SPOUSAL VIOLENCE AND HIV: EXPLORING THE LINKAGES IN FIVE SUB-SAHARAN AFRICAN COUNTRIES

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Spousal Violence and HIV:
Exploring the Linkages in Five Sub-Saharan African Countries

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Preface

One of the most significant contributions of the MEASURE DHS program is the creation of an internationally comparable body of data on the demographic and health characteristics of populations in developing countries.

The *DHS Comparative Reports* series examines these data across countries in a comparative framework. The *DHS Analytical Studies* series focuses on analysis of specific topics. The principal objectives of both series are to provide information for policy formulation at the international level and to examine individual country results in an international context.

While *Comparative Reports* are primarily descriptive, *Analytical Studies* provide in-depth, focused studies on a variety of substantive topics. The studies are based on a varying number of data sets, depending on the topic being examined. These studies employ a range of methodologies, including multivariate statistical techniques.

MEASURE DHS staff, in conjunction with the U.S. Agency for International Development (USAID), selects the topics covered in *Analytical Studies.*

It is anticipated that the *DHS Analytical Studies* will enhance the understanding of analysts and policymakers regarding significant issues in the fields of international population and health.

Sunita Kishor
Project Director

Executive Summary

Over the past decade a consensus has been growing that intimate partner violence contributes to women's vulnerability to HIV. A diverse body of research has explored this association, mostly in the developing world. Studies based on women who present at health clinics often report a significantly higher prevalence of intimate partner violence among HIV-positive women compared with HIV-negative women. Moreover, six of seven studies using nationally representative samples reported a significant association between some form of violence and HIV status.

The usual interpretation is that spousal violence increases the risk of HIV for women. Yet a direct effect on HIV status is unlikely, since there is no apparent direct causal pathway leading from most forms of spousal violence to the acquisition of HIV. This study contributes to an understanding of the relationship between spousal violence and HIV by taking advantage of data from both members of a couple and using discrete, nuanced measures of spousal violence to better specify the associated pathways through which violence influences HIV. We propose a gender-based conceptual framework in which the association between a woman's experience of spousal violence and her HIV status is mediated by two primary pathways: First, the HIV risk behaviors/factors of her husband and, second, her own behavioral and situational HIV risk factors. Both of these factors have been associated with violence experienced by women and perpetrated by men.

This study uses data on married couples from six Demographic and Health Surveys (DHS) in five sub-Saharan countries: Kenya 2008-09, Malawi 2010, Rwanda 2005, Rwanda 2010, Zambia 2007, and Zimbabwe 2010-11. These surveys included HIV testing for both women and men and also the domestic violence module, thus providing a subsample of married or cohabiting couples by their experience of violence and their HIV status.

We examine the direct or indirect linkages between spousal violence and women's HIV status. We also explore the association between spousal violence and wives' and husbands' HIV risk factors. Specifically, we include the following factors: lifetime number of sexual partners; STI or STI symptoms in the last 12 months; and for husbands only, non-marital sex in the past 12 months; having paid for sex; alcohol use; and husband's HIV status. We consider several forms of spousal violence (emotional, physical, and sexual violence) and husbands' controlling behaviors. In keeping with the conceptual framework, we develop a series of statistical analyses to test the direct effect of spousal violence on women's HIV status and the role of HIV risk factors as mediators.

The results reveal a strikingly common structure of what constitutes violence across the five countries. Five factors emerge in each country: (1) suspicion, (2) isolation, (3) emotional violence, (4) physical violence, and (5) sexual violence. These five factors account for 57 to 66 percent of the variance among the items in each country. Our factor analysis upholds the validity of experts' assignment of the various acts of spousal violence to the categories of emotional, physical, or sexual violence. An important additional insight is that the six items typically categorized as controlling behavior actually represent not one construct, but two separate constructs—suspicion and isolation—which are distinct from emotional, physical, or sexual violence.

The study finds a significant association between multiple forms of violence and women's HIV status, after adjusting for wives' and husbands' socio-demographic characteristics but not risk factors. Yet, no single form of spousal violence is consistently associated with women's HIV status in all five countries. A significant relationship is found with women's HIV status for the controlling behaviors suspicion and isolation in Zambia and Zimbabwe; for emotional violence in Kenya, Rwanda and Zimbabwe; for physical violence, in Kenya, Rwanda, and Zimbabwe; and in no country for sexual violence, the least

prevalent form of violence among study couples. In Malawi no form of violence is associated with a wife's risk of having HIV.

In all five countries both HIV risk factors for women—lifetime number of sexual partners and recent STI or STI symptoms—are significantly associated with their having HIV, after controlling for background characteristics but not for each other. Most of the spousal violence measures are associated with both wives' HIV risk factors in each country.

The most prominent predictor of a woman's HIV status is her husband's HIV status, among all the men's factors considered. Numerous husbands' HIV risk factors are associated with their wives' HIV status, but far less consistently than either husbands' HIV status or women's risk factors. The association between the experience of spousal violence and husbands' risk factors, too, is weaker and less consistent than with women's risk factors. Nevertheless, multiple relationships between spousal violence and wives' and their husbands' risk factors on one hand, and between wives' and husbands' risk factors and women's HIV status on the other, suggest that there are several possible mediators between various forms of spousal violence and women's HIV status.

Indeed, when either wives' risk factors or husbands' risk factors, or both combined, are added to our models, most spousal violence factors are no longer a significant predictor of women's HIV status. The only form of spousal violence that appears to have a direct net association with HIV is physical violence, which remains significant in all models in Kenya and Zimbabwe. For almost all forms of violence (physical violence being the exception) and in all five countries, any observed significant relationship of spousal violence with a woman's HIV status is explained away by wives' or husband's HIV risk factors.

The study provides evidence that there is no direct effect of most forms of spousal violence on women's HIV status, only an indirect effect through selected behavioral and other factors commonly considered to put an individual at high risk of HIV. The finding that sexual violence is not associated with women's HIV status, even before considering any mediating risk factors, deserves further exploration. Similarly, investigation is warranted to ascertain why physical violence continues to be associated with women's HIV status after controlling for these risk factors.

1   Introduction

Over the past decade there has been increasing international interest in how women's experience of spousal violence affects the risk of acquiring HIV, and consensus is growing that women's experience of intimate partner violence—alongside gender inequality more broadly—contributes to vulnerability to HIV infection. In 2011 the World Health Organization (WHO) included the reduction of gender-based vulnerability to HIV infection as part of its Global Health Sector Strategy on HIV/AIDS 2011-2015 (World Health Organization 2011).

It is not intuitively obvious, however, that there should be a relationship between women's experience of intimate partner violence and their risk of HIV. With the exception of sexual violence, there is no direct causal pathway leading from most forms of spousal violence to HIV infection. This study examines the direct or indirect linkage between spousal violence—a key component of intimate partner violence—and women's HIV status. It also explores the association between spousal violence and wives' and husbands' risk factors, which may more directly influence women's HIV status. The study is based on data from recent Demographic and Health Surveys (DHS) in five sub-Saharan countries—Kenya, Malawi, Rwanda, Zambia, and Zimbabwe. Note that the term "husbands" also includes partners cohabiting as if married.

A diverse body of literature, mostly in the developing world, has explored the association between intimate partner violence, with various degrees of emphasis on causal pathways. With a few notable exceptions, these studies have reported a significant association between some form of violence and women's HIV status. To date, the studies that have suggested a positive association between women's experience of intimate partner violence and risk of HIV fall into two categories: studies using clinic-based samples or other non-representative samples, or cross-sectional studies using population-based samples.

Studies based on women who present at health clinics (ranging from antenatal care clinics to VCT clinics to enrollees in HIV-prevention interventions) often have reported a significantly higher prevalence of violence among HIV-positive women compared with HIV-negative women (Dunkle et al. 2004; Fonck et al. 2005; Maman et al. 2010; Maman et al. 2002; Prabhu et al. 2011). These clinic-based studies have found women's HIV status to be associated with their experience of physical violence (Maman et al. 2002), physical or sexual violence (Maman et al. 2002), any intimate partner violence (Dunkle et al. 2004), and spousal control (Dunkle et al. 2004). In a recent study that sought to isolate the direction of causality in the association between intimate partner violence and HIV status, Maman and colleagues (2010) followed a cohort of South African women (age 15-26) enrolled in an HIV-prevention intervention. They found that women's report at baseline of one or more incidents of intimate partner violence was a significant predictor of HIV incidence during the follow-up period.

Several rigorous, non-household-based studies have also examined the association between forms of spousal violence and women's HIV status. One cohort study among young women in South Africa (Jewkes et al. 2010) reported a significant association between incident HIV infection and both intimate partner violence and relationship power inequity. A second cohort study in seven African countries, however, reported no evidence of an association between sero-conversion and the experience of intimate partner violence prior to acquiring HIV, based on an analysis of discordant couples enrolled in a clinical trial of a herpes simplex virus type 2 suppressive therapy (Were et al. 2011). Finally, a cluster randomized control trial of an HIV behavioral intervention among women age 15-26 in South Africa reported that the significant bivariate association between women's experience of intimate partner violence and HIV status did not retain its significance after adjusting for HIV risk behaviors (including risk factors for both the female and male partners) (Jewkes, Nduna, et al. 2006).

Most studies using population-based cross-sectional data have found a significant association between women's experience of intimate partner violence and HIV status. Overall, of the seven studies identified that use nationally-representative samples, six reported a significant association between some form of violence and HIV status (Andersson and Cockcroft 2012; Decker, Seage, Hemenway, Raj, et al. 2009; Ghosh et al. 2011; Kayibanda, Bitera, and Alary 2012; Sareen, Pagura, and Grant 2009; Silverman et al. 2008). Three of these six studies used data from India's third National Family Health Survey (NFHS-3) (Decker, Seage, Hemenway, Raj, et al. 2009; Ghosh et al. 2011; Silverman et al. 2008). One study used data from the Rwanda Demographic and Health Survey (DHS) (Kayibanda, Bitera, and Alary 2012), another examined a non-DHS nationally representative sample from Botswana, Namibia, and Swaziland (Andersson and Cockcroft 2012), and the sixth study reporting a positive association used data from the United States (Sareen, Pagura, and Grant 2009). The only nationally representative study identified that did not report a significant association between some form of spousal violence and HIV status used DHS data on ever-married women from 10 developing countries (Harling, Msisha, and Subramanian 2010).

While six of the seven studies reported significant findings, their samples, methodologies, and findings are noteworthy for their differences. As mentioned above, three of the six studies with significant findings relied on the same data from India, and the experience of couples in India may not be representative of couples' experience in other countries or cultures. Also, while all studies were population-based, the analytic samples varied considerably, ranging from all men and women regardless of marital status (Andersson and Cockcroft 2012), to currently married women (Silverman et al. 2008), ever-married women (Harling, Msisha, and Subramanian 2010), women who were in any romantic relationship in the last year (Sareen, Pagura, and Grant 2009), and currently cohabiting couples (Decker, Seage, Hemenway, Raj, et al. 2009; Ghosh et al. 2011; Kayibanda, Bitera, and Alary 2012).

Definitions of violence varied as well, from bivariate measures of any violence versus none (Decker, Seage, Hemenway, Gupta, et al. 2009), to summary scales counting the number of violent items experienced (Kayibanda, Bitera, and Alary 2012), to categorical variables identifying women who experienced no violence, just physical violence, or physical and sexual violence (Silverman et al. 2008), just to name a few variations. Some studies looked only at sexual violence (Ghosh et al. 2011), others physical and sexual violence (Sareen, Pagura, and Grant 2009; Silverman et al. 2008), while some included emotional violence (Kayibanda, Bitera, and Alary 2012), and a few included spousal controlling behaviors as well (Kayibanda, Bitera, and Alary 2012). The manner in which these studies assessed intimate partner violence and the forms of violence they examined may have influence both the reporting of violence and the detection of associations with other factors, including HIV prevalence (Lary et al. 2004; O'Leary and Kar 2010). Finally, the inconsistent inclusion of HIV risk behaviors across studies makes it difficult to compare their findings.

Given that the studies' methodologies and definitions vary substantially, it is not surprising that their findings also vary. Silverman and colleagues (2008) found that women who have experienced both physical and sexual spousal violence were 3.92 times more likely (p=.01) to be HIV-positive, but found no significant association between the experience of other combinations of spousal violence and HIV status. In contrast, Kayibanda and colleagues (2012) found that emotional violence—but not physical violence, sexual violence, or controlling behaviors—was significantly associated with women's HIV status, among currently married/cohabiting women in Rwanda, after adjusting for socio-demographic characteristics. Harling and colleagues (2010) examined combinations of physical and sexual violence among ever-married women and, as mentioned, found no association. The range in findings may well depend on variations across studies in the conceptualization of violence (for example, the study by Harling and colleagues did not consider domains of emotional violence and controlling behaviors), differences in analytic methodologies, and the range of covariates included in multivariate models (such as the problematic inclusion of risk factors that could be part of the pathways between spousal violence and HIV).

Our study adds to the literature on the association between spousal violence and HIV status by focusing on cross-sectional data from married couples, in the five countries mentioned. A focus on couples permits a more comprehensive examination of the link between HIV and spousal violence, since information is available on not only women at risk of spousal violence but also the spouses who perpetrate the violence. Specifically, this research considers information on both spouses' characteristics, HIV status, and risk behaviors in assessing the mechanisms through which women who experience spousal violence may have increased risk of being HIV-positive.

The remainder of this chapter attempts to specify the conceptual linkages between spousal violence, wives' and husbands' HIV risk factors, and women's HIV status. Subsequent chapters of the report detail the data and analytical approach and give results from our analyses. Results are reported in several separate sections, first describing levels and domains of spousal violence, then showing associations among the different segments of our conceptual framework, and finally presenting multivariate analyses testing for the presence of a direct effect of spousal violence on women's HIV status in the presence of women's and their husbands' HIV risk factors and husbands' HIV status. A final chapter provides some conclusions.

1.1   Gender Framework: Clusterings of HIV Risk Factors and Experience of Spousal Violence

Many of the population-based studies exploring the link between forms of intimate partner violence and HIV status have not explicitly articulated, let alone modeled, the pathways through which intimate partner violence influences HIV status. The conclusions from these studies may differ due to the variable inclusion or exclusion of intervening factors through which violence affects HIV status. This report seeks to clarify the ways in which the experience of spousal violence may lead to increased odds of having HIV among married women, using data from both wives and their husbands and guided by a conceptual framework depicting possible pathways by which violence could indirectly affect HIV status.

The usual interpretation given to an association, if detected, is that spousal violence increases the risk of HIV for women[1]. Yet, a direct effect on HIV status is unlikely. While incidents of sexual violence can directly lead to HIV infection, the low rate of transmission in any given sexual encounter makes unlikely a large, statistically significant direct association between sexual violence and a woman's HIV status unless that violence is perpetual and frequent. It is more likely that sexual violence affects HIV status indirectly via similar mechanisms as emotional or physical violence. If spousal violence is to increase the odds of a woman having HIV, it likely does so indirectly through some intervening mechanisms, by association with her own risk behaviors, those of her spouse, or her spouse's HIV status.

