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HIV Risk Perceptions, the Transition to Marriage, and Divorce in Southern Malawi

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Abstract

Little is known about whether young people in sub-Saharan Africa use the timing of marriage as a strategy to avoid HIV infection. Using five rounds of longitudinal data from the Malawi Schooling and Adolescent Survey, we do not find support for the hypothesis that young women's perceived chances of future HIV infection are associated with the transition to marriage, but do find evidence that young married women who see themselves at risk of future infection have a higher hazard of divorce relative to women who perceive no chance of future infection. We also use individual level fixed effect regressions to examine how the transition to marriage affects respondents' expectations of future HIV infection. Respondents are consistently more likely to perceive any chance of future HIV infection in the years following marriage. Our findings suggest that young women revise their risk perceptions based on their marital experiences, and that divorce may serve as a protective strategy for young married women concerned about their chance of future HIV infection.

Research has begun to recognize the behavioral strategies that individuals in countries most affected by the HIV epidemic use to avoid infection. Beyond the traditional recommendations to abstain from non-marital sex, be faithful to partners, and use condoms, researchers in sub-Saharan Africa have described the roles that marriage and partner choice play in an individual's risk avoidance (Mukiza-Gapere and Ntozi 1995; Watkins 2004; Smith and Watkins 2005; Schatz 2005; Reniers 2008). Given that abstinence and condom use with a spouse are not commonly practiced in the region, marriage is likely a site for new infections to occur (Dunkle et al. 2008; Hudson 1996; Robinson et al. 1999; Carpenter et al. 1999). Longitudinal surveys have found that HIV sero-discordant couples are more likely to divorce (Porter et al. 2004; Grieser et al. 2001) and that the likelihood of divorce is also higher in couples where a spouse is suspected of infidelity (Reniers 2008), suggesting that individuals use divorce as a strategy to reduce their risk exposure within marriage.

For young people, however, a more pressing issue is whether the transition to marriage increases exposure to the risk of infection or creates a protective space where partners are shielded from exposure through their spouse's fidelity. Evidence for a relationship between

the timing of marriage and HIV infection has been mixed, for the most part suggesting that young women in southern Africa who deviate from the local marriage pattern are at the greatest risk. Some studies have found that a later than average age at first marriage raised the risk of HIV infection, as women had a longer duration of time from first sexual intercourse until marriage and more premarital partners (Bongaarts 2006; Adair 2008). In contrast, research in Kenya and Zambia found that young married adolescents were more likely to be HIV-positive than their unmarried peers (Clark 2004; Glynn et al. 2001). Premarital sexual exposures appear to be an underlying cause of the "riskiness" of marriage for young women. A recent study from Malawi found that premarital sex in and of itself did not raise the risk of HIV infection, but that premarital relationships that did not end in a marriage were associated with higher likelihoods of infection (Boileau et al. 2009). Others have suggested that the marital search process may raise the risk of HIV infection, even among those who are serially monogamous; rapid partner turnover may increase the likelihood of encountering a partner who has a high viral load due to a recently acquired HIV infection, raising the probability of transmission (Magruder 2011).

Less is known about whether individuals use the timing of marriage as a risk avoidance strategy. Statistical associations between marriage and HIV may be less likely to provoke behavior changes than perceptions among young adults of marriage as a risky or protective space. In one of the few studies to examine this question, Clark, Poulin, and Kohler (2007) found that young men and women in Malawi were divided on whether marriage was protective against infection and whether it was better to marry at a younger or older age in order to avoid infection. If the marriage process does affect one's risk exposure, then the perceptions, motivations, and choices made during this stage of the life course have consequences both for an individual's risk of infection and the shape of the HIV epidemic. Likewise, it is unknown how the perceived risk of infection changes in response to the transition to marriage, as individuals adjust to new relationship dynamics and more regular sexual activity, and whether these changes in risk perception affect the risk of divorce during the early years of marriage.

In this paper, we use data from the 2007–2011 survey rounds of the Malawi Schooling and Adolescent Survey (MSAS) to explore the ways in which the timing of marriage has been responsive to the HIV epidemic for a single cohort of youth. First, we focus on the ways in which young women's expectations about HIV infection are associated with the timing of marriage, and how this association may be influenced by a respondent's direct exposure to the epidemic. We then examine whether the transition to marriage changes a respondent's HIV expectations. Finally, we examine how expectations about HIV infection during the early years of marriage are associated with the risk of divorce. Together, these analyses provide new evidence for how young women perceive and respond to the risk of infection.

HIV and Marriage

The HIV epidemic may influence the timing of marriage through both direct and indirect pathways. Direct experiences with HIV, such as the death or prolonged illness of adult family members, may alter a household's economy in ways that push a young person into marriage, either to relieve the resource strain caused by the loss of an economically active

adult or to escape the additional burden of work that a young person may be expected to assume. A fourteen year longitudinal survey in Tanzania found that young women whose fathers died were more likely to marry than women who had not lost a parent (Beegle and Krutikova 2008). However, other studies using cross-national data have not found an association between orphanhood and the timing of marriage (Palermo and Peterson 2009; Birdthistle et al. 2008). The death of other key family members may also influence marriage decisions; Ueyama and Yamauchi (2009) found that the death of siblings, both in childhood and adulthood, significantly decreased the age of first marriage in Malawi.

To the extent that marital behavior is influenced indirectly by the HIV epidemic, individual choices are likely to be sensitive to the local risk environment. Ueyama and Yamauchi (2009) also found that districts in Malawi with higher adult mortality rates had earlier ages at first marriage. Furthermore, high adult mortality was associated with a shorter interval between first sex and the transition to marriage. The authors inferred that young women observed the level of adult mortality in their district and used that information to form perceptions of their own potential risk of acquiring HIV/AIDS. Those perceptions then prompted young women to spend less time searching for marriage partners and, instead, choose an early marriage in order to secure a “safe” partner and minimize their premarital exposure to the risk of HIV. Unfortunately, the authors were not able to examine the hypothesized pathways underlying this association.

Changes in the timing of marriage in response to the threat of HIV infection are likely to be contingent on how young people perceive the link between marriage and HIV risk exposure. Although Clark, Poulin, and Kohler (2009) were unable to examine whether beliefs about the “riskiness” of marriage were associated with the subsequent timing of marriage, they did find that sexual behavior changed as young people approached marriage; the closer marriage was anticipated to be, young people were more likely to have ever had sex and to have had a larger number of sexual partners. If individuals base their risk perception in part on their own sexual behavior and partner history (Smith and Watkins 2005), then concerns about HIV infection may also increase as young people prepare to marry.

