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

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Abstract

Over the past decade a consensus has been growing that intimate partner violence contributes to women's vulnerability to HIV. 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. 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. The study pools Demographic and Health Survey (DHS) data across five sub-Saharan African countries and uses a sequence of logistic models to explore these pathways among married couples. The study finds a significant association between multiple forms of spousal violence and women's HIV status, after adjusting for wives' and husbands' socio-demographic characteristics but not risk factors. While the association was expected to disappear after adjusting for risky behaviors of both partners and men's status, this was not the case with physical violence. Instead, women's experiences of physical violence within her marriage remains a persistent factor that predicts her HIV status. Thus, contrary to recent reports of no direct association between spousal violence and women's HIV status, this finding points to a direct effect.

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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 direct 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. The study is based on pooled data from recent Demographic and Health Surveys (DHS) in five sub-Saharan countries—Kenya, Malawi, Rwanda, Zambia, and Zimbabwe.

A diverse body of literature, mostly in the developing world, has explored the association between intimate partner violence and women's HIV status, with varying emphasis on causal pathways. These studies employ a range of definitions of intimate partner violence. Nonetheless, with a few notable exceptions, these studies report a significant association between some form of violence and women's HIV status.

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. 2004a; 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. 2004a), and spousal control (Dunkle et al. 2004a).

Similarly, six studies using nationally-representative samples report a significant association between some form of violence and HIV status (Andersson and Cockcroft 2012; Decker et al. 2009; Ghosh et al. 2011; Kayibanda, Bitera, and Alary 2012; Sareen, Pagura, and Grant 2009; Silverman et al. 2008). Three of these studies based on data from India's DHS (referred to as the National Family Health Survey) found either physical violence (Decker et al. 2009) or sexual violence (Ghosh et al. 2011) or the combination of both physical and sexual violence (Silverman et al. 2008) to be associated with women's HIV status. A fourth study examined multiple forms of violence with the Rwanda DHS and found emotional violence to be associated with higher odds of being HIV positive (Kayibanda, Bitera, and Alary 2012).

Another study examined a non-DHS nationally representative sample from Botswana, Namibia, and Swaziland, finding physical violence, but not sexual violence, to be associated with women's HIV status (Andersson and Cockcroft 2012), while a sixth study reporting a positive association with the experience of either physical or sexual violence 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

spousal violence and HIV status used DHS data on ever-married women from 10 developing countries (Harling, Msisha, and Subramanian 2010).

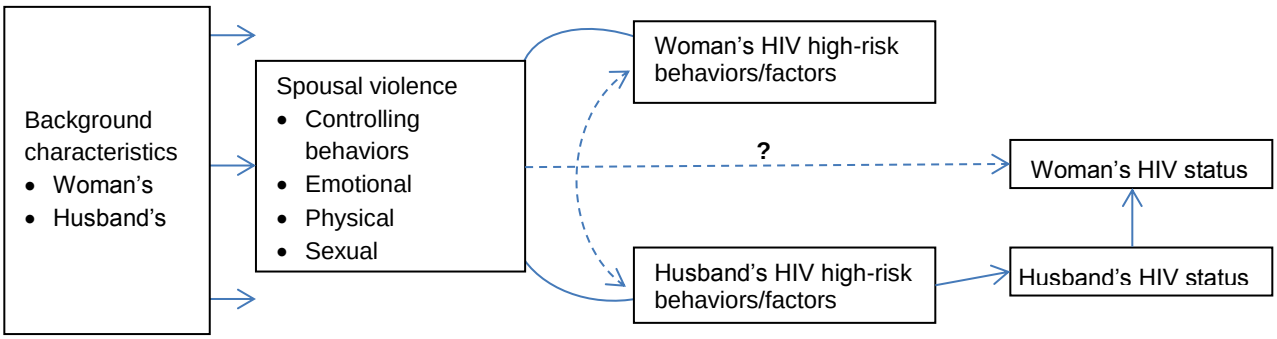
In a recent study that sought to isolate the direction of causality in the association between intimate partner violence and HIV status, Maman and colleagues (2010) followed a cohort of South African women (age 15-26) enrolled in an HIV-prevention intervention. They found that women's report at baseline of one or more incidents of intimate partner violence was a significant predictor of HIV incidence during the follow-up period.