We propose a gender-based conceptual framework in which the association between women's experience of spousal violence and her HIV status is mediated by two primary pathways. First, among men, the well-documented association between men's perpetration of violence and HIV behavioral risk factors points to an underlying traditional masculinity, associated with violent behavior toward female partners, male-dominant attitudes, multiple sexual partners, potential infidelity, risk-taking tendencies, and alcohol consumption, among other "male" behaviors (Townsend et al. 2011). In this view, men who are violent toward their spouses are also more likely to have the other behaviors associated with traditional masculine identity, and thereby are more likely to have acquired HIV.

Second, among women, there is also a gendered story to tell about the clustering of women's experience of spousal violence with higher prevalence of HIV risk behaviors. As Jewkes (2006) states, "the

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[1] The reverse causal direction, that having HIV leads to domestic violence, cannot be ruled out with cross-sectional data, and a spurious correlation is a possibility. However, the panel study conducted by Maman and colleagues (2010) lends credibility to the standard interpretation.

experience of violence…reinforces gendered power inequalities that impact on women's HIV risk." Several studies examine the psychological mechanisms through which the experience of violence could contribute to women's HIV risk behaviors—for example, through altering women's self-efficacy or diminishing women's power in the relationship (Jewkes, Dunkle, et al. 2006; Mittal, Senn, and Carey 2011; Raj, Silverman, and Amaro 2004). One study that examined the association between women's experience of violence and condom negotiation efficacy, in a sample of incarcerated women in three US states, found that women who had experienced violence had significantly lower confidence to negotiate condom use with a partner (Swan and O'Connell 2011).

It has also been theorized that this link could partially be explained by depressive symptoms resulting from intimate partner violence, and the associated increases in alcohol and drug consumption (Mittal, Senn, and Carey 2011). In a sample of women in the US, the experience of intimate partner violence in the last three months was found to be associated with having had more episodes of unprotected sex with a steady partner, with drug use before sex, and with depressive symptoms (Mittal, Senn, and Carey 2011). Pitpitan and colleagues (2013) found that the experience of physical violence was strongly associated with women's alcohol consumption, and that even after controlling for women's alcohol use, the experience of physical spousal violence remained significantly associated with women's sexual risk behaviors, including the number of male sex partners, the likelihood of unprotected sex, the occurrence of sex under the influence of alcohol, and the occurrence of a recent sexually transmitted infection (STI).

Some authors highlight the potential for direct transmission of HIV via forced sex (Andersson and Cockcroft 2012; Stockman et al. 2013). Others document that, in addition to the fact that men who perpetrate intimate partner violence have higher HIV prevalence, within couples where the man is HIV-positive the odds that the female partner contracts HIV are higher where the male partner has perpetrated intimate partner violence (Decker, Seage, Hemenway, Raj, et al. 2009). Possible explanations for this added risk include psychological trauma, reduced immunity due to stress, and potentially higher risk behaviors that increase the changes for HIV transmission (Campbell et al. 2008).

1.2   Conceptual Framework

This paper seeks to clarify the ways in which the experience of spousal violence may lead to increased odds of having HIV among married women. It does so using data from both wives and their husbands and nuanced measures of spousal violence, and is guided by a conceptual framework depicting possible pathways by which spousal violence could affect HIV status.

Figure 1. Conceptual pathways from spousal violence to HIV

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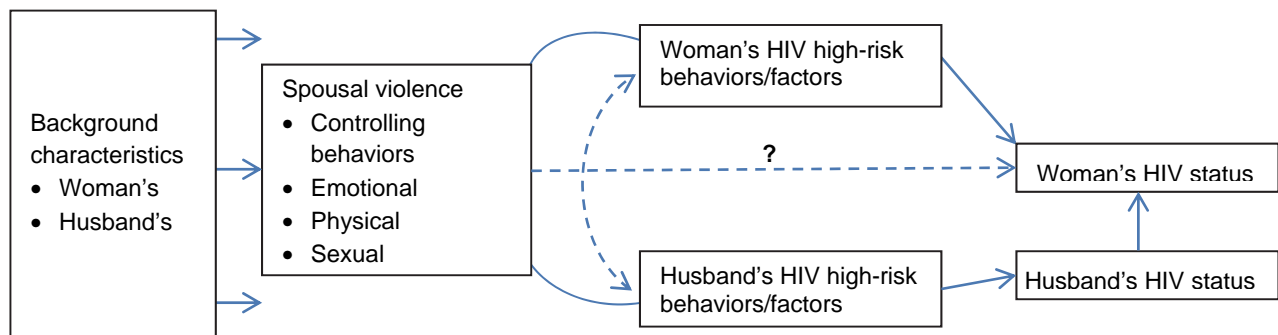
As illustrated above, we consider multiple forms of spousal violence: emotional, physical, and sexual violence. We also consider controlling behaviors by husbands toward their wives—such as acting jealous or suspicious, or trying to limit their actions (see "Analytical Approach")—which the literature alternately conceptualizes as a separate form or a predictor of spousal violence or as a component of (usually emotional) violence (e.g. Tjaden 2004; Watts and Mayhew 2004).

We question the plausibility of a direct effect of spousal violence on women's HIV status and instead posit two indirect mechanisms for such an association: husbands' HIV high-risk behaviors/factors and wives' high-risk behaviors/factors. Husbands who perpetrate violence against their wives may exhibit riskier sexual behaviors, abuse alcohol or drugs, or be HIV-positive (Campbell et al. 2008; Decker, Seage, Hemenway, Raj, et al. 2009; Dunkle and Decker 2013; Fals-Stewart and Kennedy 2005; Lary et al. 2004; Makayoto et al. 2013; Maman et al. 2010; Silverman et al. 2008; Teti et al. 2006). This association may be the result of adherence to traditional masculine norms, discussed above, or gender-inequitable attitudes that devalue women and perpetuate sexual double standards (Dunkle and Decker 2013). Since these are co-occurring behaviors—being violent is not likely to cause sexual risk-taking, nor is engaging in risky sexual behaviors likely to cause spousal violence—except insofar as risky sexual behaviors, such as infidelity, may cause marital conflict (Lary et al. 2004; Schensul et al. 2006)). No causal direction is implied in the Conceptual Framework, as indicated by the curved line in the figure above.

Women who experience violence may engage in riskier behaviors of their own, as discussed above. They are likely to experience lower levels of personal empowerment and agency, and thus their ability to demand fidelity from their partner may be compromised. They also may be less able to negotiate the terms of sexual activity, such as insisting upon condom use or refusing sex when the husband as an STI or its symptoms. That is, women who experience spousal violence face a loss of efficacy or a "choice disability" (Andersson, Cockcroft, and Shea 2008; Stockman et al. 2013). Furthermore, as mentioned, the experience of spousal violence is associated with poor mental health outcomes, low self-esteem and self-worth, alcohol and drug use, which are in turn associated with riskier sexual behaviors (González-Guarda, Florom-Smith, and Thomas 2011; Meyer, Springer, and Altice 2001; Teti et al. 2006). Several studies have noted that sexual abuse, in particular, earlier in life is associated with riskier sexual behaviors in adulthood (Andersson, Cockcroft, and Shea 2008; Stockman et al. 2013). The riskier behaviors lead to an increased likelihood of a woman herself being HIV-positive. As for men, no causal direction is attributed to the association between spousal violence and women's HIV risk factors, as these may operate in both directions, or may co-occur.

This paper addresses the following questions about the potential pathways through which the experience of spousal violence may affect women's HIV status:

- Are all forms of spousal violence equally and similarly associated with women's HIV status? For which forms of spousal violence does this association exist?

- How strong is the relationship between spousal violence and individual/partner risk factors? Is spousal violence more strongly associated with women's or their husbands' risk factors?

- Does the relationship between spousal violence and women's HIV status disappear when risk factors and their husbands' HIV status are accounted for?

2 Data, Measures, and Analytical Approach

2.1 Data

The data for this study come from six recent Demographic and Health Surveys (DHS) in sub-Saharan Africa: Kenya 2008-09, Malawi 2010, Rwanda 2005, Rwanda 2010, Zambia 2007, and Zimbabwe 2010-11. The DHS is a nationally representative, population-based household survey that monitors reproductive health behaviors, attitudes, and outcomes, demographic trends, maternal and child health, and social and demographic characteristics of women and men of reproductive age. Many DHS surveys also collect biomarker data to test for HIV, malaria parasitemia, and anemia levels. DHS data are collected in face-to-face household interviews, and three standard core questionnaires—household, woman's and man's—are included in each survey, enabling analysis across countries.

The DHS uses multistage cluster sampling techniques to obtain nationally representative samples. In the countries included in this report, in the first sampling stage each country was stratified into major regions (or districts, in the case of Malawi 2010 and Rwanda 2010). Census-based geographic enumeration areas were selected from these regions, with a probability of selection proportional to their size. The enumeration areas were then mapped and all households listed. In the second sampling stage, households were randomly selected from a list of all households within each selected enumeration area. Urban areas and less populated areas were typically oversampled to enable representative regional and rural-urban comparisons.

All analyses are weighted using the domestic violence weight calculated in the DHS datasets. Additionally, we use the svy commands available within Stata to account for the complex sampling design and estimate robust standard errors.

In addition to the core questionnaire, the DHS has several additional modules that countries can elect to include in a survey. This study takes advantage of the DHS domestic violence module, which was first developed and standardized in 2000 and has, to date, been included in 79 surveys to collect data on spousal violence against women. The portion of the module specific to spousal violence uses a greatly modified version of the conflict tactics scales (CTS) (Straus 1979, 1990). The module includes questions that ask women whether their current or most recent (if divorced, separated, or widowed) husband/partner ever perpetrated any of a series of behaviorally specific acts of physical or sexual violence. Women who say yes to a particular item are then asked about the frequency of perpetration in the 12 months preceding the interview. The module also includes questions about a series of controlling behaviors that apply to the respondent's relationship with her current or most recent husband/partner.

This study uses information from women's responses to having *ever* experienced each type of violent act by their current husband, as well as their responses to questions about whether their current husband exhibits controlling behaviors. Note that, as mentioned, throughout this report the term husband refers to men who are legally married to the respondent or who live with her as if married.

Recent sub-Saharan African surveys were considered for inclusion in the study if: (1) they were conducted in 2005 or later and the data were publicly available by June 2013; (2) they included the domestic violence module, (3) they included HIV testing for both women and men; and (4) there was an overlap between the HIV-tested subsample and the subsample selected for the domestic violence module. Of the nine countries that met these criteria, four were excluded due to the small sample size available for analysis, which greatly limited the power to detect key associations (Burkina Faso, Liberia, Mali, and Sao Tomé and Principe). While the intention was to include only the most recent survey in any given country, we included both the Rwanda 2005 and Rwanda 2010 DHS surveys, since the 2010 survey did not collect

information on several key measures (emotional violence and controlling behaviors), while the 2005 survey contained this information.

Table 1 displays the derivation of the analytic sample. From the total number of eligible women age 15-49 with completed interviews, the sample was first restricted to women who were administered the domestic violence module. Whereas all women age 15-49 in a household are eligible for the DHS woman's questionnaire, only one randomly selected eligible woman per household is administered the domestic violence module. This practice is in accordance with WHO guidelines (2001) on the ethical conduct of domestic violence research, in order to maintain confidentiality and maximize the safety of the respondents. Further, the domestic violence module may be administered in only a subsample of all sampled households. In Kenya, Zambia, and Zimbabwe, the domestic violence module was administered in all households. In Malawi, however, it was administered in every third household, and in both Rwanda surveys, in ever second household.

The sample for analysis was further restricted to women who provided blood for HIV testing and had a valid test result. HIV testing was conducted for all women who were eligible to be interviewed and who provided consent in all households in the Zambia and Zimbabwe surveys, in every second household in the Kenya and both Rwanda surveys, and in every third household in the Malawi survey. Finally, the sample was restricted to matched married couples for whom the husband also had a valid HIV test result, and both spouses had complete information for key background characteristics and risk factors. The eligibility criteria for men varied slightly across study countries. Men age 15-54 were eligible for interview in Kenya, Malawi, and Zimbabwe, while in Zambia and both Rwanda surveys men age 15-59 were eligible for interview.

The final sample used for analysis included 873 Kenyan couples, 2,627 Malawian couples, 1,452 Rwandan couples (2005 DHS), 2,013 Rwandan couples (2010 DHS), 1,611 Zambian couples, and 1,711 Zimbabwean couples (Table 1). Couples include both those who are married and those who are cohabiting as if married.

Table 1. Derivation of the analytic sample

Country	Survey year	Total unweighted number of women	Total unweighted number of women with domestic violence module administered	Total unweighted number of women who also had HIV testing done and have a valid result	Total unweighted number of women who were successfully matched with a husband with valid HIV results
Kenya	2008-9	8,444	6,318	2,862	1,071
Malawi	2010	23,020	6,229	5,836	2,994
Rwanda	2005	11,321	4,066	4,021	1,848
Rwanda	2010	13,671	5,008	4,986	2,438
Zambia	2007	7,146	5,236	4,192	1,983
Zimbabwe	2010-11	9,171	6,542	5,644	1,986

2.2   Measures

The key outcome measure in this study is women's current HIV status. HIV testing has been included as part of MEASURE DHS surveys in at least 31 countries since 2001. Standard testing protocol provides for anonymous, informed, and voluntary testing of women and men. Response rates for HIV testing in study countries range from 79.4 percent among men in Zambia to 99.6 percent among women in Rwanda (2010). Blood spots for HIV testing are collected on filter paper from a finger prick and are then transported to a laboratory. The laboratory protocol is typically based on an initial ELISA test, and then a retest of all positive samples with a second ELISA. The protocol in all countries specifies that 5 to 10 percent of the samples that are negative on the first ELISA test are retested. For samples with discordant results on the two ELISA tests, a new ELISA or a Western Blot is performed. The protocol for HIV testing undergoes ethical reviews in the host countries and in the United States.

Spousal violence, the key predictor variables, was measured using five domains of violence and controlling behaviors that consistently emerged in a factor analysis across all study countries, as will be described in more detail below (see Analytic Approach). The five domains include women's report of spousal emotional violence, spousal physical violence, and spousal sexual violence ever perpetrated by their current husbands; and women's report of two domains of controlling behaviors ever exhibited by their current husbands, which we label "suspicion" and "isolation." For all regression models, the five domains of violence and controlling behavior are measured as continuous variables, using the factor scores generated in the factor analysis. For several descriptive tables, three dichotomous summary variables are used to identify couples in which the wife reported any experience of each type of spousal violence by her husband; and two dichotomous summary variables to identify couples in which the wife reported that her husband exhibits at least one of the controlling behaviors in each domain.

The study also examined wives' and husbands' HIV risk factors, insofar as these could be important intermediary variables that might partially explain the observed association between spousal violence and HIV status. The HIV risk behaviors listed below have all been associated with HIV-positive status for women and men:

- **Lifetime number of sexual partners.** For women, the indicator has three categories: women who reported that they had sex with one partner, women who reported two partners, and women who reported three or more partners in their lifetime. For their husbands, the indicator has five categories: men who reported one partner, men who reported two partners, men who reported three partners, men who reported four or more partners, and men who reported that they did not know how many partners they had. The fifth category is included because a substantial number of husbands in several countries reported "don't know," which could indicate having many lifetime partners. Because our analysis is restricted to couples, and all respondents reported at least one sexual partner, there is no category for zero partners for either women or men. Women and men with missing responses are excluded from the analysis.

