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The Effect of Marriage and HIV Risks on Condom Use Acceptability in Rural Malawi

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Abstract

A large and increasing proportion of HIV transmissions in sub-Saharan Africa occur within marriage. Condom use within marriage could, therefore, be an important prevention strategy, but there is considerable debate about whether married couples would be willing to use condoms. This paper contributes to this debate by identifying key factors that affect the acceptability of condom use within marriage and actual condom use among men and women in rural Malawi, using three waves of longitudinal data from 2004, 2006 and 2008. Specifically, we focused on the effect of (1) entry into first marriage, (2) respondent's HIV status, HIV perceptions, and risk behaviors, and (3) spouse's HIV characteristics on condom use acceptability within marriage and actual condom use with a spouse or steady partner. Using fixed-effects regression, we found that getting married coincides with a pronounced attitudinal shift regarding the acceptability of condom use within marriage that cannot be explained by differences in fertility status or selection into marriage. In addition, we found that, for women, *perceived* HIV status of the respondent and spouse generally had greater influence than *actual* HIV status on the acceptability of condom use within marriage and actual condom use with a spouse or steady partner, even after HIV status is known; while actual HIV status and HIV risk behaviors are generally more important among men. Although condom use within marriage remained low, these findings suggest that attitudes about and use of condoms are susceptible to change and that both marital status and perceptions of risk are important influences on condom use.

Keywords

condom use; HIV/AIDS; Africa; Malawi

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Introduction

Many married men and women living in sub-Saharan Africa face substantial risk of HIV infection from their spouse or cohabiting partner (Clark et al., 2006; de Walque 2007; Glynn et al., 2003). According to a study in urban Zambia and Rwanda, between 55.1% and 92.7% of new heterosexually-acquired HIV infections take place within serodiscordant married or cohabiting couples (Dunkle, 2008). Individuals in high HIV prevalence settings of sub-Saharan Africa appear to be aware of the risk of HIV infection presented by their spouses and concern about infection from spouses seems to be growing over time (Anglewicz & Kohler, 2009, Watkins, 2004). A survey of married men and women conducted in 1998 in rural Malawi found that 32% of women and 14% of men identified their spouse as their primary source of concern regarding HIV infection; three years later these percentages rose to 52% for women and 23% for men (Watkins, 2004). In addition, concerns about HIV risks dominate the marriage decision-making process: unmarried men and women in Malawi state that “being HIV-negative” is the single most important characteristic of a potential future spouse (Clark et al., 2009). Once married, men and women whose spouses are infected have limited means of protecting themselves. One option is to leave their spouse through separation or divorce: recent studies have noted that both men and women are more likely to divorce a spouse who is or is believed to be HIV positive (Smith & Watkins, 2005, Watkins, 2004, Reniers, 2008). An alternative to ending a marital partnership where one feels at risk of contracting HIV is to consistently use condoms within marriage.

Although in principle condoms could be an important strategy in preventing the spread of HIV, in practice condom use within marriage remains very low. Consequently, some researchers have described condoms as “intruders” in the marriage (Chimbiri, 2007) and argue that the future prospect of increased use within marriage is rather bleak (Bauni & Jarabi, 2003). However, others assert that, despite the current widespread disapproval of condoms within marriage, there are some signs that the use of condoms within marriage is rising, particularly among those who perceive themselves to be at risk of HIV infection from their spouse (Maharaj & Cleland 2004; Maharaj & Cleland, 2005). Recent research (using a sample in which approximately 80% were currently married) found that HIV positive individuals who were aware of their status were more likely to report condom use (Delevande & Kohler 2012). Thus, there are signs that resistance to condoms within marriage is not immutable.

Nonetheless, although condom rates within marriage are increasing, there is little doubt that condom use outside of marriage has risen much more swiftly. Across 18 countries in Africa, condom use by married women at most recent coitus increased from 1.0% in 1993 to 2.4% in 2001. During this same time period, condom use among single women at most recent coitus rose from 5.2% to 18.8% (Cleland, Ali, & Shah 2006). More recent data from the Demographic and Health Surveys (DHS) show that the gap in condom use between married and sexually active unmarried women persists, as evidenced by recent surveys in Kenya (1.8% of married women versus 18.0% unmarried women) and Zambia (4.7% of married women versus 26.2% of unmarried women) (CSO, MOH, TDRC, University of Zambia, and Macro International Inc, 2009; Kenya National Bureau of Statistics and ICF Macro 2010). Other research in Zimbabwe showed that not only were unmarried men more likely than married men to use condoms, but that among married men they were more likely to use condoms with their extra-marital partners than with their wives (Adetunji 2000; Adetunji & Meekers 2001). Drawing on data across 13 countries in sub-Saharan Africa, de Walque & Kline (2011) show similar patterns in most countries. However, it is important to note that this prior research has predominantly employed cross-sectional comparisons of condom use by type of partner (e.g., Adetunji 2000; Adetunji & Meekers 2001, de Walque & Kline

2011), as opposed to examining how individuals change condom use practices as partnerships change.

Such large discrepancies raise the critical question of why condom use is so low among married couples. Typically-cited barriers to condom use (i.e. access, cost, health concerns, and reduced physical pleasure) are unlikely to differ by marital status. However, on average, condoms are likely to be less desirable within marriage than outside marriage due to differences in fertility preferences. While the contraceptive effects of condoms may be welcomed in sexual liaisons outside of marriage, many married couples, particularly the young and recently-married, may be actively seeking to become pregnant (Cordero-Coma & Breen 2012). The reluctance to use condoms due to fertility preferences also may apply to those who either know or think they may be HIV positive, as they may choose to accelerate their childbearing before their health deteriorates (Hayford, Agadjanian & Luz 2012; Trinitapoli & Yeatman 2012). Thus, for these couples condoms would not be practical (Cleland 2005). However, for couples who are not seeking to have additional children or who wish to delay their next pregnancy, condoms could have the advantage of offering a dual protection, both against HIV infection and pregnancy (Pullum et al 2005; Williamson et al. 2006). Nonetheless, condom use is low even among married couples who do not seek children (Pullum et al 2005; Williamson et al. 2006), which suggests that differences in fertility preferences cannot fully account for the low use of condoms within marriage.