Alternately, young people may delay marriage in response to their HIV-related concerns. An earlier qualitative study in Uganda (Mukiza-Gapere and Ntozi 1995) found that young people voiced fears about marriage and the possibility of acquiring HIV infection from an unfaithful partner. Suspicions of infidelity and fear of becoming infected with HIV within marriage have been associated with higher divorce rates since the onset of the HIV epidemic (Reniers 2008), so it is possible that young people take these risks into consideration when they first decide to marry.

Individuals, however, often do a poor job assessing their own risk exposure. In some contexts, youth assert that only high risk behaviors such as commercial sex work put individuals at risk of infection (Prata et al. 2006; Macintyre et al. 2004; MacPhail and Campbell 2001). Other studies, however, have demonstrated that most people overestimate the probability that they are currently infected, overestimating the probability of HIV transmission per act of unprotected sex and inferring risk exposure from assessments of their own sexual behavior and the suspected infidelity of spouses (Anglewicz and Kohler 2009).

If respondents' responses to questions about their chances of becoming infected with HIV in the future are interpreted as statements about their expectations for the future, then these self-assessments suggest pessimism about what the future holds. In general, the health and survival expectations of adolescents have been under-theorized in less developed countries, although research from the United States has consistently found that adolescents overestimate their chances of an early death (Fischhoff et al. 2000; Harris, Duncan and Boisjoly 2002; Jamieson and Romer 2008; Duke et al. 2011).

It is unknown to what extent young people use their perceived risk of infection to imagine their future or how those expectations shape current marriage behavior (Mische 2010). Decisions in the present are made in light of their anticipated consequences for an imagined future; these consequences are based in part on what an individual has come to expect based on their own past experiences and their observations of the world around them. HIV expectations reflect how individuals assess the degree of control they have over their future risk exposure and shape what they perceive as their options for action. For unmarried adolescents, expectations about future infection with HIV represent a type of fundamental uncertainty, such that future events are yet to be determined and are not knowable in advance (Duquech 2000). Assuming that most adolescents are not yet infected with HIV,[1] future infection will be determined by partner choice and marital fidelity. Although individuals can determine their own sexual partners and regulate their own fidelity, future partner fidelity may not be predictable and partner serostatus can only be known through the sharing of HIV test results. The chance of future infection is, therefore, highly contingent on intervening events and subject to uncertainty (Johnson-Hanks 2004).

Furthermore, if individuals with greater concerns about the HIV epidemic do marry at younger ages, it may be for reasons other than as protection against infection. The decision to marry may have less to do with regulating risk exposure than it does with responding to shorter time horizons prompted by subjective expectations about future HIV infection. The expectation of an AIDS-related early death may motivate some people to accelerate the transition to marriage and parenthood, in order to achieve family building goals before becoming sick. Although few studies have considered this pathway between HIV risk perceptions and the timing of marriage, a larger literature has examined the association between HIV risk perceptions and fertility behaviors and intentions. Some individuals who are HIV positive or worried about becoming infected express a lowered desire for more children, related to fears of not being able to raise their children to adulthood, concerns about vertical transmission, and worries about how pregnancy may affect the progression of a latent HIV infection (Grieser et al. 2001; Cooper et al. 2007; Yeatman 2009a and 2009b). Other studies have found a positive association between HIV risk perceptions and fertility at younger ages, as young women effectively race the clock to achieve their fertility goals (Noel-Miller 2003; Trinitapoli and Yeatman 2011; Yeatman 2009; Hayford, Agadjanian, and Luz 2012).

[1]The Malawi Schooling and Adolescent Survey (MSAS) measured HIV status in rounds 4 and 5. In round 4, 2.9 percent of female respondents were HIV positive, and in round 5 4.7 percent were HIV positive.

Even less research has considered how perceptions of HIV risk change in response to the transition to marriage, and there is no clear consensus from this research on how the transition to marriage may affect HIV risk perceptions and concerns. Helleringer and Kohler (2005) found no association between current marital status and worry about catching HIV in rural Malawi, whereas Shisana et al. (2004) found that married individuals in South Africa were significantly less likely than the unmarried to see themselves at risk of HIV infection. Other studies have suggested that married individuals are less accurate in their self-assessments of HIV risk exposure, such that married youth engaged in higher risk sexual behaviors are less likely to perceive themselves to be at risk of infection relative to unmarried youth (Prata et al. 2006). Condom use acceptability also declines after the transition to marriage; given that women are most likely to see their spouses as a source of potential infection, the inability to prevent marital HIV exposure may lead recently married women to perceive themselves at greater risk of infection relative to their premarital risk perceptions (Anglewicz and Kohler 2009; Anglewicz and Clark 2013). Divorce has been shown to be higher among women who suspect that their husband is unfaithful, with the strongest association emerging in the years after the onset of the HIV epidemic (Reniers 2008). Divorce is also higher among sero-discordant couples (Porter et al. 2004; Grieser et al. 2001), suggesting that divorce offers women the means of regulating their exposure to HIV infection within marriage.

Hypotheses

In this paper, we first use time-lagged indicators of perceived chance of future HIV infection to examine the transition to first marriage. We hypothesize that individuals who perceive themselves to be at risk of future infection will be more likely to marry at younger ages than their peers who do not share these concerns. We also test whether other experiences of the HIV epidemic, such as parental death and perceived community prevalence, influence the association between our measure of HIV-related concern and the timing of marriage. Third, we examine whether sexual experiences, such as having ever had sex or used a condom, mediates this association. Clark, Poulin and Kohler (2009) found that young people in Malawi were more likely to have had sex if they anticipated marrying in the near future. Given that individuals base their HIV risk perceptions in part on an evaluation of the "riskiness" of their own sexual experience (Smith and Watkins 2005; Anglewicz and Kohler 2009), we hypothesize that sexual experience may explain the association between HIV-related concerns and the transition to marriage.

