[23] and one in Ghana showing that women who were Muslim and Traditional believers were more likely to approve domestic physical violence compared to women who were Christian.[24] Partners who were 32-35 were more likely to have higher acceptance of IPV compared to male partners who were younger (18-28 years old). This is opposite from a systematic review showing a negative association of age and IPV, although this systematic review detailed perpetration of IPV, not acceptance of IPV as was described in this current analysis,[20] but is in line with a study in South Africa reporting that higher age was negatively associated with more equitable gender norms in both men and women.[5] Those with higher wealth status (second highest or highest quartile) were more likely to have higher acceptance of IPV compared to the lowest quintile. This is opposite from many studies that show that high income is associated with less IPV or less justification of IPV.[22–25] In our study, those that were unmarried were less likely to report higher support for intimate partner violence compared to those who were married. Research in the Democratic Republic of the Congo found that where men who were unmarried or separated had higher support for gender equality than those who were married.[17] Women who contributed a third to a half of household expenses with their own earnings (compared to none) were less likely to have low decision-making power compared to high decision-making power. This is consistent with a study that showed women who were economically dependent on their partners had lower gender equality.[4]

Limitations

There are a couple noteworthy limitations in this study. First, women were excluded if they were concerned about violence from their male partner if they were to bring home the HIV

self-testing kit. This was expected to bias our study population to include those with less intimate partner violence than the general population. However, the participation rates from eligible women in the original trial were very high, so very few women self-excluded from participation due to fear of IPV. Furthermore, there could have been residual confounders that impacted our observed associations due to uncollected measurements.

Conclusions

In summary, higher partner's age, marriage, religion other than Christian, lower partner's education, higher wealth status, and lack of equality in earnings were found to be associated with gender inequality. This study contributes to the literature on the influence of social and economic factors on gender inequality, especially in the country of Kenya and in an HIV-related and pregnancy context. These results show some promising areas to target to improve these specific social and economic variables (especially to increase partner education levels and increase equality in earnings between partners) or create interventions to targeted populations (specifically targeted towards different religions or wealth statuses, or married couples) to potentially improve gender equality in heterosexual couples expecting a child in Kenya.

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List of Tables

Table 1. Characteristics of women attending antenatal care at baseline and characteristics of male partners at month 3 in Central Kenya[a]

Characteristic	**Women (n=1,410)** n (%)	**Male partners (n=1,130)** n (%)
Age (years), mean ±SD*	26.4 ± 5.4	31.4 ± 5.6
Missing	0	18
Age categories*		
18-22 (women), 18-28 (men)	382 (27.1)	349 (31.4)
23-26 (women), 29-31 (men)	409 (29.1)	278 (25.0)
27-30 (women), 32-35 (men)	320 (22.7)	260 (23.4)
31-45 (women), 36-64 (men)	299 (21.2)	225 (20.2)
Age Discrepancy between partners		
Same age or woman is older	170 (15.3)	-
Man is 1-5 years older	448 (40.3)	-
Man is 6-10 years older	336 (30.2)	-
Man is 11+ years older	158 (14.2)	-
Missing	298	
Level of education*		
Primary or Lower	791 (56.1)	449 (39.9)
Secondary or Higher	619 (43.9)	677 (60.1)
Missing		4
Religion *		
Catholic	293 (20.78)	334 (29.6)
Protestant/other Christian	1096 (77.7)	757 (67.0)
Other	21 (1.5)	38 (3.4)
Missing		1
Employment status*		
Employed for wages	227 (16.1)	495 (43.8)
Self-employed	719 (51.0)	551 (48.8)
Not Employed	464 (32.9)	83 (7.4)
Missing		1
Marital status		
Currently married	1227 (87.0)	1002 (88.8)
Not Married	183 (13.0)	126 (11.2)
Missing	0	2
Proportion of expenses met by woman's earnings		
None	575 (40.8)	-
Less than a third	334 (23.7)	-
A third to a half	359 (25.5)	-
More than a half	141 (10.0)	-
Missing	1	
Wealth Status		
Lowest	300 (24.7)	-
Second Lowest	306 (25.2)	-
Second Highest	304 (25.0)	-
Highest	305 (25.1)	-
Missing	195	

HIV Status		
Positive	9 (0.68)	6 (0.6)
Negative	1277 (96.2)	966 (98.5)
Indeterminate	14 (1.1)	-
I did not receive result	28 (2.1)	-
Do not remember/do not wish to say	-	9 (0.9)
Missing	82	149
Intervention Arm		
Standard of Care	471 (33.4)	374 (33.1)
Improved Invitation Letter	467 (33.1)	361 (31.9)
HIV self-testing kits	472 (33.5)	395 (35.0)
Health Facility		
Embu PGH	168 (11.9)	82 (7.3)
Githunguri Health Center	108 (7.7)	96 (8.5)
Kangeta Health Center	84 (6.0)	82 (7.3)
Kanyakini District Hospital	51 (3.6)	50 (4.4)
Kihara Sub-District Hospital	126 (8.9)	106 (9.4)
Kiritiri Health Center	63 (4.5)	58 (5.1)
Lari Health Center	91 (6.5)	71 (6.3)
Maragua District Hospital	96 (6.8)	89 (7.9)
Mbeere District Hospital	84 (6.0)	65 (5.8)
Meru Level 5 Hospital	207 (14.7)	188 (16.6)
Muthale Mission Hospital	70 (5.0)	62 (5.5)
Nyambene District Hospital	121 (8.6)	110 (9.7)
Tigoni District Hospital	75 (5.3)	25 (2.2)
Uthiru Health Center	66 (4.7)	46 (4.1)

Abbreviations: SD, standard deviation

[a] Columns may not total to 100 due to missing values.

* P-value for comparisons between female and male partners is <0.05

Table 2. Bivariate analysis of sociodemographic characteristics of women and male partners and gender equality

	Attitudes towards IPV			Decision-Making Power		
	High support for IPV	**Medium support for IPV**	**Low support for IPV**	**None**	**Low**	**High**
Sociodemographics, n (%)						
Women age categories**^^						
18-22	72 (22.9)	78 (24.7)	165 (52.4)	69 (18.1)	127 (33.3)	186 (48.7)
23-26	73 (22.4)	66 (20.3)	187 (57.4)	52 (12.7)	133 (32.5)	224 (54.8)
27-30	50 (19.7)	55 (21.6)	149 (58.7)	36 (11.3)	106 (33.1)	178 (55.6)
31-45	55 (23.8)	51 (22.1)	125 (54.1)	23 (7.7)	90 (30.1)	186 (62.2)
Men age categories**^^						
18-28	87 (25.1)	60 (17.3)	200 (57.6)	37 (10.6)	122 (35.0)	190 (54.4)
29-31	39 (14.1)	77 (27.8)	161 (58.1)	57 (20.5)	80 (28.8)	141 (50.7)
32-35	59 (22.7)	58 (22.3)	143 (55.0)	34 (13.1)	71 (27.3)	155 (59.6)
36-64	62 (27.6)	54 (24.0)	109 (48.4)	10 (4.4)	62 (27.6)	153 (68.0)
Age Discrepancy between partners						
Same age or woman is older	29 (17.3)	36 (21.6)	102 (61.0)	25 (14.7)	47 (27.6)	98 (57.6)
Man is 1-5 years older	98 (21.9)	87 (19.4)	263 (58.7)	46 (10.3)	148 (33.0)	254 (56.7)
Man is 6-10 years older	76 (22.6)	83 (24.7)	177 (52.7)	44 (13.1)	104 (30.9)	188 (55.9)
Man is 11+ years older	44 (27.8)	43 (27.2)	71 (44.9)	23 (14.6)	36 (22.8)	99 (62.7)
Women Level of education						
Primary	167 (25.4)	148 (22.5)	342 (52.0)	101 (12.8)	257 (32.5)	433 (54.7)
Secondary (A or O level)	83 (17.7)	102 (21.8)	284 (60.5)	79 (12.8)	199 (32.2)	341 (55.1)
Man Level of Education**^						
Primary or Lower	148 (33.0)	120 (26.7)	181 (40.3)	65 (14.5)	146 (32.5)	238 (53.0)
Secondary or Higher	101 (15.0)	129 (19.1)	444 (65.9)	73 (10.8)	196 (28.9)	408 (60.3)
Religion						
Catholic	55 (23.6)	47 (20.2)	131 (56.2)	40 (13.6)	90 (30.7)	163 (55.6)
Protestant/other Christian	190 (21.7)	198 (22.6)	489 (55.8)	138 (12.6)	361 (32.9)	597 (54.5)
Other	5 (31.3)	5 (31.3)	6 (37.5)	2 (9.5)	5 (23.8)	14 (66.7)
Women Employment^^						
Employed for wages	40 (22.5)	31 (17.4)	107 (60.1)	33 (14.5)	73 (32.2)	121 (53.3)
Self-employed	135 (22.7)	128 (21.5)	187 (53.0)	39 (8.4)	152 (32.8)	273 (58.8)
Out of work	75 (21.3)	91 (25.8)	332 (55.8)	108 (15.0)	231 (32.1)	380 (52.8)
Men Employment^						
Employed for wages	94 (19.0)	106 (21.5)	294 (59.5)	50 (10.1)	153 (30.9)	292 (59.0)
Self-employed	132 (24.0)	131 (23.9)	286 (52.1)	84 (15.3)	163 (29.6)	304 (55.2)
Student/Out of Work	24 (31.2)	13 (15.7)	46 (55.4)	5 (6.0)	26 (31.3)	52 (62.6)
Marital status**^^						
Currently married	231 (24.0)	223 (23.1)	509 (52.9)	155 (12.6)	377 (30.7)	695 (56.6)
Not Married	19 (11.7)	27 (16.6)	117 (71.8)	25 (13.7)	79 (43.2)	79 (43.2)
Woman HIV status**^						
Positive	4 (66.7)	0 (0)	2 (33.3)	0 (0)	4 (44.4)	5 (55.6)
Negative	227 (22.1)	226 (22.0)	576 (56.0)	157 (12.3)	417 (32.6)	703 (55.0)
Indeterminate	1 (9.1)	1 (9.1)	8 (81.8)	0 (0)	3 (21.4)	11 (78.6)
Did not receive result	11 (55.0)	4 (20.0)	5 (25.0)	7 (25.0)	12 (42.9)	9 (32.1)
Man HIV status						
Positive	1 (16.7)	1 (16.7)	4 (66.7)	0 (0)	2 (33.3)	4 (66.7)
Negative	209 (21.6)	216 (22.4)	540 (56.0)	133 (13.8)	280 (29.0)	553 (57.3)
Don't wish to say	4 (44.4)	1 (11.1)	4 (44.4)	1 (11.1)	2 (22.2)	6 (66.7)

Wealth Status*^^						
Lowest	43 (15.7)	57 (20.8)	173 (63.4)	44 (14.7)	105 (35.0)	151 (50.3)
Second Lowest	43 (15.7)	77 (28.1)	154 (56.2)	72 (23.5)	85 (27.8)	149 (48.7)
Second Highest	70 (25.0)	61 (21.8)	149 (53.2)	19 (6.3)	107 (35.2)	178 (58.6)
Highest	90 (32.3)	51 (18.3)	138 (49.5)	15 (4.9)	86 (28.2)	204 (66.9)
Proportion of expenses met by woman's earnings**^						
None	112 (25.1)	94 (21.0)	241 (53.9)	79 (13.7)	212 (36.9)	284 (49.4)
Less than a third	50 (18.2)	61 (22.2)	164 (59.6)	27 (8.1)	113 (33.8)	194 (58.1)
A third to a half	59 (20.6)	61 (21.3)	167 (58.2)	44 (12.3)	96 (26.7)	219 (61.0)
More than a half	28 (24.1)	34 (29.3)	54 (46.6)	30 (21.3)	34 (24.1)	77 (54.6)
Attitudes towards IPV: *p<0.05, **p< 0.01, Decision-Making Power: ^p<0.05, ^^p<.01						

Table 3. Multivariate modeling for the ordinal outcome of gender inequality (measured by attitudes towards Intimate Partner Violence)

	Attitudes Towards Intimate Partner Violence
	OR (95% CI)
Partner's Age (Ref=18-28)	
29-31	1.22 (0.81-1.84)
32-35	1.81 (1.19-2.75)*
36-64	1.39 (0.87-2.23)
Woman's Age (Ref 18-22)	
23-26	1.07 (0.73-1.57)
27-30	0.83 (0.53-1.29)
31-45	0.83 (0.51-1.34)
Marital Status (Ref=Married)	
Not Married	0.59 (0.35-0.97)*
Partner Religion (Ref=Protestant/Other Christian)	
Catholic	1.06 (0.76-1.47)
Other	4.75 (2.14-10.53)*
Partner Education (Ref=Primary or lower)	0.42 (0.31-0.59)*
Proportion of Expenses Met by Woman's Earnings (Ref=None)	
Less than one-third	0.84 (0.57-1.24)
One-third to one-half	0.95 (0.64-1.40)
More than one-half	1.39 (0.85-2.28)
Wealth Status (Ref=Lowest)	
Second Lowest	1.13 (0.75-1.72)
Second Highest	1.89 (1.20-2.99)*
Highest	1.70 (1.02-2.82)*
Woman Baseline HIV Status (Ref=Negative)	
Positive	2.83 (0.31-25.54)
Indeterminate	0.42 (0.04-4.21)
Did not receive results	6.39 (1.90-21.42)*
Partner HIV Status (Ref=Negative)	
Positive	0.21 (0.03-1.71)
Do not remember/did not want to say	2.28 (0.40-12.95)