Instead, these findings suggest that there are important differences between married and unmarried individuals in their *attitudes* about condoms, rendering their use less acceptable with spouses. There are several potential reasons why attitudes towards condoms may differ between married and unmarried individuals. First, Tavory and Swidler (2009) argue that condom use in itself signifies “less serious” and “less intimate” partnerships. Numerous studies find that using condoms implies that one has other sexual partners or suspects that their partner has other sexual relationships (Bauni & Jarabi, 2003; Maharaj & Cleland, 2005; Muhwava, 2004). Such levels of suspicion and mistrust may be acceptable to acknowledge within short-term casual relationships, but not in longer-term more serious unions.

Second, differences in attitudes towards condom use between married and unmarried men and women may also be driven by a variety of individual-level factors that affect both marriage and condom use. Most notably, married individuals tend to be older than unmarried individuals. To the extent that condom use may be more acceptable to younger individuals, some of the differences in condom use between married and unmarried individuals may reflect their differences with respect to age. Other individual-level factors, such as sexual drive, tolerance for risk, and belief regarding family obligations may also influence the selection into marriage and be associated with their willingness to use condoms. Research on these factors has, however, been limited; due in part to the fact that many individual-level factors are unobserved in datasets from sub-Saharan Africa.

Third, attitudes about condom use are likely to reflect an individual’s perceived risk of HIV and their actual HIV status, both of which may vary by marital status and change over time. While an individual’s HIV status may be strongly associated with their attitudes towards condom use, many individuals may not be aware of whether they are HIV positive. Moreover, several studies suggest that *perceptions* about HIV risk can be as, if not more, important than *actual* HIV status. For example, perceived HIV risk is associated with a range of HIV-related behaviors, such as multiple sexual partnerships (Akwara et al. 2003), condom use (Cerwonka, Isbell, & Hansen 2000; Estrin 1999; Maharaj & Cleland 2004; Prata et al. 2006), sexual debut (Anderson et al. 2007), marriage-related behaviors (Clark et al. 2009; Smith & Watkins 2005), and spousal discussion of HIV risk (Kohler et al. 2007). Both HIV status and perceptions about HIV risk are likely to change with respect to

marriage. While some men and women may perceive themselves to be at higher risk within marriage, others may consider themselves to be at a lower risk relative to their risk before marriage. Moreover, those who perceive themselves to be at high risk in marriage may be more likely to get divorced (Reniers 2008; Smith & Watkins 2005) and recent analysis shows that remarried individuals in sub-Saharan Africa are particularly likely to be infected (de Walque & Kline 2012).

Lastly, the process of marriage itself may also alter an individual's attitudes about condom use within marriage. Even if an unmarried young man or woman may theoretically approve of condom use within marriage for HIV prevention, these attitudes may change once this individual becomes married, because their views towards condoms may depend on their spouses' attitudes, risks, and behaviors. Individual-level analyses examining condom use typically miss the important influence of spouse's characteristics. However, extensive research on contraception choices and fertility preferences demonstrates the importance of a couples-based approach (Bankole & Singh 1998; Becker 1996, Miller et al. 2004; Sobel & Arminger 1992; Thomson 1997; Wolff et al. 2000). Moreover, a study across six countries found that if partners have divergent attitudes towards condom use, the negative one is sufficient to prevent the use of condoms (Pullum et al. 2005). Research in South Africa found that women's perceived risk of being infected by their husbands was the most powerful determinant of condom use within marriage (Maharaj & Cleland, 2005). These findings suggest that spouse's attitudes and risks could be an important determinant in attitudes towards condom use.

This paper examined factors related to attitudes towards and actual condom use within marriage for HIV prevention. We focused on three sets of factors. First, we examined whether attitudes about condom use within marriage for HIV prevention changed as individuals entered their first marriages or whether these differences simply reflected selection into marriage based on observed and unobserved characteristics. Second, we assessed whether being HIV positive or thinking one is HIV positive makes condom use in marriage for HIV prevention more acceptable. Third, using linked couples data, we identified the influence of spouses' attitudes, behaviors, and perceived and actual HIV status on condom use acceptability for HIV prevention. Finally, we compared the relative importance of these three factors with respect to actual condom use with a spouse or steady partner.

Setting

Our data came from Malawi, where 10.6% of all adults aged 15–49 are HIV-positive (National Statistical Office (NSO) and ICF Macro 2011). In addition to having one of the highest rates of HIV in the world, Malawi shares some marriage-related features with other AIDS-affected countries. As in many other sub-Saharan African countries, Malawi has high rates of union formation with nearly all women entering first marriage by their mid-20s. (Reniers 2003). Residents of Malawi, however, marry at a relatively early age compared to most other countries (Reniers 2003): the mean age of first marriage is 17.9 for women and 22.6 for men (National Statistical Office and ICF Macro. 2011).

Similar to other sub-Saharan African countries, HIV/AIDS awareness and knowledge of condoms is high in Malawi: 99% of men and women have heard of HIV/AIDS, over 70% are aware that condoms protect from HIV infection, and over 85% believe that HIV can be prevented by limiting sexual intercourse to one uninfected partner (NSO and ICF Macro. 2011). As with Kenya and Zambia, there are significant differences in condom use by marital status, as 2.4% of married women reported currently using condoms compared to 23.0% of sexually active unmarried women (NSO and ICF Macro 2011). Although not

popular among married individuals in Malawi, DHS shows a small increase in current condom use among currently married women aged 15–49, from 1.6% in 1992 to 1.8% in 2004 and 2.4% in 2010 (NSO and ICS Macro 2011). The vast majority of the population has access to condoms: 79% of women and 89% of men know a place where they can obtain condoms (NSO and ICS Macro 2011).

Data and Methods

We used a dataset from rural Malawi with several unique features that enabled us to address our research questions. As described above, we were interested in the effect of (1) entry into first marriage, (2) perceived versus actual HIV status, and (3) spousal HIV-related characteristics on attitudes towards condom use in marriage and actual condom use with a spouse or steady partner. An analysis of these three research questions requires rich longitudinal panel data with (1) both married and unmarried individuals, (2) repeated measures of both HIV risk perceptions and actual HIV status for both husbands and wives; and (3) linked husbands' and wives' data to evaluate the effects of spouses' perceived and actual HIV status on the acceptability of condoms and actual condom use.

Data from the Malawi Longitudinal Study of Families and Health (MLSFH, formerly the Malawi Diffusion and Ideational Change Project) met these requirements. The MLSFH was designed as a couples' survey, targeting a population-based representative sample of approximately 1,500 ever-married women and 1,000 of their husbands in the three rural sites of Malawi, first interviewed in 1998. A description of MLSFH data and sampling technique is presented in Watkins et al. (2003). Bignami et al. (2003) and Anglewicz et al. (2009) provide assessments of MLSFH data quality. The MLSFH study was approved by the IRB at the University of Pennsylvania and the Malawi National Health Sciences Research Council (NHSRC).

