# MARITAL STRATEGIES FOR REGULATING EXPOSURE TO HIV*

GEORGES RENIERS

*In a setting where the transmission of HIV occurs primarily through heterosexual contact and where no cure or vaccine is available, behavioral change is imperative for containing the epidemic. Abstinence, faithfulness, and condom use most often receive attention in this regard. In contrast, this article treats marriage as a resource for HIV risk management via mechanisms of positive selection (partner choice) and negative selection (divorce of an adulterous spouse). Retrospective marriage histories and panel data provide the evidence for this study, and results indicate that men and women in Malawi increasingly turned to union-based risk-avoidance strategies during the period that the threat of HIV/AIDS materialized. Although both sexes strategize in a similar fashion, men are better equipped than women to deploy these strategies to their advantage. The article concludes with reflections on the long-term and population-level implications of these coping mechanisms.*

Without a medical fix, controlling the HIV/AIDS epidemic in sub-Saharan Africa will remain largely contingent on behavioral change. The evidence for such change is slowly accumulating (e.g., Bloom et al. 2000; Fylkesnes et al. 2001; Gregson et al. 1998; Kamali et al. 2000; Stoneburner and Low-Beer 2004), but the tone in the literature often remains subdued with reports of fatalistic attitudes toward life and death, low or diminishing responsiveness to program interventions, and a changing sex ratio of infections that is symptomatic of the special vulnerability of women (Caldwell 2000; Caldwell et al. 1999; Eaton, Flisher, and Aaro 2003; Mwaluko et al. 2003; UNAIDS 2004). What most authors of these reports—optimists and pessimists alike—have in common is an almost exclusive focus on the constituent elements of the ABC of HIV/AIDS prevention, a set of behavioral prescriptions (Abstinence, Be faithful, and use Condoms) that has dominated the HIV/AIDS advocacy discourse for several years (Green 2003).[1] The premise of this article is that coping strategies are not confined to those outlined by the ABC, and that risk management involves behavioral responses that do not often feature in AIDS awareness campaigns or scientific inquiry. The likely motivation for men and women to look beyond the ABC for resources to contain their risk of infection is that these prescripts are not always very realistic or practical (e.g., abstinence and condom use within marriage) or are beyond individual control (e.g., faithfulness of the spouse) (see also Heise and Elias 1995; Schatz 2005). The focus of

*Georges Reniers, Institute of Behavioral Science, Population Program, University of Colorado–Boulder; Visiting Lecturer, School of Social Sciences and School of Public Health, University of the Witwatersrand. Address correspondence to the author at Institute of Behavioral Science, Population Program, University of Colorado–Boulder, 484 UCB, Boulder, CO 80309; E-mail: georges.reniers@colorado.edu. The data for this study were collected using the support of three NIH grants: RO1 HD372-276, RO1 HD044228, and RO1 HD/MH41713. Additional support was received from a School of Arts and Sciences Dissertation Fellowship (University of Pennsylvania), a Hewlett Foundation grant to the University of Colorado at Boulder for the African Population Studies Research and Training Program, and from the NICHD-funded University of Colorado Population Center (R21 HD51146). I also wish to acknowledge the Graduate Group in Demography at the University of Pennsylvania, which hosted me in the period that this study was conducted. I am thankful to Doug Ewbank, Hans-Peter Kohler, Nancy Luke, Gayatri Singh, Kirsten Smith, Richard Rogers, Rania Tfaily, the late Etienne van de Walle, and the journal's reviewers, who contributed to this article with thoughtful comments and methodological advice. I am particularly indebted to Susan Watkins, who advised me on this article from its inception to the editorial refinements.

1. This appraisal does not apply to a tradition of critical scholars who focus on underlying or "upstream" determinants of HIV infection (Parker 2001; Schoepf 2001). In this article, too, the discussion is limited to partner selection and retainment—factors that are intimately related to what Boerma and Weir (2005) have labeled "the proximate determinants" of HIV infection—and largely ignores more fundamental causes of the spread of HIV.

this article is on marriage, and a survey of the behavioral responses in this domain reveals greater agency than we usually attribute to the men and women on the ground.