* 95% CI does not include 1

Table 4: Multivariate modeling for the nominal outcome of gender inequality (as measured by decision-making power, reference group=High)

	Decision-Making Power
Partner Age (Ref=18-28)	
29-31, outcome no power	1.31 (0.67-2.54)
29-31, outcome low power	1.13 (0.73-1.76)
32-35, outcome no power	0.99 (0.49-1.97)
35-35, outcome low power	0.82 (0.52-1.28)
36-64, outcome no power	0.47 (0.19-1.20)
36-64, outcome low power	0.62 (0.37-1.03)
Woman's Age (Ref 18-22)	
23-26, outcome no power	0.53 (0.28-1.02)
23-26, outcome low power	0.73 (0.48-1.12)
27-30, outcome no power	0.74 (0.36-1.54)
27-30, outcome low power	0.89 (0.55-1.43)
31-45, outcome no power	0.59 (0.25-1.36)
31-45, outcome low power	0.78 (0.46-1.34)
Marital Status (Ref=Married)	
Not Married, outcome no power	1.67 (0.71-3.91)
Not Married, outcome low power	1.33 (0.79-2.28)
Partner Education (Ref=Primary or Lower)	
Secondary or Higher, outcome no power	0.77 (0.45-1.34)
Secondary or Higher, outcome low power	0.66 (0.46-0.93)*
Proportion of Expenses Met by Woman's Earnings (Ref=None)	
Less than one-third, outcome no power	0.58 (0.27-1.23)
Less than one-third, outcome low power	0.89 (0.57-1.36)
One-third to one-half, outcome no power	0.56 (0.27-1.17)
One-third to one-half, outcome low power	0.60 (0.37-0.95)*
More than one-half, outcome no power	0.39 (0.14-1.05)
More than one-half, outcome low power	0.53 (0.28-1.01)
Wealth Status (Ref=Lowest)	
Second Lowest, outcome no power	0.85 (0.44-1.66)
Second Lowest, outcome low power	0.74 (0.46-1.20)
Second Highest, outcome no power	0.55 (0.24-1.27)
Second Highest, outcome low power	0.77 (0.47-1.25)
Highest, outcome no power	0.51 (0.20-1.34)
Highest, outcome low power	0.61 (0.35-1.06)
Woman Employment (Ref=Employed for Wages)	
Out of Work (unemployed), outcome no power	1.00 (0.47-2.13)
Out of Work (unemployed), outcome low power	1.02 (0.61-1.70)
Self-Employed, outcome no power	0.56 (0.25-1.26)
Self-Employed, outcome low power	1.30 (0.79-2.14)

* 95% CI does not include 1

CHAPTER 3: 'Relationship Gender Equality and Couples Uptake of Oral HIV Self-Testing Kits Delivered by Pregnant Women in Kenya'

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The authors declare that they have no conflict of interest. The original trial was approved by the institutional review board of the Kenya Research Medical Institute. Written informed consent was obtained from all participants for the original trial. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors. The current data analysis was performed on completely de-identified data, and was deemed by the institutional review board of the Medical University of South Carolina as not human subjects research.

Running Head: Gender Equality and HIV Self-Testing in Kenya

Abstract

Higher gender equality is associated with many HIV preventive behaviors, including HIV testing. HIV self-testing is a relatively new testing technology that could assist with HIV prevention. We examined the associations between gender equality and couple's uptake of HIV self-testing in central Kenya. Generalized linear mixed models framework was used to account for site-level clustering. In comparison to male partners reporting high acceptance of IPV, couples with male partners reporting medium acceptance (OR=2.36, 95% CI 0.99-5.63) or low acceptance (OR=2.50, 95% 1.20-5.21) were significantly more likely to use HIV self-testing. Gender equality measured by decision-making power was not associated with couples' uptake of HIV self-testing. This study is the first of its kind to examine the association between gender equality and couples' HIV self-testing. This holds important implications for HIV self-testing as we strive to achieve the UNAIDS goal that 90% of individuals living with HIV should know their status.

Keywords: HIV self-testing, couples testing, gender equality, decision-making power, intimate partner violence

Introduction

Higher gender equality, especially within sexual relationships, has been associated with many HIV preventive behaviors, including condom use, reduced partner concurrency, use of pre-exposure prophylaxis (PrEP), use of HIV antiretroviral treatment (ART), decreased involvement in other sexually risky behaviors, as well as improved maternal and child health outcomes.[1–12] One important HIV preventive behavior is HIV testing. A literature review assessing gender equality and sexual and reproductive health found that women who face violence within their relationship were less likely to access HIV testing services.[13] A study focusing on married women in Kenya, Zimbabwe, and Zambia found that education (a key element of gender equality) was positively associated with married women testing for HIV, and found that the belief that gender-based violence is never acceptable (a key gender equality measure) was positively associated with older married women testing for HIV, and high financial decision-making (another key gender equality measure) was positively associated with HIV testing for older married women in Zimbabwe.[14]

However, these studies were assessing HIV testing, traditionally accomplished in Kenya by use of rapid blood tests in health clinics. A new method of HIV testing is HIV self-testing (HST), which has been established as a potential alternative to or preliminary method before clinic-based testing. In 2012, the United States Food and Drug Administration (FDA) approved the OraQuick In-Home HIV Test as the first rapid HIV self-test to be purchased over-the-counter in the United States.[15] HST has been shown to be a discreet and convenient method of testing that can reduce barriers to conventional HIV testing, and has high acceptability, feasibility, and accuracy among many different populations.[16–18] The World Health Organization gave a recommendation that there is moderate quality evidence for HIV self-testing, and they put forth a

strong recommendation that HIV self-testing should be offered as an additional approach to HIV testing services.[19] The Kenyan Ministry of Health made HIV self-test kits available at both public and private health facilities and selected pharmacies in May of 2017.[20] Studies involving behavioral-change interventions regarding HIV prevention within couples have also been shown to reduce HIV transmission among serodiscordant couples.[21–24] However, only 31.5% of women and men in a relationship in Kenya had ever tested for HIV together.[25] In sub-Saharan Africa, the majority of new infections are from heterosexual transmission, so testing among heterosexual couples, especially in terms of couples expecting a child is extremely important.[26] The National AIDS and STI Control Programme (NASCOP) in Kenya has recommended couples testing due to these important benefits.[27] Therefore, HST could be used not only to improve testing rates in individuals, but also to improve the rates of couples testing for HIV.

This is the first study of its kind to study gender equality and how it is associated with couples' uptake of HIV self-testing. To address this question, we used data from a randomized controlled trial of an HIV self-testing intervention among heterosexual couples expecting a child in central Kenya. Our aim was to identify the associations between gender equality (measured by decision-making power and attitudes towards intimate partner violence (IPV)) and uptake of the couple's HIV self-testing. We hypothesize that higher gender equality will be associated with higher uptake of HIV self-testing by couples.

Methods

Design and Study Population

This analysis uses data from a HIV self-testing randomized intervention trial that was conducted in 14 separate clinics with five counties in central and eastern Kenya between July 2015 and February 2016.[28] Women could participate in the study if they were at least 18 years

old and pregnant, and attending antenatal clinic (ANC) for the first time in this pregnancy. The women also had to have reported contact with their male partner (not necessarily the father of the child) at least once per week, had to believe their male partner was either HIV negative or had unknown status at recruitment, and reported that their male partner had not tested for HIV in the past three months before the study. If the women were concerned about a potential for violence from their male partner due to the topic of HIV testing, they were excluded due to safety concerns, but very few women were excluded for this reason. Women were randomized into one of three arms after providing informed consent and completing a baseline questionnaire. Arm 1 was based on the standard Kenyan Ministry of Health card that invites the male partner to come to the health clinic for a discussion on family health but did not mention HIV in the card. Arm 2 included an enhanced invitation card that described not only family health, but the benefits of the male partner testing for HIV in order to prevent mother-to-child transmission of HIV. Arm 3 included the card from Arm 2 plus two OraQuick HIV self-testing (HST) kits with instructions to test for HIV at home. The women were interviewed three months after the baseline interview to assess the status of HIV testing for the male partner since the baseline interview, and the method of testing (e.g. using the self-testing kit or testing at a clinic). The male partners were also contacted at three months after the female baseline interview, and they were administered a questionnaire including variables from both the female baseline and the female three-month follow-up surveys if they consented for an interview. For this analysis, only the data from Arm 3 (the intervention arm) were used. At the time of the original trial, HIV self-testing kits were not yet approved for use in Kenya, so the only way to acquire these kits was through participation in the RCT. Therefore, since the primary outcome in this current analysis was the use of HIV self-

testing kits, we limited the analysis to participants in the intervention arm, since participants in the control arms had no way of acquiring these kits.

Measurements

The two primary exposure variables used in this study are two markers of gender equality – decision-making power as assessed by the female, and attitudes towards IPV as reported by the male's personal attitudes. Decision-making power was measured by the woman's report on the validated Household Decision-Making Scale, which includes decision making in three areas: visiting family or relatives, major household purchases, and daily household needs (Cronbach's alpha=0.71).[29] These variables had available selections of the female partner alone, her male partner or someone else alone, or jointly between the female and male partner. During data analysis, each response to the three questions was dichotomized, and took on a value of 0 if the decision was made by her male partner or someone else, and a value of 1 if the woman reported that the decision was made by either herself or jointly with her male partner. An index was created by summing those three dichotomized responses to assess the level of decision-making power by the female partner. This index took on a value of 0 if the woman made no decisions by herself or jointly (no decision-making power), 1 if she made one or two decisions by herself or jointly (low decision-making power), and 2 if she made all three decisions by herself or jointly (high decision-making power). Attitudes towards IPV was measured by the male partner's report for the validated Violence Domain of the Gender Equitable Men (GEM) Scale, a 5 question scale regarding hypothetical violence towards women, with answers of either agree (score of 1) or disagree (score of 3) (Cronbach's alpha=0.81). [30] An index was created by summing scores across all five questions, and was categorized into three levels: high acceptance of IPV (score of 5-11), medium acceptance of IPV (score of 13), and low acceptance of IPV (score of 15), where

the higher the score, the lower acceptance of IPV, and therefore higher support for equitable gender norms.[30] The primary outcome variable was a binary variable of couples' uptake of the HIV self-testing kit, as assessed by the combined reports of the woman's and man's response (i.e., we assessed the couple to have tested if either partner affirmed that they had tested as a couple).

Covariates included age of both the man and woman (categorized from a continuous variable based on distributional balance), education (primary or lower, or secondary or higher), employment status (self-employed, employed for wages, or other), marital status (currently married or not currently married), previous HIV testing by the woman (tested for HIV before or had not), male partner's alcohol and drug use (currently using or not currently using), equality in earnings (the proportion of household expenses met by the woman's earnings: none, less than a third, a third to a half, and more than half), and wealth index (a composite measure of a household's cumulative living standard constructed by the International Demographic and Health Surveys Program).[31] The wealth index consisted of the following variables: source of drinking water for the household, type of toilet facility for the household, sharing of toilet with other households, type of fuel used for cooking, ownership of transportation (bicycle, motorcycle, car), any modern appliances in the home (electricity, solar panels, generator, radio, television, refrigerator, telephone), material of the house floor and roof, ownership of land or their house, ownership of any productive assets (e.g. cattle or a sewing machine), and cash savings. Rasch modeling was performed in the original trial to create the wealth index, and then was separated into quartiles.[28]

Data Analysis

SAS 9.4 (SAS Institute, Cary, NC) was used for all analyses. Descriptive statistics were conducted with mean and SD (for continuous variables), and proportions (for categorical variables). Cochran Mantel-Haenzel or Cochran-Armitage Trend tests were used for comparisons in bivariate analyses. Modeling was performed with a generalized linear mixed models (GLMMs) framework in order to account for clinic site-level clustering.[32] All analyses included a binary variable of couples' uptake of the HIV self-testing kit, as assessed by the combined reports of the woman's and man's response as the primary outcome. The first set of analyses focused on gender equality as measured by attitudes towards IPV from the man's report, and the second set of analyses focused on gender equality as measured by decision-making power from the woman's report as the primary exposure. GLMM was used to estimate odds ratio (OR) and corresponding 95% CI for both sets of analyses. We ran sequential modeling for each set of analyses, first running unadjusted analysis, and then added sets of domains (demographic variables, demographic variables and economic variables, and then all of the previous variables and behavioral variables). Two measures of model fit were used to assess confounding and potential modification (-2 Log Likelihood and R^2 values, when appropriate). The 95% CI not including 1 was used for significance for our primary exposures.