In the second part of the analysis, we examine whether HIV risk expectations change after the transition to marriage relative to an individual's beliefs prior to marriage. If individuals use marriage as a protective strategy to reduce their chance of becoming infected, we hypothesize that HIV-related expectations will decline in the year after marriage, as young women respond to the perceived "safety" of their new status. Alternately, if young women are marrying because concerns about HIV have shortened their time horizons, we would expect to see no significant difference in perceived risk of future HIV infection by marital status. An increase in HIV risk perceptions following marriage would not preclude either hypothesis, but would indicate that these perceptions respond to the perceived risk of infection within the marriage.

Finally, other studies have found that individuals use divorce as a strategy to protect oneself from the chance of being infected with HIV by a spouse. Therefore, we hypothesize that young married women who expect to become infected will be more likely to divorce than women who perceive no chance of future infection.

Data and Methods

The data come from the Malawi Schooling and Adolescent Study (MSAS), a longitudinal study comprising a sample of 1,764 students and 885 out-of-school Malawians aged 14–16 at the start of 2007. The student sample was selected from fifty-nine primary schools in Balaka and Machinga, two adjacent districts in southern Malawi. The 30 schools visited in Machinga represent nearly 20 percent of the primary schools in the district, whereas those in Balaka represent nearly 25 percent of the primary schools in that district. The probability of a particular school being included in the sample was proportional to its enrollment in 2006.[2] At each school we interviewed approximately 30 students in standards 4–8, the last 4 years of primary school, stratified by gender and age. The students were randomly selected from registers recording enrollment at the beginning of the 2007 school year. Adolescents were classified as out-of-school if they had not attended in the second term of the school year. Out-of-school adolescents were identified through key informants located at the school and within the randomly selected school catchment villages.[3]

It is important to note that if a student entered school on time at age six and progressed through primary school without interruption, he/she should have completed primary at age 14. Therefore, by definition, our student sample is composed of respondents who have experienced some type of delay. We do not have data on adolescents in the same age group who were already in secondary school. However, our student sample reflects the typical educational experience of young people in Malawi. According to the 2004 Malawi DHS, of the 76 percent of 14–16 year olds who were enrolled in school, 92 percent were still enrolled at the primary level. Even among 16 year olds, 82 percent of current students were attending primary school (NSO and ORC Macro 2004).

The respondents were interviewed for the first time between May and July of 2007 and have been re-interviewed annually. The study achieved a re-interview rate of 91% of the baseline sample in 2008, 90% in 2009, and 88% in 2010 and 2011. Less than six percent of never married respondents were lost to follow-up prior to the transition to marriage; these observations are censored after their last interview. There is no association between HIV risk perceptions and sample attrition (results not shown). This paper focuses on the sample of female respondents who were unmarried in 2007. Our final analytic sample consists of 1,155 respondents who contribute 3,206 person years of exposure. We omit from the

[2]The number of schools visited in each district was based on estimates of (1) the proportion of students in the age group attending primary school, (2) estimated attendance rates (3) estimated attrition rates, (4) estimates of transitions to secondary school and school dropout.

[3]Sample weights are the inverse of the product of the probability that a respondent was selected within a school and the probability that a sample school was chosen. For the in-school sample, the probability of being selected from within a sample school is based on the pool of eligible students within the school roster stratified by sex. For the out-of-school sample, the pool of eligible 14–16 year olds who were not enrolled in school was estimated as proportional to the size of the sampled school through which the respondent was identified.

analysis 168 females who were married at the baseline and 14 females who were not re-interviewed after the baseline.

The adolescent instrument included an extensive set of questions on household and family characteristics, educational attainment, schooling history and experiences, household labor and employment, sexual behavior, marriage, and health. Sensitive portions of the survey, including questions about students' sexual experience, harassment or abuse by teachers and fellow classmates at school, and substance abuse were asked using an audio-computer assisted survey instrument (ACASI); all other modules of the survey were collected using a face to face interview format. The majority of questions were asked in all rounds.

Marriage and divorce

This analysis examines the timing of first marriage, measured as the number of rounds (years) until respondents enter their first marriage. In our study area, all cohabiting unions are locally recognized as marriages, regardless of the formality of the union. Formal unions are distinguished by the involvement of *ankhoswe*, representatives from the families of the husband and wife who negotiate the terms of the marriage. Marriages may be further solemnized in a traditional or religious ceremony. In this analysis, we define the transition to marriage as entry into the first cohabiting union.

All respondents enter the analysis at the time of our first survey round, aged 14–17 years. Respondents who had not yet transitioned into first marriage by round 5 of our data collection and respondents who were not interviewed in any subsequent round are censored in the analysis. We asked the month of marriage in the first three rounds of the survey but reporting of months across rounds is highly inconsistent; for example, of respondents who gave a month of first marriage in rounds 2 and 3, only 25% reported the same month in the two rounds. In contrast, less than five percent of women in rounds 2 and 3 reported that they had never been married following a report of marriage in the previous survey round; many of these rescinded reports reflect short-lived informal unions that ended prior to the involvement of *ankhoswe*. Beginning in Round 4, marital status was measured relative to the marital status reported in the prior survey round, which improved the reliability of these measures. In the second section of analysis, we use a time varying indicator of entry into first marriage and duration in first marriage as the key explanatory variable in the analysis of changes in HIV-related expectations.

Finally, the transition to divorce is measured as the number of survey rounds (years) until a respondent ends her marriage. Respondents enter the analysis in the first survey round after their marriage, and are censored from the analysis if the marriage has not ended by the final interview.

HIV risk perceptions

Our second set of key variables measure a respondent's expectations about their risk of future HIV infection. In all five rounds of the survey, respondents were asked "Do you think that your chances of getting HIV/AIDS in the future are great, moderate, small, or that you have no chance at all?" This variable is also coded into three categories, for respondents

who believe that they have (1) no chance of becoming infected with HIV in the future; (2) any chance of getting HIV in the future; and (3) does not know or missing. In the first and third sections of analysis, expectations about HIV risk are the key explanatory variables of interest and are lagged one survey round behind the marriage outcome variable. In the second section of analysis, this measure of future HIV risk perceptions is the dependent variable.

Control variables

In addition to HIV expectations, we also include three time-varying variables that capture household and community exposure to the HIV epidemic: maternal death, paternal death, and perceived community HIV prevalence.[4] We also include two time-varying variables that capture whether respondents reported ever having had sex and whether they reported ever using a condom. Note that reporting of ever having sex and ever using a condom across rounds is highly inconsistent; for example, almost 30% of females retracted reports of ever having had sex between round 1 and 2 (see BLINDED for a detailed examination of inconsistent reporting). For the purpose of this analysis, we code respondents as ever having had sex or ever using a condom in a particular round if they acknowledge having sex or using a condom in that round or in any prior round. There was no substantive difference in the results when an alternate, non-cumulative version of this variable was used.