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 et al. 2006).

Clusterings of HIV Risk Factors and Experience of Spousal Violence, a Conceptual Framework:

Many of the studies exploring the link between forms of intimate partner violence and HIV status have not explicitly articulated or modeled the pathways through which intimate partner violence influences HIV status, although several do include selected HIV risk factors. The conclusions from these studies may differ due to the variable inclusion or exclusion of intervening factors through which violence affects HIV status. This study 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.

Figure 1. Conceptual pathways from spousal violence to HIV



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

[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.

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 other forms of 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.

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 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, 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. 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?

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

The current pooled analysis facilitates the detection of significant relationships where sample sizes of couples in individual country datasets would not yield a sufficient power of study to do so. This may be

especially appropriate in the case of sexual violence, which is the least prevalent form of spousal violence in all our study countries. The pooled analysis is justified, given that in an earlier study by MacQuarrie et al (2013), spousal violence was found to have a common structure across all five countries and a similar relationship with women's and husbands' HIV risk factors.

Data, Measures, and Analytical Approach

Data

The data for this study come from five recent Demographic and Health Surveys (DHS) in sub-Saharan Africa: Kenya 2008-09, Malawi 2010, Rwanda 2005, 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 the pooling of data across countries. The DHS uses multistage cluster sampling techniques to obtain nationally representative samples.

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 the Rwanda 2005 rather than the Rwanda 2010 DHS survey, since the 2010 survey did not collect information on several key measures (emotional violence and controlling behaviors).

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, 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 pooled sample included 9,385 couples, including 873 Kenyan couples, 2,627 Malawian couples, 1,452 Rwandan couples (2005 DHS), 1,611 Zambian couples, and 1,711 Zimbabwean couples. Couples

include both those who are married and those who are cohabiting as if married. Therefore, the term "husbands" also includes partners cohabiting as if married.

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.

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 developed and standardized in 2000 and has been included in over 80 surveys. The portion of the module specific to spousal violence uses a 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. 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 study the term husband refers to men who are legally married to the respondent or who live with her as if married.

Spousal violence was measured using five domains of violence and controlling behaviors that consistently emerged in a factor analysis across all study countries (MacQuarrie, Winter, and Kishor 2013). 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. 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. 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.

- **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 three high-risk behaviors included in the analysis, information is available only for men:

- **Sex with non-spousal, non-cohabiting partner**. This variable identifies men who reported sexual partners in the past 12 months other than their spouses or cohabitating partners. Men with missing information and women who responded that they did not know are excluded from the analysis. While this information is also collected for women, due to the small number of women who reported sex with a non-spousal partner, we examine the variable for men only.

- **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), 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). To test and control for differences across countries, country indicator variables are also included in all models.

Analytical Approach

Using 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 first run an unadjusted model by regressing women's HIV status on each of the spousal violence variables, and then we run an adjusted

model with controls for country, urban-rural residence, 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. 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.

Next, to our base model of women's experience of spousal violence and socio-demographic controls (Model 1), we add women's risk factors, the husbands' HIV status and risky behaviors (Model 2). This 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.

For pooled multi-country analyses, there are several strategies for weighting the data. Two types of pooled weights were generated and considered for use in the study: one which weighted each country equally, and one which weighted each country proportional to its population size. To weight each country equally, after merging the five prepared couples files, the DHS-constructed domestic violence weight was adjusted so that within the analytic sample for each country the weights summed to one. The adjusted weight was then normalized in the pooled file.