Ethical Approval

The original trial was approved by the institutional review board of the Kenya Research Medical Institute (IRB no. 485). Written informed consent was obtained from all participants. The current data analysis was performed on completely de-identified data, and was deemed by the institutional review board of the Medical University of South Carolina to not be human subjects research.

Results

Table I shows the demographic characteristics of the women and their male partners. Overall, 1,410 women were enrolled and randomized into the study, with 472 women enrolled and randomized into arm 3 (the intervention arm with the provision of HIV self-testing kits), and 422 women were interviewed at the three-month follow-up visit. The original study attempted to reach all 472 male partners in the intervention arm, and 395 male partners were interviewed at the three-month follow-up visit. Male partners were on average older than the women (31.7 years versus 26.7 years, respectively), and in 83.9% of the relationships, the man was older than the woman. For women, the majority had a primary or lower education (52.3%), were mostly Protestant or other Christian besides Catholic (76.1%), were mostly self-employed (51.7%), were currently married (86.9%), had less than a third or none of the household expenses met by their earnings (64.2%), and the vast majority were HIV negative (96.6%). For the men, the majority had a secondary or higher education (66.2%), were mostly Protestant or other Christian besides Catholic (68.6%), were either employed for wages or self-employed (47.9% and 47.3%, respectively), were currently married (89.4%), and the vast majority were HIV negative (98.3%). The variables that were significantly different between male and female partners were age, education, religion, and employment. Overall, 19.6% of the men showed high acceptance of hypothetical IPV, 21.2% had moderate acceptance of IPV, and 58.7% had low acceptance of IPV. For decision-making power, 12.7% of the women had no decision-making power, 31.1% of the women had low decision-making power, and 56.1% had high decision-making power.

Table II shows the bivariate association between the primary exposures and couples' uptake of HIV self-testing. The Gender Equitable Man (GEM) Scale was significantly associated

with couples' uptake of the HIV self-testing kits, showing that lower acceptance of IPV was associated with higher couples' HIV self-testing uptake ($p<0.01$).

Table III shows the modeling of couples' uptake of HIV self-testing kits by gender equality. With gender equality measured as attitudes towards IPV, the unadjusted models found that those with medium acceptance of IPV and low acceptance of IPV had more than double the odds of using the HIV self-testing kits to test as a couple as compared to those with high acceptance of IPV (OR 2.27, 95% CI 1.03-4.99, and OR 2.27, 95% CI 1.37-5.17, respectively). Adjusting the model for age, male and female education, male employment, marital status, wealth status, previous female HIV testing, and male partner alcohol/drug use showed that those with medium acceptance of IPV still had higher odds of using couples HIV self-testing (although no longer statistically significant) compared to those with high acceptance of IPV (OR 2.36, 95% CI 0.99-5.63). Those with low acceptance of IPV had 2.5 times the odds of using couples HIV self-testing compared to those with high acceptance of IPV (OR of 2.50, 95% CI 1.20-5.21). We did not find any statistically significant results for the association between decision-making power (with an index of decision-making regarding major household purchases, daily household needs, and visiting family) and couples' uptake of HIV self-testing, both with unadjusted and adjusted models.

Discussion

In this study, we examined uptake of HIV self-testing among heterosexual couples expecting a child in Kenya, where the pregnant women brought home two oral self-testing kits from the antenatal clinic to present to her male partner for HIV testing. This study was conducted in order to examine the association between gender equality (as measured by male partner's attitudes towards intimate partner violence, and woman's report of decision-making power) and

uptake of HIV self-testing uptake among these couples. The decision-making power index was not significantly associated with couples' uptake of HIV self-testing. As the decision-making power index consisted of power regarding major household purchases, daily household needs, and visiting family, there could be a mixing of effects within the index due to the differing proportions within the component variables (67% woman-only or joint decisions for major household purchases, 80% woman-only or joint decisions for daily household needs, and 72% woman-only or joint decisions for visiting family). However, among couples where the man had low acceptance of IPV there was a 2.5 times higher odds of couples' uptake of HIV self-testing compared to couples where the man had high acceptance of IPV.

Eighty-one percent of the participants tested together as a couple using the HIV self-testing kits. This high proportion underscores the promise of HIV self-testing to increase testing rates, and corroborates other studies showing high acceptability of HIV self-testing and high uptake of this testing method,[16,17] including among male partners of pregnant women.[33] The Joint United Nations Programme on HIV/AIDS (UNAIDS) put forth a target that states by 2020, 90% of people living with HIV should know their status, 90% of people with diagnosed HIV should receive antiretroviral therapy, and 90% of people on antiretroviral therapy should be virally suppressed.[34] HIV self-testing seems to be an important way to contribute towards reaching that first 90% goal.

These results show the benefits of appropriate attitudes regarding IPV on couples testing together using this new testing technology of HIV self-testing. Our results suggest that if the male partner doesn't accept intimate partner violence, he may be more likely to be open for discussion within the partnership, and more willing to test for HIV with their female partner. In particular, male partners less accepting of IPV may be more accepting of the scenario in which

the pregnant female partner brings home self-testing kits from the clinic and initiates the discussion about HIV testing. If these individuals are more willing to test for HIV as a couple using these self-testing kits, and they do test positive, this could have important implications in reducing transmission of HIV between heterosexual partners in a relationship, as well as prevention of mother-to-child transmission of HIV. Second, these findings highlight a potential dual intervention. A community-based HIV self-testing study in Malawi found that fear of HIV discordant test results, unequal household gender roles, and couple dynamics were barriers for couples to self-test together.[35] It is possible that an intervention focused on reducing men's acceptance of intimate partner violence, could also have the dual benefit of increasing the men's willingness to self-test for HIV, especially with a sexual partner. A community-level intervention trial in Uganda attempting to shift harmful social norms that promote gender inequality found that males in the intervention group, over a one year follow-up, were more likely to have an HIV test compared to controls.[36] Furthermore, qualitative interviews with men participating in a rights-based gender equality and health program intervention in South Africa found that men who participated reported an increased capacity to overcome masculinity-related barriers to HIV testing, and had increased ability to discuss HIV with others, which led to greater willingness to be tested for HIV.[37] These interventions dealt with standard HIV testing, but future research in this area could potentially confirm these results with couples' HIV self-testing uptake as well.

Limitations

There are several limitations in this study. This study population might be limited in the generalizability of the results, as this analysis was limited to heterosexual couples expecting a child, and women self-excluded from the original trial if they were concerned about intimate partner violence. Furthermore, IPV concerns or negative results when offering self-testing could

be different among the participants who were lost to follow-up, for which we have no data. However, the original trial had very high participation rates with very few women self-excluding due to IPV concerns. There is also a limitation in the measurement of gender equality within this data. Gender equality cannot be generalized beyond how it is measured. In this study, gender equality was measured as attitudes towards intimate partner violence, and decision-making power was measured by decision-making regarding visiting family, major household purchases, and daily household needs. There could be other ways of measuring gender equality that were not captured in this analysis, including influences on HIV preventive behaviors like condom use or measures of relationship quality.

Conclusions

In summary, lower acceptance of intimate partner violence from the male partner of pregnant women in central Kenya is significantly associated with more than double the odds of HIV self-testing as a couple compared to couples in which the men had high acceptance of intimate partner violence. This study appears to be the first to investigate the relationship between gender equality and uptake of HIV self-testing. Realizing the importance of low acceptance of intimate partner violence in increasing couples testing, especially in the context of HIV self-testing, is vital as we work towards achieving the first 90% in the UNAIDS 90:90:90 target.

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List of Tables

Table I: Characteristics of women attending antenatal care at baseline and characteristics of male partners at month 3 in Central Kenya

Characteristic	**Women (n=472)** n (%)	**Male partners (n=395)** n (%)
Age (years), mean ±SD *	26.7 ± 5.6	31.7 ± 5.6
Missing	0	
Age categories*		
18-22 (women), 18-28 (men)	125 (36.5)	113 (29.4)
23-26 (women), 29-31 (men)	124 (26.3)	94 (24.4)
27-30 (women), 32-35 (men)	114 (24.2)	92 (23.9)
31-45 (women), 36-64 (men)	109 (23.1)	86 (22.3)
	0	10
Age Discrepancy between partners		
Same age or woman is older	62 (16.1)	-
Man is 1-5 years older	146 (37.9)	-
Man is 6-10 years older	120 (31.2)	-
Man is 11+ years older	57 (14.8)	-
Missing	87	
Level of education*		
Primary or Lower	247 (52.3)	133 (33.8)
Secondary or Higher	225 (47.7)	261 (66.2)
Missing	0	1
Religion*		
Catholic	107 (22.7)	109 (27.6)
Protestant/other Christian	359 (76.1)	15 (3.8)
Other	6 (1.3)	271 (68.6)
Missing	0	0
Employment status*		
Employed for wages	83 (17.6)	189 (47.9)
Self-employed	244 (51.7)	187 (47.3)
Not Employed	145 (30.7)	19 (4.8)
Missing	0	0
Marital status		
Currently married	410 (86.9)	353 (89.4)
Not Married	62 (13.1)	42 (10.6)
Missing	0	0
Proportion of expenses met by woman's earnings		
None	177 (37.5)	-
Less than a third	126 (26.7)	-
A third to a half	124 (26.3)	-
More than a half	45 (9.5)	-
Missing	0	
Wealth Status		
Lowest	119 (28.2)	-
Second Lowest	108 (25.6)	-
Second Highest	99 (23.5)	-
Highest	96 (22.8)	-
Missing	50	
Previous HIV testing		

Yes	444 (94.1)	
No	28 (5.9)	
HIV Status		
Positive	3 (0.7)	4 (1.1)
Negative	432 (96.6)	355 (98.3)
Indeterminate	4 (0.9)	-
I did not receive result	8 (1.8)	-
Do not remember/do not wish to say	-	2 (0.6)
Missing		34
Male Partner Alcohol and Drug Use		
Yes	142 (35.2)	-
No	257 (63.6)	-
Don't Know	5 (1.4)	-
Missing	68	
Health Facility		
Embu PGH	56 (11.9)	32 (8.1)
Githunguri Health Center	36 (7.6)	32 (8.1)
Kangeta Health Center	28 (5.9)	28 (7.1)
Kanyakini District Hospital	17 (3.6)	17 (4.3)
Kihara Sub-District Hospital	42 (8.9)	36 (9.1)
Kiritiri Health Center	21 (4.5)	21 (5.3)
Lari Health Center	31 (6.6)	31 (7.9)
Maragua District Hospital	32 (6.8)	31 (7.9)
Mbeere District Hospital	28 (5.9)	22 (5.6)
Meru Level 5 Hospital	69 (14.6)	62 (15.7)
Muthale Mission Hospital	25 (5.3)	22 (5.6)
Nyambene District Hospital	40 (8.5)	37 (9.4)
Tigoni District Hospital	25 (5.3)	10 (2.5)
Uthiru Health Center	22 (4.7)	14 (3.5)

Abbreviations: SD, standard deviation

[a] Columns may not total to 100 due to missing values.

Table II: Bivariate Analysis of Gender Equality and Couples HIV Self-Testing Uptake

	Combined Man's and Woman's Report	
	Couple Testing Together Using HIV Self-Testing	**Did not test together or did not use HIV self-testing**
Sociodemographics, n (%)		
Gender Equitable Scale**		
Low Acceptance of IPV	194 (84.0)	37 (16.0)
Medium Acceptance of IPV	68 (81.9)	15 (18.1)
High Acceptance of IPV	53 (68.8)	24 (31.2)
Decision-Making Authority		
No decision-making power	41 (77.4)	12 (22.6)
Low decision-making power	98 (82.4)	21 (17.6)
High decision-making power	192 (81.7)	43 (18.3)

**p<0.01

Table III: Modeling of Associations between Gender Equality and Couples HIV Self-Testing Uptake

	Model 1[a]	**Model 2[b]**	**Model 3[c]**	**Model 4[d]**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Attitudes towards IPV (Ref=High Acceptance of IPV)				
Medium Acceptance	2.27 (1.03, 4.99)	2.66 (1.17, 6.09)	2.53 (1.09, 5.87)	2.36 (0.99, 5.63)
Low Acceptance	2.27 (1.37, 5.17)	2.99 (1.48, 6.03)	2.89 (1.43, 5.87)	2.50 (1.20, 5.21)
[a] Unadjusted [b] Adjusted for age and education (both male and female) [c] Adjusted for age, education, male employment, marital status, and wealth status [d] Adjusted for age, education, male employment, marital status, wealth status, previous female HIV testing, and partner alcohol/drug use				
	Model 1[a]	**Model 2[b]**	**Model 3[c]**	**Model 4[d]**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Decision-Making Power (Ref=None)				
Low Decision-Making Power	1.49 (0.60, 3.71)	1.42 (0.54, 3.77)	1.48 (0.55, 4.03)	1.52 (0.55, 4.21)
High Decision-Making Power	1.49 (0.62, 3.54)	1.39 (0.55, 3.54)	1.54 (0.59, 3.98)	1.59 (0.60, 4.22)
[a] Unadjusted [b] Adjusted for age and education (both male and female) [c] Adjusted for age, education, marital status, wealth status, and proportion of household expenses met by women's earnings. [d] Adjusted for age, education, marital status, wealth status, proportion of household expenses met by women's earnings, previous female HIV testing, and partner/alcohol drug use				

CHAPTER 4: 'Sociodemographic Predictors of Gender Inequality among Heterosexual Couples Expecting a Child in south-central Uganda'

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Abstract

Gender inequality is a pervasive problem in sub-Saharan Africa, including Uganda, and has negative effects on health and development. We sought to identify social and economic predictors of gender inequality (measured by low decision-making power and high acceptance of intimate partner violence) within heterosexual couples expecting a child in south-central Uganda. We used data from a two-arm cluster randomized controlled HIV self-testing intervention trial conducted in three antenatal clinics in south-central Uganda among 1,618 women and their male partners. Analysis included Cochran Mantel-Haenzel, proportional odds models, logistic regression, and generalized linear mixed model (GLMM) framework to account for site-level clustering.