We used data from the third (2004), fourth (2006), and fifth (2008) waves of MLSFH, as these data captured three features essential for our analyses. First, in addition to interviewing all respondents from previous waves and any new spouses, the third wave added a new sample of 1,476 young adults aged 15–25, of which 45% (665) were never-married in 2004 (53% of men and 36% of women). We drew on this sample to examine the relationship between transitions into first marriage and changes in condom use. Second, MLSFH offered HIV testing and test results to all respondents in 2004, 2006, and 2008. A detailed description of the HIV testing procedure is available in Bignami-Van Assche et al. (2004). HIV testing acceptance rates were consistently high: only 9.1% (291 individuals) refused testing in 2004, and acceptance rates were also over 90% in 2006 and 2008. All respondents tested were also given the opportunity to receive their results; approximately two-thirds received their results in 2004, and 98% and 93% received their HIV test results in 2006 and 2008, respectively. The lower percentage of respondents receiving HIV test results in 2004 is due to the testing approach: whereas rapid-results HIV tests were used in 2006 and 2008, in 2004 saliva samples were sent to a laboratory and test results communicated 4–6 weeks later (described further in Obare et al. 2009). Third, in 2004, MLSFH interviewed 1,149 women and 951 men who were married at the time of the survey. Of these currently married respondents, 622 husband and wife pairs were both interviewed and tested for HIV. We use these linked couples data, as well as similar linkages in 2006 and 2008, to examine how spouse's perceived and actual HIV status as well as spouse's views about condoms influence the respondent's opinion on the acceptability of condoms within marriage and actual condom use.

Condom Use Acceptability for HIV Prevention

To assess attitudes towards condom use with a married partner, we used an attitudinal question on condom use: “Do you think it is acceptable to use a condom with a spouse to protect against HIV infection” (we henceforth refer to this question as CUAM, short for condom use acceptability in marriage for HIV prevention). Attitudes towards condom use are important for several reasons. Research shows that indirect questions about sensitive behaviors (such as beliefs or attitudes) are often more reliable than self-reported behaviors (Fisher 1993; Kidder & Judd, 1986). Also, actual condom use is likely to be influenced by fertility outcomes and preferences (Cordero-Coma & Breen 2012), whereas the purpose of these analyses is to examine whether *attitudes* about the acceptability of condoms within marriage change in response to changes in union status or HIV risks irrespective of fertility desires.

There are noteworthy features of the CUAM variable. First, it measures the acceptability of condom use in marriage for a specific purpose: to protect against HIV infection. Second, our CUAM measure is for the acceptability of condom use in marriage when the HIV status of a spouse is unspecified, as opposed to when one knows or suspects that a spouse is HIV positive or HIV negative. Third, research has shown that rural Malawians also use other strategies to avoid HIV infection, such as partner selection and divorce from a risky spouse (Watkins 2004). So it is important to note that respondents were *not* asked if condom use in marriage was the best, or the only, strategy for avoiding HIV infection in marriage. They were asked only if condom use in marriage for HIV prevention was an *acceptable* strategy.

Actual Condom Use

For the reasons stated above, we were primarily interested in the attitudinal measure of condom use acceptability for HIV prevention. However, actual condom use can provide an important complement to the attitudinal measure of condom use acceptability. The MLSFH surveys in 2004 and 2006 included a series of questions about current and former sexual partners, including condom use. Specifically, we used a measure of whether MLSFH respondents had ever used condoms with a spouse, steady partner, or fiancé, to compare actual condom use with CUAM. For this measure, condom use with a steady partner/fiancé was included only for unmarried respondents to eliminate the possibility that the partner was extramarital. We, therefore, focused on partnerships with relatively greater levels of intimacy and stability in this analysis. We refer to this measure as condom use with a spouse or steady partner.

Independent Variables

Social and Demographic Characteristics—For our analysis we included background characteristics such as education, age, household economic status (which was analyzed using a constructed wealth index based on ownership of 14 household durable assets, achieved by using principal component analysis (Filmer & Pritchett 2001)). Because religious status can influence attitudes towards condom use, we also included a measure of respondents’ religious denomination, which is categorized into Muslim, Christian, Evangelical Christian, Traditional African, or other. Moreover, research in sub-Saharan Africa indicates that individuals change their religion for reasons related to marriage or HIV infection (Agadjanian 2001). Thus, although relatively few respondents change religious status across waves, we treat this measure as a time-varying covariate.

Marital Characteristics—One of our primary aims is to assess the effect of marriage on both CUAM and actual condom use. Thus, we include a variable for whether the respondent entered his or her first marriage between waves. In some instances, respondents reported switching partners when then got married, while in others they married their steady partner.

Thus, we include a variable for whether respondents changed partners before and after marriage in our analyses of actual condom use. In addition, we include several characteristics that are related to marriage and condom use, such as number of living children, since fertility preferences may be related to perceived or actual HIV status and also affect CUAM (Hayford, Agadjanian & Luz 2012).

Respondents' Actual and Perceived HIV Status, and HIV Risk Behaviors—An important distinction was made between perceptions of HIV risk and actual HIV infection, for the following reasons. First, a large percentage of respondents were not aware of their actual HIV status: only 8% of women and 12% of men knew their HIV status by 2004. This increased after MLSFH conducted HIV testing in 2004, but still less than 60% of 2006 MLSFH respondents were aware of their HIV status by 2006. Also, comparisons of perceived HIV status and actual HIV status show that many rural Malawians overestimate their likelihood of HIV infection, and the likelihood that their spouse is currently infected (Anglewicz et al. 2010; Anglewicz & Kohler 2009; Bignami et al. 2007).

Interestingly, the discordance between perceived and actual HIV status remains even after respondents receive their HIV test results. While one might expect that all individuals who learned that they tested HIV positive would report a “high” likelihood of current HIV infection, this is not the case in the MLSFH data (see also Delevande & Kohler, 2012). Inclusion of both actual status and perceived risk thus allows for direct comparison of the relative importance of each.

Furthermore, learning that one is HIV positive may influence HIV-related attitudes and behaviors more than learning that one is HIV negative (Helleringer & Reniers 2010). Individuals who learn that they are HIV positive may want to protect their spouse from becoming infected, and thus find condoms more acceptable than those who know they are HIV negative.