The lack of scientific attention to marital coping strategies in studies of AIDS in Africa is surprising since marriage—as well as the absence thereof—has repeatedly been invoked as a risk factor for HIV infection, particularly for women (e.g., Bongaarts 2007; Carpenter et al. 1999; Clark 2004; Glynn et al. 2003). Admittedly, the evidence for union-based strategies in HIV risk management is not entirely absent from the literature. Previous research has shown that spousal communication may be used deftly to persuade a spouse to reform and to provide information useful for evaluating one's own risk of infection (Gregson et al. 1998; Schatz 2005; Zulu and Chepngeno 2003). Strategies for selecting low-risk partners and the divorce of spouses who are believed to bring HIV into the household are other avenues for limiting risk. So far, the latter has been identified in predominantly qualitative research (Kaler 2004; Mukiza-Gapere and Ntozi 1995; Poulin 2007; Schatz 2005; Smith and Watkins 2005; Watkins 2004). Simulations suggest that (some of) these strategies could indeed be effective in regulating exposure to HIV (Bracher, Santow, and Watkins 2003). I revisit these hypotheses using marital histories and longitudinal evidence from rural Malawi.

The idea that marriage mediates health trajectories is not new (e.g., Farr 1858). Usually it is invoked in research aimed at resolving the relative importance of selection into marriage based on health characteristics versus the beneficial health outcomes of marriage itself (i.e., marriage protection) (Goldman 1993a, 1993b; Lillard and Waite 1995; Murray 2000; Umberson 1987; Waite 1995; Waldron, Hughes, and Brooks 1996; Wyke and Ford 1992). At times the debate is extended to include the effect of health status on marital quality and stability (Booth and Johnson 1994; Waldron et al. 1996). The latter has also been observed in cohort studies in Uganda, where divorce rates are higher for HIV-serodiscordant couples than for couples in which both spouses are HIV-negative (Carpenter et al. 1999; Porter et al. 2004).

Following the literature on marriage and health, I use the concept of *negative selection* to denote exit from marriage based on adverse health, and *positive selection* to refer to selection into marriage based on good health. In what follows, I investigate one hypothesis in support of each of these mechanisms: (1) behavior or characteristics associated with a relatively high risk of HIV infection (e.g., adultery) have a destabilizing effect on unions (negative selection); and (2) behavior or characteristics associated with lower risk of infection are a criterion for spouse selection (positive selection).[2] I am sensitive to male-female variability in the use of these strategies because of possible gender differences in the social acceptance of behavior related to initiating and terminating sexual partnerships.[3] The expectation that these strategies are a response to the threat of HIV infection implies that they become increasingly important as HIV prevalence and AIDS mortality rates increase. That proposition will be formally tested as well.

This study deviates from a common practice in the literature by considering perceptions of a (potential) partner's health rather than observed health status as the driving factor behind these selection processes. This approach is justified in a setting where little is known about one's own and each others' true HIV status,[4] but where an abundance of information

2. Not all selection into marriage needs to be driven by favorable health characteristics (Lillard and Panis 1996), but I assume it to dominate in this setting.

3. Differences in the social acceptance of "deviant" behavior by gender are not uncommon (e.g., Huselid and Cooper 1992). This is also the case for casual and/or extramarital sex that is repeatedly found to be more common for men than for women (Caraël et al. 1992). In certain African settings, a greater permissiveness of extramarital affairs for men has been associated with the practice of polygyny (which normalizes the idea of multiple sexual partners) and postpartum abstinence (which serves as justification for the practice) (Cleland, Ali, and Capo-Chichi 1999; Orubuloye, Caldwell, and Caldwell 1997).

4. In the 2004 Malawi Demographic and Health Survey (DHS), 5.6% of rural women and 12.3% of rural men reported having been tested for HIV and having received their test results (NSO and ORC Macro 2005).

circulates regarding individuals' sexual biographies and other characteristics that are considered important for evaluating someone's exposure to HIV (Swidler and Watkins 2005; Watkins 2004). It is also supported by a finding of Fu and Goldman (1996), who argued that it is the risk-taking behavior or health potential rather than observable health status that drives marital selection processes.

In the next section, I introduce the study setting and discuss the data sources. Using retrospectively reported marriage histories, I then test the negative and positive selection hypotheses. Where the data permit, I augment the analyses with longitudinal evidence. Finally, I discuss the efficacy of these strategies for HIV risk management as well as their population-level implications.

## THE SETTING AND THE DATA

Even by African standards, Malawi is a relatively poor country. It ranks 165th out of 177 on the Human Development Index, and its per capita gross domestic product (GDP) is US$580 (in purchasing power parity) compared with an average of US$1,790 for sub-Saharan Africa (UNDP 2004).