In addition to these variables, we include a set of time-varying control variables that may also be associated with the timing of marriage: whether respondents were attending school at the time of the interview; the highest grade respondents had ever attended; three categories for respondents' academic skills: lacking basic skills (illiterate and innumerate), limited skills (literate but not numerate), and literate and numerate[5]; whether respondents could read out loud two simple sentences in English (the official language); and a count of household assets[6]. We also control for respondents' age at baseline and ethnicity.

The analysis of divorce includes three additional variables about the respondent's marriage in order to reduce the possibility of a spurious association between the HIV attitudinal variables and marriage dissolution: age at marriage, the age difference between spouses, and the formality of the respondent's marriage. Age at marriage is collapsed into four categories: 14–15, 16–17, 18–19, and 20–22 years old. Respondents were also asked to categorize the age difference between themselves and their husbands: the same age, husband 1–5 years older, and husband more than 5 years older. Finally, the survey identified four categories of union formality: consensual unions, married with an *ankhoswe*, married with a traditional ceremony, and married with a religious ceremony. These questions about the formality of

[4]Respondents were asked the following question in all rounds: "If we took a group of 10 people from this area –just normal people whom you found working in the fields or in homes—how many of them do you think would now have HIV/AIDS?".

[5]Respondents were asked to read aloud two simple sentences in the national language, Chichewa; we considered respondents literate if they could read both sentences correctly. Respondents were also asked to complete a short mathematics assessment. In 2007, the assessment consisted of 12 problems that involved ordering numbers, addition, subtraction, multiplication, division, and solving word problems drawn from the Malawi Institute of Education (MIE) achievement tests for standard 3. We consider respondents numerate if they solved at least 10 of the 12 problems.

[6]Respondents' were asked whether their household had any of the following 16 items: mattress, sofa, table, chairs, paraffin glass lamp, television, radio, cell phone, mosquito net, bicycle, motorcycle, car, tin roof, electricity, boat/canoe, books to read. We include a simple count of these items, results do not change in any significant way if instead we use an index generated through principal components analysis.

marriage were not introduced until the fourth survey round, at which point they were asked retrospectively for all prior unions. Respondents who were not re-interviewed in rounds 4 and 5, for whom this information is missing, were coded as having an unknown union type.

Methods

First, we conduct nonparametric analysis and compare survivor functions for the never married state by perceived risk of future HIV infection. Next, we use Cox proportional hazards models (Cox 1972) to estimate the effect of the perceived HIV risk covariates on the hazard of first marriage, while controlling for other explanatory variables. The Cox proportional hazard models are estimated for rounds 1–5, and all time-varying covariates are lagged by one round; that is, we use covariates measured at round 1 to explain transition into first marriage by round 2; covariates measured at round 2 to explain transition into first marriage by round 3, and so on. Although the Efron approximation method is the recommended approach to handle tied failures when an exact marginal calculation for an underlying continuous-time model is computationally infeasible (Cleves, Gould, and Gutierrez 2004), the estimation of this method in Stata does not support sample weights or controls for complex survey designs. Therefore, we use the Breslow method to handle tied failures in our analysis. This specification leads to slightly different estimated hazard ratios, but our overall conclusions do not change.

The second part of the analysis uses individual-level fixed effect logit regressions to estimate how the transition to first marriage, and time spent in marriage, affect females' perceptions of HIV risk. To estimate the fixed-effect logit regressions we pool the data for all five rounds. Individuals with no change over time in their report of HIV-related expectations are excluded from the respective analysis. Respondents are censored from this analysis if their first marriage ends before the fifth survey round.

Finally, we use Cox proportional hazard models to estimate the association between the HIV attitudinal variables and the hazard of divorce among married respondents. These regressions are estimated for observed years of marriage and all time-varying covariates are lagged by one round; for example, a respondent's characteristics measured during the first year of marriage are used to estimate whether the union survived until the next survey round. One limitation of this and the previous analysis is that we must exclude respondents with short-lived unions that began and ended during an inter-survey period, because we do not have a measurement of HIV expectations captured during the marriage. These short-lived unions account for 11.5 percent of all first marriages as of the fifth survey round. Among ever married respondents, women were more likely to marry and divorce during an inter-survey period if they were the same age as their partner or in an informal union, and less likely if they were better educated or had a religious marriage ceremony. All statistical analyses are conducted in Stata Version 13.1 (College Station, TX). The survival analyses are weighted and use the svy command in Stata to control for the complex sample design. Appendix tables A.1–A.3 present summary statistics for females contributing to each analysis.

Results

Non parametric estimates for first marriage

Figure 1 compares the survival function for never being married by our measure of HIV-related concern. By the fifth survey round, over 67 percent of young women had entered a union. At any given time in the analysis, females who perceive they have any chance of becoming infected with HIV are less likely to 'survive' in the never married state than females who think they have no chance or don't know, but the difference in hazards is not statistically significant.

Transition to Marriage

Table 1 shows results from Cox proportional hazards regressions that estimate the impact of respondents' perceived chance of future HIV infection in one round on the hazard of first marriage by the next round. Model 1a only includes the covariates for the respondent's perceived chance of becoming infected with HIV in the future. Results show that females who in any given round reported that they believed themselves to have any chance of becoming infected with HIV have a hazard of marrying by the next round that is 12 percent higher than that of females who reported no perceived chance of future infection; this result is marginally statistically significant (p=0.064).

Model 1b adds controls for respondents' age and ethnicity, schooling, literacy and numeracy, as well as household assets. The estimated hazard ratio for the respondent's perceived chance of future HIV infection in model 1b is close (1.11) to the hazard ratio estimated in model 1a (1.11) and is marginally statistically significant at the 10% level. In this model, we also confirm that many of our control variables are significantly associated with the transition to marriage. Women not categorized into one of the three predominant ethnic groups have a lower hazard of marriage relative to the Yao. We also find that the hazard of marriage for respondents who were attending school in round t-1 is only 36 percent of the hazard of respondents who were not attending school. Respondents who had completed primary school, begun secondary school and who were literate in English also had lower hazards of marriage. Respondents with numeracy skills, however, had higher hazards of transitioning into marriage than those with no skills. Finally, each additional household asset reduces the hazard of marriage by two percent.