Our HIV-related measures include the respondents' perception of their likelihood of being HIV positive, whether the respondent had extramarital sexual partnerships, and the respondent's actual HIV status. We combined respondents who reported having either a medium or high likelihood of being infected with HIV. Different dichotomizations of this variable produced similar results. Lastly, we included an indicator for whether the respondent had been previously tested and received his or her results.

Spouses' HIV-Status and HIV-Related Behaviors and Attitudes—Among a subset of married respondents, we used spouse-linked data and examined the effects of (1) spouses' attitudes towards condom use within marriage (2) spouse's perceived likelihood of their own HIV infection, (3) an indicator for whether the spouse was tested for HIV and received the test results, and (4) spouse's actual HIV status. In addition, we included a measure of the respondent's perception of the likelihood that their spouse is HIV positive and whether the respondent thinks their spouse has extramarital partners.

Analytic Methods

We analyzed the effect of (1) marital status, (2) respondent's perceived and actual HIV status, and (3) spouse's characteristics on two dependent variables: (1) CUAM, and (2) actual condom use with a spouse or steady partner. Regressions were run separately for men and women. The first model included marriage-related characteristics; the second added individual-level HIV-related variables, and the third added spousal dyadic characteristics. The last model, thus, included only currently married men and women.

We used fixed effects logit regression models. The use of fixed effects is appealing because it enabled us to control for any time-invariant (observed or unobserved) differences across respondents that may affect the outcome (Allison 2005; Hsiao 2003). This is important because of the potential selection of less risk-averse individuals to be both more likely to be HIV positive and less inclined to find condom use acceptable. We also considered random effects models to examine the relationship between marriage, HIV infection, and CUAM, and used Hausman tests to compare the fixed and random effects models. Since Hausman tests indicated that random effects would be inappropriate for most models and fixed effects models are less affected by biases (Allison 2005), we relied on results of the fixed effects regressions and show only these results. Fixed effects models also utilized a continuous “year” variable (2004, 2006, 2008), which enabled us to examine if CUAM and condom use are changing over time. To account for the possibility that the effect of time varies by age, we also include an interaction between age and year in the models.

Results

Background Characteristics

Our initial sample included all respondents who were interviewed in at least two of three waves of MLSFH data from 2004, 2006 and 2008: a total of 2,999 respondents (1,643 women and 1,356 men). Background characteristics for these individuals are displayed in Table 1. As shown in Table 1, the proportion ever-married increased steadily for men and women 2004–2008. Due to the earlier age at first marriage, women were more likely to be ever-married in all waves. More men than women were married for the first time between 2004 and 2008: 95 (12.7%) of men and 63 (6.3%) of women were married for the first time between 2004 and 2008. Relatively small percentages changed partners across waves: approximately 3–5% of women and 8–11% of men listed different primary sexual partners across waves.

HIV prevalence increased from 2.7% in 2004 to 7.2% in 2008 for men and from 4.6% in 2004 to 10.8% for women. As expected the percentage of respondents who had been previously-tested for HIV and knew their results also increases over time. For example, while only 7.9% of women and 11.7% of men were tested for HIV and knew their test result before 2004, the percentages aware of their HIV test results increase to over 50% by 2006.

As previous research suggests, self-perceived likelihood of HIV infection was higher than actual HIV prevalence for men and women. The extent of difference between perceptions and actual HIV infection varied by gender. As expected, men were more likely than women to claim extramarital partnerships, and women were more likely than men to suspect or know that their current spouse had partners outside of marriage. Women were more likely to think they were HIV positive than men: in all three waves, a larger percentage of women estimated a medium or high likelihood of current HIV infection.

Trends in CUAM and Actual Condom Use

Table 2 (panel A) shows a slight, but not monotonic, increase in the acceptability of condom use within marriage from 2004 to 2008. However, Table 2 also shows relatively large percentages of respondents who changed their response to CUAM across waves: although the overall percent of CUAM changed only by 3% to 8% in between waves for men and women, respectively, over 40% of women and 34% of men changed their response to CUAM across waves.

More respondents reported that condom use is acceptable than those who reported actual condom use. Actual condom use was lower than CUAM in 2004 and 2006 for both men and women, although the differences between CUAM and actual condom use were larger for

women than for men (Table 2, panel B). An increasing trend in actual condom use was evident: the percentage of women who ever used a condom with a spouse or steady partner increased by approximately 2% to 20.7% in 2006, while men experienced a 4% increase to 31.4%. As with CUAM, there was considerable fluctuation in the percentages ever using condoms: over 20% of women and 25% of men reported changes in their condom use behavior between 2004 and 2006.

In addition to fluctuation over time, there was also substantial and interesting variation in CUAM by background characteristics. Non-parametric graphs of CUAM by age for men and women (in Figure 1) show relatively large differences across age groups. Figure 1 shows two important age patterns of CUAM for men and women. First, CUAM was generally highest at the youngest age groups and was lower at older ages. Second, there appear to be changes over time in age patterns for men and women: acceptability was higher at most ages in 2008 compared with 2004 and 2006 with an important exception -- at youngest ages CUAM was highest in 2004. There were also large differences in CUAM by marital status: as shown in Figure 2, ever-married men and women were significantly less likely to find condoms acceptable than never-married respondents.

While the patterns of CUAM shown in Table 2 and Figures 1 and 2 display compelling patterns, they do not resolve the issue of whether CUAM is becoming more acceptable over time (perhaps as a result of increasing awareness and worry of the AIDS epidemic), whether CUAM simply declines with age, or whether individuals change their mind about condom use after becoming married. To disentangle these different factors, we turn to our multivariate regression analyses.

Regression Results

Table 3 shows that entry into first marriage has a strong effect on CUAM for both men and women. Men and women who were married for the first time between waves experienced a greater than 50% decline in the odds of finding condoms acceptable within marriage.

While the effect of first marriage was consistent for men and women, other characteristics affecting CUAM differed by gender. Religion was not importantly related to views towards condom use for women, though it was for men. Table 3 shows that men who converted to Islam experienced decreased odds of condom use acceptability. Consistent with Figure 1, there was also evidence that the effect of time varied by age for men. The interaction variable between men's age and year was highly significant, indicating that older men experienced greater increases in CUAM over time.