Overall, we found that 31.1% of the men had high acceptance of hypothetical IPV, and 15.9% of the women had low decision-making power. We found that the significant social and economic variables associated with lower gender equality include Catholic religion, lower education for both the man and woman, the woman being known to be HIV positive, older age in the woman, and currently married.

By better understanding the prevalence and predictors of gender inequality, this knowledge will allow us to predict and better target interventions to decrease inequalities and improve health care delivery to underserved populations in Uganda.

Keywords: Gender inequality, Pregnancy, HIV/AIDS, Prenatal Care, HIV Self-Testing

Introduction

Gender equality refers to the equal rights, responsibilities and opportunities of women and men, and equality between women and men is both a human rights issue and is necessary for sustainable development.[1] However, in most sub-Saharan African societies, men have substantial power over women, and many national achievements in reproductive health, empowerment, and labor market participation have been diminished by gender inequality.[2,3]

There have been many studies in sub-Saharan Africa assessing sociodemographic factors and gender inequality, which have shown that low educational, occupational, and economic opportunities, and food insecurity have been associated with gender inequality, although with differing measures of gender inequality.[4–13]

Pregnant women are especially important to study, as they are considered a vulnerable population and gender inequality affects the ability of pregnant women to attain reproductive health services, and maternal and child health outcomes. There has been previous work showing the associations between women's decision-making power and autonomy, and how high decision-making autonomy and lack of intimate partner violence is associated with beneficial maternal and child health outcomes.[14–18] However, there has been a relative lack of studies assessing sociodemographic variables associated with gender inequality within the context of a pregnancy. We recently performed an analysis of social and economic variables and gender inequality among heterosexual couples expecting a child in central Kenya, which had some promising results and areas to target for improvement of these gender inequality measures.[19] Therefore, we attempted to identify potential associations between social and economic variables and gender inequality (which in this case were measured as high acceptance of intimate partner violence and low women's decision-making power), within the context of heterosexual couples expecting a child in south-central Uganda.

Methods

Design and Study Population

These data stem from a two-arm cluster randomized HIV self-testing intervention trial conducted in three clinics in south-central Uganda, with study information collected at baseline, and both a one-month and three-month follow-up visit. Briefly, women were eligible to participate in the study if they were pregnant, at least 14 years old (pregnant women between 14 and 18 years old are considered emancipated minors in Uganda), and attending an antenatal clinic (ANC) for this current pregnancy. Further inclusion criteria included reported contact (either sexual or otherwise) with their male partner at least once per week, if their male partner was either HIV negative or their status unknown at the time of the woman's recruitment, and that their male partner was at least 18 years of age and had not tested for HIV in the past six months. After the women provided informed consent, they were randomized by clinic day into one of two arms: Arm 1, the standard of care for antenatal clinics in Uganda, and Arm 2: standard of care plus up to four OraQuick HIV self-testing (HST) kits with instructions for testing the male partner at home as well as up to three other adult members of the household. The women also then completed a baseline questionnaire. Both one month and three months after enrollment, the women were interviewed to ascertain whether or not their male partner tested for HIV, and the method of testing. The male partners were also contacted at one month and three months, and those consenting for an interview were administered a questionnaire on socio-demographics and HIV testing history.

Measurements

Sociodemographic variables included age of both the man and woman (categorized from a continuous variable based on distributional balance), woman's education level, religion, woman's employment status, marital status, and woman's report on the male partner's additional

sexual partners. Further variables included partner's education level, food insecurity, partner's employment status, woman's HIV status, and equality in earnings (the proportion of household expenses met by the woman's earnings: none, less than half, half, more than half, or all).

The two primary outcome variables used in this study are measures of gender equality – namely attitudes towards IPV and decision-making power. Attitudes towards IPV was measured by the male's report for the validated Violence Domain of the Gender Equitable Scale, a 5-question scale regarding hypothetical violence towards women, with available answers on a 3-point scale, where 1=agree, 2=partially agree, and 3=disagree (Cronbach's alpha=0.81).[20] Scores across all questions were summed, and categorized into three levels: high acceptance of IPV (score of 5-11), medium acceptance of IPV (score of 12-13), and low acceptance of IPV (score of 14-15), where the higher the score, the lower acceptance of IPV (i.e. higher support for gender norms).[20] Decision-making power was measured by the woman's report on an extended version of the Household Decision-Making Scale (Cronbach's alpha=0.71), which includes decision making in three areas: the woman's earnings, the woman's healthcare, visiting family or relatives, major household purchases, and daily household needs.[21] The available answers were: 1) Myself, 2) My partner, 3) Jointly, or 4) Others. Each response to the five questions was dichotomized, with a value of 1 if the woman reports that a decision was made by either herself or jointly, and 0 if the decision was made by her male partner or someone else. We then created an index by summing the five dichotomized responses, with a value of 0 if the woman made none or only 1 decision (low decision-making power), 1 if she made two or three decisions by herself or jointly (medium decision-making power), and 2 if she made either four or all five decisions by herself or jointly (high decision-making power).

Data Analysis

We summarized data using descriptive statistics where mean/SD were reported for continuous variables and proportions were reported for categorical variables. To make comparisons between groups, we used the Cochran Mantel-Haenzel statistic. We checked the proportional odds assumption using the score test for proportional odds given in logistic regression.[22] For the first set of analysis, we analyzed gender equality as measured by attitudes towards IPV from the man's report (with an ordinal outcome) and we used a logistic regression framework with a cumulative logit to estimate the odds ratios (OR) and corresponding 95% CI, due to not enough variability in the site-level clustering for a generalized linear mixed model approach. The second set of analyses was gender equality as measured by decision-making power from the woman's report (with an ordinal outcome), with modeling performed with cumulative logit in a generalized linear mixed models (GLMMs) framework to account for site-level clustering.[23] We chose our final model for each analysis based on a combination of factors including conceptual plausibility, individual variable significance in the model, confounding, and two measures of model fit (Akaike's Information Criterion and -2 Log Likelihood, when appropriate). A two-sided p-value of <0.05 for specific variables was used to assess significance of specific variables, as well as 95% CI not including 1. Proc GLIMMIX and Proc LOGISTIC in SAS 9.4 (SAS Institute, Cary, NC) was used for the modeling analyses.

Ethical Approval

The original trial was approved by both the institutional review board of the Medical University of South Carolina and Makerere University School of Public Health in Kampala, Uganda. Written informed consent was obtained from all participants. The current data analysis was performed on completely de-identified data.

Results

Table 1 shows the sociodemographic characteristics of the women and their male partners. Overall, 1,618 women were enrolled and randomized into the study (47.7% in the standard of care arm and 52.3% in the intervention arm), 1,347 women and 1,198 of their male partners were interviewed at their one-month follow-up visit, and 1,299 women and 1,123 of their male partners were interviewed at their three-month follow-up visit. For the woman, they were on average 25.2 years old, and the majority had a secondary or higher education (57.7%), were currently not married (83.4%), were currently not aware of their male partner having any other sexual partners (79.7%), always had enough food and the types of food they wanted (55.5%), had less than half or none of the household expenses met by their own earnings (76.8%), and were HIV negative (89.7%). For the men, they were on average 32.2 years old, and the majority had a secondary or higher education (55.0%), were mostly Catholic or Other/Not Christian (28.1% and 21.6%, respectively), were either employed for wages or self-employed (21.1% and 35.8%, respectively), were currently not married (84.5%), and the vast majority were HIV negative (97.1%). Overall, 31.1% of the men showed high acceptance of hypothetical IPV, 28.9% had moderate acceptance of IPV, and 40.0% had low acceptance of IPV. For decision-making power, 15.9% of the women had low decision-making power, 43.8% of the women had medium decision-making power, and 40.4% had high decision-making power.

Table 2 shows the bivariate analyses between the sociodemographic characteristics and gender equality. We found that lower scores on the Gender Equitable Men scale (i.e. high acceptance of IPV) were significantly associated with the following sociodemographics: primary or lower for man's education, Protestant or other Christian religion or Catholic, and being currently not married. Lower decision-making power was significantly associated with lower

woman's age, primary or lower woman's education, primary or lower man's education, and higher proportion of expenses met by the woman's earnings.

Table 3 shows the modeling of the two gender equality variables by sociodemographics. The significant sociodemographic variables for attitudes towards intimate partner violence included partner's religion, women's education, and woman's baseline HIV status. Specifically, compared to those who were Catholic, men who reported an "Other/Not Christian" religion were less likely to have higher acceptance of IPV (OR 0.65, 95% CI 0.47-0.89). Women with a secondary or higher education were less likely to have their partner report increasing acceptance of IPV compared to women with a primary or lower education (OR 0.75, 95% CI 0.56-0.996). Women who were HIV positive at baseline were more likely to have partner report higher acceptance of IPV compared to women who were HIV negative or unknown HIV status (OR 1.77, 95% CI 1.19-2.63).

The significant sociodemographic variables for decision-making power included woman's age, marital status, and partner's education. Women who were 27-30 or 31-45 were much less likely to have lower decision-making power compared to women who were 18-22 (OR 0.44, 95% CI 0.26-0.72 and OR 0.28, 95% CI 0.16-0.49, respectively). Those who were not married were less likely to have lower decision-making power compared to those who were currently married (OR 0.65, 95% CI 0.44-0.95). Partners with a secondary or higher education were less likely to have lower decision-making power compared to partners with a primary or lower education (OR 0.69, 95% CI 0.52-0.92).

Discussion

This analysis was conducted in order to determine the social and economic variables that were associated with gender inequality (as measured by attitudes towards intimate partner violence and decision-making power) among heterosexual couples expecting a child within the

context of an HIV self-testing intervention trial in south-central Uganda. We found that Catholic religion, lower woman's education, and women with known HIV at baseline were associated with higher acceptance of intimate partner violence by the male partner. We also found that younger age of the woman, marital status of currently married, and lower partner's education was associated with lower decision-making power reported by the female partner.

Lower education was found to be associated with both higher acceptance of intimate partner violence and lower woman's decision-making power in our results. Similar results regarding education have been reported and shown not only for support for gender equality [8,9,24,25], but also perpetration of intimate partner violence,[26–28] and we found similar results in our study in central Kenya among heterosexual couples expecting a child.[19]

In our analysis, we found that those reporting "Other/Not Christian" religion were less likely to have high acceptance of intimate partner violence compared to those who reported as being Catholic. These results are in the opposite direction from a study in Ghana that reported women who were Muslim and "Traditional" believers were more likely to approve domestic physical violence compared to women who were Christian,[11] and another study showing that compared to Catholic women, Muslims in Mali and Benin and followers of other religions in Zimbabwe were more likely to justify domestic abuse.[10] The male partner of women with a known history of HIV had significantly higher acceptance of intimate partner violence. This is in line from a study among married and cohabitating women in Zimbabwe that found that women had experienced any form of intimate partner violence were more likely to be HIV positive,[29] and in India, HIV positive women were three times more likely to experience sexual violence compared to HIV negative women.[30]

We found that currently married couples had lower decision-making power reported by the woman compared to couples who were cohabitating but unmarried. This is consistent with research in the Democratic Republic of the Congo, where they found that men who were unmarried or separated had higher support for gender equality than those who were married.[8] Younger women had lower decision-making power compared to older women in our analysis. This is in line with studies in Ghana, Ethiopia, and a literature review showing a negative association of women's age with both perpetration and justification of intimate partner violence (another measure of gender equality).[11,26,31]

Limitations

There are a few notable limitations to this data. First, there were large proportions of missing data for the women's self-report of religion and employment status. This prevented us from using these variables in our multivariate analysis, and therefore we could have missed potential associations that we simply did not have the power to detect. Second, this data was analyzed in the context of an HIV self-testing intervention trial, so the population that was enrolled in this trial will not be generalizable to the general population of heterosexual couples expecting a child in this area due to the specific inclusion and exclusion criteria. Furthermore, gender inequality can only be interpreted in how it was measured (in this case, attitudes towards intimate partner violence and decision-making power), so we can only make interpretations within this context.