When parental death and perceived community prevalence of HIV are introduced in model 1c, the hazard ratio for respondents' perceived chance of becoming infected with HIV remains the same as in model 1b. None of the variables introduced in model 1c were significantly associated with the transition to marriage. When the sex and condom use covariates are added in model 1d, the hazard ratio for the respondent's HIV expectations is smaller (1.07) than in the previous models and is no longer statistically significant at the 10 percent level. Furthermore, respondents who reported ever having had sex in a previous round or who reported ever using a condom in a previous round had higher, but not significantly different, hazards of first marriage.

Changes in HIV Expectations

The next table presents individual-level fixed effect regressions of the factors associated with reported expectations about HIV/AIDS. Our primary interest is in whether the transition to first marriage and time since marriage change a young woman's attitudes about HIV relative to the time when she had not yet married.

The first model in Table 2 (2a) suggests that after marriage women are more likely to expect to become infected with HIV, and that this association persists throughout the first four years of marriage. The magnitude of these odds ratios increases in model 2b after controlling for socio-demographic characteristics. Respondents with some secondary education are statistically significantly less likely to change their HIV expectations than respondents with less than primary education, while those who are literate are more likely to change their HIV expectations than those who have no skills. When the HIV-related variables are controlled for in model 2c, the magnitude of the odds ratios for all categories of duration in marriage are slightly reduced. Women who perceive a higher HIV prevalence in their communities are more likely to change their HIV expectations. The inclusion of the transition to sexual experience and condom use further reduces the odds ratios for all of the marriage duration categories, although the association with HIV expectations remains statistically significant in all these categories.

Divorce

Only 58 percent of marriages were intact by the fifth year of marriage. Figure 2 presents the survivor functions for the transition to divorce by HIV expectations status. At all marital durations, women who perceived any chance of becoming infected with HIV were less likely to remain in the union. By the fifth year of marriage, 48.8 percent of women who perceived any chance of future infection were divorced, as compared to 33.3 percent of women who perceived no chance of future infection.

Table 3 shows results from Cox proportional hazards regressions that estimate the impact of respondents' perceived chance of future HIV infection in one round on the hazard of divorce by the next round. The first model (3a) finds that women who perceived a chance of future infection had almost 40 percent higher hazards of divorce relative to women who perceived no chance of future infection, and this association was marginally statistically significant ($p=0.101$). When socio-economic controls are added in Model 3b, there is minimal change in the association between HIV expectations and the hazard of divorce. Educational attainment is the only socio-economic variable with a significant association with the transition to divorce, such that women with higher levels of educational attainment had lower hazards of divorce relative to women who had not completed primary school.

Marriage characteristics are included in Model 3c. Age at marriage and the age difference between partners are not significantly associated with the hazard of divorce. The formality of the union, however, is strongly associated the transition to divorce. Relative to women who had a traditional ceremony, women who were in a consensual union or who were married by a meeting of the *ankhoswe* but without a ceremony were significantly more likely to divorce (HR=1.83 and 1.47, respectively). In contrast, women who had a religious

ceremony had a hazard of divorce only a third as high as women who had a traditional ceremony. The hazard ratio for perceiving any chance of future HIV infection increased slightly to 1.40.

The final model (3d) adds the set of HIV-related variables. After these variables are included, the hazard ratio for HIV expectations increased to 1.51 and became statistically significant (p=0.022). There is no significant association between parental survival or condom use and the hazard of divorce. The respondent's perceived community HIV prevalence, however, was negatively associated with the hazard of divorce; for each additional person out of ten that a respondent thought was HIV positive, the hazard of divorce decreased by 9 percent. The interaction between HIV expectations and perceived community prevalence (not shown) is not statistically significant.

Discussion

Our research did not find support for the hypothesis that young women who perceive any chance of becoming infected with HIV are more likely to marry than women with no perceived chance of future infection. Although the association between these variables was initially positive and marginally significant, the addition of control variables weakened the hazard ratio and rendered the association non-significant. Furthermore, the transition to marriage does not reduce HIV risk perceptions as had been hypothesized; in fact, we find that young women are more likely to perceive any chance of future HIV infection in the years following marriage relative to when the respondents were never married. Finally, young married women who perceived any chance of future infection were significantly more likely to divorce within the first five years of marriage relative to women with no chance of future infection. Women are less likely to divorce, however, when they perceive a higher prevalence of HIV in their community.

The statistical non-significance of the association between HIV risk perceptions and the transition to marriage signals the heterogeneity of responses that young women have to the HIV epidemic. Although other studies on HIV risk perceptions and fertility intentions from the region support the idea that young women are motivated to begin their families "now or never," while they are still young, healthy, and, most likely, still HIV-negative (Hayford et al. 2012; Yeatman 2009b; Grieser et al. 2001), we find that the story on the transition to marriage is less clear. Our results echo the finding of Clark, Poulin, and Kohler (2009) that unmarried youth were almost equally like to consider early marriage and delayed marriage as protective strategies to avoid HIV infection, and that no one pattern of expectations guides marital behavior. Without qualitative data, however, we cannot answer the question of whether young women are consciously weighing their HIV risk perceptions when they entertain the idea of marriage. We also did not find support for our second and third hypotheses, that the transition to marriage would be related to other HIV-related variables, such as orphanhood and perceived community HIV prevalence, and sexual experience. In contrast, the strongest predictors of entry into first marriage were school enrollment status and schooling attainment.

Nonetheless, we believe that these attitudinal variables provide valuable insight into how young women make decisions in the context of the HIV epidemic. Our finding that the perceived chance of future HIV infection increases following marriage suggests that young women revise their risk perceptions in response to their marital experiences. Other studies have found significant associations between HIV risk perceptions and suspicions of marital infidelity (Anglewicz and Kohler 2009; Agadjanian, Arnaldo, and Cau 2011). We believe that measures of marital behavior such as this are among the unobserved experiences that are informing the observed intra-individual changes in HIV risk perception. Unfortunately, the MSAS did not ask questions about suspected partner infidelity, so we cannot evaluate how these suspicions may be contributing to the pattern of increased risk perception.