- **Sex with non-spousal, non-cohabiting partner**. This variable identifies women/men who reported sexual partners in the past 12 months other than their spouses or cohabiting partners. Men and women with missing information and women who responded that they did not know are excluded from the analysis.

- **Had an STI or STI symptoms in last 12 months**. During the interview, male and female respondents are asked three questions about sexually transmitted infections: whether in the 12 months preceding the survey they had a) an STI; b) a bad smelling abnormal genital discharge; and c) a genital sore or ulcer. This summary variable identifies women/men who reported either

that they had an STI, a genital sore or ulcer, or an unusual discharge in the past 12 months. Respondents with missing information for all three questions are excluded.

For an additional two high-risk behaviors included in the analysis, information is available only for men:

- **Ever paid for sex**. Men who reported that they have ever paid for sex are compared with men who reported that they have never paid for sex. In the Kenya and Zambia surveys studied, information was only collected about whether men paid for sex *in the last 12 months.* In these two cases, paying for sex in the last 12 months is used as a proxy for having ever paid for sex.

- **Husband's alcohol use**. This indicator, based on the wife's report, has three categories: husband does not drink or drinks but never gets drunk, husband drinks and sometimes gets drunk, and husband drinks and often gets drunk. Alcohol consumption has been associated with both perpetrating spousal violence and being infected with HIV. In cases where a wife did not provide the information on her husband's drinking habits, this variable is excluded.

Our analysis adjusted for demographic factors that, per the literature, would be likely to confound the association between spousal violence and women's HIV status. In selecting control variables, we were careful to avoid including variables that could be part of causal pathways between spousal violence and HIV, such as men's and women's HIV risk factors. From a full list of potential confounders, variables were selected for inclusion only if they had a significant bivariate association with women's HIV status and at least one violence factor score in at least one country. Three variables did not meet these criteria and were not included in the analysis: marital status (married versus cohabiting), whether the respondent's father beat her mother, and the spousal age difference. The controls chosen for inclusion in the analysis are the standard DHS household wealth quintiles, household place of residence (urban-rural), geographic region of the country, women's educational attainment (none, primary, secondary or higher), men's educational attainment (none, primary, secondary or higher), women's total number of children ever born (measured continuously), and wife's age at first marriage (measured continuously).

2.3   Analytical Approach

The DHS domestic violence module, as mentioned, uses a greatly shortened and modified conflict tactics scale (CTS) (Straus 1979) to measure different forms of spousal violence. One benefit of a CTS-style instrument for comparative research is that these items refer to specific behavioral acts, regardless of whether they are understood to constitute violence in a given cultural setting (Kishor and Bradley 2012). The many different types of acts and behaviors asked about in the DHS are organized into categories of physical, emotional, and sexual violence and controlling behaviors. Assigning different acts/behaviors into these four types of behavior is based on the face validity of the items according to experts in the field. However, we are unaware of any analysis that determines conclusively whether these groupings are validated by the data in the range of cultural settings in which the DHS module has been applied—for example, whether acts that other researchers consider to be physical violence share have more in common with each other than with acts that we consider to be emotional or sexual violence.

Additionally, for measuring prevalence or conducting analysis, the different items have to be summarized in some way to provide one or more indicators of violence. One common approach has been to assume that women in DHS surveys can be counted as having experienced violence if they respond yes to having experienced even one act (or some other predefined number of acts), thereby converting a large number of questions into a single dichotomous indicator. This indicator is based on the assumption that the experience of any act/behavior versus no act/behavior is more meaningful than the specific act/behavior or how many acts/behaviors are experienced. Another approach with similar assumptions uses a simple

additive index (sometimes referred to as a naïve index), which gives equal weight to each act/behavior (DiStefano, Zhu, and Mindrila 2009).

In this report we use factor analysis to understand the underlying structure of items related to spousal violence in the data and determine if these structures are similar or dissimilar across study countries. We then define violence measures derived from the factor scores resulting from this analysis. A factor score is essentially a weighted index in which the respondent's value on each item is weighted by the importance or influence of that item in the overall factor, as measured by its factor loading score (Pett, Lackey, and Sullivan 2003). These factor scores hold several advantages for measuring violence compared with other commonly used summary indicators. Factor scores are linear combinations of the observed variables produced by a multivariate procedure that accounts for correlations among factors (DiStefano, Zhu, and Mindrila 2009). By assessing the shared variance and uniqueness of items, the use of factor scores eliminates the need for arbitrary assumptions about how to combine the different items and how to weight them.

The factor analysis was conducted on the full sample of women to whom the domestic violence module was administered, rather than the restricted sample of women in couples in which both members had valid HIV test results. The larger, unrestricted sample was used in all study countries in order to uncover the relationship among observed spousal violence variables in the broadest sample possible.

We conducted exploratory factor analysis (EFA) using principal component factor extraction technique with oblique (Promax) rotation of factor loadings, as no strong assumptions about the independence of factors could be asserted (Pett, Lackey, and Sullivan 2003). Separate EFA solutions were sought for each survey sample, rather than pooling countries together. Factors were retained based on a combination of screeplots and a minimum eigenvalue of approximately 1.0 (Pett, Lackey, and Sullivan 2003). A strict restriction of an eigenvalue ≥ 1.0 was relaxed so as to detect any common structure across countries that might lie just below this threshold.

Sixteen spousal violence items, including six describing controlling behaviors, were included in the factor analysis, as follows:

Husband:

- Is jealous or angry if respondent talks with other men
- Frequently accuses respondent of being unfaithful
- Insists on knowing where respondent is at all times
- Does not permit respondent to meet her female friends
- Tries to limit respondent's contact with family
- Does not trust respondent with any money
- Ever says or does something to humiliate respondent in front of others
- Ever threatens to hurt or harm respondent or someone close to her
- Ever insults respondent or makes her feel bad about herself
- Ever pushes, shakes, or throws something at respondent
- Ever slaps respondent
- Ever punches respondent with his fist or hits with something that could hurt her

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- Ever kicks, drags, or beats up respondent

- Ever tries to choke or burn respondent on purpose

- Ever physically forces respondent to have sexual intercourse with him even when she does not want to

- Ever forces respondent to perform any sexual acts she does not want to

A seventeenth item describing violence with a weapon[2] was excluded from the analysis because the wording of the question was inconsistent across countries; the loading score for this item was both poor and sensitive to the variation in wording. The Rwanda 2010 survey included neither items describing controlling behaviors nor the three items describing humiliation, threats, and insults.

Items with factor loadings >0.40 were retained (Kootstra 2004; Pett, Lackey, and Sullivan 2003). Cronbach's alpha was calculated for each factor as a measure of inter-item reliability. Finally, factors were tested for correlation and, since they were slightly correlated, the oblique rotation was retained (Kootstra 2004). The final factor scores are estimated for each case and saved as new variables in the dataset. These factor scores, generated from the sample of women completing the domestic violence module, are subsequently used as latent variables in the regression analyses of spousal violence and HIV, which uses the more restricted sample of matched couples with spousal violence data from the wife and HIV status data for both members of the couple.

Using the factor regression scores as the key independent spousal violence variables, we analyze the relationship, if any, between spousal violence and women's HIV status. We run a sequence of multivariate regression models separately for each of the five countries (six surveys). For each, we first run unadjusted models by regressing women's HIV status on each of the spousal violence variables, and then we run adjusted models with controls for urban-rural residence, region, wealth quintile, women's education, husbands' education, women's occupation, husbands' occupation, women's age, husbands' age, total number of children ever born, and women's age at first birth (Table 5). The adjusted model serves as the base model for each country and indicates whether there is a relationship between the dependent variable, HIV-positive status, and the independent variables of interest.

We then run partial logistic regressions that model, in sections, each pathway of our conceptual model. Each of these models includes the same socio-demographic control variables as the corresponding base model. In sequence we regress women's HIV status on (a) their husbands' HIV status and HIV risk factors and (b) women's HIV risk factors (Table 6). We then regress women's risk factors on the spousal violence variables (Table 7), and the spousal violence variables on their husbands' risk factors (Table 8), with the spousal violence variables expressed as factor scores in both sets of regressions. This sequence of models helps to establish relationships between variables in each segment of the pathway(s) through which we expect spousal violence to affect women's HIV status.

A preferable analytical strategy to adopt for this purpose might be to simultaneously estimate a system of regression equations, but the cross-sectional nature of the survey data does not allow us to temporally sequence each of the variables to facilitate such an analysis. Therefore, we are restricted to making conclusions about associations rather than causation between HIV status, spousal violence, and factors along the conceptual pathway.

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[2] Some DHS questionnaires had an item about "*threats or attacks* with a knife or gun or any other weapon," while others asked about "*threats* with a knife or gun" only. In one survey, respondents were asked about threats and attacks in separate items.

Next, we run a series of additive models. To our base model of women's experience of spousal violence (again expressed as factor scores) and socio-demographic controls (Model 1), we first add husbands' HIV status and risk factors (Model 2). In Model 3 we replace husbands' risk factors with women's risk factors and, in Model 4 we include both sets of risk factors. This modeling approach allows us to distinguish any direct effect of spousal violence variables on women's HIV status from their indirect effects through HIV risk factors with which they are associated. A weakening of the significance of and/or reduction in the magnitude of the odds ratio for spousal violence variables in the presence of risk factors is taken as evidence of an indirect effect. Any residual significant odds ratio after controlling for risk factors is taken as evidence of a direct association between spousal violence and women's HIV status. All analyses are conducted using the domestic violence weights, unless otherwise indicated.

3   Results

3.1   Forms of Spousal Violence

We conducted factor analysis to determine how many violence-related factors emerge and if the same factors emerge in different settings. The results of the factor analysis using 16 violence-related items reveal a strikingly common structure of what constitutes different types of violence across the five countries included in this report.

Five factors emerge in each country, which we labeled as: (1) suspicion, (2) isolation, (3) emotional violence, (4) physical violence, and (5) sexual violence. These five factors account for 57 to 66 percent of the variance among the items in each country. All items load onto these factors in an identical pattern across the countries, as illustrated in Table 2. In the Rwanda 2010 survey, which did not include all 16 items, just two factors emerge—physical violence and sexual violence—but with the same items loading onto these factors as in the other countries. Detailed data on the factors and their item loading scores for each country can be found in Appendix Tables A1.1-A1.6.

Table 2. Pattern of spousal violence factors and item loadings

	Physical violence	Emotional violence	Suspicion	Isolation	Sexual violence
Husband/partner:					
Is jealous or angry if respondent talks with other men			▪		
Frequently accuses respondent of being unfaithful			▪		
Insists on knowing where respondent is at all times			▪		
Does not permit respondent to meet her female friends				▪	
Tries to limit respondent's contact with family				▪	
Does not trust respondent with any money				▪	
Ever says or does something to humiliate respondent in front of others		▪			
Ever threatens to hurt or harm respondent or someone close to her		▪			
Ever insults respondent or makes her feel bad about herself		▪			
Ever pushes, shakes, or throws something at respondent	▪				
Ever slaps respondent	▪				
Ever punches respondent with his fist or hits with something that could hurt her	▪				
Ever kicks, drags, or beats up respondent	▪				
Ever tries to choke or burn respondent on purpose	▪				
Ever spits in respondent's face*	▪				
Ever physically forces respondent to have sexual intercourse with him even when she does not want to					▪
Ever forces respondent to perform any sexual acts she does not want to					▪

*Rwanda 2005 only

Table 3 shows the Cronbach's alpha internal reliability measure for each of the factors and the eigenvalue for the five factor solution, all of which approach 1.0, among the five countries (six surveys). In all countries the first factor that emerges is the physical violence factor, followed by the emotional violence factors. Physical violence is composed of five items, with a sixth item, "husband/partner ever spit in respondent's face," included only in the Rwanda 2005 survey, also loading on the physical violence factor in that sample. The Cronbach's alpha for this factor ranges from 0.73 in Zimbabwe to 0.84 in Malawi.

Table 3. Internal reliability and eigenvalues for five spousal violence factors

		Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
Cronbach's alpha	Suspicion	0.6759	0.6546	0.6088	na	0.6815	0.6277
Cronbach's alpha	Isolation	0.5815	0.6609	0.6750	na	0.5765	0.6375
Cronbach's alpha	Emotional Violence	0.7619	0.7963	0.6844	na	0.7423	0.6466
Cronbach's alpha	Physical Violence	0.7795	0.8384	0.8312	0.7801	0.7437	0.7273
Cronbach's alpha	Sexual Violence	0.5821	0.6474	0.6700	0.6653	0.7530	0.7079
Eigenvalue for the five factor solution		*0.8618*	*1.0077*	*1.0364*	*0.9811*	*0.9344*	*0.8997*

na: not available

Emotional violence is composed of three items capturing whether a woman's husband ever humiliated her in front of others, threatened to hurt her, or insulted her. The Cronbach's alpha for this factor ranges from 0.65 in Zimbabwe to 0.80 in Malawi. Sexual violence, with its two items, consistently remains as a separate factor, and its alpha ranges from 0.58 in Kenya to 0.75 in Zambia. This apparent structure regarding these three factors largely validates the three forms of violence commonly conceptualized by experts in this field.

Two factors, rather than one, consistently emerge to capture controlling behaviors. The first, termed "suspicion", includes three items for husband is jealous if respondent talks with other men, accuses her of infidelity, and insists on knowing where she is. For this factor, the Cronbach's alpha ranges from 0.61 in Rwanda (2005) to 0.68 in Zambia. The second controlling behavior factor, "isolation", includes three items for husband prevents respondent from meeting with female friends, limits her contact with family, and does not trust her with money; and its alpha ranges from 0.58 in Zambia and Kenya to 0.68 in Rwanda (2005).

This finding of two factors for the controlling behaviors offers new insight into the nature of spousal violence, in two ways. First, it indicates that controlling behaviors are separate factors from emotional violence or any other violence factor, rather than being a component of any of these forms of violence. Second, it suggests that suspicion and isolation are distinct forms of controlling behaviors.

Most factors are only modestly correlated with one another, with a correlation coefficient ranging from 0.2 to 0.6 (not shown). Correlations are weakest between the sexual violence factor and either of the two controlling behavior factors, suspicion and isolation. They are highest between physical violence and emotional violence, ranging from 0.54 in Rwanda (2005) to 0.61 in Kenya. This pattern persists in all five countries. Because factors are somewhat correlated, an oblique rotation was retained for the solution that produced the factor scores for these five factors.

3.2 Profile of Spousal Violence and HIV

As discussed, findings from the factor analysis suggest that there are two consistent domains of controlling behaviors (isolation and suspicion) and three consistent domains of spousal violence (emotional violence, physical violence, and sexual violence) across the five study countries. Table 4 presents the prevalence of each domain of spousal violence and controlling behaviors, as well as HIV prevalence among women in the study population (married couples with complete information on spousal violence and HIV status). Prevalence is here defined as experiencing at least one item in that domain of spousal violence. For successive analyses, spousal violence factors scores are used rather than this measure. A profile of the countries in terms of their background characteristics and risk factors can be found in Appendix Tables A2 and A3.