Conclusions

In summary, we found that lower women's age, lower man's and woman's education, being married, being Catholic, and the woman being HIV positive were associated with lower gender equality. This study helps to contribute to the body of literature regarding sociodemographic factors and gender inequality, especially in the country of Uganda and in an

HIV-related context in the setting of pregnancy. These results show some promising areas to target to potentially improve relationship gender equality (especially to increase education levels among both men and women, and attempt to reduce the HIV prevalence among women). These areas could also help create targeted interventions (specifically targeted towards different religions or married couples) to improve gender equality in heterosexual couples expecting a child in Uganda.

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List of Tables

Table 1: Characteristics of women attending antenatal care at baseline and characteristics of male partners at month 1 in south-central Uganda[a]

Characteristic	**Women (n=1,618)** n (%)	**Male partners (n=1,198)** n (%)
Age (years), mean ±SD	25.2 ± 5.5	32.2 ± 8.1
Missing	21 (1.3)	19 (1.6)
Age categories		
15-19 (women), 18-24 (men)	225 (14.1)	183 (15.5)
20-24 (women), 25-34 (men)	611 (38.3)	603 (51.1)
25-29 (women), 35-44 (men)	425 (26.6)	294 (25.0)
30-49 (women), 45-68 (men)	336 (21.0)	99 (8.4)
Missing	21 (1.3)	19 (1.6)
Level of education		
Primary or Lower	673 (42.3)	535 (45.0)
Secondary or Higher	918 (57.7)	655 (55.0)
Missing	27 (1.7)	8 (0.7)
Religion		
Catholic	181 (11.2)	337 (28.1)
Protestant/other Christian	104 (6.4)	219 (18.3)
Other	152 (9.4)	259 (21.6)
Missing	1181 (73.0)	383 (32.0)
Employment status		
Employed for wages	55 (3.4)	253 (21.1)
Self-employed	112 (6.9)	429 (35.8)
Other (business partnership, unemployed, student, housewife, retired, other)	272 (16.8)	129 (10.8)
Missing	1179 (72.9)	387 (32.3)
Marital status		
Currently married	263 (16.6)	185 (15.5)
Not Married	1325 (83.4)	1005 (84.5)
Missing	30 (1.9)	8 (0.7)
Male Partner has other sexual partners		
Yes	324 (20.3)	-
No/Don't Know	1269 (79.7)	-
Missing	25 (1.5)	
Food Insecurity		
Always have enough food and the kinds we want	884 (55.5)	-
Have enough food, but not always the kinds we want	608 (38.2)	-
Sometimes don't have enough to eat	67 (4.2)	-
Often don't have enough to eat	34 (2.1)	-
Missing	25 (1.5)	
Proportion of expenses met by woman's earnings		
None	729 (45.8)	-
Less than half	501 (31.5)	-
Half	179 (11.3)	-
More than half	135 (8.5)	-
All	47 (3.0)	-

Missing	27 (1.7)	
Missing		
HIV Status		
Positive	161 (10.4)	29 (2.9)
Negative/Indeterminate/Didn't receive results	1395 (89.7)	983 (97.1)
Missing	62 (3.8)	
Intervention Arm		
Standard of Care	771 (47.7)	559 (46.7)
HIV self-testing kits	847 (52.3)	639 (53.3)
Health Facility		
Nakaseke	333 (20.6)	299 (25.0)
Mpigi	559 (34.6)	433 (36.1)
Entebbe	726 (44.9)	466 (38.9)

Abbreviations: SD, standard deviation

[a] Columns may not total to 100 due to missing values.

Table 2: Bivariate analysis of sociodemographic characteristics of women and male partners and gender equality (attitudes towards IPV and decision-making power)

	Attitudes towards IPV			Decision-Making Power		
	High support for IPV	**Medium support for IPV**	**Low support for IPV**	**Low decision-making power**	**Medium decision-making power**	**High decision-making power**
Sociodemographics, n (%)						
Women age categories^^						
15-19	54 (33.5)	50 (31.1)	57 (35.4)	64 (29.5)	101 (46.5)	52 (24.0)
20-24	139 (30.8)	129 (28.5)	184 (40.7)	106 (17.5)	288 (47.6)	211 (34.9)
25-29	90 (29.6)	95 (31.3)	119 (39.4)	45 (10.7)	173 (41.2)	202 (48.1)
30-49	78 (31.3)	65 (26.1)	106 (42.6)	35 (10.5)	128 (38.2)	172 (51.3)
Men age categories						
18-24	64 (35.8)	52 (29.1)	63 (35.2)	38 (21.8)	85 (48.9)	51 (29.3)
25-34	175 (29.5)	183 (30.8)	236 (39.7)	89 (15.1)	256 (43.5)	244 (41.4)
35-44	93 (31.9)	78 (26.7)	121 (41.4)	46 (15.9)	112 (38.8)	131 (45.3)
45-68	31 (32.0)	26 (26.8)	40 (41.2)	19 (19.2)	45 (45.5)	35 (35.6)
Women Level of education^^						
Primary or Lower	181 (34.4)	143 (27.2)	202 (38.4)	125 (18.7)	309 (46.3)	233 (34.9)
Secondary or Higher	178 (28.0)	195 (30.7)	262 (41.3)	124 (13.7)	379 (41.9)	401 (44.4)
Man Level of Education**^^						
Primary or Lower	187 (35.4)	145 (27.5)	196 (37.1)	106 (20.2)	241 (46.0)	177 (33.8)
Secondary or Higher	178 (27.6)	195 (30.3)	271 (42.1)	89 (14.0)	260 (40.8)	289 (45.3)
Woman's Religion						
Catholic	46 (36.8)	38 (30.4)	41 (32.8)	28 (15.8)	79 (44.6)	70 (39.6)
Protestant/other Christian	24 (32.9)	19 (26.0)	30 (41.1)	17 (16.3)	56 (53.8)	31 (29.8)
Other	34 (35.8)	30 (31.6)	31 (32.6)	26 (17.5)	56 (37.6)	67 (45.0)
Man's Religion**						
Catholic	113 (34.4)	88 (26.8)	128 (38.9)	63 (19.0)	142 (42.9)	126 (38.1)
Protestant/other Christian	79 (36.2)	56 (25.7)	83 (38.1)	28 (13.2)	102 (48.1)	82 (38.7)
Other	56 (21.8)	84 (32.7)	117 (45.5)	44 (17.0)	102 (39.5)	112 (43.4)
Women Employment^^						
Employed for wages	14 (38.9)	11 (30.6)	11 (30.6)	9 (16.3)	14 (25.5)	32 (58.2)
Self-employed	29 (35.4)	23 (28.1)	30 (36.6)	16 (14.5)	44 (40.0)	50 (45.5)
Other	63 (35.4)	53 (29.8)	62 (34.8)	49 (18.4)	132 (49.4)	86 (32.2)
Men Employment						
Employed for wages	77 (30.9)	60 (24.1)	112 (45.0)	39 (15.6)	101 (40.4)	110 (44.0)
Self-employed	133 (31.4)	124 (29.3)	166 (39.2)	68 (16.2)	187 (44.4)	166 (39.4)
Other	37 (28.9)	41 (32.0)	50 (39.1)	27 (21.4)	55 (43.6)	44 (34.9)
Marital status*						
Currently married	51 (25.4)	57 (28.4)	93 (46.3)	42 (16.2)	124 (47.7)	94 (36.2)
Not Married	307 (32.1)	281 (29.3)	370 (38.6)	206 (15.7)	562 (42.9)	541 (41.3)
Male Partner has other sexual partners						
Yes	80 (33.1)	76 (31.4)	86 (35.5)	52 (16.3)	136 (42.6)	131 (41.1)
No/Don't Know	281 (30.5)	261 (28.4)	387 (41.1)	197 (15.7)	552 (44.0)	506 (40.3)
Food Insecurity						
Always have enough food and the kinds they want	205 (32.2)	186 (29.3)	245 (38.5)	147 (16.8)	375 (43.0)	351 (40.2)
Have enough food, but not always the kinds we want/Sometimes	155 (29.4)	152 (28.8)	221 (41.9)	101 (14.4)	313 (44.7)	286 (40.9)

don't have enough/Often don't have enough						
Proportion of expenses met by woman's earnings^^						
None	153 (29.8)	145 (28.2)	216 (42.0)	3 (6.4)	18 (38.3)	26 (55.3)
Less than half	117 (31.2)	124 (33.1)	134 (35.7)	17 (12.8)	45 (33.8)	71 (53.4)
Half	48 (33.3)	36 (25.0)	60 (41.7)	18 (10.3)	71 (40.8)	85 (48.8)
More than half	29 (32.2)	19 (21.1)	42 (46.7)	57 (11.5)	218 (43.8)	223 (44.8)
All	12 (31.6)	13 (34.2)	13 (34.2)	152 (21.1)	336 (46.7)	231 (32.1)
Woman HIV status						
Positive	48 (40.0)	31 (25.8)	41 (34.2)	17 (10.6)	70 (43.5)	74 (46.0)
Negative/Indeterminate/Didn't receive results	308 (30.3)	298 (29.4)	409 (40.3)	223 (16.2)	600 (43.5)	555 (40.3)
Attitudes towards IPV*:p<0.05, **:p<0.01, Decision-Making Power ^:p<0.05, ^^:p<0.01						

Table 3: Multivariate modeling for the ordinal outcomes of gender inequality (as measured by attitudes towards IPV and Decision-Making Power)

	Attitudes Towards Intimate Partner Violence	**Decision-Making Power**
	OR (95% CI)	**OR (95% CI)**
Woman's Age (Ref=18-22)		
23-26	0.99 (0.63-1.55)	0.67 (0.43-1.04)
27-30	1.17 (0.71-1.92)	0.44 (0.26-0.72)*
31-45	0.92 (0.53-1.59)	0.28 (0.16-0.49)*
Partner's Age (Ref 18-28)		
29-31	0.74 (0.48-1.13)	0.88 (0.58-1.35)
32-35	0.73 (0.44-1.20)	1.09 (0.66-1.80)
36-64	0.56 (0.29-1.09)	1.58 (0.81-3.07)
Male Partner has other sexual partners (Ref=No/Don't Know)	1.23 (0.87-1.72)	
Marital Status (Ref=Currently Married)	-	0.65 (0.44-0.95)*
Partner Religion (Ref=Catholic)		
Protestant/Other Christian	0.97 (0.69-1.36)	0.78 (0.55-1.10)
Other	0.65 (0.47-0.89)*	0.75 (0.54-1.05)
Woman's Education (Ref=Primary or lower)	0.75 (0.56-0.996)*	-
Partner's Education (Ref=Primary or lower)	0.83 (0.63-1.10)	0.69 (0.52-0.92)*
Food Insecurity (Ref=Always have enough food and the kinds they want)		
Have enough food, but not always the kinds we want/Sometimes don't have enough/Often don't have enough	0.82 (0.62-1.08)	0.76 (0.57-1.005)
Proportion of expenses met by woman's earnings (Ref=None)		
Less than half	-	1.39 (0.51-3.79)
Half	-	1.43 (0.55-3.71)
More than half	-	1.22 (0.50-2.99)
All	-	2.31 (0.94-5.65)
Woman Baseline HIV Status (Ref=Negative/Indeterminate/Don't Know)		
Positive	1.77 (1.19-2.63)*	-
Facility (Ref=Nakaseke)		
Entebbe	0.75 (0.53-1.06)	-
Mpigi	1.11 (0.76-1.64)	-

* 95% CI does not include 1

CHAPTER 5: 'Low Acceptance of Intimate Partner Violence by Pregnant Women in Uganda Predicts Higher Uptake of HIV Self-Testing Among Their Male Partners'

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Abstract

Heterosexual couples are at high risk for HIV acquisition in sub-Saharan Africa, including Uganda, and pregnancy is a critical period for prevention of mother-to-child transmission of HIV. HIV self-testing (HST) could be an additional approach to traditional HIV testing services to increase testing rates among heterosexual couples, especially with the possibility that pregnant women can bring HST kits home from the clinic for their male partners to use. However, it is not known how gender equality is associated with HIV self-testing by male partners when the woman provides the HST kits to their male partners. We used data from the intervention arm of an HIV self-testing intervention trial conducted in three separate antenatal clinics in south-central Uganda (847 women and their corresponding male partners) to determine the association between gender equality and male partner HIV self-testing uptake. Our dependent variable was male partner's uptake of HIV self-testing, and the two main independent variables were attitudes towards intimate partner violence (IPV) and decision-making power. We analyzed the data using the Cochran Mantel-Haenzel statistic, Cochran Armitage trends, and multivariate logistic regression models. We found that male partner uptake of HST was high (61% overall), and did not vary depending on male partner's attitudes towards IPV or decision-making power. However, in couples where the female partner had medium or low acceptance of IPV, the male partners were 1.8 and 1.9 times more likely to use the HIV self-testing kits than in couples where the female partner had high acceptance of IPV. HIV self-testing delivered by the woman appears to hold promise for increasing rates of male partner testing, even in couples reporting lower levels of gender equality. This present work shows the importance of low acceptance of IPV in increasing male partner's HIV self-testing uptake in order to integrate HST into national health care policies in sub-Saharan African countries and elsewhere.