Differences by gender were also evident in the analysis of actual condom use (Table 3). Having another child was associated with decreased likelihood of using condoms for men. Religious status was important for men and women, in which women converting to other religions experienced a decline in the odds of using condoms; and men converting to Christian and Evangelical religion experienced an increased odds of using condoms. Women who changed partners across waves were less likely to use condoms. Finally, it appears that men and women were more likely to use condoms with a spouse or steady partner in 2006, compared with 2004. There was no significant effect of entry into first marriage on actual condom use for women or men.

Table 4 (panel A), which shows results for the relationship between the respondent's perceived and actual HIV status and CUAM, reveals striking gender differences. For women, perceived HIV risk was significantly related to CUAM. An increased likelihood of HIV infection was associated with increased likelihood of finding condom use acceptable in marriage (OR 1.83). There was also an effect of HIV voluntary counseling and testing

(VCT) on CUAM for women, but perhaps not in the expected direction: women tested for HIV experienced decreased odds of CUAM. This could reflect the fact that the vast majority of tested women were HIV negative (and their husbands were also HIV negative). There was, however, no effect of changes in actual HIV status on CUAM for women. Finally, the time trend variable was significant for women, indicating that women were more likely to find condom use in marriage for HIV infection acceptable over time between 2004 and 2008.

In contrast, actual HIV status appears to be more important than perceived status for men. As shown from the first set of models, men who became HIV positive experienced increased odds of accepting condom use in marriage. Interestingly, the interaction between actual HIV status and receiving HIV test results (Table 4, panel A, model 2) means that men who became HIV positive and aware of their HIV positive status experienced an increased odds of accepting condom use within marriage. However, there was no greater acceptability of condoms with spouses among men who reported having an extra-marital partner. Finally, the effect of changes in religion, and the increasing effect of age over time remained in the second set of regressions for men.

Comparing the correlates between actual condom use (Table 4, panel B) and CUAM shows an interesting result: as with CUAM, for women an increase in the perceived likelihood of HIV infection was associated with a greater likelihood of using condoms. Women also reported greater actual condom use in 2006 (compared with 2004), as with CUAM. Perceived likelihood and year aside, however, factors associated with actual condom use were generally different than CUAM for men and women. Changes in religious status were important for women. However, whereas becoming HIV positive and learning results was associated with CUAM for men, having an extramarital partnership and being tested for HIV were associated with increased odds of actual condom use with a spouse or steady partner.

Lastly, the effect of spouses' attitudes towards condoms and their HIV characteristics are presented in Table 5. Somewhat surprisingly, changes in husbands' and wives' CUAM were uncorrelated with changes in respondent's CUAM (Table 5 panel A). Moreover, a change in the actual HIV status of a spouse had no effect on CUAM for either men or women. In contrast, the importance of HIV perceptions was evident in several ways. First, while changes in respondent's beliefs about whether their spouse had extramarital partners had no effect on CUAM, men who thought their wives likelihood of HIV infection increased experienced more than a two-fold increase in the odds of having a favorable attitude towards condoms in marriage. Second, both men and women whose spouses thought their likelihood of HIV infection increased showed greater condom acceptability, corresponding to an increased odds of 77% for women and 89% for men.

Although HIV perceptions were important for both men and women, a gendered pattern is evident in the exact relationship between HIV perceptions and CUAM. For women, a change in both their own and their spouse's perceived HIV status was significantly associated with CUAM. For men, however, their own perceived HIV status had no effect on CUAM- it is only when they become aware of their HIV positive status (Table 4 panel A), perceive an increased likelihood of their wife's HIV infection, (Table 5 panel A), or when their wife herself experienced an increased likelihood of HIV infection (Table 5 panel A), that men were more willing to accept CUAM.

Finally, the importance of perceptions is again shown in the results for actual condom use, particularly for women (Table 5 panel B). Women who increased their perceived likelihood of husband's infection experienced increased odds of actual condom use with their spouse or

steady partner. In contrast, actual HIV risk behavior was more important for men: men who had an extramarital partner or were tested for HIV experienced increased odds of condom use, as did men who thought their wife had an extramarital partnership.

Discussion

This research identified factors associated with attitudes towards condom use and actual condom use within intimate partnerships, using a unique dataset and a new analytic approach. Our results highlight the importance of several factors affecting attitudes towards condom use in marriage. First, it is clear that there is an effect of marriage itself on views towards condom use: entry into first marriage sharply decreases the perceived acceptability of condom use in marriage even after controlling for all time-constant observed and unobserved characteristics. While unmarried young men and women may theoretically support the use of condoms in marriage, their opinions often change after union. However, there was no effect of first marriage on actual condom use, which remains quite low both among regular partners before marriage and among spouses after marriage. Interestingly, having an additional child was an important measure in only the first set of models and only for men, which suggests that fertility intentions are not the primary determinant of attitudes towards condoms or condom use.

Second, while HIV perceptions seemed important for women, actual HIV status and behaviors were more important for men. For women, a perceived increase in the likelihood of their own HIV infection was associated with increases in both CUAM and actual condom use; while for men, having an extramarital partner and becoming HIV positive were important determinants. A possible explanation for this result is evident in rural Malawians' perceived and actual HIV risk. Research has found that rural Malawians overestimate the likelihood of HIV transmission in unprotected sex; and women's greatest fear of HIV infection is from their spouse, while men are more likely to fear HIV infection from extramarital partners (Anglewicz & Kohler 2009). Therefore, men may be more confident about their HIV status and less likely to think their status has changed because they are more in control of this status, while women may think their actual HIV status could change and thus base behaviors and attitudes on their perceptions instead. In any case, these results are encouraging as they indicate willingness on the part of HIV-positive men and women who perceive themselves to be at risk to use condoms. Programs emphasizing the use of condoms within and outside of marriage are clearly needed.

Third, spousal characteristics were important influences on attitudes towards condom use in marriage and actual condom use with a spouse or steady partner. Men who believed that their wives to be infected were twice as likely to find condom use in marriage acceptable, and men who thought their spouse was unfaithful were more likely to use condoms with them. Moreover, married men and women whose spouses thought they were infected were more likely to approve of condom use in marriage, even though their spouses' actual HIV status has no effect on their condom acceptability. In addition, women whose husbands thought they were infected were more likely to use condoms. While the importance of HIV perceptions are expected if respondents are unaware of their actual HIV status, their continued importance after controlling for HIV testing is perhaps surprising. Lastly, spouses' attitudes about condom use in marriage were not correlated with each other, suggesting that couples may be largely unaware of their partners' views.