Table 4. Prevalence of spousal violence, controlling behaviors, and women's HIV status in the analytic sample

	Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
	N=873	N=2,627	N=1,452	N=2,013	N=1,611	N=1,711
	%	%	%	%	%	%
Prevalence of spousal violence						
Controlling behaviors						
Suspicion*	55.9	58.1	46.1	na	74.9	62.2
Isolation**	33.0	18.3	24.5	na	36.2	21.3
Emotional violence***	27.6	23.2	9.3	na	22.2	26.5
Physical violence^	33.7	19.6	32.9	53.9	44.8	30.0
Sexual violence^^	14.5	15.3	11.7	14.8	16.7	16.6
Women's HIV prevalence	6.1	9.5	1.9	3.0	12.6	15.1

na: not available

* Identifies couples for whom the wife reports that her current husband exhibits at least one of the following behaviors: he is jealous if she talks with other men, accuses her of unfaithfulness, or insists on knowing where she is.

** Identifies couples for whom the wife reports that her current husband exhibits at least one of the following behaviors: he does not permit her to meet her female friends, tries to limit her contact with her family, or does not trust her with money.

*** Identifies couples for whom the wife reports any lifetime experience of the following items of violence with her current husband: the partner ever said or did something to humiliate the respondent in front of others, threatened to hurt or harm respondent or someone close to her, or ever insulted respondent or made her feel bad.

^ Identifies couples for whom the wife reports any lifetime experience of the following items of violence by her current husband: he ever pushed, shook her, or threw something at her, ever slapped her, ever punched respondent with his fist or hit with something that could hurt her, ever kicked, dragged, or beat up respondent, ever twisted respondent's arm or pulled hair, ever spit on her, or tried to choke or burn respondent on purpose.

^^ Identifies couples for whom the wife reports any lifetime experience of the following items of violence by her current husband: ever physically forced her to have sexual intercourse with him even when she did not want to, or ever forced her to perform any sexual acts she did not want to.

Of the five domains of violence and controlling behaviors, the cluster of suspicion-related controlling behaviors is the most prevalent form among couples in the five countries studied, ranging from 46 percent of wives in Rwanda (2005) to 75 percent in Zambia who reported that their husbands exhibit at least one of the three controlling behaviors in this domain (the husband is jealous or angry if she talks with other men, the husband accuses her of unfaithfulness, or insists on knowing where she is at all times). The second domain of controlling behaviors, which identifies women whose husbands do not permit them to meet their female friends, try to limit their contact with their family, or do not trust them with money, is far less prevalent, ranging from 18 percent of wives in Malawi to 36 percent in Zambia who reported that their husbands exhibit at least one of these controlling behaviors.

Of the three traditional forms of spousal violence, physical violence is consistently the most prevalent among study couples, followed by emotional violence and then sexual violence. Women's reported lifetime experience of any spousal physical violence ranges from 20 percent in Malawi to 54 percent in Rwanda (2010). About one-third of women in Kenya, Rwanda (2005), and Zimbabwe reported experiencing any physical violence, and nearly half of women in Zambia did. In all countries except Rwanda, between 20 and 30 percent of women reported any lifetime experience of spousal emotional violence; in Rwanda less than 10 percent of women reported any spousal emotional violence. In the five study countries the percentage of women who reported any lifetime experience of spousal sexual violence ranged from 12 percent in Rwanda (2005) to 17 percent in Zambia and Zimbabwe.

Table 4 also presents HIV prevalence among women in the study couples. HIV prevalence varies across the six surveys—at 2 percent in Rwanda 2005 and 3 percent in Rwanda 2010, 6 percent in Kenya, 10 percent in Malawi, 13 percent in Zambia, and 15 percent in Zimbabwe. Recall that these estimates are not representative of all women in the study countries, but rather a unique subsample of couples of reproductive age with both spouses successfully interviewed and tested for HIV with a valid result.

3.3 Associations between Spousal Violence and HIV
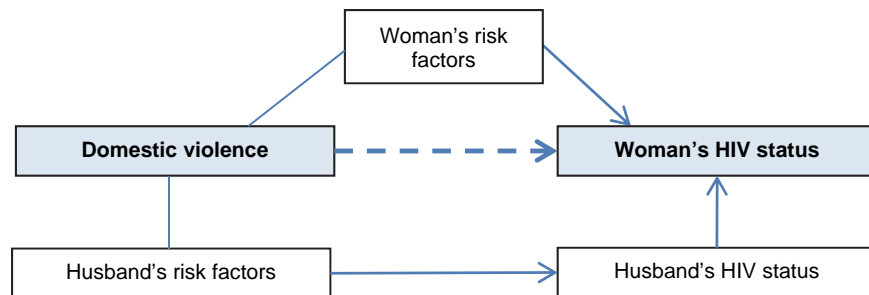
Table 5 presents unadjusted and adjusted odds ratios comparing the odds within study couples of the woman being HIV-positive, regressed on different forms of spousal violence. In the adjusted models the associations between each form of violence and women's HIV status were modeled separately, controlling for key demographic characteristics including the couple's place of residence, geographic region, and wealth quintile, both spouses' level of education, occupation, and age, the total number of children born to the wife, and the woman's age at first marriage/cohabitation.

Table 5. Unadjusted and adjusted associations between forms of spousal violence and women's HIV status in the analytic sample: odds ratios from separate logistic regressions

| | Kenya | | Malawi | | Rwanda 2005 | | Rwanda 2010 | | Zambia | | Zimbabwe | |
| | N=873 | | N=2,627 | | N=1,452 | | N=2,013 | | N=1,611 | | N=1,711 | |
	uOR	aOR	uOR	aOR	uOR	aOR	uOR	aOR	uOR	aOR	uOR	aOR
Controlling behaviors												
Suspicion	1.02	1.05	1.00	0.95	1.11	0.94	na	na	1.22*	1.18[†]	1.20**	1.31***
Isolation	1.03	1.10	1.00	1.02	1.23	1.00	na	na	1.23*	1.19[†]	1.13[†]	1.20*
Emotional	1.23	1.31[†]	1.02	0.97	1.41*	1.32[†]	na	na	1.28**	1.19	1.13*	1.21**
Physical	1.27*	1.36*	1.11	1.08	1.15	1.28	1.18	1.38*	1.18[†]	1.16	1.28***	1.39***
Sexual	1.05	1.00	0.95	0.97	1.13	1.01	1.03	1.12	1.10	1.04	1.05	1.13

*** p<=0.001; ** p<=0.01; * p<=0.05; [†] p<=0.10

uOR: unadjusted odds ratio; aOR: adjusted odds ratio

na: Not available

Note: the adjusted model control for place of residence (urban/rural), region, wealth (quintiles), women's education (none/primary/secondary+), men's education (none/primary/secondary+), women's occupation (unemployed/employed in agriculture/employed in non-agriculture), men's occupation (unemployed/employed in agriculture/employed in non-agriculture), women's age (4 categories), men's age (4 categories), total children ever born (continuous), women's age at first cohabitation (continuous).

In four of the six surveys, a significant bivariate association is observed between at least one form of violence and women's HIV status. In the adjusted model, spousal physical violence is significantly associated with women's HIV status in three of six surveys (Kenya, Rwanda 2010, and Zimbabwe). In Zimbabwe, notably, four of the five violence domains are significant. In Rwanda 2005 and Zambia, the association is not significant but the direction and magnitude of association are consistent, such that in all six surveys the odds of being HIV-positive are greater among women with higher scores on the physical violence scale. In Kenya, for example, each unit increase on the physical violence scale (which ranges from -1.1 to 4.2) is associated with a 36 percent increase in the adjusted odds of being HIV-positive.

Emotional violence is significantly associated with women's HIV status in the adjusted model in Zimbabwe, and is borderline significant (p<0.10) in Kenya and Rwanda 2005, such that scoring higher on the spousal emotional violence scale is associated with increased adjusted odds of being HIV-positive. In Zimbabwe each one unit increase on the emotional violence scale is associated with a 21 percent increase in the odds of being HIV-positive.

The association between spousal sexual violence—the least prevalent form of violence among study couples—and women's HIV status is not statistically significant in any of the six surveys.

The two domains of controlling behaviors are strongly and significantly associated with women's HIV status in Zimbabwe only. With each one-unit increase on the suspicion and isolation scales (scales range from -1.8 to 2.3 for suspicion, and -1.1 to 3.4 for isolation), the odds that a Zimbabwean woman is HIV-positive increase by 31 percent (suspicion) and 20 percent (isolation), respectively. In Zambia, too, suspicion and isolation are associated with women's HIV status, but the significance is only marginal.

In sum, after adjusting for likely confounders, at least one domain of spousal violence remains significantly associated with women's HIV status in Kenya, Rwanda (2010), and Zimbabwe. The most consistent associations appear to be between spousal physical and emotional violence and women's HIV status. Given that there is no direct causal pathway between any of the forms of spousal violence and women's HIV status, subsequent sections of the report will attempt to better understand indirect pathways that could explain the observed significant associations.

3.4   Relationship between HIV Status and Risk Factors

In order to understand the potential indirect effect that spousal violence may have on women's HIV status, we first need to assess the magnitude of the relationship between this outcome and the factors through which we expect spousal violence to exert influence on women's HIV status. Table 6 presents adjusted odds ratios obtained by regressing the wife's HIV status on known HIV risk behaviors and factors reported by women and by their husbands, controlling for a range of background characteristics.

We considered two variables representing HIV risk factors for women in separate models: lifetime number of partners and STI and STI symptoms in the last 12 months. A third risk factor, sex with a non-spousal partner, was omitted because reports of this behavior were exceedingly rare in most countries (See Appendix Table A3). A more extensive set of HIV risk factors for husbands, as well as the husband's HIV status, were also examined for an association with the wife's HIV status, again in separate models.

Table 6. Adjusted associations between women's HIV status (dependent variable) and wives' risk factors, husbands' HIV status, and husbands' risk factors in the analytic sample: odds ratios from separate logistic regressions

	Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
	N=873	N=2,627	N=1,452	N=2,013	N=1,611	N=1,711
	aOR	aOR	aOR	aOR	aOR	aOR
Women's risk factors^						
Lifetime number of partners						
One (reference)	1.00	1.00	1.00	1.00	1.00	1.00
Two	1.71	3.47 ***	2.38 *	3.88 ***	2.44 ***	4.02 ***
Three or more	4.14 ***	9.13 ***	2.31	6.32 ***	3.16 ***	6.78 ***
STI symptoms in last 12 months						
No STI (reference)	1.00	1.00	1.00	1.00	1.00	1.00
STI	3.42 *	1.83 **	4.55 **	4.06 ***	1.87	2.87 ***
Men's HIV status						
HIV negative (reference)	1.00	1.00	1.00	1.00	1.00	1.00
HIV positive	74.23 ***	31.06 ***	252.47 ***	432.39 ***	16.90 ***	32.67 ***

(Continued...)

Table 6. – *Continued*

	Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
	N=873	N=2,627	N=1,452	N=2,013	N=1,611	N=1,711
	aOR	aOR	aOR	aOR	aOR	aOR
Men's risk factors						
Lifetime number of partners						
One (reference)	1.00	1.00	1.00	1.00	1.00	1.00
Two	0.83	2.60 *	1.78	4.62 **	5.04 **	1.78 †
Three	0.97	5.32 ***	2.40 †	5.60 **	4.67 *	2.27 *
Four or more	0.66	6.12 ***	2.62 †	7.84 ***	8.20 ***	3.29 ***
Don't know	2.12	10.62 ***		63.10 **	7.25 **	5.67 ***
Sex with nonspousal, noncohabiting partner in last 12 months						
No (reference)	1.00	1.00	1.00	1.00	1.00	1.00
Yes	0.83	0.81	0.79	5.75 ***	2.09 **	0.89
STI symptoms in last 12 months						
No STI (reference)	1.00	1.00	1.00	1.00	1.00	1.00
STI	1.06	2.33 **	12.68 ***	4.16 ***	2.73 **	2.60 ***
Ever paid for sex						
No (reference)	na	1.00	1.00	1.00	1.00	1.00
Yes	na	1.02	1.42	4.03 ***	1.80	1.57 **
Alcohol use						
Husband doesn't drink or drinks but never drunk (reference)	1.00	1.00	1.00	na	1.00	1.00
Husband drinks and sometimes drunk	1.29	1.28	0.99	na	1.58 *	1.18
Husband drinks and often drunk	2.54 †	1.64 †	0.63	na	2.14 **	1.56 †

*** p<=0.001; ** p<=0.01; * p<=0.05; † p<=0.10

^ Women's risk factors are each run in separate models, adjusting for the following key control variables: place of residence (urban/rural), region, wealth (quintiles), women's education (none/primary/secondary+), men's education (none/primary/secondary+), women's occupation (unemployed/employed in agriculture/employed in non-agriculture), men's occupation (unemployed/employed in agriculture/employed in non-agriculture), women's age (4 categories), men's age (4 categories), total children ever born (continuous), women's age at first cohabitation (continuous).

Women's risk factors and women's HIV status
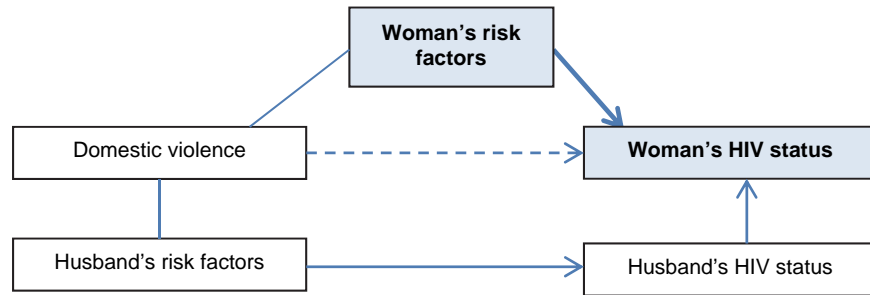
In general, in all countries both of the HIV risk factors for women that we examine are significantly associated with women being HIV-positive, controlling for background characteristics but not for each other. In Kenya, the odds of being HIV-positive are more than 400 percent higher among women who have had three or more sexual partners in their lifetime compared with women with one partner, but there is no significant difference between women with two lifetime partners and one lifetime partner. Curiously, among women in Rwanda (2005), having two partners in their lifetime is significantly associated with being HIV-positive, but having three or more partners is not. For the other surveys, women having either two partners or three or more partners in their lifetime are each significantly associated with increased odds of being HIV-positive. Similarly, in four countries the odds of being HIV-positive are 183 to 406 percent greater among women who had an STI or reported an STI or STI symptoms in the last 12 months. In Zambia no significant association is found between having an STI or STI symptoms and being HIV-positive.

Men's HIV status and women's HIV status

The most prominent predictor of a woman's HIV status, among all the factors considered in separate models, is her husband's HIV status. The odds ratio for a woman whose husband is HIV-positive being HIV-positive herself range from 16.9 times higher in Zambia to 432.4 times higher in Rwanda, compared with women whose husbands are not HIV-positive.