Keywords: HIV self-testing, gender equality, decision-making power, intimate partner violence, prenatal care, Uganda

Introduction

Many heterosexual couples are at high risk for HIV acquisition in Uganda, as the majority of new HIV infections in sub-Saharan Africa are from heterosexual transmission. Therefore, testing for HIV in the context of a heterosexual couple expecting a child is imperative.[1] Globally, women are more likely than men to have ever tested for HIV (69% versus 47%).[2] This is primarily due to the integration of HIV testing into antenatal care. Therefore, additional methods are needed in order to increase HIV testing rates of male partners of pregnant women.

A relatively new testing method for HIV testing is HIV self-testing (HST), which has been touted as an additional approach to conventional HIV testing services. The United States Food and Drug Administration approved the OraQuick Home HIV test as the first rapid oral HIV self-test that was able to be purchased over-the-counter in the United States in 2012.[3] This testing technology has been given a strong recommendation from the World Health Organization that it be offered as an additional approach to existing HIV testing services,[4] especially in unique environments that are underserved by traditional HIV testing services.[5] The Ugandan Ministry of Health has now implemented HIV self-testing as an additional approach for delivering HIV testing services in Uganda in May of 2018,[6] and it is now legal for pharmacies to sell HIV self-testing kits.[7] HIV self-testing has been shown to be an acceptable testing method and reduces barriers to testing,[8–11] and has also been shown to increase testing rates compared to conventional HIV testing.[12–16] Higher gender equality has been shown to be associated with improved HIV preventive behaviors, including condom use, pre-exposure prophylaxis, reduced partner concurrency, coverage and retention of people on antiretroviral treatment, and conventional HIV testing.[17–28] However, there has been no research on how gender equality within a relationship is associated with HIV self-testing. This question is of increasing importance as the Ministries of

Health in Uganda and Kenya have begun to roll out HIV self-testing for male partners of pregnant women through kits delivered by the pregnant women.

This is the first study we are aware of to assess gender equality and how it is associated with male partner's uptake of HIV self-testing after being delivered by their pregnant partner. To address this research question, we used data from a randomized controlled trial of an HIV self-testing intervention among heterosexual couples expecting a child in south-central Uganda. Our aim was to identify the associations between gender equality (measured by attitudes towards intimate partner violence (IPV) and decision-making power) and uptake of oral HIV self-testing by the male partner. We hypothesized that higher gender equality would be associated with higher uptake of HIV self-testing by the male partner.

Methods

Design and Study Population

These data stemmed from a two-arm cluster randomized HIV self-testing intervention trial in three clinics in south-central Uganda, with study information collected at baseline, one-month, and three-months post-baseline. Inclusion criteria included: 1) woman's age of at least 14 years old and being currently pregnant (as pregnant women between 14 and 18 years old were considered emancipated minors in Uganda), and 2) attending one of the study's three antenatal clinics (ANC) for this pregnancy. Additionally, the woman needed to have a male partner of at least 18 years old, interacting with the male partner at least once per week, HIV status of the male partner of either HIV negative or unknown by the woman, and the male partner could not have tested for HIV in the past six months. After the women provided informed consent, they were randomized by clinic day (randomly varying) into one of two arms: Arm 1, the standard of care for antenatal clinics in Uganda, and Arm 2: standard of care plus up to four OraQuick HIV self-testing (HST) kits with instructions for testing the male partner at home and up to three other

adult members of the household. One month and three months after enrollment, the women were interviewed to determine whether their male partner tested for HIV as well as the method of testing. The male partners were also contacted at one month and three months, and those consenting for an interview were administered a questionnaire on sociodemographics and HIV testing history. For this analysis, only the data from Arm 2 (the intervention arm) were used. At the time of the original trial, HIV self-testing kits were not yet approved for use in Uganda, so the only way to acquire these kits was through participation in the trial. As the primary outcome in this current analysis was the use of HIV self-testing kits by the male partner, we limited the analysis to participants in the intervention arm, since participants in the control arms had no way of acquiring these kits.

Measurements

The two primary exposure variables used for this analysis were two measures of gender equality – attitudes towards IPV (reported by both the male and female partners) and decision-making power (reported by the female partner). Attitudes towards IPV were measured by the male's report and the female's report for the validated Violence Domain of the Gender Equitable Scale, a 5-question scale regarding hypothetical violence towards women, with available answers on a 3-point scale, where 1=agree, 2=partially agree, and 3=disagree (Cronbach's alpha=0.81).[29] Scores across all questions were summed, and categorized into three levels: high acceptance of IPV (score of 5-11), medium acceptance of IPV (score of 12-13), and low acceptance of IPV (score of 14-15), where the higher the score, the lower acceptance of IPV (i.e. higher support for gender equitable norms).[29] Decision-making power was measured by the woman's report of an extended version of the validated Household Decision-Making Scale (alpha=0.71),[30] with decision making for: the woman's earnings, the woman's healthcare, major household purchases,

daily household needs, and visiting family or relatives. Available answers included the woman alone, her male partner or someone else alone, or a joint decision between the male and female partners. Each response to the five questions was dichotomized, with a value of 1 if the woman reported that a decision was made by either herself or jointly, and 0 if the decision was made by her male partner or someone else. An index was created by summing the five dichotomized responses, with a value of 0 if the woman made none or only 1 decision by herself or jointly (low decision-making power), 1 if she made two or three decisions by herself or jointly (medium decision-making power), and 2 if she made either four or all five decisions by herself or jointly (high decision-making power). The primary outcome variable was a binary variable of the male partner's uptake of the HIV self-testing kit, as assessed by combining the woman's and man's reports (i.e., we assessed the man to have tested if either partner affirmed that he had tested).

Covariates included age of both the woman and male partner (categorized from a continuous variable based on distributional balance), education level (primary or lower, and secondary or higher), religion (Catholic, Protestant/other Christian, or Other), employment status (employed for wages, self-employed, or other), marital status (currently legally married or not married), woman's report on the male partner's additional sexual partners, food insecurity, woman's HIV status at baseline, and equality in earnings (the proportion of household expenses met by the woman's earnings: none, less than half, half, more than half, or all).

Data Analysis

Descriptive statistics included mean/SD for continuous variables and proportions for categorical variables. We used the Cochran Mantel-Haenzel statistic or Cochran-Armitage Trend test to make comparisons between groups. All modeling analyses used a multivariate logistic regression framework to estimate the odds ratios (OR) and corresponding 95% CI, due to not

enough variability in the site-level clustering for a generalized linear mixed model approach. The first set of analyses used gender equality with the marker of attitudes towards IPV from the male's report as the primary exposure, the second set of analyses used gender equality with the marker of attitudes towards IPV from the female's report as the primary exposure, and the third set of analyses had a primary exposure of gender equality measured by decision-making power from the female's report. We ran sequential modeling for each set of analyses, first running unadjusted analysis, and then added sets of domains (demographic variables, demographic variables, economic variables, and behavioral variables, then all of the previous variables and relationship quality variables). Two measures of model fit were used to assess confounding and potential modification (-2 Log Likelihood and R^2 values, when appropriate). In fully adjusted models, interaction terms between both reports of attitudes towards IPV and decision-making power were tested, but neither was statistically significant (p-value >0.5). The 95% CI not including 1 was used for significance for our primary exposures in both sets of analyses. SAS 9.4 (SAS Institute, Cary, NC) was used for all analyses.

Ethical Approval

The original trial was approved by both the institutional review board of the Medical University of South Carolina and Makerere University in Kampala, Uganda. Written informed consent was obtained from all participants. The current data analysis was performed on completely de-identified data.

Results

Table 1 shows the sociodemographic characteristics of the women and their male partners in the intervention arm of the original trial. Overall, 1,618 women were enrolled and randomized into the study, with 847 women enrolled and randomized into the intervention arm. The original study attempted to reach all 847 male partners in the intervention arm, and 639 male partners

were consented and interviewed. For women, the average age was 25.1 years old, and the majority had a secondary or higher education (58.8%), were mostly Catholic or Other Religion (40.6% and 33.5%, respectively), had an employment status of other (59.2%), were currently not legally married (85.5%), were currently not aware of their husbands having other sexual partners (81.9%), their household always had enough food and the types of food they wanted (55.9%), had more than half or all of the household expenses met by their earnings (75.3%), and were HIV negative (87.7%). For the men, the average age was 31.9 years, and the majority had a secondary or higher education (54.2%), were mostly Catholic or Other religion (28.3 and 35.5%, respectively), were self-employed (53.0%), were currently not married (86.8%), and the vast majority were HIV negative at baseline (96.2%). Overall, 31.3% of the men showed high acceptance of hypothetical IPV, 29.6% had moderate acceptance of IPV, and 39.1% had low acceptance of IPV. From the female's report, 39.1% of the women showed high acceptance of hypothetical IPV towards women, 30.2% had moderate acceptance of IPV, and 30.8% had low acceptance of IPV. For decision-making power, 16.7% of the women had low decision-making power, 45.3% of the women had medium decision-making power, and 38.0% had high decision-making power. Overall, 61% of the male partners used the HIV self-testing kit.

Table 2 shows the bivariate association between the primary exposures and male partner's uptake of HIV self-testing. Neither male partner's attitudes towards IPV nor decision-making power were significantly associated with male partner's uptake of the HIV self-testing kits. However, the female partner's attitudes towards IPV against women was statistically significantly associated with male partner's uptake of the HIV self-testing kits, showing that the woman's lower acceptance of IPV was associated with higher male partners' HIV self-testing uptake ($p<0.01$).

Table 3 shows the modeling of male partner's uptake of HIV self-testing by gender equality. Unadjusted models found that in couples where the women had low acceptance of IPV, the male partners were more likely to use the HIV self-testing kits compared to couples where women had high acceptance of IPV (OR 1.74, 95% CI 1.15-2.62) After model adjustments for facility, age, education, food insecurity, additional sexual partners, female's baseline HIV status, ANC support, relationship quality, and ease of HIV discussion, we found statistically significant results. In couples where the women had medium acceptance of IPV or low acceptance of IPV, the male partners were almost two times more likely to use the HIV self-testing kits compared to couples where the woman had high acceptance of IPV (OR of 1.76, 95% CI 1.06-2.92 and OR of 1.82, 95% CI 1.08-3.08, respectively). Both in unadjusted and in sequential adjusted models, neither male partners' attitudes towards IPV nor decision-making power were significantly associated with male partner's uptake of the HIV self-testing kits.

Discussion

In this study, we assessed the association between gender equality (measured here by male partner's attitudes towards intimate partner violence, women's attitudes towards intimate partner violence, and woman's report of her decision-making power) and male partner's uptake of HIV self-testing among heterosexual couples expecting a child in south-central Uganda. We found that uptake of HST by the male partners was high (between 59% and 65% depending on levels of decision-making power, between 62% and 70% depending on level of male partner's attitudes towards IPV, and between 61% and 73% depending on level of female partner's attitudes towards IPV). We found that neither male partner's attitudes towards IPV nor women's decision-making power were associated with the male partner's uptake of HIV self-testing. Interestingly, we did find that the pregnant female partner's lower acceptance of IPV towards women was significantly associated with higher rates of the male partner's uptake of HIV self-

testing. In an analysis of the same measures of gender equality and couples' uptake of HIV self-testing among heterosexual couples expecting a child in central Kenya, we found that male partner's lower acceptance of IPV was significantly associated with more than double the odds of HIV self-testing as a couple compared to those with high acceptance of IPV (unpublished data).

There has been limited research on gender equality and HIV testing in sub-Saharan Africa, but one study using Demographic and Health Survey data in sub-Saharan Africa found that the belief that gender-based violence is never acceptable (a key gender equality measure) was positively associated with older married women testing for HIV in Kenya and Zambia, and high financial decision-making power was associated with older married women testing for HIV in Zimbabwe.[20] A study in rural Uganda found that women perceiving greater social support from their partner (perhaps reflecting better relationship quality) was significantly associated with their male partner testing for HIV.[31] Between 2016 and 2017, the proportion of women who tested for HIV during their pregnancy in Uganda was extremely high, at 95%, while only 31% of their male partners tested for HIV at the antenatal clinic during that pregnancy.[32] It is imperative that the male partners of pregnant women get tested for HIV in order to prevent mother-to-child transmission of HIV, as well as to identify HIV positive men in need of linking to care. Women's attitudes about IPV could be an important indicator of communication and power balance within the relationship, which could be an important predictor of and even impact the man's likelihood of being tested for HIV, either at a clinic or through HIV self-testing.