Sentinel surveillance data from antenatal clinics (ANCs) suggest that HIV prevalence among pregnant women in urban areas increased from under 10% in the late 1980s to 25% by the end of the 1990s. The first data points for areas outside the main urban centers date from 1992 and indicate prevalence in ANC attendees of just above 5%. By the end of the decade, this figure had increased to 20%. National adult prevalence (ages 15–49) for 2003 is estimated at 14.2% (UNAIDS/WHO 2004). Adult mortality rates increased in the 1990s as well: reports based on sibling survival in the Demographic and Health Surveys (DHS) suggest that adult mortality (ages 15–49) increased by 75% between the late 1980s and late 1990s (NSO and ORC Macro 2001). According to United Nations statistics, life expectancy peaked in the early 1990s at 48.0 and 50.9 years for men and women, respectively, before declining to 44.4 and 45.7 years for the period 2000–2005 (United Nations 2007).

These steep increases in HIV prevalence and mortality do not imply that most people are or were ignorant about AIDS. To the contrary, AIDS knowledge spread quickly: by 1992, over 95% of the rural population had heard about AIDS, and 85.6% and 92.4% of rural women and men, respectively, identified sexual intercourse as a mode of transmission (NSO and ORC Macro 1994). In 2000, HIV awareness and knowledge about its transmission via heterosexual intercourse was virtually universal (NSO and ORC Macro 2001). The concrete threat of HIV[5] and the understanding of its epidemiology are two conditions that are likely to intensify effective behavioral responses to HIV. The above evidence suggests that these prerequisites were increasingly met in the 1990s. I will therefore take 1990 as a turning point after which we should witness an increasing use of union-based strategies to contain exposure to HIV.

The data in this article come from the Malawi Diffusion and Ideational Change Project (MDICP).[6] These longitudinal survey data include information for approximately 1,500 ever-married women and their husbands who were interviewed in 1998 (MDICP1), 2001 (MDICP2), 2004 (MDICP3), and 2006 (MDICP4). The sample consists of three ethnically and religiously heterogeneous rural districts (see Figure 1). Rumphi in the north is characterized by a predominantly patrilineal system of descent with virilocal residence after marriage; the Tumbuka are the major ethnic group in the northern district. The Yao in Balaka (southern district) follow a matrilineal system of filiation, and residence after

5. Several authors have argued that it is particularly AIDS mortality (and hence the death of relatives or close friends) that translated HIV/AIDS from a topic of public health information campaigns to a tangible threat, and thus served to catalyze awareness into response (Gregson et al. 1998; Macintyre, Brown, and Sosler 2001; Watkins 2004).

6. A comprehensive introduction to the project is available in a special collection in *Demographic Research* (Watkins et al. 2003). Survey instruments and data are available at http://www.malawi.pop.upenn.edu/.

**Figure 1. Location of the Research Sites in Malawi**


marriage is most often uxorilocal. Descent is less rigidly matrilineal, and residence may be either uxorilocal or virilocal among the Chewa in Mchinji in the center of the country. The southern district is predominantly Muslim; Christians are in the majority in the other two areas. Marriage in Malawi is quasi-universal, but divorce rates are high, with some variation between the three research sites: in the south, over 50% of first marriages dissolve within 15 years; in the two other districts, this figure is between 30% and 40%.[7] Part of this discrepancy is related to the matrilineal system of filiation that predominates in the southern ethnic groups wherein marriage dissolution is traditionally higher (Reniers 2003). Marriage payments are more common in the northern ethnic groups but not very substantial in any of the three districts. Though parents and kin are often involved in the marriage process, their involvement rarely affects its outcome (Phiri 1983; Schatz 2002; Zulu 1996). As is the case in other parts of Africa (Locoh and Thiriat 1995; Ogbu 1978), divorce can be initiated by women as well as men (Watkins 2004).

In 2004 (MDICP3), respondents were counseled and tested for HIV. The testing protocol is summarized in Bignami-Van Assche et al. (2004). HIV prevalence in the sample used here is 9.3% for women (95% confidence interval: 7.6–11.3) and 6.4% for men (95% confidence interval: 4.6–8.7).[8] As is also observed in the Malawi DHS, HIV prevalence is highest in the southern district (NSO and ORC Macro 2005).

7. High levels of marriage instability in Malawi are not a novel phenomenon but have been observed throughout the twentieth century (Douglas 1950; Kaler 2001; Mitchell 1956).