Our findings also provide evidence for the hypothesis that divorce is a protective strategy used by young women to protect themselves from exposure to HIV transmission (Reniers 2008; Schatz 2005). Young women who perceived any chance of future HIV infection were significantly more likely to divorce than young women with no chance of future infection. Given that young women were more likely to see themselves at risk of infection after marriage, these findings suggest that young women were more likely to leave marriages that they perceived to be "risky." We also find further evidence of the strategic use of divorce, such that women are less likely to divorce when they perceive themselves as living in a community with high HIV prevalence. Remaining in a marriage may be a protective strategy when the chance of encountering a new partner who is HIV-positive is perceived to be high. The absence of a significant interaction between HIV expectations and perceived community prevalence indicates that women's use of divorce as a response to "risky" marriages is not conditioned on their perception of the broader risk environment.

Although we are able to observe the transition to marriage for almost 70 percent of our sample, this is a limitation for our analysis of the association between marriage and HIV risk perceptions. We are unable to observe the transition to marriage for women who were married at the time of the first survey round, and women who marry later are either not contributing any married observations to the fixed effect and divorce analyses or are overrepresented in the first years of marriage. This may be biasing our estimation if women who marry earlier or later differ from other women in our sample in other relevant ways. For example, women who marry at earlier ages are more likely to have a larger age difference relative to their spouse and to be in a polygamous union (Clark, Bruce and Dude 2006), which may upwardly bias the estimated effect of marriage on HIV-related expectations.

Furthermore, our findings are limited to a single cohort of young women in Malawi and may not be generalizable to other HIV-affected countries. The indirect effects of the epidemic documented in our research, together with the pre-existing norms of early marriage in Malawi, may help explain the relative stability of the median age at first marriage over the past twenty years (NSO and ICF Macro 2011). The different sets of social and economic forces present in other countries in Eastern and Southern Africa may have led to a different dynamic between the HIV epidemic and marriage. The median age at first marriage in South Africa, for instance, has steadily increased over the past thirty years as young people increasingly delayed marriage and adopted long term cohabiting relationships (Hosegood, McGrath and Moultrie 2009; Posel, Rudwick and Casale 2011). These intimate

arrangements share many underlying causes with the HIV epidemic (Hunter 2010), and may yield a different pattern of association than what we have documented in Malawi. Even countries with levels of HIV prevalence more comparable to Malawi have experienced increases in the age at first marriage (Mensch, Grant and Blanc 2006; Mensch, Casterline and Singh 2006; Marston et al. 2009), suggesting that caution is needed when extrapolating these findings to other contexts.

Beyond documenting the potential indirect effects of the HIV epidemic on the timing of marriage, our findings also raise questions about the consequences of this association for the future of the HIV epidemic. If early marriage does raise the vulnerability of young women to HIV infection, then marital choices prompted by pre-existing HIV expectations may be self-fulfilling. If, on the other hand, young women enter marriages where both partners embrace the dominant public messages of partner fidelity (Green et al. 2006; Schatz 2005), then early marriage may transform the incidence of new infections. Policy interventions and messages that target newly married couples may not only reinforce the positive potential for these patterns to affect the future of the epidemic, but may also help reduce the concerns of young women that are triggered by the transition to marriage.

The association between HIV risk perceptions and the transition to marriage may also change as the HIV epidemic changes. The HIV prevalence rate in Malawi has been stable for almost a decade, and a general understanding that the African AIDS epidemic has peaked has begun to emerge (Bongaarts et al. 2008; NSO and ICF Macro 2011). More importantly, the availability of anti-retroviral therapy (ART) may increase subjective life expectancies and improve outlooks for the future (Baranov, Bennett and Kohler 2012). The possibility of life-sustaining medication may not only change young people's perceived chances of future infection, but may also change what those expectations mean. If HIV infection is no longer synonymous with an early death, the link between HIV expectations and divorce may weaken. However, changes in marital behavior may be slow, as access to ART and public understanding of its implications slowly diffuses through communities.

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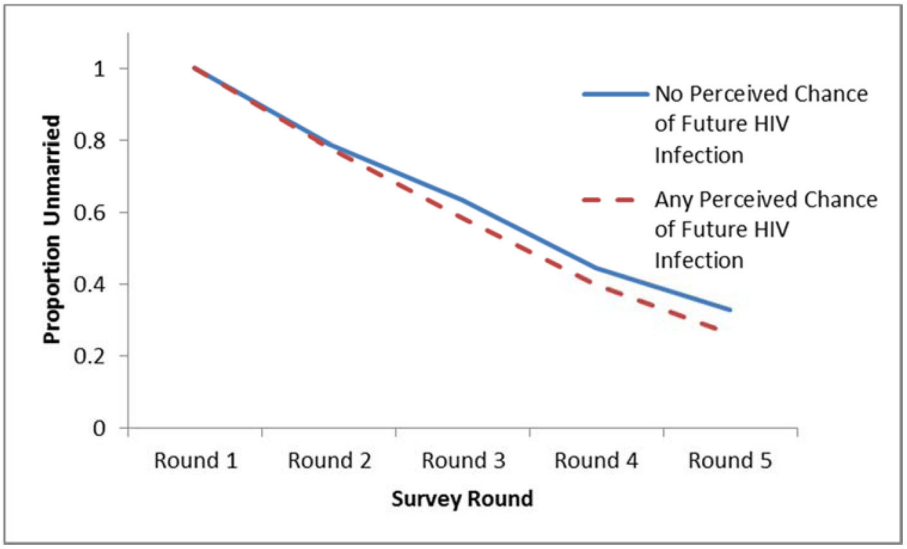

Figure 1.