The proportional-to-population size weight was constructed using the women's data files and then merged into the pooled couples file. After pooling the five women's files together, the standard women's individual weight was adjusted by the mid-year population size for women age 15-49, using the primary year of field work for each survey. Specifically, the original weight, v005, was multiplied by two adjustment factors, one country-specific and one common factor: the country-specific factor was the ratio of the country's mid-year population to that country's sample size, and the common factor was the ratio of the total sample size to the sum total of all countries' mid-year populations, thereby normalizing the weight (Ren 2012). Since we were interested in using the domestic violence weight – rather than the women's individual weight – the final step was to multiply the domestic violence weight by the newly calculated adjustment factor.

The analysis was repeated three ways: unweighted, weighted proportional to the countries mid-year population size for women 15-49, and weighted with each country weighted equally. The results were quite consistent across the three weight categories. Overall findings, levels of significance, and magnitude of association were stable across the three sets of results. The study presents results with each country weighted equally, because these results generally fell in the middle of the unweighted and weighted-proportional-to-size results. However, the unweighted and weighted proportional-to-population-size results are available upon request. Additionally, we use the svy commands available within Stata to account for the complex sampling design and estimate robust standard errors.

Results

Profile of Spousal Violence and HIV

Table 1 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). Results are presented separately for each country, and in the pooled sample. 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.

Table 1. Prevalence of spousal violence, controlling behaviors, and women's HIV status in the analytic sample

	Kenya	Malawi	Rwanda	Zambia	Zimbabwe	Pooled[6]
	N=873	N=2,627	N=1,452	N=1,611	N=1,711	N=9,385
	%	%	%	%	%	%
Prevalence of spousal violence						
Controlling behaviors						
Suspicion[1]	55.9	58.1	46.1	74.9	62.2	59.4
Isolation[2]	33.0	18.3	24.5	36.2	21.3	26.7
Emotional violence[3]	27.6	23.2	9.3	22.2	26.5	21.8
Physical violence[4]	33.7	19.6	32.9	44.8	30.0	32.2
Sexual violence[5]	14.5	15.3	11.7	16.7	16.6	15
Women's HIV prevalence	6.1	9.5	1.9	12.6	15.1	**9.0**

[1] 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.

[2] 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.

[3] 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.

[4] 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.

[5] 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.

[6] Reported Ns are weighted Ns. For each country, samples are weighted within each country, while in the pooled sample, weights are adjusted to weight each country subsample equally and then normalized across. Thus the five weighted country samples do not sum to the weighted pooled sample size.

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. In the pooled sample nearly 60 percent of wives 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); this ranged from 46 percent of wives in Rwanda to 75 percent in Zambia. 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, with 27 percent of wives in the pooled sample reporting that their husbands exhibit at least one of these controlling behaviors, ranging from 18 percent of wives in Malawi to 36 percent in Zambia.

Of the three traditional forms of spousal violence, physical violence is consistently the most prevalent among study couples (32 percent in the pooled sample), followed by emotional violence (22 percent in the pooled sample) and then sexual violence (15 percent in the pooled sample). Women's reported lifetime experience of any spousal physical violence ranges from 20 percent in Malawi to 45 percent in Zambia. About one-third of women in Kenya, Rwanda, and Zimbabwe reported experiencing any physical violence. 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 to 17 percent in Zambia and Zimbabwe.

Table 1 also presents HIV prevalence among women in the study couples. HIV prevalence varies across the five countries—at 2 percent in Rwanda, 6 percent in Kenya, 10 percent in Malawi, 13 percent in Zambia, 15 percent in Zimbabwe, and 9 percent in the pooled sample. 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.

Table 2. Unadjusted and adjusted associations between forms of spousal violence and women's HIV status in the pooled sample: odds ratios from separate logistic regressions

	WN=9,385	
	uOR	**aOR**
Controlling behaviors		
Suspicion	1.15**	1.13*
Isolation	1.12**	1.11*
Emotional	1.18***	1.2***
Physical	1.21***	1.26***
Sexual	1.06	1.07

*** p<=0.001; ** p<=0.01; * p<=0.05; † p<=0.10; uOR: unadjusted odds ratio; aOR: adjusted odds ratio

Note: the adjusted model controls for country, place of residence (urban/rural), 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).