Men's risk factors and women's HIV status
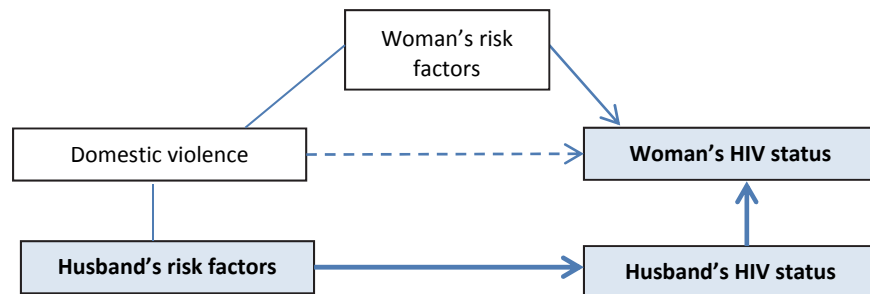
Husbands' other HIV risk factors are far less consistent in their adjusted associations with their wives' HIV status than are either husbands' HIV status or women's risk factors. In Kenya, none of the husbands' risk factors examined are significantly associated with their wives being HIV-positive, except for husbands' alcohol use, which is marginally significantly associated ($p<0.10$) with women's HIV status only for women whose husbands are frequently drunk. In the other countries, the husbands' risk factors that are most commonly associated with women's HIV status are experience of STI or STI symptoms in the last 12 months and lifetime number of partners, which are significant in four of the five countries. The odds of being HIV-positive are approximately 200 percent higher among women whose husbands have had an STI or STI symptom in the last 12 months compared with women whose husbands have had no symptoms, in most samples; this figure is even higher in both Rwanda surveys. In all countries except Kenya, the odds of the wife having HIV increases steadily with the lifetime number of partners her husband has had. However, this association is only borderline significant in the Rwanda 2005 survey.

The other husbands' risk factors are less frequently associated with women's HIV status. In Rwanda (2010) and Zambia the odds of being HIV-positive are higher among women whose husbands reported having had sex with a non-spousal, non-cohabiting partner in the last 12 months, and in Rwanda 2010 and Zimbabwe among women whose husbands reported ever paying for sex. In Zambia women whose husbands drink and are sometimes or often drunk have increased odds of being HIV-positive, In Malawi and Zimbabwe, as in Kenya, and this association is also borderline significant among women whose husbands are often drunk.

3.5   Relationship between HIV Risk Factors and Spousal Violence
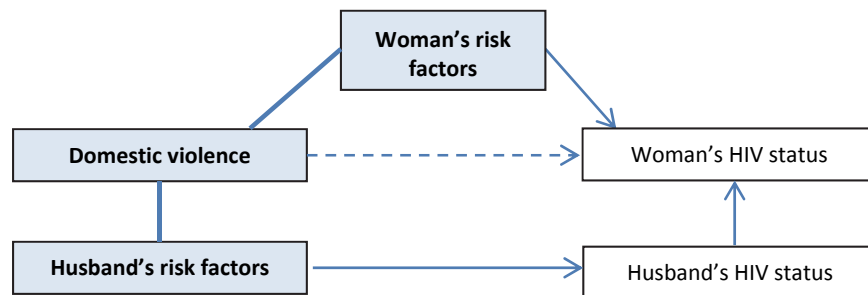
In this section we explore the potential indirect effect of spousal violence on women's HIV status by investigating the association between spousal violence and women's and their husbands' HIV risk factors, many of which are significantly associated with women's HIV-positive status, as demonstrated in the previous section. Table 7 shows the adjusted associations between spousal violence and both women's HIV risk factors—first, having an STI or STI symptoms in the last 12 months and, second, having two or more sexual partners in their lifetime. For each risk factor, the effect of the three forms of spousal violence and both forms of controlling behaviors are estimated in separate models, controlling for background characteristics. Table 8 shows the adjusted coefficients in ordinary least squares models in which women's spousal violence and controlling behavior factor scores (one adjusted model for each factor) are regressed on husbands' risk factors, with background characteristics as covariates.

Spousal violence and women's HIV risk factors

As Table 7 shows, most of the spousal violence measures are significantly associated with both risk factors for women. These associations are weakest in Kenya.

Table 7. Adjusted associations^ between women's HIV risk factors and spousal violence in the analytic sample: odds ratios from separate logistic regressions

	Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
	N=873	N=2,627	N=1,452	N=2,013	N=1,611	N=1,711
	aOR	aOR	aOR	aOR	aOR	aOR
Dependent variable 1: woman had STI or STI symptoms in last 12 months						
Controlling behaviors						
Suspicion	0.88	1.41 ***	1.37 **	na	1.32 *	1.32 **
Isolation	0.98	1.32 ***	1.31 *	na	1.12	1.24 *
Emotional	1.46 *	1.47 ***	1.33 *	na	1.50 ***	1.33 **
Physical	1.28 †	1.24 **	1.45 ***	1.51 ***	1.51 ***	1.41 ***
Sexual	1.37 **	1.27 ***	1.29 **	1.39 ***	1.33 **	1.32 ***
Dependent variable 2: woman reported 2 or more lifetime sexual partners^^						
Controlling behaviors						
Suspicion	1.49 ***	1.20 ***	1.24 **	na	1.20 **	1.38 ***
Isolation	1.16	1.07	1.20 *	na	1.19 **	1.16 *
Emotional	1.38 **	1.12 *	1.15 †	na	1.29 ***	1.21 **
Physical	1.40 **	1.13 *	1.17 *	1.33 ***	1.34 ***	1.25 ***
Sexual	1.00	1.17 **	0.91	1.11 †	1.15 *	1.09

*** p<=0.001; ** p<=0.01; * p<=0.05; † p<=0.10

^ Forms of violence are run in separate logistic models, adjusting for the following key control variables: place of residence (urban/rural), region, wealth (quintiles), women's education (none/primary/secondary+), men's education (none/primary/secondary+), women's occupation (unemployed/employed in agriculture/employed in non-agriculture), men's occupation (unemployed/employed in agriculture/employed in non-agriculture), women's age (4 categories), men's age (4 categories), total children ever born (continuous), women's age at first cohabitation (continuous).

^^ Women's lifetime number of sexual partners was collapsed to create a binary indicator comparing women with two or more lifetime sexual partners to women with 1 reported sexual partner, so that comparable logistic regression models could be run for both risk factors.

Women in Malawi, Rwanda, Zambia and Zimbabwe face 32 to 41 percent higher odds of having an STI or STI symptom in the last 12 months with each unit increase in the experience of suspicious controlling behavior by their husbands. A similar increase in odds is apparent for women who experience isolating behaviors by their husbands in Malawi, Rwanda, and Zimbabwe, but not Zambia. These associations were not found in Kenya.

The experience of emotional, physical, or sexual violence is each associated with higher odds of having had an STI or STI symptom in the last 12 months, in all five countries. The magnitude of this association is largest for emotional and physical violence, although in Kenya the experience of spousal physical violence is only marginally significantly associated with reported STI or STI symptoms.

Similarly, with regard to the lifetime number of sexual partners, in Rwanda (2005), Zambia, and Zimbabwe both controlling behavior measures are associated with greater odds of having two or more partners, while in Kenya and Malawi experiencing suspicious controlling behaviors, but not isolating behaviors, is associated with having two or more partners. In all five countries women who experience a greater degree of either emotional or physical violence by their husbands also are more likely to have had two or more sexual partners in their lifetime. However, a significant association between the experience of sexual violence and the lifetime number of partners is apparent in only three of the six surveys (Malawi, Rwanda 2010, and Zambia), and the magnitude of the odds ratio is smaller than for other violence measures.

In summary, several measures of spousal violence are frequently associated with women's HIV risk factors. The relationship between husbands' controlling behaviors, especially isolation, and women's risk factors is less consistent than with other forms of violence. The association between experience of sexual violence and a wife's lifetime number of partners is evident in fewer countries.

Spousal violence and husbands' HIV risk factors

In general, the association between women's experience of spousal violence and husbands' HIV risk factors is weaker and less consistent than with women's HIV risk factors (Table 8). Alcohol use is the risk factor most strongly and consistently associated with the experience of spousal violence. The likelihood of experiencing every form of spousal violence and controlling behavior is much greater among women whose husbands are often drunk compared with women whose husbands do not drink at all or who drink but are never drunk.

Table 8. Adjusted linear associations^ between spousal violence (dependent variable) and husbands' HIV risk factors in the analytic sample: coefficients from linear regressions

	Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
	aβ	aβ	aβ	aβ	aβ	aβ
Dependent variable 1: suspicion controlling behavior						
Husband's lifetime number of partners						
One (reference)	1.00	1.00	1.00	na	1.00	1.00
Two	-0.18	0.21 **	0.04	na	0.03	0.26 **
Three	-0.24	0.10	0.04	na	0.17 †	0.22 *
Four or more	0.01	0.16 *	0.03	na	0.20 *	0.15 †
Don't know	0.02	0.35 *	na	na	0.10	0.39 **
Husband had sex with nonspousal, noncohabiting partner in last 12 months (Y/N)	-0.03	-0.07	0.15 †	na	-0.06	-0.02
Husband had STI symptoms in last 12 months (Y/N)	0.30	0.15	0.05	na	0.12	0.13
Husband ever paid for sex (Y/N)	0.34	0.05	0.10	na	0.05	0.05
Husband's alcohol use						
Husband doesn't drink or drinks but never drunk (reference)	1.00	1.00	1.00	na	1.00	1.00
Husband drinks and sometimes drunk	0.28 *	0.12 *	0.12 *	na	0.20 **	0.19 ***
Husband drinks and often drunk	0.52 ***	0.49 ***	0.65 ***	na	0.42 ***	0.55 ***
Dependent variable 2: isolation controlling behavior						
Husband's lifetime number of partners						
One (reference)	1.00	1.00	1.00	na	1.00	1.00
Two	-0.22	0.14 **	0.04	na	-0.07	0.19 *
Three	-0.33	0.17 *	0.06	na	-0.05	0.14 †
Four or more	-0.31	0.17 **	0.01	na	-0.02	0.14 †
Don't know	-0.31	0.01	na	na	0.01	0.38 *
Husband had sex with nonspousal, noncohabiting partner in last 12 months (Y/N)	-0.05	-0.06	0.24 *	na	0.14 *	-0.06
Husband had STI symptoms in last 12 months (Y/N)	-0.09	0.03	0.01	na	0.00	0.12
Husband ever paid for sex (Y/N)	-0.03	0.01	0.11	na	-0.19	0.01

(Continued...)

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Table 8. – *Continued*

	Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
	aβ	aβ	aβ	aβ	aβ	aβ
Husband's alcohol use						
Husband doesn't drink or drinks but never drunk (reference)	1.00	1.00	1.00	na	1.00	1.00
Husband drinks and sometimes drunk	0.10	0.08	0.06	na	0.03	0.10 †
Husband drinks and often drunk	0.56 ***	0.39 ***	0.53 ***	na	0.22 **	0.41 ***
Dependent variable 3: emotional spousal violence						
Husband's lifetime number of partners						
One (reference)	1.00	1.00	1.00	na	1.00	1.00
Two	-0.11	0.10 †	0.07	na	-0.02	0.07
Three	-0.09	0.00	0.09	na	0.01	0.08
Four or more	0.11	0.08	0.16 *	na	0.10	0.09
Don't know	0.19	0.05	na	na	0.10	0.30
Husband had STI symptoms in last 12 months (Y/N)	0.38	0.27 **	0.09	na	-0.04	0.02
Husband's alcohol use						
Husband drinks and sometimes drunk	0.01	0.16 **	0.08 *	na	0.08	0.17 **
Dependent variable 4: physical spousal violence						
Husband's lifetime number of partners						
One (reference)	1.00	1.00	1.00	1.00	1.00	1.00
Two	0.00	0.10 †	0.11 *	0.15 **	0.03	0.16 *
Three	-0.01	0.04	0.19 **	0.05	0.05	0.16 †
Four or more	0.14	0.09 †	0.26 ***	0.14 *	0.10	0.17 *
Don't know	0.00	0.03	na	0.60 *	0.19	0.45 **
Husband had sex with nonspousal, noncohabiting partner in last 12 months (Y/N)	0.14	0.23 *	0.05	0.41 ***	0.04	0.12
Husband had STI symptoms in last 12 months (Y/N)	0.11	0.19 †	-0.02	0.01	0.19	0.05
Husband ever paid for sex (Y/N)	-0.25	-0.02	-0.16 †	-0.15 †	0.34	-0.15 *
Husband's alcohol use						
Husband doesn't drink or drinks but never drunk (reference)	1.00	1.00	1.00	na	1.00	1.00
Husband drinks and sometimes drunk	0.05	0.10 *	0.17 ***	na	0.10 *	0.09 †
Husband drinks and often drunk	1.10 ***	0.85 ***	1.01 ***	na	0.72 ***	0.65 ***

(Continued...)

	Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
	aβ	aβ	aβ	aβ	aβ	aβ
Dependent variable 5: sexual spousal violence						
Husband's lifetime number of partners						
One (reference)	1.00	1.00	1.00	1.00	1.00	1.00
Two	-0.04	0.12 *	0.03	0.08	-0.07	-0.05
Three	0.06	0.15 *	0.16 *	-0.04	0.09	0.24 *
Four or more	-0.15	0.18 **	-0.03	0.00	0.11	0.01
Don't know	-0.12	0.16		-0.23	0.30	0.32 *
Husband had sex with nonspousal, noncohabiting partner in last 12 months (Y/N)	-0.06	-0.11	0.14	0.11	0.02	-0.13 †
Husband had STI symptoms in last 12 months (Y/N)	0.02	0.08	0.30 †	0.09	0.23	0.02
Husband ever paid for sex (Y/N)	0.07	0.13 †	0.14	0.16	0.06	-0.07
Husband's alcohol use						
Husband doesn't drink or drinks but never drunk (reference)	1.00	1.00	1.00	na	1.00	1.00
Husband drinks and sometimes drunk	0.13	0.05	0.10 *	na	0.01	-0.01
Husband drinks and often drunk	0.87 ***	0.51 ***	0.39 ***	na	0.39 ***	0.41 ***

*** $p<=0.001$; ** $p<=0.01$; * $p<=0.05$; † $p<=0.10$

na: not available

^ Husband's risk factors are run together in one model, adjusting for the following key control variables: place of residence (urban/rural), region, wealth (quintiles), women's education (none/primary/secondary+), men's education (none/primary/secondary+), women's occupation (unemployed/employed in agriculture/employed in non-agriculture), men's occupation (unemployed/employed in agriculture/employed in non-agriculture), women's age (4 categories), men's age (4 categories), total children ever born (continuous), women's age at first cohabitation (continuous).

Husbands' lifetime number of partners is associated with suspicion, physical violence, and sexual violence in three of the countries, and with isolation and emotional violence in two countries. The association of the experience of spousal violence with husbands' other HIV risk factors varies. For no form of spousal violence is there a consistent association with any other HIV risk factor in a majority of countries. For example, women whose husbands reported having an STI or STI symptoms in the last 12 months experience greater spousal emotional violence and physical violence in Malawi, but not elsewhere.