Limitations:

There are a few notable limitations in this analysis. First, these data stemmed from a randomized controlled trial, so these results may not be generalizable to the broader population.

Only men believed (by the women) to be HIV negative (or unknown status) were eligible to participate in the study. However, men who were HIV positive or did not believe in gender equality might have been less likely to participate in the study, and in particular might have been less receptive to an HIV self-testing kit offered to them by their female partner. Since this study was randomized to either standard of care or provision of the HIV self-testing kits, however, we do not believe that this potential problem was likely to substantially bias our results. Second, gender equality in this study was measured by attitudes towards intimate partner violence and decision-making power. We might have found different results if gender equality were measured in a different manner. Furthermore, this study focused on women and men in a partnership expecting a child, so these gender equality measures might not represent the experiences of those not expecting a child or not in a stable partnership.

Conclusions

In summary, the male partner's attitudes towards intimate partner violence and female partner's decision-making power were not significantly associated with male partner's uptake of HIV self-testing. However, in couples with lower acceptance of IPV from the woman, the male partner's had higher uptake of HIV self-testing compared to couples where the woman had higher acceptance of IPV. Uptake of HIV self-testing was relatively high overall among the male partners, and our results provide some comfort against the concern that some men may not respond well to their female partners bringing home HST kits from the ANC clinic. Our findings appear to offer a potentially valuable tool for planning and implementing the roll-out of HIV self-testing in countries including Uganda and Kenya, as acceptance of IPV appears to be a marker for relationship factors that significantly predict the successful uptake of HIV self-testing among male partners of pregnant women who bring their kits home from the ANC clinic. Thus, we may be able to better predict which male partners may be more resistant to testing, and more

effectively direct resources to maximize uptake. It is also possible that effective interventions could be implemented to decrease pregnant women's acceptance of IPV and other relationship imbalances, empowering them to better engage their male partners in efforts to maintain their own health and the health of their infants.

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List of Tables

Table 1: Characteristics of women attending antenatal care at baseline and characteristics of male partners at month 1 in south-central Uganda[a]

Characteristic	**Women (n=847)** n (%)	**Male partners (n=639)** n (%)
Age (years), mean ±SD	25.1 ± 5.5	31.9 ± 8.2
Missing	9 (1.1)	10 (1.6)
Age categories		
15-19 (women), 18-24 (men)	120 (14.3)	106 (16.9)
20-24 (women), 25-34 (men)	330 (39.4)	325 (51.7)
25-29 (women), 35-44 (men)	219 (26.1)	146 (23.2)
30-49 (women), 45-68 (men)	169 (20.2)	52 (8.3)
Missing	9 (1.1)	10 (1.6)
Level of education		
Primary or Lower	344 (41.3)	291 (45.8)
Secondary or Higher	490 (58.8)	344 (54.2)
Missing	13 (1.5)	4 (0.6)
Religion		
Catholic	97 (40.6)	168 (38.3)
Protestant/other Christian	62 (25.9)	115 (26.2)
Other	80 (33.5)	156 (35.5)
Missing	608 (71.8)	200 (31.3)
Employment status		
Employed for wages	35 (14.6)	134 (30.7)
Self-employed	63 (26.3)	231 (53.0)
Other (business partnership, unemployed, student, housewife, retired, other)	142 (59.2)	71 (16.3)
Missing	607 (71.7)	203 (31.8)
Marital status		
Currently married	121 (14.5)	84 (13.2)
Not Married	712 (85.5)	551 (86.8)
Missing	14 (1.7)	4 (0.6)
Male Partner has other sexual partners		
Yes	151 (18.1)	-
No/Don't Know	684 (81.9)	-
Missing	12 (1.4)	
Food Insecurity		
Always have enough food and the kinds we want	467 (55.9)	-
Have enough food, but not always the kinds we want	315 (37.7)	-
Sometimes don't have enough to eat	37 (4.4)	-
Often don't have enough to eat	17 (2.0)	-
Missing	11 (1.3)	
Proportion of expenses met by woman's earnings		
None	24 (2.9)	-
Less than half	78 (9.3)	-
Half	105 (12.6)	-
More than half	247 (29.6)	-
All	382 (45.7)	-
Missing	11 (1.3)	

HIV Status		
Positive	100 (12.3)	22 (3.8)
Negative/Indeterminate/Didn't receive results	713 (87.7)	561 (96.2)
Missing	34 (4.0)	56 (8.8)
Health Facility		
Nakaseke	177 (20.9)	157 (24.6)
Mpigi	292 (34.5)	231 (36.2)
Entebbe	378 (44.6)	251 (39.3)

Abbreviations: SD, standard deviation

[a] Columns may not total to 100 due to missing values.

Table 2: Bivariate analysis of sociodemographics, gender equality (measured by attitudes towards IPV and decision-making power) and male uptake of HIV self-testing

	Combined Man's and Woman's Report	
	Man Tested Using HIV Self-Testing	**Did not use HIV Self-Testing or Did Not Test**
Sociodemographics, n (%)		
Male's Attitudes Towards IPV		
High Acceptance of IPV	114 (61.6)	71 (38.4)
Medium Acceptance of IPV	120 (69.8)	52 (30.2)
Low Acceptance of IPV	152 (67.0)	75 (33.0)
Female's Attitudes Towards IPV		
High Acceptance of IPV	150 (61.2)	95 (38.8)
Medium Acceptance of IPV	126 (66.3)	64 (33.7)
Low Acceptance of IPV	140 (73.3)	51 (26.7)
Decision-Making Power		
No decision-making power	81 (64.8)	44 (35.2)
Low decision-making power	197 (59.0)	137 (41.0)
High decision-making power	171 (60.9)	110 (39.1)
Women age categories		
15-19	69 (64.5)	38 (35.5)
20-24	182 (62.1)	111 (37.9)
25-29	117 (59.4)	80 (40.6)
30-49	88 (57.5)	65 (42.5)
Men age categories*		
18-24	68 (73.9)	24 (26.1)
25-34	203 (67.2)	99 (32.8)
35-44	89 (62.7)	53 (37.3)
45-68	27 (55.1)	22 (44.9)
Women Level of education		
Primary or Lower	180 (59.6)	122 (40.4)
Secondary or Higher	274 (61.7)	170 (38.3)
Man Level of Education		
Primary or Lower	177 (64.4)	98 (35.6)
Secondary or Higher	213 (67.4)	103 (32.6)
Woman's Religion		
Catholic	36 (46.8)	41 (53.3
Protestant/other Christian	24 (55.8)	19 (44.2)
Other	23 (44.2)	29 (55.7)
Man's Religion		
Catholic	116 (69.1)	52 (30.9)
Protestant/other Christian	81 (70.4)	34 (29.6)
Other	109 (69.9)	47 (30.1)
Women Employment		
Employed for wages	11 (36.7)	19 (63.3)
Self-employed	27 (54.0)	23 (46.0)
Other	46 (49.5)	47 (50.5)
Men Employment		
Employed for wages	96 (71.6)	38 (28.4)
Self-employed	155 (67.1)	76 (32.9)
Other	53 (74.7)	18 (25.3)

Marital status		
Currently married	61 (57.0)	46 (43.0)
Not Married	392 (61.4)	246 (38.6)
Male Partner has other sexual partners*		
Yes	73 (53.3)	64 (46.7)
No/Don't Know	381 (62.4)	230 (37.6)
Food Insecurity*		
Always have enough food and the kinds they want	263 (64.3)	146 (35.7)
Have enough food, but not always the kinds we want/Sometimes don't have enough/Often don't have enough	192 (56.6)	147 (43.4)
Proportion of expenses met by woman's earnings		
None	12 (50.0)	12 (50.0)
Less than half	46 (63.0)	27 (37.0)
Half	57 (59.4)	39 (40.6)
More than half	137 (61.2)	87 (38.8)
All	204 (61.6)	127 (38.4)
Woman HIV status		
Positive	51 (54.8)	42 (45.2)
Negative/Indeterminate/Didn't receive results	392 (61.4)	246 (38.6)
Male partner supports with antenatal care related issues**		
Yes	440 (61.9)	271 (38.1)
No	15 (39.5)	23 (60.5)
Relationship Quality*		
Very good with no disagreements	136 (64.1)	76 (35.9)
Good with a few disagreements	271 (61.7)	168 (38.3)
Sometimes difficult and sometimes good/ Very difficult with frequent disagreements	45 (47.4)	50 (52.6)
Ease of discussing HIV with male partner		
Very Easy	171 (62.4)	103 (37.6)
Easy	228 (63.3)	132 (36.7)
Somewhat Hard/Hard/Very Hard	56 (49.6)	57 (50.4)

* $p<0.05$, ** $p<0.01$

Table 3: Multivariable modeling between gender quality (measured by attitudes towards IPV and decision-making power) and male uptake of HIV self-testing

	Model 1[a]	**Model 2[b]**	**Model 3[c]**	**Model 4[d]**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Male's Attitudes towards IPV (Ref=High Acceptance of IPV)				
Medium Acceptance	1.44 (0.93, 2.23)	1.39 (0.89, 2.18)	1.36 (0.86, 2.16)	1.30 (0.81, 2.09)
Low Acceptance	1.26 (0.84, 1.89)	1.21 (0.79, 1.85)	1.21 (0.79, 1.88)	1.21 (0.77, 1.90)

[a] Unadjusted
[b] Adjusted for facility, age and education (both male and female)
[c] Adjusted for facility, age, education, food insecurity, additional sexual partners, and female's baseline HIV status
[d] Adjusted for facility, age, education, food insecurity, additional sexual partners, female's baseline HIV status, ANC support, relationship quality, and ease of HIV discussion

	Model 1[a]	**Model 2[b]**	**Model 3[c]**	**Model 4[d]**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Female's Attitudes towards IPV (Ref=High Acceptance of IPV)				
Medium Acceptance	1.25 (0.84, 1.85)	1.61 (0.99, 2.62)	1.61 (0.984, 2.64)	1.76 (1.06, 2.92)
Low Acceptance	1.74 (1.15, 2.62)	1.69 (1.03, 2.78)	1.87 (1.12, 3.13)	1.82 (1.08, 3.08)

[a] Unadjusted
[b] Adjusted for facility, age and education (both male and female)
[c] Adjusted for facility, age, education, food insecurity, additional sexual partners, and female's baseline HIV status
[d] Adjusted for facility, age, education, food insecurity, additional sexual partners, female's baseline HIV status, ANC support, relationship quality, and ease of HIV discussion

	Model 1[a]	**Model 2[b]**	**Model 3[c]**	**Model 4[d]**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Decision-Making Power (Ref=Low)				
Medium Decision-Making Power	0.78 (0.51, 1.20)	0.70 (0.43, 1.17)	0.72 (0.43, 1.20)	0.69 (0.41, 1.17)
High Decision-Making Power	0.84 (0.55, 1.31)	0.83 (0.49, 1.43)	0.84 (0.49, 1.46)	0.84 (0.48, 1.47)

[a] Unadjusted
[b] Adjusted for facility, age and education (both male and female)
[c] Adjusted for facility, age, education, food insecurity, additional sexual partners, and female's baseline HIV status
[d] Adjusted for facility, age, education, food insecurity, additional sexual partners, female's baseline HIV status, ANC support, relationship quality, and ease of HIV discussion

CHAPTER 6: Discussion and Conclusions

Specific Aims Revisited

The aims of this dissertation were to:

6. Identify social and economic predictors of low decision-making power and high acceptance of IPV within heterosexual couples expecting a child in central Kenya.
7. Determine the association between high gender equality (measured by high decision-making power and low acceptance of IPV) and couples' uptake of HIV self-testing kits in central Kenya.
8. Identify social and economic predictors of low decision-making power and high acceptance of IPV within heterosexual couples expecting a child in south-central Uganda.
9. Determine the association between high gender equality (measured by high decision-making power and low acceptance of IPV) and male partners' uptake of HIV self-testing kits in south-central Uganda.

Summary and Conclusions

The research presented in this dissertation examined social and demographic factors that were associated with relationship gender equality, and how relationship gender equality was associated with uptake of HIV self-testing among heterosexual couples expecting a child in central Kenya and south-central Uganda. This area of research is of importance for several reasons. First, in previous research, assessing multiple social and economic variables related to gender inequality, studies have used different definitions of gender inequality, and there has been a lack of research on this topic within a pregnancy context. Second, gender equality has been studied in the context of many HIV preventive behaviors, including HIV testing, but has never been studied in the context of HIV self-testing. Therefore, Aims 2 and 4 consist of the only known analysis, to date, examining gender equality and HIV self-testing. Data from two

randomized controlled HIV self-testing intervention trials in Kenya and Uganda were used to assess the social and demographic predictors of relationship gender equality and how this is associated with couples' uptake of HIV self-testing (in Kenya) and male partners' uptake of HIV self-testing (in Uganda).