Proportion of female respondents who remain unmarried by perceived chance of future HIV infection and survey round, Malawi Schooling and Adolescent Survey

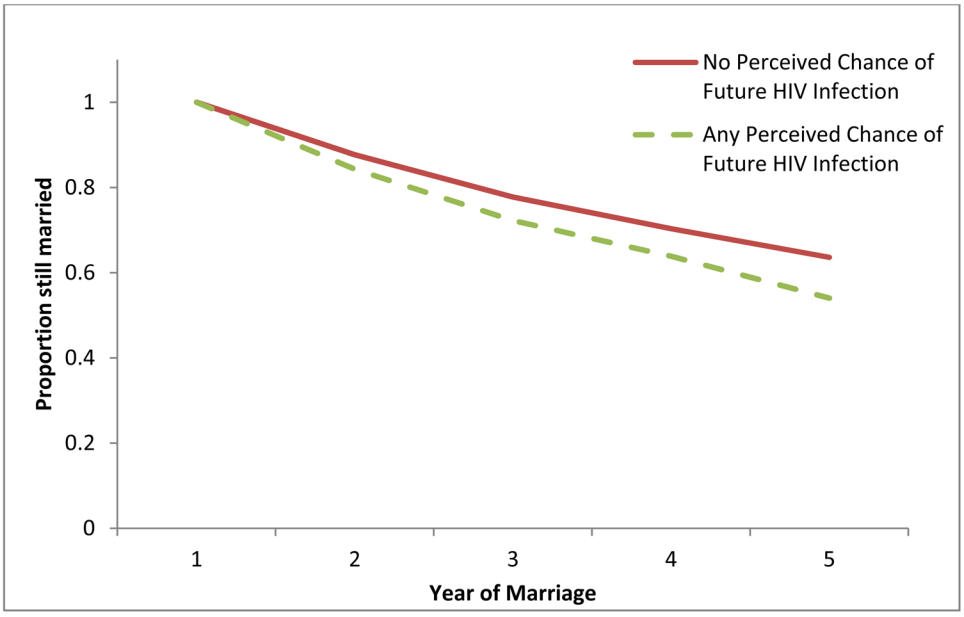

Figure 2.

Proportion of respondents who remain married, by perceived chance of future HIV infection and year of marriage, Malawi Schooling and Adolescent Survey

Table 1

Hazard ratios, Cox proportional hazard regressions for first marriage, by perceived chance of becoming infected with HIV, females aged 14–17 years old and never married at baseline, Malawi Schooling and Adolescent Survey 2007–2011.

	(a)	(b)	(c)	(d)
Chances of becoming infected with HIV (t-1)				
No chances	1.00	1.00	1.00	1.00
Any chances	1.12 [a]	1.11 [b]	1.11 [c]	1.07
Don't know/missing	1.10	1.03	1.00	0.99
Age at baseline				
14		1.00	1.00	1.00
15		1.00	1.00	0.98
16		1.33 ***	1.33 **	1.30 **
17		1.08	1.08	1.04
Ethnic group				
Yao		1.00	1.00	1.00
Chewa		0.82	0.82	0.82
Lomwe		0.87	0.88	0.86
Other		0.80 *	0.81	0.80 *
Attends school (t-1)		0.36 ***	0.36 ***	0.39 ***
Highest grade attended (t-1)				
Less than standard 8		1.00	1.00	1.00
Standard 8		0.81 *	0.81 *	0.81 *
Some secondary		0.66 ***	0.66 ***	0.65 ***
Chichewa literacy and numeracy (t-1)				
No skills		1.00	1.00	1.00
Literate but not numerate		1.19	1.18	1.20 *
Numerate		1.34 *	1.35 **	1.36 **
Can read in English (t-1)		0.94	0.94	0.93
Household items (t-1)		0.98 *	0.98	0.97 *
Mother has died (t-1)			0.98	0.96
Father has died (t-1)			1.02	1.01
Perceived HIV prevalence in community (t-1)			0.99	0.98
Don't know HIV prevalence in community (t-1)			1.03	1.00
Ever reported having sex (t-1)				1.21
Ever reported condom use (t-1)				1.20
Number of subjects	1155	1155	1155	1155
Time at risk	3034	3034	3034	3034
F-test	1.76	37.92 ***	37.57 ***	32.42 ***

Note: All variables (t-1) are lagged one round and are time varying.

*** p<0.001

** p<0.01

* p<0.05

a p = 0.064

b p=0.099

c p=0.080

Table 2

Odds ratios from fixed-effects logistic regressions, any perceived chance of becoming infected with HIV, females aged 14–17 years old and never married at baseline, Malawi Schooling and Adolescent Survey, 2007–2011.

	(a)	(b)	(c)	(d)
Time since first marriage				
Never married	1.00	1.00	1.00	1.00
0–1 years	1.52 ***	1.74 ***	1.68 ***	1.56 ***
1–2 years	1.48 **	1.68 ***	1.60 **	1.42 *
2–3 years	1.47 *	1.70 **	1.60 **	1.40
3–4 years	1.99 **	2.26 ***	2.04 **	1.75 *
Attends school		1.16	1.19	1.27 *
Highest grade attended				
Less than standard 8		1.00	1.00	1.00
Standard 8		0.91	0.88	0.83
Some secondary		0.58 **	0.51 ***	0.45 ***
Chichewa literacy and numeracy				
No skills		1.00	1.00	1.00
Literate but not numerate		1.61 *	1.51	1.51
Numerate		1.55	1.42	1.42
Can read in English		1.11	1.08	1.09
Household items		0.98	0.98	0.97
Mother has died			0.59	0.58
Father has died			1.50	1.47
Perceived HIV prevalence in community			1.09 ***	1.10 ***
Don’t know HIV prevalence in community			0.82	0.81
Ever reported having sex				1.19
Ever reported condom use				1.20
Number of observations	4113	4113	4113	4113
Number of groups (subjects)	916	916	916	916
LR chi2	27.54 ***	54.58 ***	96.58 ***	102.94 ***

Note: 249 respondents (861 observations) dropped because of all positive or all negative outcomes.

*** p<0.001

** p<0.01

* p<0.05

Table 3

Hazard ratios, Cox proportional hazard regressions for divorce, by perceived chance of becoming infected with HIV, females aged 14–17 years old at baseline and ever married, Malawi Schooling and Adolescent Survey 2007–2011.