3.6   Nuanced Relationship between Spousal Violence and HIV
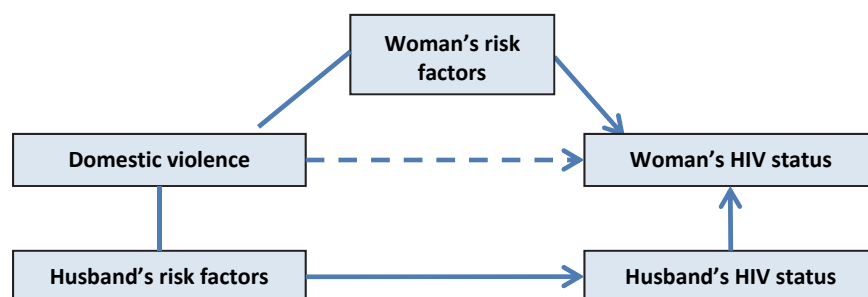
In order to determine whether the experience of spousal violence exerts an indirect effect on women's HIV status through their own or their husbands' risk factors, or has a net direct effect even controlling for these factors, a sequence of logistic regression models was run. In the first model women's HIV status is regressed on the experience of spousal violence and a range of background characteristics (also shown in Table 5). In Model 2 we add to this base model husbands' HIV status and HIV risk factors. We substitute women's own risk factors for their husbands' risk factors in Model 3; and in Model 4 we combine both sets of risk factors in a complete model of the projected pathways through which the experience of spousal violence may influence women's HIV status. Rather than presenting an exhaustive series of regressions for all five forms of violence and controlling behaviors for all five countries, we estimate this series of four models only for those forms of violence that initially have a significant association with women's HIV status in the base model (Model 1).

Suspicion and women's HIV status

As Table 9a shows, the odds of a woman being HIV-positive are 18 percent higher in Zambia and 31 percent higher in Zimbabwe with each unit increase in her suspicion factor score. However, in Zambia, this observed association disappears with the inclusion of either or both her own risk factors and her husband's risk factors and HIV status. This is in spite of the fact that few risk factors are independently associated with women's HIV status in either the spouse-specific models (Models 2 and 3) or the combined model (Model 4). Only women whose husbands are often drunk and who themselves have had more than two sexual partners in their lifetime have increased odds of being HIV-positive.

Table 9a. Multivariate associations^ between women's HIV status (dependent variable) and suspicion in the analytic sample: odds ratios from a sequence of logistic regressions^^

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
Zambia (WN=1,611)				
Controlling behavior--suspicion factor score	1.18 [†]	1.11	1.13	1.08
Male partner's HIV status				
Negative (reference)		1.00	1.00	1.00
Positive		15.85 ***	16.25 ***	15.72 ***

(Continued...)

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
Men's risk factors				
Lifetime number of partners				
One (reference)		1.00		1.00
Two		3.13		2.68
Three		2.26		1.87
Four or more		3.49 †		2.85
Don't know		2.83		2.43
Sex with nonspousal, noncohabiting partner in last 12 months				
No (reference)		1.00		1.00
Yes		1.47		1.41
STI symptoms in last 12 months				
No STI (reference)		1.00		1.00
STI		1.31		1.18
Ever paid for sex				
No (reference)		1.00		1.00
Yes		1.32		1.47
Alcohol use				
Husband doesn't drink or drinks but never drunk (reference)		1.00		1.00
Husband drinks and sometimes drunk		1.48		1.44
Husband drinks and often drunk		1.86 **		1.71 *
Women's risk factors				
Lifetime number of partners				
One (reference)			1.00	1.00
Two			2.28 ***	2.09 **
Three or more			2.80 ***	2.47 **
STI symptoms in last 12 months				
No STI (reference)			1.00	1.00
STI			1.32	1.12
Zimbabwe (WN=1,711)				
Controlling behavior--suspicion factor score	1.31 ***	1.23 *	1.14	1.11
Male partner's HIV status				
Negative (reference)		1.00	1.00	1.00
Positive		31.89 ***	33.30 ***	34.01 ***

(Continued...)

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
Men's risk factors				
Lifetime number of partners				
One (reference)		1.00		1.00
Two		1.23		1.12
Three		2.32 *		2.40 †
Four or more		2.44 *		1.83
Don't know		4.34 **		4.19 **
Sex with nonspousal, noncohabiting partner in last 12 months				
No (reference)		1.00		1.00
Yes		0.54 *		0.52 *
STI symptoms in last 12 months		.		.
No STI (reference)		1.00		1.00
STI		2.10 **		2.18 **
Ever paid for sex		.		.
No (reference)		1.00		1.00
Yes		0.88		1.00
Alcohol use		.		.
Husband doesn't drink or drinks but never drunk (reference)		1.00		1.00
Husband drinks and sometimes drunk		1.08		1.07
Husband drinks and often drunk		1.52		1.42
Women's risk factors				
Lifetime number of partners			.	.
One (reference)			1.00	1.00
Two			4.37 ***	4.43 ***
Three or more			6.23 ***	5.99 ***
STI symptoms in last 12 months				
No STI (reference)			1.00	1.00
STI			2.62 ***	2.70 ***

*** p<=0.001; ** p<=0.01; * p<=0.05; † p<=0.10

^ Models control for the following key control variables: place of residence (urban/rural), region, wealth (quintiles), women's education (none/primary/secondary+), men's education (none/primary/secondary+), women's occupation (unemployed/employed in agriculture/employed in non-agriculture), men's occupation (unemployed/employed in agriculture/employed in non-agriculture), women's age (4 categories), men's age (4 categories), total children ever born (continuous), women's age at first cohabitation (continuous). Model 1: Adjusts only for the control variables; Model 2: Adjusts for control variables, husband's HIV risk factors, and husband's HIV status; Model 3: Adjusts for control variables, the wife's HIV risk factors, and husband's HIV stats; Model 4: Adjusts for control variables, the husband and wife's HIV risk factors, and husband's HIV status.

^^ The model sequence is presented for all surveys in which the suspicion factor score was significantly associated with women's HIV status (p<.10) after adjusting for key control variables (see Table 5).

The findings appear to be slightly different in Zimbabwe. The highly significant direct effect of the experience of suspicious controlling behaviors is explained away not by the husbands' HIV risk factors but by women's own risk factors. Additionally, Models 2 and 3 indicate that more risk factors for both members of the couple are associated with women's HIV status. Both of the women's risk factors, and three of their husbands' risk factors—lifetime number of partners, having had an STI or STI symptoms, and having had a non-marital sexual partner—but not husbands' alcohol use—are associated with higher odds of women being HIV-positive. In both Zambia and Zimbabwe, their husbands' HIV status is, unsurprisingly, a significant predictor of women's own HIV status, and the odds ratios indicate this effect to be sizable.

Isolating controlling behaviors and women's HIV status

As Table 9b shows for Zambia and Zimbabwe, women's experience of isolating controlling behaviors by their husbands is associated with higher odds of having HIV, as was the case for husbands' suspicion. The pattern of this association across the series of models is also much the same. While women in both countries face approximately 20 percent greater odds of being HIV-positive with a unit increase in isolation scores when controlling only for background characteristics, this effect is no longer significant in models that control for women's own HIV risk factors and their husbands' risk factors.

Table 9b. Multivariate associations^ between women's HIV status (dependent variable) and isolation in the analytic sample: odds ratios from a sequence of logistic regressions^^

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
Zambia (WN=1,611)				
Controlling behavior--isolation factor score	1.19 †	1.11	1.11	1.08
Male partner's HIV status				
Negative (reference)		1.00	1.00	1.00
Positive		15.69 ***	16.13 ***	15.61 ***
Men's risk factors				
Lifetime number of partners				
One (reference)		1.00		1.00
Two		3.17		2.69
Three		2.33		1.91
Four or more		3.58 †		2.89
Don't know		2.83		2.41
Sex with nonspousal, noncohabiting partner in last 12 months				
No (reference)		1.00		1.00
Yes		1.45		1.39
STI symptoms in last 12 months				
No STI (reference)		1.00		1.00
STI		1.31		1.18

(Continued...)

33

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
Ever paid for sex				
No (reference)		1.00		1.00
Yes		1.35		1.49
Alcohol use				
Husband doesn't drink or drinks but never drunk (reference)		1.00		1.00
Husband drinks and sometimes drunk		1.51 [†]		1.46
Husband drinks and often drunk		1.89 **		1.73 *
Women's risk factors				
Lifetime number of partners				
One (reference)			1.00	1.00
Two			2.28 ***	2.08 **
Three or more			2.83 ***	2.48 **
STI symptoms in last 12 months				
No STI (reference)			1.00	1.00
STI			1.32	1.12
Zimbabwe (WN=1,711)				
Controlling behavior--isolation factor score	1.2 *	1.14	1.11	1.08
Male partner's HIV status				
Negative (reference)		1.00	1.00	1.00
Positive		32.04 ***	33.37 ***	33.98 ***
Men's risk factors				
Lifetime number of partners				
One (reference)		1.00		1.00
Two		1.29		1.15
Three		2.43 *		2.46 *
Four or more		2.48 *		1.84
Don't know		4.43 **		4.21 **
Sex with nonspousal, noncohabiting partner in last 12 months				
No (reference)		1.00		1.00
Yes		0.56 *		0.53 *
STI symptoms in last 12 months				
No STI (reference)		1.00		1.00
STI		2.14 **		2.2 **

(Continued...)

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
Ever paid for sex		.		.
No (reference)		1.00		1.00
Yes		0.9		1.01
Alcohol use				
Husband doesn't drink or drinks but never drunk (reference)		1.00		1.00
Husband drinks and sometimes drunk		1.12		1.09
Husband drinks and often drunk		1.56		1.43
Women's risk factors				
Lifetime number of partners				
One (reference)			1.00	1.00
Two			4.44 ***	4.49 ***
Three or more			6.43 ***	6.14 ***
STI symptoms in last 12 months				
No STI (reference)			1.00	1.00
STI			2.63 ***	2.71 ***

*** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$; † $p \leq 0.10$

^ Models control for the following key control variables: place of residence (urban/rural), region, wealth (quintiles), women's education (none/primary/secondary+), men's education (none/primary/secondary+), women's occupation (unemployed/employed in agriculture/employed in non-agriculture), men's occupation (unemployed/employed in agriculture/employed in non-agriculture), women's age (4 categories), men's age (4 categories), total children ever born (continuous), women's age at first cohabitation (continuous). Model 1: Adjusts only for the control variables; Model 2: Adjusts for control variables, husband's HIV risk factors, and husband's HIV status; Model 3: Adjusts for control variables, the wife's HIV risk factors, and husband's HIV stats; Model 4: Adjusts for control variables, the husband and wife's HIV risk factors, and husband's HIV status.

^^ The model sequence is presented for all surveys in which the suspicion factor score was significantly associated with women's HIV status (p<.10) after adjusting for key control variables (see Table 5).

In these models, too, a similar set of women's and husbands' HIV risk factors are associated with women's HIV status, as is the case for the models that included the suspicion factor. Notable differences include that the isolation factor in Zimbabwe is no longer significantly associated with the wife's HIV status when her husband's risk factors are controlled for (Model 2).

Emotional violence and women's HIV status

The emotional violence factor is significantly associated with higher odds of having HIV for women in Kenya, Rwanda (2005), and Zimbabwe (Table 9c). The odds of being HIV-positive are roughly 30 percent higher in Kenya and Rwanda (2005) and 20 percent higher in Zimbabwe with each unit increase in the emotional violence factor score.

Table 9c. Multivariate associations^ between women's HIV status (dependent variable) and emotional violence in the analytic sample: odds ratios from a sequence of logistic regressions^^

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
Kenya (WN=873)				
Emotional violence factor score	1.31 †	1.34	1.39	1.28
Male partner's HIV status				
Negative (reference)		1.00	1.00	1.00
Positive		126.72 ***	82.3 ***	144.66 ***
Men's risk factors				
Lifetime number of partners				
One (reference)		1.00		1.00
Two		0.59		0.69
Three		0.79		1.05
Four or more		0.28		0.28
Don't know		1.08		1.03
Sex with nonspousal, noncohabiting partner in last 12 months				
No (reference)		1.00		1.00
Yes		0.30		0.21
STI symptoms in last 12 months				
No STI (reference)		1.00		1.00
STI		1.63		1.18
Alcohol use				
Husband doesn't drink or drinks but never drunk (reference)		1.00		1.00
Husband drinks and sometimes drunk		1.08		1.02
Husband drinks and often drunk		4.52 *		4.26 †
Women's risk factors				
Lifetime number of partners				
One (reference)			1.00	1.00
Two			1.59	2.06
Three or more			4.09 **	5.64 ***
STI symptoms in last 12 months				
No STI (reference)			1.00	1.00
STI			2.91	2.44
Rwanda 2005 (WN= 2,013)				
Emotional violence factor score	1.32 †	1.18	0.98	1.1

(Continued...)

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
Male partner's HIV status				
Negative (reference)		1.00	1.00	1.00
Positive		259.07 ***	349.97 ***	401.37 ***
Men's risk factors				
Lifetime number of partners				
One (reference)		1.00		1.00
Two		1.90		1.68
Three		2.38		2.41
Four or more		2.13		1.53
Don't know				
Sex with nonspousal, noncohabiting partner in last 12 months				
No (reference)		1.00		1.00
Yes		0.49		0.56
STI symptoms in last 12 months				
No STI (reference)		1.00		1.00
STI		12.53 ***		11.31 ***
Ever paid for sex				
No (reference)		1.00		1.00
Yes		1.11		1.48
Alcohol use				
Husband doesn't drink or drinks but never drunk (reference)		1.00		1.00
Husband drinks and sometimes drunk		0.65		0.57
Husband drinks and often drunk		0.19 *		0.18 [†]
Women's risk factors				
Lifetime number of partners				
One (reference)			1.00	1.00
Two			5.27 **	5.23 **
Three or more			1.61	1.61
STI symptoms in last 12 months				
No STI (reference)				
STI			3.01	2.79
Zimbabwe (WN=1,711)				
Emotional violence factor score	1.21 **	1.19 *	1.16 [†]	1.12
Male partner's HIV status				
Negative (reference)		1.00	1.00	1.00
Positive		32.36 ***	33.71 ***	34.18 ***

(Continued...)