Associations between Spousal Violence and HIV

Table 2 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 country, place of residence, 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.

For all forms of violence and controlling behaviors except sexual violence, a significant bivariate association is observed between the form of violence and women's HIV status. The association between each form of violence (except sexual violence) remains significant after adjusting for key demographic characteristics.

Nuanced Relationship between Spousal Violence and HIV

To our base model, we add women's risk factors, husbands' risk factors, and husbands' HIV status to determine whether the experience of spousal violence exerts an indirect effect on women's HIV status through these factors or has a net direct effect even controlling for them. The results of both the base model (Model 1) and expanded model (Model 2) are presented in Table 3.

Suspicion and isolation controlling behaviors and emotional violence

As Table 3 shows, the odds of a woman being HIV-positive are 13 percent higher with each unit increase in her suspicion factor score. Similarly, the odds of a woman having HIV are 11 percent higher with an increase in the isolation factor score and 20 percent higher with an increase in emotional violence. However, the observed association between each of these three forms of violence and women's HIV status disappears with the inclusion of her own risk factors and her husband's risk factors and HIV status.

Physical violence

The odds of a woman being HIV positive are 26 percent higher with each unit increase in her physical violence score, controlling only for socio-demographic factors in the base model. In contrast to suspicion, isolation, or emotional violence, spousal physical violence maintains its significant association with women's HIV status when risk factors and husbands' HIV status are added to the model. The level of confidence in the significant association between physical violence and women's HIV status decreases from 99.9 percent confidence to 95 percent confidence and the magnitude of the odds ratio also decreases. Nonetheless, women experience 15 percent higher odds of being HIV positive with an increase in their physical violence score, net of their own risk factors, those of their husbands, and their husbands' HIV status.

Sexual violence

There initially is no significant relationship between sexual violence and women's HIV status in the pooled base model controlling for basic background characteristics. Likewise, there is no association between women's experience of sexual violence and their HIV status when controlling for women's and their husbands' HIV risk factors.

Table 3. Multivariate associations between women's HIV status (dependent variable) and spousal violence in the pooled sample: Adjusted odds ratios from logistic regressions

	Controlling Behavior--suspicion factor score		Controlling Behavior--isolation factor score		Emotional violence factor score		Physical violence factor score		Sexual violence factor score	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Violence Measure	1.13 *	1.00	1.11 *	1.04	1.20 ***	1.03	1.26 ***	1.15 *	1.07	0.97
Husband's HIV Status (ref=negative)										
Positive		26.01 ***		26.05 ***		26.00 ***		26.16 ***		25.98 ***
Husband's Lifetime # of partners (ref=one)										
Two		1.21		1.20		1.21		1.19		1.21
Three		1.60 +		1.59 +		1.60 +		1.57		1.61 +
Four or more		1.51		1.5		1.5		1.48		1.51
Don't know		2.66 *		2.64 *		2.65 *		2.59 *		2.68 *
Husband had sex with nonspousal, noncohabiting partner in last 12 months (ref=no)										
Yes		0.83		0.83		0.83		0.82		0.82
Husband's STI symptoms in last 12 months (ref=none)										
STI symptoms		1.36 +		1.36 +		1.36 +		1.35 +		1.37 +
Husband ever paid for sex (ref=no)										
Yes		0.95		0.95		0.95		0.96		0.95
Husband's alcohol use (ref= never drunk)										
Drinks and sometimes drunk		1.11		1.1		1.1		1.09		1.11
Drinks and often drunk		1.72 **		1.7 **		1.68 **		1.52 *		1.76 **
Woman's lifetime # of partners (ref=one)										
Two		2.78 ***		2.78 ***		2.77 ***		2.76 ***		2.79 ***
Three or more		4.13 ***		4.12 ***		4.1 ***		4.02 ***		4.15 ***
Woman's STI symptoms in last 12 months (ref=none)										
STI symptoms		1.92 ***		1.91 ***		1.9 ***		1.88 ***		1.95 ***