Our analyses went beyond previous research in several ways. First, by using longitudinal data, we examined how changes in marital status and other characteristics are related to acceptability of and actual condom use. Second, by including indicators of both perceived and actual HIV status, we were able to analyze the relative importance of each, before and

after HIV testing. Third, our linked couple data enabled us to explore the influence of spousal attitudes and behaviors on acceptability of and actual condom use. Finally, our use of fixed effects enabled us to control for unobserved time-invariant characteristics that affect condom use and other measures of interest.

While our data and approach addressed several potential biases that often affect research on condom use, there are some important limitations in this research. Some of these limitations involve our use of fixed effects. Although fixed effects eliminates the effect of unobserved stable characteristics, there are likely to be unobserved time-varying characteristics that we did not control for and may be associated with the dependent variable. For example there may be changes in individual's access to condoms or their frequency of sex, both of which could affect condom-related beliefs and behaviors and are not measured in MLSFH data. Also, establishing the ordering of events is also a potential limitation of fixed effects analysis. For any independent variable that changes across waves, it is challenging to establish whether the independent variable or the dependent variable changed first; this limits our ability to establish causal relationships. Second, like most longitudinal analyses, our analysis was limited to individuals who did not move from the MLSFH survey village clusters. Thus, our analysis does not address potential differences in CUAM between migrants and non-migrants, which has been previously demonstrated in this context (Anglewicz 2012). We examined whether attrition bias exists in this study by comparing CUAM at baseline for individuals who dropped out between waves with those who remained in the sample. The results of this analysis are mixed: individuals who were lost-to-follow-up between 2004 and 2006 were significantly more likely to accept CUAM than those who remained ($p=0.01$), but individuals who left the study area between 2006 and 2008 did not significantly differ from those who remain ($p=0.42$). Third, research has shown that self-reports of sensitive behaviors are often unreliable, and this lack of reliability has been established for self-reported condom use specifically (Allen et al. 2003; Gallo et al. 2006; Rose et al. 2009). Fourth, due to relatively small numbers of respondents who experienced a change in some characteristics or behaviors (particularly actual HIV status), some of the estimates in our regression models have large standard errors, and should therefore be interpreted with caution. While this is an important limitation, it is not uncommon in studies using fixed-effects analysis. Finally, in order to examine the effect of first marriage on actual condom use, we have to include unmarried individuals with regular partners and examine how condom use changes with becoming married. Thus, our analysis is not strictly on condom use within marriage, but rather condom use within regular partnerships, including marriage.

The proportion of HIV serodiscordant couples is greater than HIV concordant positive in many countries in sub-Saharan Africa (de Walque 2007). Furthermore, as access to anti-retroviral treatment for HIV infection becomes more widely available in sub-Saharan Africa, as it is currently in Malawi, the prevalence of sero-discordant couples may increase. As a result, strategies for increasing condom use in marriage have great practical purpose and could greatly reduce the risk of acquiring HIV within marriage. Our findings show that over 30% of men and 40% of women in our sample think that condom use is acceptable within marriage for HIV prevention, and 20% of women and 30% of men report having used a condom with a spouse or steady partner. Differences in these attitudes and behaviors are less determined by fertility outcomes than by perceived and actual HIV status of the respondent and their spouse. However, entry into marriage coincides with a decline in condom use acceptance and there appears to be considerable uncertainty relating to spouse's HIV status and opinions about condoms, suggesting low levels of spousal communication. Thus, programs designed to encourage spousal communication could play an essential role to reducing the barrier to condom use in marriage.

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Highlights

- Getting married coincided with a sharp change in attitudes towards condom use.
- The influence of perceived and actual HIV status on condom use differs by sex.
- Attitudes about and use of condoms are susceptible to change.

Figure 1.

Non-parametric graphs of CUAM by age for MLSFH men and women 2004–2008

Notes: MLSFH=Malawi Longitudinal Study of Families and Health.

Figure 2.

Percentages of CUAM by marital status for MLSFH women and men 2004–2008

Notes: MLSFH=Malawi Longitudinal Study of Families and Health.

Differences by marital status are significant at $p < 0.05$ in all three waves, for men and women

Table 1

Background characteristics for MLSFH men and women, 2004–2008

MLSFH wave	Women		Men	
	2004	2006	2004	2006
Mean 2004 age (SD)	31.3(12.0)	33.8(12.8)	34.6(14.2)	36.4(14.4)
Schooling				
None	25.1%	29.5%	15.5%	16.5%
Primary	66.5	61.5	66.4	63.8
Secondary	8.4	9.0	18.1	16.7
Mean wealth index (SD)	−0.09 (1.7)	−0.08 (1.7)	0.10 (1.6)	0.11 (1.6)
Religion				
Muslim	21.2%	22.5%	19.8%	22.4%
Christian	31.9	32.9	28.7	33.5
Evangelical	9.1	16.3	7.9	16.7
Traditional African	12.1	14.8	12.8	13.8
Other	25.8	13.5	30.8	13.6
Marriage-related				
Mean number of living children (SD)	3.0 (2.6)	3.6 (2.4)	3.0 (3.4)	3.6 (3.4)
Ever married	90.7%	95.0%	78.6%	81.5%
Changed partners since previous wave	----	5.4%	----	10.7%
HIV-related				
Had extramarital partners	2.4%	3.6%	14.4%	31.3%
Perceived spousal extramarital partners	30.7%	34.1%	11.2%	14.4%
Med/high likelihood of HIV infection	14.4%	9.8%	8.3%	4.6%
Med/high spouse's likelihood of HIV infection	11.9%	9.7%	4.3%	6.5%
Previously tested for HIV and received test results	7.9%	53.7%	11.7%	56.0%
HIV prevalence	4.6%	7.3%	2.7%	4.3%
N ^a	1363	1515	1111	1251

Notes: MLSFH=Malawi Longitudinal Study of Families and Health.

^aThe sample for Table 1 is all respondents who were interviewed in at least two of three MSLFH waves between 2004 and 2008, which is the sample used for the fixed effects regressions in Table 3. The total number of women and men in the sample is 1,643 and 1,356 (respectively). Of these individuals, 999 women and 755 men were interviewed in all three waves; and 644 women and 601 men were interviewed in two waves; 236 women and 251 men were interviewed in waves 1 and 2 but not wave 3, 280 women and 245 men were interviewed in waves 2 and 3 but not wave 1, and 128 women and

105 men were interviewed in waves 1 and 3 but not wave 2. These numbers sum to the sample size for each column above: e.g. women interviewed in all three waves (999) + interviewed in waves 1 & 2 (236) + interviewed in 1 & 3 (128) = 1363.