8. These figures are lower than the national average because of the rural character of the sample and sample attrition due to migration and mortality. As in most countries, HIV prevalence in Malawi is markedly lower in rural than in urban areas (UNAIDS/WHO 2004). The relationships between migration and HIV infection (Crampin et

Sample attrition is a common phenomenon in panel designs, and because those lost for follow-up tend to be selective, attrition may bias means and coefficient estimates in regression models (Alderman et al. 2001; Bignami-Van Assche, Reniers, and Weinreb 2003). Close to 20% of the women interviewed in MDICP1 were not interviewed in MDICP2, primarily because they moved out of the sample areas (75%) or died (15%). An important characteristic of attrition for this study is the regional difference in the propensity to migrate following change in marital status. To the extent that marriages involve partners from different villages, marriage formation and dissolution often leads to the emigration of one of the spouses: where residence after marriage is virilocal, women are more likely to move, and vice versa where residence is uxorilocal. To compensate for marriage migration–related attrition, the MDICP2 sample included new spouses of the men and women who were interviewed in MDICP1. Residual regional variability in attrition is dealt with statistically by using district as a control variable. Mortality-related attrition—most of which is AIDS-related (Doctor and Weinreb 2003)—is numerically less important but cannot be accommodated by replacement of respondents.

This study relies in great part on retrospectively reported marriage histories (collected as part of the MDICP2 survey round).[9] Retrospective reporting may be biased because of the problematic reporting of ages and dates, the *ex post facto* rationalization of decision-making processes, and possibly because of a greater propensity to omit short unsuccessful unions from marriage histories as time passes. Retrospective reporting also implies that the information is confined to those who survived and were present at the time of the survey. Some of these problems are beyond the reach of this article and will just be acknowledged; others will affect the results in predictable ways, and where that is the case, it will be highlighted in the text. Where possible, the retrospective evidence will be strengthened with longitudinal analyses.

## NEGATIVE SELECTION: DIVORCE

If divorce is used as a means to regulate exposure to HIV, divorce should (1) be higher for couples in which one of the spouses engages in risky sexual behavior, and (2) become more responsive to risky sexual behavior as the spread of the HIV epidemic gains momentum. I investigate both propositions through analyses of retrospectively reported marriage histories. For each respondent, these histories contain information on his or her last (often current), previous, and first marriage. The marriage histories were reorganized to create a data set of marriages rather than individuals.[10] For each marriage, information is available on the start, duration, and outcome, as well as on marriage characteristics such as the residence pattern during marriage, polygyny, and, importantly, the respondent's evaluation of his/her spouse's fidelity. The latter is operationalized via the question, "During your time together, did/do you suspect or know that your husband/wife had/has sexual relations with other women/men apart from you?" It is hereafter referred to with the shorthand *EMA* (for

al. 2003; Decosas et al. 1995), and between HIV infection and mortality have been repeatedly observed in Malawi as well as other African countries (Crampin et al. 2002; Porter and Zaba 2004).

9. Marital status is retrospectively defined by the respondent as one of four precoded categories (married, separated, divorced, and widowed). This rather conventional approach does not appreciate the possible intricacy of marriage processes observed in West Africa (see, e.g., Van de Walle and Meekers 1994). Nonmarital cohabiting unions are rare and were combined with formal marriages (e.g., 2% of women reported being in a cohabiting union in the 2000 Malawi DHS (NSO and ORC Macro 2001)). Retrospective reports of separation are relatively rare because it is a transient state that is followed by formal divorce or reunion. Cases of separation are grouped with divorces. It is unknown which partner initiated the separation or divorce.

10. This means that the marriage histories are not complete for those married more than three times (5% and 2% for men and women, respectively). In some of the analyses that follow, the unit of analysis is a marriage or marriage interval. Robust standard errors are reported to accommodate the nonindependence of observations.

extramarital affairs).[11] Because of the retrospective nature of the data, this is a cumulative measure of suspected adultery rather than a time-varying indicator.

Table 1 indicates that women more often suspect that their husbands have extramarital affairs than vice versa (33.2% versus 14.5%). Self-reports of adultery are much lower, but they point to similar differences between men and women. Of further interest is that 32.5% and 7.0% of the marriages of women have ended in divorce and widowhood, respectively. These figures are slightly lower for men because they have been selected into the sample by virtue of their marital status. The age difference between spouses and the difference in male-female life expectancy are likely to contribute to a higher proportion of widows compared with widowers. Table 1 also contains a first indication that marriages in which one of the spouses suspects infidelity are more volatile than those in which that is not the case. This difference in the probability of a divorce is markedly greater when the wife is the perpetrator (67.7% versus 9.3%) than in unions in which the husband is suspected of straying (37.4% versus 20.3%), suggesting that female infidelity is more often followed by divorce than is male infidelity.