	(a)	(b)	(c)	(d)
Chances of becoming infected with HIV (t-1)				
No chances	1.00	1.00	1.00	1.00
Any chances	1.37	1.40 [a]	1.40 [b]	1.51 *
Don't know/missing	1.39	1.33	1.26	1.23
Ethnic group				
Yao		1.00	1.00	1.00
Chewa		1.30	1.23	1.31
Lomwe		0.97	0.95	1.02
Other		0.83	0.88	0.93
Highest grade attended (t-1)				
Less than standard 8		1.00	1.00	1.00
Standard 8		0.57 *	0.56 *	0.57 *
Some secondary		0.82	0.70	0.70
Household items (t-1)		0.97	0.97	0.97
Age at marriage			0.99	0.99
Age difference between spouses				
Same age			1.00	1.00
Husband 1–4 years older			0.64	0.70
Husband 5+ years older			0.63	0.72
Unknown			0.45	0.42
Formality of marriage				
Consensual union			1.82 *	1.83 *
Ankhoswe only, no ceremony			1.20	1.20
Traditional ceremony			1.00	1.00
Religious ceremony			0.39 *	0.38 *
Unknown			0.29 **	0.29 **
Mother has died (t-1)				0.99
Father has died (t-1)				1.02
Perceived HIV prevalence in community (t-1)				0.91 *
Don't know HIV prevalence in community (t-1)				0.75
Reports condom use (t-1)				0.96
Time at risk	1362	1362	1362	1362
Number of respondents	710	710	710	710
F-test	1.41	1.99	2.58 **	1.79 *

Note: All variables (t-1) are lagged one round and are time varying.

*** p<0.001

** p<0.01

* p<0.05

a p = 0.079

b p=0.069

Appendix Table 1

Summary statistics of explanatory variables included in Table 1

	Rounds 1–2	Rounds 2–3	Rounds 3–4	Rounds 4–5
Chances of getting HIV (t-1), %				
No chances	45.4	53.9	55.2	55.1
Any chances	51.2	44.9	41.8	42.5
Don't know	3.4	1.2	3.1	2.4
Age at baseline, %				
14	26.1	26.6	29.9	28.4
15	38.3	40.1	38.8	43.4
16	27.6	25.4	24.0	21.3
17	8.0	8.0	7.2	6.9
Ethnic group, %				
Yao	40.4	37.3	37.4	36.9
Chewa	19.9	20.7	20.2	22.3
Lomwe	22.6	24.3	24.2	23.0
Other	17.1	17.6	18.2	17.8
Attends school (t-1), %	76.1	74.6	72.0	65.7
Highest grade attended (t-1), %				
Less than standard 8	73.8	54.7	39.0	24.3
Standard 8	24.8	28.6	27.6	22.8
Some secondary	1.4	16.7	33.4	52.9
Chichewa literacy and numeracy skills (t-1), %				
No skills	13.5	10.6	7.7	7.6
Literate but not numerate	39.2	38.4	41.6	45.3
Numerate	47.4	51.0	50.7	47.1
Can read in English (t-1), %	64.0	74.1	77.2	76.6
Mean household items (t-1)	5.1	5.5	6.0	6.8
Mother has died (t-1), %	14.7	15.3	15.6	16.3
Father has died (t-1), %	25.7	26.8	27.0	30.4
Mean perceived HIV prevalence (t-1)	3.7	4.1	4.4	4.6
Don't know HIV prevalence (t-1), %	10.1	5.0	2.5	5.2
Ever reported having sex (t-1), %	37.2	51.0	62.3	67.3
Ever reported condom use (t-1), %	21.1	29.1	39.1	44.9
N	1085	839	649	461

Appendix Table 2

Summary statistics of explanatory variables included in Table 2

	Round 1	Round 2	Round 3	Round 4	Round 5
Time in marriage, %					
Never married	100.0	79.7	64.3	46.5	35.3
1 round	0.0	20.3	17.0	20.5	14.2
2 rounds	0.0	0.0	18.8	15.1	17.9
3 rounds	0.0	0.0	0.0	17.9	14.9
4 rounds	0.0	0.0	0.0	0.0	17.8
Attends school, %	77.1	60.0	46.5	29.5	22.7
Highest grade attended, %					
Less than standard 8	73.5	60.4	50.5	45.8	43.3
Standard 8	25.0	25.4	25.8	23.5	22.6
Some secondary	1.5	14.1	23.7	30.8	34.1
Chichewa literacy and numeracy skills, %					
No skills	14.7	13.0	13.4	14.8	13.3
Literate but not numerate	39.2	40.6	44.2	47.1	42.2
Numerate	46.2	46.4	42.4	38.0	44.5
Can read in English, %	63.9	68.7	67.9	61.8	65.7
Mean household items	5.0	5.3	5.4	5.8	5.9
Mother has died, %	14.8	15.6	17.0	17.3	18.9
Father has died, %	27.2	28.6	30.0	30.8	33.2
Mean perceived HIV prevalence	3.6	4.1	4.3	4.4	4.9
Don’t know HIV prevalence, %	9.6	4.8	3.1	5.0	3.0
Ever reported having sex, %	35.3	57.4	76.8	86.4	91.3
Ever reported condom use, %	19.3	33.6	45.9	59.3	67.4
N	853	857	837	800	766

Appendix Table 3

Summary statistics of explanatory variables included in Table 3

	Year of Marriage			
	1	**2**	**3**	**4**
Chances of getting HIV, %				
No chances	38.3	40.0	41.3	34.4
Any chances	58.9	58.5	57.8	63.9
Don't know	2.7	1.6	0.9	1.6
Ethnic group, %				
Yao	46.2	46.7	53.2	59.0
Chewa	19.9	20.9	17.9	11.5
Lomwe	21.1	21.4	16.5	19.7
Other	12.9	11.1	12.4	9.8
Highest grade attended, %				
Less than standard 8	71.2	72.9	78.9	85.3
Standard 8	20.7	21.9	17.9	9.8
Some secondary	8.1	5.2	3.2	4.9
Mean household items	3.3	3.4	3.5	3.6
Age at marriage (mean)	16.6	16.3	15.9	15.3
Spouse age difference, %				
Same age	3.5	1.8	1.4	0.0
1–4 years older	83.9	92.3	94.0	96.7
5+ years older	11.4	5.2	3.7	3.3
Unknown	1.2	0.8	0.9	0.0
Formality of marriage, %				
Consensual union	8.7	6.7	3.2	8.2
Ankhoswe only, no ceremony	29.2	27.8	24.8	21.3
Traditional ceremony	40.1	43.0	45.4	41.0
Religious ceremony	11.8	15.2	18.4	21.3
Unknown	10.3	7.2	8.3	8.2
Mother has died, %	17.9	17.3	18.4	19.7
Father has died, %	26.1	27.6	28.4	31.2
Mean perceived HIV prevalence	4.0	4.0	4.3	4.0
Don't know HIV prevalence, %	5.5	5.4	5.5	4.9
Ever reported condom use, %	53.4	62.1	66.5	68.9
N	806	388	218	61