Table 2

Percentages and consistency in the acceptability of condom use within marriage for HIV prevention, and actual condom use with a spouse or steady partner across MLSFH waves for men and women, 2004–2008

Panel A: Condom use acceptability in marriage for HIV prevention (CUAM)		Women		Men	
		2004	2006	2004	2006
Condom use acceptability in marriage for HIV prevention (CUAM)		41.6%	40.0%	47.6%	33.3%
CUAM consistency across waves					
Changed CUAM since previous wave			40.1%	43.6%	34.5%
Changed not accept to accept CUAM			18.8%	25.6%	15.9%
Changed accept to not accept CUAM			21.4%	18.0%	18.7%
Consistent CUAM since previous wave			59.9%	56.4%	60.4%
No change accept CUAM			19.8%	20.6%	17.7%
No change not accept CUAM			40.1%	35.8%	47.8%
N			1235	1279	1006
Panel B: Ever used condom with a spouse or steady partner		Women		Men	
		2004	2006	2004	2006
Ever used condom with a spouse or steady partner		18.6%	20.7%	27.4%	31.4%
Condom use consistency across waves					
Changed condom use since previous wave			20.6%	27.2%	
Changed not used to used condoms			11.3%	15.6%	
Changed used to not used condoms			9.3%	11.6%	
Consistent condom use since previous wave			79.4%	72.8%	
No change used condoms			9.4%	15.8%	
No change did not use condoms			70.0%	57.0%	
N			1025		777

Notes: MLSFH=Malawi Longitudinal Study of Families and Health.

In 2004, 3.7% of cases for CUAM were missing (including 3.0% who reported “don’t know” and 0.7% whose response was missing) and 1.2% of cases for actual condom use with a spouse or steady partner were missing. In 2006, 0.1% of CUAM cases were missing and 0.5% of actual condom use with a spouse or intimate partner was missing. In 2008, 0.7% of CUAM cases were missing. Comparing respondents with missing values and non-missing values in background characteristics shows a significant difference in only one: men and women with missing values of CUAM were significantly less likely to be ever-married ($p<0.045$). We use listwise deletion of all cases with missing values in our analysis.

Table 3

Fixed-effects regression results for the effect of first marriage on condom use acceptability for HIV prevention (CUAM) MLSFH 2004–2008 and actual condom use with a spouse or steady partner, MLSFH 2004–2006

	CUAM				Actual Condom Use			
	Women		Men		Women		Men	
	Odds	SE	Odds	SE	Odds	SE	Odds	SE
Household wealth index	0.97	0.04	1.07	0.05	1.14	0.11	1.09	0.11
Religion								
Muslim (reference)	----	----	----	----	----	----	----	----
Christian	1.17	0.44	3.64***	1.68	0.43	0.33	5.47**	3.95
Evangelical	1.05	0.40	2.24*	1.01	0.43	0.32	4.27**	2.84
Traditional African	1.01	0.40	2.45*	1.14	0.64	0.52	1.54	1.05
Other	1.01	0.37	2.40**	1.02	0.29*	0.20	2.10	1.23
Marriage-related								
Had first marriage	0.38***	0.12	0.47**	0.14	1.75	0.91	1.45	0.62
Number of children	1.01	0.04	1.01	0.03	1.05	0.14	0.81**	0.08
Changed partners between waves	0.95	0.14	0.99	0.19	0.27**	0.13	0.98	0.44
Year	1.08	0.09	0.82**	0.07	1.22**	0.09	1.35***	0.11
Age*year interaction	1.00	0.00	1.01***	0.00	----	----	----	----
N=	958		678		262		271	
Hausman test fixed vs. random	0.001		0.000		0.001		0.001	

Notes: MLSFH=Malawi Longitudinal Study of Families and Health.

* p<0.10;

** p<0.05;

*** p<0.01

Sample sizes differ from Table 2 due to respondents who did not have an HIV test value in at least two waves of MLSHF 2004–2008.

Other measures, including polygamous marriage, perceived HIV prevalence, number of times married, and marital duration were tested and dropped due to lack of significance in any models.

Table 4

Panel A: Fixed-effects regression results for the effect of marriage, HIV status, and learning HIV test results on condom use acceptability for HIV prevention (CUAM), MLSFH 2004–2008

	Women				Men			
	Model 1		Model 2		Model 1		Model 2	
	Odds	SE	Odds	SE	Odds	SE	Odds	SE
Household wealth index	0.97	0.04	0.98	0.04	1.04	0.06	1.05	0.06
Religion								
Muslim (reference)								
Christian	1.21	0.49	1.25	0.51	4.38***	2.29	4.46***	2.32
Evangelical	0.92	0.38	0.95	0.39	2.35*	1.20	2.38*	1.21
Traditional African	1.06	0.45	1.09	0.47	3.13**	1.63	3.08**	1.60
Other	0.96	0.38	1.00	0.40	2.56*	1.23	2.54*	1.22
Marriage-related								
Had first marriage	0.38***	0.13	0.41***	0.14	0.56*	0.19	0.59	0.21
Number of children	0.97	0.04	0.98	0.04	1.00	0.03	0.99	0.03
Changed partners between waves	0.91	0.15	0.89	0.14	0.82	0.18	0.78	0.18
HIV-related								
Had extramarital partners	1.02	0.28	1.01	0.28	0.88	0.14	0.88	0.14
Med/high perceived likelihood of HIV infection	1.83***	0.23	1.82***	0.23	1.35	0.26	1.33	0.26
Previously tested for HIV and received results	0.75**	0.10	0.73**	0.09	1.11	0.16	1.04	0.15
Respondent HIV positive	1.78	0.85	1.36	0.72	5.75*	6.49	3.11	3.67
Respondent HIV positive * received results interaction								
Year	1.15***	0.12	1.16***	0.05	0.81*	0.09	0.82*	0.09
Age * year interaction					1.01**	0.00	1.01**	0.00
N=			845				566	
Hausman test fixed vs. random	0.402		0.398		0.000		0.000	

Panel B: Fixed-effects regression results for the effect of marriage, HIV status, and learning HIV test results on actual condom use with a spouse or steady partner, MLSFH 2004–2006