Aim 1 attempted to identify social and economic predictors of gender inequality (measured by decision-making power and acceptance of IPV) within heterosexual couples expecting a child in central Kenya. We found that there are significant social and economic variables associated with acceptance of IPV including: higher age, being married, "Other" religion, lower partner education, higher wealth status, and variables associated with a lower decision-making power (for the female partner) that included lower partner education and lack of equality in earnings.

Aim 3 focused on the social and economic predictors of gender inequality (measured by decision-making power and acceptance of IPV) within heterosexual couples expecting a child in south-central Uganda. We found that the significant sociodemographic variables associated with increased acceptance of IPV were Catholic religion, lower women's education, and a woman's positive HIV status at baseline. The variables associated with lower decision-making power were younger women, being married, and lower partner education.

Aim 2 examined the association between gender equality and a couples' uptake of HIV self-testing among heterosexual couples expecting a child in central Kenya. We found that, in comparison to male partners reporting high acceptance of IPV, couples with male partners reporting medium IPV acceptance (OR=2.36, 95% CI 0.99-5.63) or low IPV acceptance (OR=2.50, 95% 1.20-5.21) were significantly more likely to use HIV self-testing. However,

gender equality measured by decision-making power was not associated with couples' uptake of HIV self-testing.

Aim 4 examined the association between gender equality and the male partners' uptake of HIV self-testing among heterosexual couples expecting a child in south-central Uganda. We found that in couples where the women had medium acceptance of IPV (OR of 1.76, 95% CI 1.06-2.92) or low acceptance of IPV (OR of 1.82, 95% CI 1.08-3.08), the male partners were more likely to use the HIV self-testing kits compared to couples where the woman had high acceptance of IPV. However, both in unadjusted and in sequential-adjusted models, neither male partner's attitudes towards IPV nor decision-making power were significantly associated with male partner's uptake of the HIV self-testing kits.

Similarities and differences in the two original RCT trials

There were substantial differences between the Kenya RCT (Aims 1 and 2) and the Uganda RCT (Aims 3 and 4). While the overall number of pregnant women recruited and enrolled into the studies were similar, the Kenya study had 14 clinic sites, while the Uganda study had only 3 sites. The Uganda study also had a second phase, in which we actively recruited 104 additional women (mainly HIV positive women, with the inclusion of HIV negative women in order to improve confidentiality by not making it obvious that we were really targeting HIV positive women), who were added to the dataset for this dissertation. The women recruited into the study in Kenya had to be at least 18 years of age and attending an antenatal clinic for the first time for that current pregnancy, while women in Uganda had to be at least 14 years of age, and could be attending the antenatal clinic at any time during their current pregnancy. In the Kenya study, there were three arms to the original trial: the standard of care, standard of care plus a card detailing the need for male partners to test for HIV, and Arm 2 plus the provision of HIV self-

testing kits. In Uganda, there were two arms to the original trial: standard of care, and standard of care plus the provision of HIV self-testing kits.

In terms of this dissertation research, the largest difference between the two datasets was the measurement of decision-making power and the additional measure of female partner's attitudes towards IPV. In Kenya, that index consisted of three variables (major household purchases, daily household needs, and visiting family). In Uganda, the index consisted of five variables (the woman's earnings, the woman's healthcare, major household purchases, daily household needs, and visiting family). Due to the distributions, the levels of the index in Kenya were no power, low power, and high power, while in Uganda, the levels of the index were low power, medium power, and high power. In the Uganda dataset, data were also collected regarding the female partner's attitudes on hypothetical IPV towards women. We were then able to run additional analyses examining the relationship between female partner's attitudes towards IPV and male partner's uptake of HIV self-testing in Aim 4 that we were not able to for Aim 2.

Similarities and Differences between Aims 1 and 3

We found evidence that lower education was consistently associated with lower gender equality between aims 1 and 3. This has been supported by many studies showing that secondary or higher education (as compared to primary or lower) is consistently associated with high support for gender equality in men[1–3] and associated with reduced perpetration of IPV.[4–6]

Being currently married was associated with lower gender equality (measured by higher acceptance of IPV) in Kenya, and measured by lower decision-making power in Uganda. This corroborates research in the Democratic Republic of the Congo that found that men who were unmarried or separated had higher support for gender equality than those who were married.[1] However, between our two datasets, the proportions of those married were quite different. In

Kenya, 87% of the couples were currently married, but only 17% of the couples in Uganda were currently married and the rest were cohabitating. The 2016 Uganda Demographic and Health Survey found that among all women aged 15-49, 30.3% were married and 30.3% were living together with a partner,[7] while the 2014 Kenya Demographic and Health Survey found that among all women aged 15-49, 54.6% were married while only 5.1% were living together with a partner.[8] Even though the countries share Lake Victoria as a border, there are clear social and cultural differences between these two countries in their views on marital status, so this will be very important to keep in mind for future research and interventions in these two countries.

A woman reporting a positive HIV status at baseline was associated with her partner's increased acceptance of IPV in Uganda. This is corroborated with evidence from other studies showing increased IPV among women who were HIV positive compared to HIV negative.[9,10] However, the proportion of women with an HIV positive status at baseline was too low in Kenya to examine any association with gender equality.

Age was an important variable between Aims 1 and 3. In Aim 1, higher partner's age was associated with lower gender equality (as measured by high acceptance of IPV), while in Aim 3, lower woman's age was associated with lower gender equality (as measured by lower decision-making power). There were no associations with woman's age and either measure of gender equality in Aim 1, nor partner's age and either measure of gender equality in Aim 3. There is conflicting evidence regarding age, with studies showing that higher age was negatively associated with more equitable gender norms in both men and women,[11] but also that there is a negative association between increasing woman's age and both perpetration and justification of IPV. [4,12,13] It could be that, in Aim 1, older men still have traditional beliefs regarding IPV and the patriarchy (i.e., justification of male superiority, and therefore the justification of IPV, when

necessary) compared to younger men, who might be taught more gender equitable beliefs. In Aim 3, younger women might have less education and less knowledge about what is equitable, and would then have less decision-making power. Future research, especially with qualitative methods, should attempt to tease out the differences that gender and age have on gender equality, especially on differing measures of gender equality.

Religion was also a variable that was at odds between Aims 1 and 3. In Aim 1, "Other" religion compared to Catholic was associated with higher acceptance of IPV, while in Aim 3, "Other" religion compared to Catholic was associated with lower acceptance of IPV. Studies have shown that women who are Muslim were more likely to think that IPV was justified compared to any other religion,[14] women who are Muslim and Traditional believers were more likely to approve domestic physical violence compared to women who were Christian.[12] Similarly, compared to Catholic women, Muslims in Mali and Benin and followers of other religions in Zimbabwe were more likely to justify domestic abuse. [15] However, all of these studies examined women's justification of IPV, not men's attitudes towards IPV. Furthermore, "Other" religion in our studies encompassed all other religions besides Christian religions, so there could be a mixing of effects due to the classification.

Similarities and Differences between Aims 2 and 4

The distributions of the measures of gender equality were different between the two studies in Aims 2 and 4. Men in our Kenya sample had lower acceptance of IPV compared to men in our Uganda sample (Kenya: 19.6% high acceptance of IPV, 21.2% moderate acceptance, and 58.7% low acceptance, compared to Uganda: 31.3% high acceptance of IPV, 29.6% moderate acceptance, and 39.1% low acceptance). For decision-making power, more women in Kenya had high decision-making power compared to Uganda (Kenya: 12.7% no decision-

making power, 31.1% low decision-making power, and 56.1% high decision-making power, compared to Uganda: 16.7% low decision-making power, 45.3% medium decision-making power, and 38.0% high decision-making power).

In Aim 2, men with low acceptance of IPV were 2.5 times more likely to use the HIV self-testing kit as a couple compared to men who had high acceptance of IPV. These results suggest that if the male partner doesn't accept IPV, he may be more likely to be open for discussion within the partnership, and more willing to test for HIV with his female partner. Furthermore, in Aim 4, in couples where women had medium or low acceptance of IPV, their male partners were 1.76 and 1.82 times more likely, respectively, to use the HIV self-testing kit. This also suggests that if the pregnant female partner does not accept IPV, she may be more likely to successfully encourage her male partner to test using HIV self-testing. While this is the first time that gender equality and HIV self-testing has been studied, these results do corroborate research that showed high gender equality was associated with increased testing for HIV.[16–19] However, in Aim 4, the male partner's attitudes towards IPV were not significantly associated with the male partner's uptake of HIV self-testing. It could be that male partner's attitudes towards IPV could have a greater impact on whether or not couples used HIV self-testing together rather than the male partner's using the HIV self-testing kit alone. There was overall higher gender equality in Kenya compared to Uganda, and there was also higher rates of uptake of HIV self-testing in Kenya compared to Uganda (81% of couples used the HIV self-testing kits in Kenya compared to 61% of males used the HIV self-testing kits in Uganda).

Among both Aims 2 and 4, there was no association between decision-making power and uptake of HIV self-testing, either as a couple (in Aim 2), or the male partner alone (Aim 4). There are a few potential reasons for these null findings. There could be a mixing of effects

within the decision-making power index due to the differing proportions within the component variables. For example, in both datasets, the women have the lowest proportions of joint or sole decision-making for major household purchases, and highest proportions of joint or sole decision-making for daily household needs (in Kenya) or decisions regarding her own money (in Uganda). Furthermore, the outcomes of Aims 2 and 4 are focused on the male partner testing for HIV (as the women already test as part of ANC care and PMTCT), so the woman's decision-making power may be less relevant than the male partner's attitudes towards IPV. However, these results from both Aims 2 and 4 shows that the woman's report of her household decision-making power in her relationship does not affect whether or not her partner used the HIV self-testing kit after she brought it home from the ANC clinic.

There are myriad future directions that could be taken with this research. To corroborate these results, these aims should be replicated as their own study, rather than secondary analysis from an original randomized controlled trial. Second, these results can inform a future dual intervention of attempting to improve both attitudes towards intimate partner violence and HIV self-testing, specifically through HIV self-testing.

Limitations

There are several limitations that need to be highlighted. In the Kenya study, there were errors in the data collection software regarding non-couple HIV self-testing uptake. Therefore, we could not assess uptake of the self-testing kits by the male partners alone. However, 81% of the couples in the intervention arm tested as a couple using the self-testing kits, so a high majority of the kits were not used by the male partners alone. Furthermore, in the Uganda study, there were high proportions of missing data for the women's employment records and religious preferences. Therefore, we could not identify if there were any associations between these

sociodemographic variables and relationship gender equality. Fortunately, we also measured the male partner's religious preference, so that was able to be included in the analysis. These data are only generalizable to heterosexual couples expecting a child, and characteristics of couples who chose to take part in an RCT could be different than those who did not participate in these trials. However, gender equality and HIV self-testing are important to study in a pregnancy context, so this information is valuable to this population.

Overall, this dissertation fills a gap in research on sociodemographic predictors of gender equality within a pregnancy context in Kenya and Uganda, and a gap in research of the associations between gender equality and HIV self-testing uptake. We found, through Aims 1 and 3, that there are promising areas to target to improve specific social and economic variables that are associated with lower gender equality (e.g., to increase men and women's education levels, equality in earnings between partners, and to reduce HIV prevalence) or create interventions to targeted populations (specifically targeted towards different religions or wealth statuses and married couples) to potentially improve gender equality in heterosexual couples expecting a child in Kenya and Uganda. We found, through Aims 2 and 4, that there was no association between decision-making power and uptake of HIV self-testing, either as a couple (in Aim 2), or the male partner alone (Aim 4). Men with low acceptance of IPV were 2.5 times more likely to use the HIV self-testing kits as part of a couple compared to men with high acceptance of IPV (in Kenya), and in couples where women had medium or low acceptance of IPV, their male partners were 1.76 and 1.82 times more likely to use the HIV self-testing kits compared to couples where women had high acceptance of IPV (in Uganda). Both the countries of Kenya and Uganda are already scaling up distribution of HST kits to male partners, partially based on the results of the original randomized controlled trials used in this dissertation. Overall, our findings

suggest that both male and female attitudes towards IPV against women might be important predictors of HIV self-testing uptake success, especially in this model of HST distribution to male partners of pregnant women. Practically, attitudes towards intimate partner violence could be an important addition in a screening tool for when HST kits are distributed to male partners of pregnant women. This work and these findings can be leveraged towards improving the health of pregnant women, their male partners, and their unborn children as we work towards the goal of 90% of all people living with HIV knowing their status.

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