Table 9c. – *Continued*

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
Men's risk factors				
Lifetime number of partners				
One (reference)		1.00		1.00
Two		1.30		1.14
Three		2.38 *		2.40 †
Four or more		2.46 *		1.82
Don't know		4.43 **		4.18 **
Sex with nonspousal, noncohabiting partner in last 12 months				
No (reference)		1.00		1.00
Yes		0.55 *		0.53 *
STI symptoms in last 12 months				
No STI (reference)		1.00		1.00
STI		2.13 **		2.21 **
Ever paid for sex				
No (reference)		1.00		1.00
Yes		0.90		1.01
Alcohol use				
Husband doesn't drink or drinks but never drunk (reference)		1.00		1.00
Husband drinks and sometimes drunk		1.08		1.07
Husband drinks and often drunk		1.45		1.35
Women's risk factors				
Lifetime number of partners				
One (reference)			1.00	1.00
Two			4.39 ***	4.45 ***
Three or more			6.34 ***	6.10 ***
STI symptoms in last 12 months				
No STI (reference)			1.00	1.00
STI			2.60 ***	2.70 ***

*** p<=0.001; ** p<=0.01; * p<=0.05; † p<=0.10

^ Models control for the following key control variables: place of residence (urban/rural), region, wealth (quintiles), women's education (none/primary/secondary+), men's education (none/primary/secondary+), women's occupation (unemployed/employed in agriculture/employed in non-agriculture), men's occupation (unemployed/employed in agriculture/employed in non-agriculture), women's age (4 categories), men's age (4 categories), total children ever born (continuous), women's age at first cohabitation (continuous). Model 1: Adjusts only for the control variables; Model 2: Adjusts for control variables, husband's HIV risk factors, and husband's HIV status; Model 3: Adjusts for control variables, the wife's HIV risk factors, and husband's HIV stats; Model 4: Adjusts for control variables, the husband and wife's HIV risk factors, and husband's HIV status.

^^ The model sequence is presented for all surveys in which the suspicion factor score was significantly associated with women's HIV status (p<.10) after adjusting for key control variables (see Table 5).

In both Kenya and Rwanda (2005), any independent effect of the experience of emotional violence is absent in models controlling for either husbands' HIV risk factors or women's risk factors, or both. This is the case although only a few risk factors predict women's HIV status. These are: women's lifetime number of partners, husbands' alcohol use, and, in Rwanda only, husbands' reports of STI or STI symptoms.

Zimbabwe shows slightly different results: the odds ratio for emotional violence remains little changed with the addition of either husbands' or women's HIV risk factors, and it maintains its significant association with women's HIV status. Only when both sets of risk factors are controlled for is the experience of emotional violence no longer significantly associated with women's HIV status. Zimbabwe is also set apart by the fact that both of the women's risk factors and a greater number of and different husbands' risk factors are associated with women's HIV status.

Physical violence and women's HIV status

We examined physical violence more closely in the three countries where it has a significant association with women's HIV status: Kenya, Rwanda (2010), and Zimbabwe. In these countries the odds of women being HIV-positive are 36 to 39 percent higher with each unit increase in their physical violence score (Table 9d).

Table 9d. Multivariate associations^ between women's HIV status (dependent variable) and physical violence in the analytic sample: odds ratios from a sequence of logistic regressions^^

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
Kenya (WN=873)				
Physical violence factor score	1.36 *	1.51 *	1.59 **	1.44 [†]
Male partner's HIV status				
Negative (reference)		1.00	1.00	1.00
Positive		126.67 ***	87.31 ***	138.98 ***
Men's risk factors				
Lifetime number of partners				
One (reference)		1.00		1.00
Two		0.63		0.75
Three		0.82		1.10
Four or more		0.31		0.32
Don't know		1.29		1.26
Sex with nonspousal, noncohabiting partner in last 12 months				
No (reference)		1.00		1.00
Yes		0.29		0.22

(Continued...)

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
STI symptoms in last 12 months				
No STI (reference)		1.00		1.00
STI		1.77		1.24
Alcohol use				
Husband doesn't drink or drinks but never drunk (reference)		1.00		1.00
Husband drinks and sometimes drunk		1.05		1.00
Husband drinks and often drunk		3.52		3.33
Women's risk factors				
Lifetime number of partners				
One (reference)			1.00	1.00
Two			1.68	2.06
Three or more			4.07 **	5.43 ***
STI symptoms in last 12 months				
No STI (reference)			1.00	1.00
STI			2.87	2.48
Rwanda 2005 (WN= 2,013)				
Physical violence factor score	1.38 *	0.92	0.90	0.85
Male partner's HIV status				
Negative (reference)		1.00	1.00	1.00
Positive		448.69 ***	340.68 ***	363.11 ***
Men's risk factors				
Lifetime number of partners				
One (reference)		1.00		1.00
Two		2.07		1.81
Three		1.97		1.62
Four or more		1.06		0.77
Don't know		0.49		0.40
Sex with nonspousal, noncohabiting partner in last 12 months				
No (reference)		1.00		1.00
Yes		6.67 **		6.59 **

(Continued...)

	Model 1	Model 2	Model 3	Model 4
	aOR	aOR	aOR	aOR
STI symptoms in last 12 months				
No STI (reference)		1.00		1.00
STI		1.20		1.36
Ever paid for sex				
No (reference)		1.00		1.00
Yes		1.46		1.60
Alcohol use				
Husband doesn't drink or drinks but never drunk (reference)				
Husband drinks and sometimes drunk				
Husband drinks and often drunk		.		.
Women's risk factors				
Lifetime number of partners				
One (reference)			1.00	1.00
Two			3.19 *	3.36 **
Three or more			2.20	2.53
STI symptoms in last 12 months				
No STI (reference)			1.00	1.00
STI			2.29 [†]	2.10
Zimbabwe (WN=1,711)				
Physical violence factor score	1.39 ***	1.54 ***	1.47 ***	1.45 ***
Male partner's HIV status				
Negative (reference)		1.00	1.00	1.00
Positive		34.68 ***	36.73 ***	36.48 ***
Men's risk factors				
Lifetime number of partners				
One (reference)		1.00		1.00
Two		1.21		1.06
Three		2.19 [†]		2.18 [†]
Four or more		2.35 *		1.73
Don't know		3.65 **		3.40 *
Sex with nonspousal, noncohabiting partner in last 12 months				
No (reference)		1.00		1.00
Yes		0.54 *		0.52 *

(Continued...)

Table 9d. – *Continued*

	Model 1	Model 2	Model 3	Model 4
	aOR	**aOR**	**aOR**	**aOR**
STI symptoms in last 12 months				
No STI (reference)		1.00		1.00
STI		2.18 **		2.29 **
Ever paid for sex				
No (reference)		1.00		1.00
Yes		0.97		1.10
Alcohol use				
Husband doesn't drink or drinks but never drunk (reference)		1.00		1.00
Husband drinks and sometimes drunk		1.05		1.03
Husband drinks and often drunk		1.11		1.06
Women's risk factors				
Lifetime number of partners				
One (reference)			1.00	1.00
Two			4.34 ***	4.37 ***
Three or more			6.15 ***	5.97 ***
STI symptoms in last 12 months				
No STI (reference)			1.00	1.00
STI			2.43 ***	2.56 ***

*** $p<=0.001$; ** $p<=0.01$; * $p<=0.05$; † $p<=0.10$

^ Models control for the following key control variables: place of residence (urban/rural), region, wealth (quintiles), women's education (none/primary/secondary+), men's education (none/primary/secondary+), women's occupation (unemployed/employed in agriculture/employed in non-agriculture), men's occupation (unemployed/employed in agriculture/employed in non-agriculture), women's age (4 categories), men's age (4 categories), total children ever born (continuous), women's age at first cohabitation (continuous). Model 1: Adjusts only for the control variables; Model 2: Adjusts for control variables, husband's HIV risk factors, and husband's HIV status; Model 3: Adjusts for control variables, the wife's HIV risk factors, and husband's HIV stats; Model 4: Adjusts for control variables, the husband and wife's HIV risk factors, and husband's HIV status.

^^ The model sequence is presented for all surveys in which the suspicion factor score was significantly associated with women's HIV status (p<.10) after adjusting for key control variables (see Table 5).

In Kenya and Zimbabwe the experience of spousal physical violence maintains its significant association with women's HIV status as their husbands' HIV status and husbands' or women's HIV risk factors are added to the model, either separately or combined (although the level of significance diminishes somewhat in Kenya). Furthermore, a comparison of the odds ratios across the models shows that the effect of the physical violence factor increases when incorporating HIV risk factors. In the comprehensive model (Model 4) in Kenya and Zimbabwe, the odds of women being HIV-positive are 44 and 45 percent higher, respectively, with each unit increase in their physical violence score.

The results from these two countries differ from one another in minor ways. Whereas in Kenya none of the HIV risk factors husbands are significant predictors of women's HIV status in the presence of women's experience of physical violence and husbands' HIV status (Models 2 and 4), several of the

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husbands' risk factors remain significant in Zimbabwe—lifetime number of sexual partners, non-marital sex, and STI or STI symptoms. Additionally, women's HIV risk factors are more strongly predictive of their HIV status in Zimbabwe than in Kenya.

Compared with Kenya and Zimbabwe, results of the 2010 Rwanda survey indicate a different pattern altogether. Initially significant, the association between women's HIV status and experience of physical violence loses its association when either husbands' or women's HIV risk factors and husbands' HIV status are entered into the model. The non-significant odds ratio also reverses direction. The only HIV risk factor for husbands that predicts women's HIV status is sex with a non-marital partner in the last 12 months (Models 2 and 4). Women's lifetime number of partners and their experience of an STI or STI symptoms in the last 12 months are both associated with women's HIV status, although only women's lifetime number of partners (specifically, having two partners) retains significance in the comprehensive model (Model 4).

Sexual violence and women's HIV status

In none of the five countries is there an initially significant relationship between sexual violence and women's HIV status, controlling for basic background characteristics. Therefore, no further analysis was performed to examine its association while controlling for women's and their husbands' HIV risk factors.

4   Conclusions and Discussion

In spite of great variation in the prevalence of the various forms of spousal violence reported by married women among sampled couples in the five countries studied, there is remarkable consistency in the *structure* of spousal violence across countries. Notably, our factor analysis unequivocally upheld the face validity of the categories of emotional, physical, or sexual violence that experts have assigned to the different acts of violence asked about in the DHS domestic violence module. The factor analysis provides another important insight: that the six items typically categorized as controlling behaviors actually represent not one, but two separate concepts, which we label "suspicion" and "isolation" in this report. These terms describe husbands' behaviors that represent suspicion of their wives and behaviors that aim to isolate them. Both are distinct from any of the three categories of emotional, physical, and sexual spousal violence.

The items in these two controlling behavior factors are similar to those in the dominance/isolation subscale of the Psychological Maltreatment of Women Inventory (PMWI) (Tolman 1999). While they may be similar in underlying construct to the "jealousy" and "dominance" factors identified in other research using PMWI-type measures (Kar and O'Leary 2013; Kasian and Painter 1992), we apply different labels because the sets of items comprising "suspicion" and "isolation" differ both in number and in wording from those comprising "jealousy" and "dominance". Additional psychometric testing would be needed to determine whether these differences are meaningful and represent distinct constructs, or whether they are immaterial to assessing the same latent construct.

Despite the striking consistency in the structure of spousal violence across countries, there is substantial variation in the relationships between the various forms of violence and women's HIV status, and in their associations with the two pathways through which violence exerts influence. No single form of spousal violence is consistently associated with a woman's risk of HIV in all five countries studied. In Malawi no form of violence is associated with a wife's risk of having HIV. A significant relationship was found with women's HIV status for the factors of suspicion and isolation in Zambia and Zimbabwe; for emotional violence in Kenya, Rwanda, and Zimbabwe; and for physical violence in Kenya, Rwanda, and Zimbabwe; and in no country was a significant relationship found between sexual violence and women's HIV status.

It is somewhat surprising that there is no apparent association in any of the countries in this report between spousal sexual violence and women's HIV status, even in the base model, as this form of violence is the only one for which there is a conceptual basis for a direct effect on women's HIV status. Of all the forms of violence and controlling behaviors, sexual violence is the least prevalent in all countries. One possibility is that, given the low prevalence, the sample sizes are insufficient to detect any significant effect. Another possibility is that there is truly no relationship between sexual violence and women's HIV status, either directly or indirectly. Sexual violence is associated with women's experience of an STI or STI symptom in the last 12 months, women's lifetime number of sexual partners, husbands' alcohol use, and husbands' lifetime number of partners in multiple countries. However, compared with other forms of spousal violence, sexual violence is associated with fewer HIV risk factors for women and their husbands, and in fewer countries. Where an association is found, the magnitude of the odds ratio is smaller than for other forms of violence. These findings suggest that, if sexual violence is to influence women's HIV status through the same pathways as other forms of violence, these linkages are relatively weak.

The investigation into the pathways through which the different forms of violence may be associated with a woman's risk of HIV is also revealing. For almost all forms of spousal violence, with the exception of physical violence, and in all countries, any observed significant relationship between spousal violence and a woman's risk of HIV, is explained away by women's or their husbands' HIV risk factors, or both. In

other words, a woman's experience of different forms of spousal violence is positively associated with her risk of HIV because either a) her own high-risk behaviors or STI status are affected by her experience of violence and in turn affect her risk of HIV; or b) her husband's HIV and STI status along with his high-risk behaviors are also positively associated with her risk of violence and her risk of HIV; or because of both (a) and (b).

Thus, this report provides evidence that there is no direct effect of most forms of spousal violence on women's HIV status, only an indirect effect through selected behavioral and other factors commonly considered to put an individual at high risk of HIV.

The only form of violence that appears to have a direct net association with HIV is physical violence. Physical violence remains significant in all models in Kenya and Zimbabwe. In Zimbabwe, even with controls for all high-risk factors, a unit increase in the physical violence factor score increases the odds of the wife being HIV-positive by 45 percent, and this relationship remains highly significant for the entire analysis. In Kenya, by contrast, although a similar relationship is observed, the significance is greatly reduced if all risk factors are controlled for.

Several potential explanations can be proposed for this finding. It could be that the net positive direct association of the experience of physical violence with the risk of having HIV remains because some key variables that represent additional indirect pathways through which physical violence influences women's HIV status are absent from this analysis. Alternately, perhaps, the direct relationship is capturing a simultaneous association between spousal violence and women's HIV status in the reverse causal direction. That is, at the same time that the experience of physical violence increases the risk of a woman having HIV (through multiple risk factors), being HIV-positive may be a trigger for episodes of physical violence. Or, finally, it may be that physical violence does in fact have a direct effect, perhaps by triggering increased levels of stress that compromise a woman's immune system, leaving her more susceptible to HIV infection (Campbell et al. 2008).

This study has some limitations, primarily the limitations imposed by the cross-sectional nature of DHS data. We use retrospective measures of the experience of spousal violence and data on the prevalence—but not incidence—of HIV. As such, and like the vast majority of empirical research on this question, we do not know whether experience of spousal violence preceded infection with HIV or if infection with HIV preceded spousal violence, or both. This constraint prevents us from interpreting any causal direction to the associations we find between spousal violence and women's HIV status, or between spousal violence and wives' and husbands' HIV risk factors.

The use of data on both members of a couple is a strength of this report. However, the use of couple data presents some trade-offs. These data rely on couples in which both members could be successfully interviewed and for whom there are valid HIV test results and in which the wife was administered the domestic violence module of the DHS questionnaire. Thus, we exclude couples in which either the wife or the husband was not present in the household, was unavailable for interview, or declined HIV testing. Additionally, both HIV and spousal violence may contribute to dissolution of marriages, through death of one spouse, divorce, or separation. As a result, our sample of couples may or may not be fully representative of all marriages in which spousal violence occurs. Finally, spousal violence and several of the personal risk factors included in our analyses may be subject to underreporting, due to recall error, embarrassment, or social desirability bias. It is not fully known how any underreporting of these variables may impact the results we observe.