	Women						Men					
	Model 1			Model 2			Model 1			Model 2		
	Odds	SE		Odds	SE		Odds	SE		Odds	SE	
Household wealth index	1.14	0.12		1.15	0.12		1.10	0.13		1.11	0.13	
Religion												
Muslim (reference)												
Christian	0.26	0.24		0.28	0.26		7.15**	6.18		7.23**	6.27	
Evangelical	0.24	0.22		0.26	0.24		6.03**	4.63		6.18**	4.78	
Traditional African	0.41	0.40		0.44	0.43		1.63	1.34		1.67	1.38	
Other	0.18*	0.16		0.19*	0.17		3.18*	2.22		3.24*	2.28	
Marriage-related												
Had first marriage												
Number of children	1.18	0.74		1.21	0.76		1.64	0.84		1.66	0.86	
Changed partners between waves	1.05	0.16		1.05	0.15		0.83	0.10		0.82	0.10	
	0.53	0.28		0.51	0.27		0.61	0.32		0.70	0.38	
HIV-related												
Had extramarital partners	2.20	1.19		2.19	1.19		2.72***	0.80		2.73***	0.81	
Med/high perceived likelihood of HIV infection	1.69*	0.51		1.65*	0.50		0.90	0.38		0.90	0.38	
Previously tested for HIV and received results	1.30	0.32		1.26	0.31		2.68***	0.71		2.91***	0.80	
Respondent HIV positive	2.15	3.63		1.48	2.77		2.37	3.34		2.42	3.44	
Respondent HIV positive*received results interaction				1.92	1.85					0.35	0.31	
Year												
	1.89**	0.57		1.88**	0.57		1.01	0.11		0.99	0.11	
Age*year interaction												
	0.99*	0.01		0.99*	0.01							
N=			240			240						
Hausman test fixed vs. random	0.105			0.120			0.000			0.000		

Notes: MLSFH=Malawi Longitudinal Study of Families and Health.

* p<0.10;

** p<0.05;

*** p<0.01

Sample sizes differ from Table 2 due to respondents who did not have an HIV test value in at least two waves of MLSHF 2004–2008.

Difference between model 1 and model 2: model 2 includes the interaction between HIV positive status and receiving HIV test results, to account for the difference in the effect of knowing one's HIV status between HIV positive and HIV negative individuals.

Other measures, including polygamous marriage, perceived HIV prevalence, number of times married, and marital duration were tested and dropped due to lack of significance in any models.

The age x year interaction term was not significant for women in the models in panel A, so it was not included in the final models.

Table 5

Panel A: Fixed-effects regression results for the effect of spouse's HIV-related characteristics on condom use acceptability (CUAM), for currently married MLSFH respondents 2004–2008, including spouse's actual HIV status

	Women		Men	
	Odds	SE	Odds	SE
Household wealth index	0.92	0.06	0.96	0.09
Religion				
Muslim (reference)	----	----	----	----
Christian	0.25	0.22	14.19**	16.16
Evangelical	0.28	0.24	2.96	3.05
Traditional African	0.33	0.30	5.29	5.60
Other	0.26	0.22	4.41	4.49
Marriage-related				
Number of children	0.99	0.06	1.11	0.10
Changed partners between waves	1.33	0.49	0.62	0.23
HIV-related				
Had extramarital partners	0.91	0.39	1.06	0.28
Med/high perceived likelihood of HIV infection	1.84***	0.43	1.54	0.57
Previously tested for HIV and received results	0.66*	0.15	1.19	0.29
Respondent HIV positive	1.86	0.93	22.45	30.20
Perceptions of spouses' behavior				
Perceived spousal extramarital partners	0.85	0.15	1.63	0.50
Med/high spouse's likelihood of HIV infection	1.25	0.24	2.13***	0.59
Spouses' attitudes and beliefs				
Spouse's CUAM	0.90	0.16	0.82	0.17
Spouse's med/high likelihood of HIV infection	1.96**	0.51	2.12***	0.58
Spouses' HIV-related measures				
Spouse previously tested for HIV and received results	1.13	0.23	0.76	0.22
Spouse HIV positive	1.02	1.03	2.93	3.78
Year	1.11	0.08	1.05	0.11
N=	330		229	
Hausman test fixed vs. random	0.315		0.089	

Panel B: Fixed-effects regression results for the effect of spouse's HIV-related characteristics on actual condom use with a spouse, for currently married MLSFH respondents 2004–2006, including spouse's actual HIV status

	Women		Men	
	Odds	SE	Odds	SE
Household wealth index	1.31**	0.16	0.99	0.12
Religion				
Muslim (reference)	----	----	----	----
Christian	0.39	0.47	1.03	0.97
Evangelical	0.23	0.27	1.29	1.17

Panel B: Fixed-effects regression results for the effect of spouse's HIV-related characteristics on actual condom use with a spouse, for currently married MLSFH respondents 2004–2006, including spouse's actual HIV status

	Women		Men	
	Odds	SE	Odds	SE
Traditional African	0.48	0.59	0.47	0.41
Other	0.11 *	0.12	0.82	0.68
Marriage-related				
Number of children	1.05	0.13	1.12	0.10
Changed partners between waves	2.25	2.15	0.58	0.31
HIV-related				
Had extramarital partners	1.13	0.83	3.06 ***	1.09
Med/high perceived likelihood of HIV infection	0.74	0.33	0.74	0.38
Previously tested for HIV and received results	1.50	0.50	2.16 **	0.68
Perceptions of spouses' behavior				
Perceived spousal extramarital partners	1.11	0.36	3.07 **	1.48
Med/high spouse's likelihood of HIV infection	4.01 **	2.17	2.61 *	1.45
Spouses' attitudes and beliefs				
Spouse's med/high likelihood of HIV infection	2.32 *	1.10	1.33	0.50
Spouses' HIV-related measures				
Spouse previously tested for HIV and received results	0.92	0.29	0.75	0.26
Year	0.96	0.14	1.12	0.16
N=	180		189	
Hausman test fixed vs. random	0.140		0.092	

Notes: MLSFH=Malawi Longitudinal Study of Families and Health.

*
p<0.10;

**
p<0.05;

p<0.01.

Sample sizes differ from Table 4 and 5 due to men and women who were (1) not currently married, (2) were in polygamous marriages, or (3) respondents whose spouse was not interviewed and tested for HIV in at least two waves of MLSFH between 2004 and 2008. All respondents who had at least one of these conditions were not included in these regressions.

Interactions between (1) age and year, and (2) HIV positive and received test result were not significant in these models and thus were not included in the above table.

Respondent and spouse's actual HIV status dropped out of the above fixed effects models due to complete separation.

In this case, all respondents who became HIV positive (4) and whose spouse became HIV positive (3) changed from not using condoms to using condoms between 2004 and 2006.