*** p<=0.001; ** p<=0.01; * p<=0.05; † p<=0.10. Model 1 controls for the following key control variables: country, place of residence (urban/rural), wealth (quintiles), women's education (none/primary/secondary+), men's education(none/primary/secondary+), women's occupation (unemployed/employed in agriculture/employed in non-agric.), men's occupation (unemployed/employed in agriculture/employed in non-agric.), 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 and wife's HIV risk factors, and husband's HIV status.

Conclusions and Discussion

This study finds that four of five forms of spousal violence—suspicion, isolation, emotional violence, and physical violence—are associated with women's HIV status in bivariate and multivariate models controlling for background characteristics. This study's 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, 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. 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 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.

It is somewhat surprising that there is no apparent association in this study between spousal sexual violence and women's HIV status when data are pooled, 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. An earlier analysis conducted on each sample separately showed no association in any of the study countries (MacQuarrie, Winter, and Kishor 2013). Pooling data increases the power of study to detect significant relationships between sometimes rare events. One possibility is that, given the low reported prevalence of sexual violence, the sample size is still insufficient despite pooling the data 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. Compared with other forms of spousal violence, sexual violence is associated with few to no HIV risk factors for women and their husbands and, where an association is found, the size of the effect is smaller among study countries, suggesting 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 (MacQuarrie, Winter, and Kishor 2013).

The lack of an association between the experience of sexual violence and women's HIV status in this study is consistent with two other multi-country studies in which no bivariate association between the experience of sexual violence on its own and women's HIV status was found (Harling, Msisha, and Subramanian 2010; Kayibanda, Bitera, and Alary 2012) and with several others in which a bivariate association disappeared in final multivariate models (Andersson and Cockcroft 2012; Silverman et al. 2008). This finding contrasts with several other studies in which a significant association remained in multivariate models including selected HIV risk factors (Dunkle et al. 2004c; Maman et al. 2002; Sareen, Pagura, and Grant 2009). However, in each of these studies, sexual violence was included in a broader measure of intimate partner violence that included physical violence (e.g., experience of either physical or sexual violence or of both physical and sexual violence), meaning that the association of violence with HIV status may be dominated by the strength of the association between physical violence and HIV status, rather than sexual violence. Only one study, in India, detected a significant association between sexual violence, alone, and women's HIV risk in couples (Ghosh et al. 2011).

Physical violence stands out among the various forms of violence for the strength of its association with women's HIV status. Controlling for background characteristics, the odds of women being HIV positive

are 26 percent higher with each unit increase in the physical violence score, greater than any other form of violence considered in this study. Furthermore, the significant association with women's HIV status persists in the complete model controlling for risk factors, with the odds ratio only declining from 1.26 to 1.15. Thus, physical violence is the only form of violence that appears to have a direct net association with HIV.

This finding is surprising to the authors, who expected that any association with HIV status would weaken and disappear in the presence of women's and their husbands' risk factors, indicating physical violence influences HIV status indirectly through these factors. It is consistent with several previous studies that detected a relationship between physical violence, on its own or combined with sexual violence, and women's HIV status (Dunkle et al. 2004b; Jewkes et al. 2010; Maman et al. 2002), including two in which this association was significant after controlling for selected HIV risk factors (Decker et al. 2009; Silverman et al. 2008).

Several potential explanations can be proposed for this unexpected finding. It could be that the net positive direct association of the experience of physical violence with the risk of having HIV remains because 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 indeed trigger biological processes that represent a direct effect, perhaps through an immunosuppressive effect that leaves women who experience physical violence more susceptible to HIV infection when exposed to the virus (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.

The use of data on both members of a couple is a strength of this study, but presents certain 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, which would serve to underestimate the strength of the association between violence and HIV (Ellsberg et al. 2001).

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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