Despite these limitations, the study contributes to an understanding of the relationship between spousal violence and HIV. It takes advantage of data from both members of a couple and uses discrete, nuanced measures of violence to better specify the associated pathways through which the various forms of spousal violence influence women's HIV status.

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Appendix

Table A1.1. Items and oblique rotated factor loadings: Kenya 2008-09

	Suspicion	Isolation	Emotional violence	Physical violence	Sexual violence	Uniqueness
Husband/partner:						
Is jealous or angry if respondent talks with other men	0.8436					0.3203
Frequently accuses respondent of being unfaithful	0.4904					0.5112
Insists on knowing where respondent is at all times	0.7140					0.3929
Does not permit respondent to meet her female friends		0.6434				0.3973
Tries to limit respondent's contact with family		0.7211				0.3864
Does not trust respondent with any money		0.5618				0.5522
Ever say or do something to humiliate respondent in front of others			0.8364			0.3254
Ever threaten to hurt or harm respondent or someone close to her			0.6624			0.3968
Ever insult respondent or make her feel bad about herself			0.7510			0.3413
Ever push, shake, or throw something at respondent				0.5906		0.4050
Ever slap respondent				0.6272		0.3886
Ever punch respondent with his fist or hit with something that could hurt her				0.8141		0.3358
Ever kick, drag, or beat up respondent				0.7669		0.3635
Ever try to choke or burn respondent on purpose				0.6018		0.4428
Ever physically force respondent to have sexual intercourse with him even when she did not want to					0.7172	0.3285
Ever force respondent to perform any sexual acts she did not want to					0.9368	0.1931
Cronbach's alpha	0.6759	0.5815	0.7619	0.7795	0.5821	
Unweighted n	4,740					
Eigenvalue	0.8618					
Variance explained	62%					

Table A1.2. Items and oblique rotated factor loadings: Malawi 2010

	Suspicion	Isolation	Emotional violence	Physical violence	Sexual violence	Uniqueness
Husband/partner:						
Is jealous or angry if respondent talks with other men	0.8398					0.2979
Frequently accuses respondent of being unfaithful	0.4106					0.4816
Insists on knowing where respondent is at all times	0.8707					0.3471
Does not permit respondent to meet her female friends		0.8157				0.3482
Tries to limit respondent's contact with family		0.8100				0.3134
Does not trust respondent with any money		0.6732				0.5278
Ever say or do something to humiliate respondent in front of others			0.8925			0.2699
Ever threaten to hurt or harm respondent or someone close to her			0.7036			0.3233
Ever insult respondent or make her feel bad about herself			0.8530			0.2713
Ever push, shake, or throw something at respondent				0.7235		0.3836
Ever slap respondent				0.6662		0.4037
Ever punch respondent with his fist or hit with something that could hurt her				0.8681		0.2738
Ever kick, drag, or beat up respondent				0.8495		0.2822
Ever try to choke or burn respondent on purpose				0.7395		0.4579
Ever physically force respondent to have sexual intercourse with him even when she did not want to					0.7972	0.2742
Ever force respondent to perform any sexual acts she did not want to					0.9171	0.2071
Cronbach's alpha	0.6609	0.6546	0.7963	0.8384	0.6474	
Unweighted n	5,321					
Eigenvalue	1.0077					
Variance explained	66%					

Table A1.3. Items and oblique rotated factor loadings: Rwanda 2005

	Controlling behavior	Emotional violence	Physical violence	Sexual violence	Uniqueness
Husband/partner:					
Is jealous or angry if respondent talks with other men	0.6606				0.4950
Frequently accuses respondent of being unfaithful	0.5958				0.5326
Insists on knowing where respondent is at all times	0.7008				0.3952
Does not permit respondent to meet her female friends	0.6288				0.3940
Tries to limit respondent's contact with family	0.7228				0.4910
Does not trust respondent with any money	0.4994				0.6129
Ever say or do something to humiliate respondent in front of others		0.6293			0.3391
Ever threaten to hurt or harm respondent or someone close to her		0.7551			0.3324
Ever push, shake, or throw something at respondent			0.7704		0.3388
Ever slap respondent			0.7759		0.3959
Ever punch respondent with his fist or hit with something that could hurt her			0.8002		0.3581
Ever kick, drag, or beat up respondent			0.6991		0.4539
Ever try to choke or burn respondent on purpose			0.4353		0.7283
Ever spit in the face of respondent			0.7259		0.4172
Ever physically force respondent to have sexual intercourse with him even when she did not want to				0.8121	0.2588
Ever force respondent to perform any sexual acts she did not want to				0.8885	0.2252
Cronbach's alpha	0.7375	0.6844	0.8312	0.6700	
Unweighted n	2,470				
Eigenvalue	1.0364				
Variance explained	58%				

(Continued...)

	Suspicion	Isolation	Uniqueness
Husband/partner:			
Is jealous or angry if respondent talks with other men	0.8157		
Frequently accuses respondent of being unfaithful	0.9192		
Insists on knowing where respondent is at all times	0.5553		
Does not permit respondent to meet her female friends		0.8991	
Tries to limit respondent's contact with family		0.7513	
Does not trust respondent with any money		0.5535	
Cronbach's alpha	0.6088	0.6750	
Unweighted n	2,470		
Eigenvalue	0.9140		
Variance explained	60%		

Table A1.4. Items and oblique rotated factor loadings: Rwanda 2010

	Isolation	Emotional violence	Physical violence	Sexual violence	Uniqueness
Husband/partner:					
Ever push, shake, or throw something at respondent			0.7376		0.4547
Ever slap respondent			0.8730		0.3357
Ever punch respondent with his fist or hit with something that could hurt her			0.6069		0.5481
Ever kick, drag, or beat up respondent			0.7365		0.4588
Ever try to choke or burn respondent on purpose			0.6292		0.4499
Ever spit in respondent's face			na		
Ever physically force respondent to have sexual intercourse with him even when she did not want to				0.7869	0.2717
Ever force respondent to perform any sexual acts she did not want to				0.9543	0.1890
Cronbach's alpha	0.6653				
Unweighted n	3,461				
Eigenvalue	0.9811				
Variance explained	61%				

Table A1.5. Items and oblique rotated factor loadings: Zambia 2007

	Suspicion	Isolation	Emotional violence	Physical violence	Sexual violence	Uniqueness
Husband/partner:						
Is jealous or angry if respondent talks with other men	0.8680					0.2986
Frequently accuses respondent of being unfaithful	0.6358					0.4269
Insists on knowing where respondent is at all times	0.6613					0.4169
Does not permit respondent to meet her female friends		0.6374				0.3479
Tries to limit respondent's contact with family		0.8163				0.4508
Does not trust respondent with any money		0.6600				0.5804
Ever say or do something to humiliate respondent in front of others			0.8618			0.3127
Ever threaten to hurt or harm respondent or someone close to her			0.6875			0.4001
Ever insult respondent or make her feel bad about herself			0.8236			0.2893
Ever push, shake, or throw something at respondent				0.7300		0.4015
Ever slap respondent				0.4671		0.5603
Ever punch respondent with his fist or hit with something that could hurt her				0.8413		0.3585
Ever kick, drag, or beat up respondent				0.8370		0.3471
Ever try to choke or burn respondent on purpose				0.5886		0.5442
Ever physically force respondent to have sexual intercourse with him even when she did not want to					0.8950	0.1984
Ever force respondent to perform any sexual acts she did not want to					0.9077	0.1956
Cronbach's alpha	0.6815	0.5765	0.7437	0.7437	0.7530	
Unweighted n	4,115					
Eigenvalue	0.9344					
Variance explained	62%					

Table A1.6. Items and oblique rotated factor loadings: Zimbabwe 2010-11

	Suspicion	Isolation	Emotional violence	Physical violence	Sexual violence	Uniqueness
Husband/partner:						
Is jealous or angry if respondent talks with other men	0.8589					0.3039
Frequently accuses respondent of being unfaithful	0.4547					0.5591
Insists on knowing where respondent is at all times	0.7286					0.3620
Does not permit respondent to meet her female friends		0.7654				0.3520
Tries to limit respondent's contact with family		0.7736				0.3940
Does not trust respondent with any money		0.6349				0.5949
Ever say or do something to humiliate respondent in front of others			0.8431			0.3725
Ever threaten to hurt or harm respondent or someone close to her			0.6303			0.4634
Ever insult respondent or make her feel bad about herself			0.7462			0.3818
Ever push, shake, or throw something at respondent				0.6519		0.4364
Ever slap respondent				0.6030		0.4641
Ever punch respondent with his fist or hit with something that could hurt her				0.8140		0.3840
Ever kick, drag, or beat up respondent				0.8185		0.3718
Ever try to choke or burn respondent on purpose				0.5051		0.6412
Ever physically force respondent to have sexual intercourse with him even when she did not want to					0.8664	0.2286
Ever force respondent to perform any sexual acts she did not want to					0.8804	0.2212
Cronbach's alpha	0.6277	0.6375	0.6466	0.7273	0.7079	
Unweighted n	5,193					
Eigenvalue	0.8997					
Variance explained	59%					

Table A2. Percent distribution of demographic characteristics of each partner and household-level characteristics in the analytic sample

	Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
	N=873	N=2,627	N=1,452	N=2,013	N=1,611	N=1,711
	%	%	%	%	%	%
Wealth quintile						
poorest	17.30	15.20	20.90	17.50	25.30	22.20
poorer	18.70	22.10	21.80	19.80	19.30	21.20
middle	16.80	22.30	20.00	21.90	20.10	20.00
richer	18.70	21.00	22.80	22.70	19.40	20.70
richest	28.50	19.40	14.60	18.20	16.00	15.90
Place of residence						
urban	27.00	15.70	10.80	12.40	30.40	25.40
rural	73.00	84.30	89.20	87.60	69.60	74.60
Respondent's occupation						
unemployed	34.90	23.60	21.90	10.00	38.80	57.50
agric-employed	29.10	46.50	71.90	77.70	36.50	13.90
non-ag employed	35.90	29.90	6.20	12.30	24.70	28.60
Husband's occupation						
unemployed	1.10	2.30	36.00	0.60	1.90	17.20
agric-employed	35.60	48.80	43.60	71.70	56.50	29.40
non-ag employed	63.30	48.90	20.40	27.70	41.60	53.40
Woman's education						
None	7.20	18.70	28.50	19.40	13.00	2.60
Primary	60.80	66.90	64.30	71.50	61.30	34.10
Secondary+	32.00	14.40	7.20	9.10	25.70	63.30
Husband's education						
None	4.60	8.80	22.50	17.70	5.90	1.20
Primary	51.60	63.80	67.00	70.70	52.10	26.70
Secondary+	43.80	27.40	10.50	11.60	42.00	72.10
Respondent's age						
15-19	3.90	7.40	1.00	1.40	6.80	7.90
20-29	49.60	48.50	40.20	42.60	44.20	50.10
30-39	30.50	29.70	35.40	36.10	33.10	30.10
40-49	16.10	14.50	23.30	19.80	15.80	11.80

(Continued...)

	Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
	N=873	N=2,627	N=1,452	N=2,013	N=1,611	N=1,711
	%	%	%	%	%	%
Husband's age						
15-24	7.40	11.30	7.10	7.30	8.60	9.90
25-34	42.00	40.80	34.70	42.30	39.20	44.20
35-44	29.80	29.30	33.80	28.10	31.30	30.50
45+	20.70	18.60	24.40	22.30	20.90	15.40
Total children ever born						
0	7.60	4.60	5.00	6.00	6.20	7.60
1	14.20	13.60	12.00	16.20	11.50	21.00
2	19.40	16.70	13.90	16.00	16.10	25.40
3	18.00	17.80	13.60	14.60	14.20	19.00
4 or more	40.70	47.30	55.50	47.10	51.90	27.00
Mean total children ever born	*3.40*	*3.80*	*4.30*	*3.80*	*4.10*	*2.60*
Age at first cohabitation						
under age 15	9.20	12.90	2.30	2.30	11.80	6.30
15-17	23.20	42.80	18.30	16.20	42.70	34.20
18-20	37.20	33.20	39.50	35.40	28.60	36.10
21-23	15.20	8.40	27.00	29.20	10.50	13.60
over age 23	15.20	2.70	13.00	16.90	6.30	9.90
Mean age at first cohabitation	*19.30*	*17.40*	*20.00*	*20.50*	*17.70*	*18.80*
Total	100.00	100.00	100.00	100.00	100.00	100.00

Table A3. Percent distribution of wives' and husbands' HIV risk factors in the analytic sample

	Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
	WN=873	WN=2,627	WN=1,452	WN=2,013	WN=1,611	WN=1,711
	%	%	%	%	%	%
Wives' risk factors						
Lifetime number of partners						
One	42.30	59.60	78.40	80.40	50.20	71.90
Two	32.90	29.70	16.70	15.40	28.80	19.90
Three or more	24.80	10.70	4.90	4.20	21.00	8.20
Mean	2.00	1.60	1.30	1.30	1.90	1.80

(Continued...)

	Kenya	Malawi	Rwanda 2005	Rwanda 2010	Zambia	Zimbabwe
	WN=873	WN=2,627	WN=1,452	WN=2,013	WN=1,611	WN=1,711
	%	%	%	%	%	%
Sex with nonspousal, noncohabiting partner in last 12 months						
No	99.10	99.40	99.90	99.50	99.40	99.60
Yes	0.90	0.60	0.10	0.50	0.60	0.40
STI symptoms in last 12 months						
No STI	93.60	88.40	94.90	91.50	94.70	88.80
STI	6.40	11.60	5.10	8.50	5.30	11.20
Husbands' risk factors						
Lifetime number of partners						
One	9.70	16.50	32.40	40.80	9.60	13.80
Two	14.30	24.10	28.20	28.10	15.50	18.00
Three	13.20	22.80	18.70	14.10	15.90	17.40
Four or more	51.40	34.70	20.70	16.80	56.70	46.60
Don't know	11.50	2.00	0.00	0.20	2.30	4.30
Mean	7.10	4.00	3.00	2.70	6.60	6.20
Sex with nonspousal, noncohabiting partner in last 12 months						
No	95.10	91.10	95.20	96.30	84.00	88.10
Yes	4.90	8.90	4.80	3.70	16.00	11.90
STI symptoms in last 12 months						
No STI	97.70	94.30	97.60	92.60	94.80	92.60
STI	2.30	5.70	2.40	7.40	5.20	7.40
Ever paid for sex						
No	99.00	84.60	94.70	94.80	97.30	74.40
Yes	1.00	15.40	5.30	5.20	2.70	25.60
Alcohol use						
Husband doesn't drink or drinks but never drunk	65.60	66.20	43.20	na	51.20	53.40
Husband drinks and sometimes drunk	24.00	24.20	45.10	na	32.00	36.00
Husband drinks and often drunk	10.40	9.60	11.70	na	16.90	10.60
Total	100.00	100.00	100.00	100.00	100.00	100.00