To evaluate change in divorce rates over time and their responsiveness to infidelity, I use an extended Cox regression model. Cox regression is appealing in this context because it accommodates right censoring of observations due to widowhood and the timing of the survey and allows for the control of confounders. Parameter estimates are an expression of the ratio of divorce hazards. The divorce hazard by marriage duration is left unspecified. For divorce to be considered a plausible strategy in response to the HIV epidemic, we should witness change in divorce rates from the early 1990s onward (when both HIV prevalence and AIDS mortality increased). To model that effect, marriage year (*YM89*) was coded 0 for marriages contracted before or during 1989 and 1 to 12 for the following years through 2001. Most of the other variables in the models are controls that were previously used in an exploratory analysis of marriage dissolution in Malawi (Reniers 2003). These include district, marriage order, educational attainment, age at marriage, the age difference between spouses, indicators of polygyny, ethnic homogamy, and the residence pattern after marriage.

The first model in Table 2 presents the effects of district, marriage order, year of marriage, and the suspicion of infidelity. For women, the divorce hazards are highest for first-order marriages and in the predominantly matrilineal southern district (reference category). When these confounders are controlled for, the divorce hazard increases by 6% a year during the 1990s. This effect could be the result of retrospective reporting bias because older women may be more likely than younger women to omit early unsuccessful marriages from their marriage histories. The effect of *EMA* confirms that adultery contributes to marriage instability. The interaction between marriage year and the suspicion of adultery (*YM89* and *EMA*) in Model 2 is a direct test of the negative selection hypothesis and is highly suggestive of behavioral change in response to the AIDS epidemic. It indicates that the association between suspected adultery and divorce has increased by about 5% a year since 1989. This means that extramarital affairs were progressively more often penalized with divorce during the period that AIDS materialized as a threat. Worth noting is that the possible omission of early unsuccessful marriages from marriage histories does not account for this effect, since that bias will affect all marriages and not just those that were burdened by the suspicion of infidelity.

In Model 3, a number of additional controls are introduced, and their effects replicate the results from a previous study (Reniers 2003). As a relaxation to the proportional hazards

11. The interviewers were instructed to stress that for polygynous men, the question refers to women who were not their wives. The answers were recoded to create an indicator variable that distinguishes respondents who suspect(ed) or know (knew) that their spouse has (had) extramarital affairs versus those who answered the question negatively or claimed they do (did) not know. Missing values account for 5.7% and 6.2% of the cases for men and women, respectively.

**Table 1. Percentage Distributions of Selected Marriage Characteristics (MDICP2)[a]**

| Variable | Women | Men |
|---|---|---|
| Marriage Outcome | | |
| Divorced/separated | 32.5 | 28.6[a] |
| Widowhood | 7.0 | 4.3[a] |
| First Marriage | 66.9 | 58.6 |
| Marriage Cohort | | |
| 1945–1979 | 23.0 | 27.9 |
| 1980–1989 | 29.9 | 27.0 |
| 1990–2001 | 47.1 | 45.2 |
| Suspicion of Spousal Adultery (EMA) | 33.2 | 14.5 |
| Self-reported Adultery | 2.5 | 19.5 |
| Divorce Conditional on EMA[b] | 37.4 | 67.7 |
| Divorce Conditional on No EMA[b] | 20.3 | 9.3 |
| Age at Marriage (mean) | 20.9 | 26.8 |
| Age at First Marriage (mean) | 17.8 | 22.5 |
| Polygyny[c] | 38.6 | 31.8 |
| Husband had another wife/wives | 21.8 | 17.3 |
| Husband married an additional wife/wives | 22.5 | 16.9 |
| Age Difference Between the Spouses (husband > wife + 5 years)[d] | 39.1 | 40.2 |
| Ethnic Homogamy | 72.0 | 71.9 |
| Virilocal Residence | 54.5 | 59.7 |
| Coresidence[e] | 81.3 | 87.8 |
| Number of Marriages | 2,337 | 1,826 |
| Number of Individuals | 1,563 | 1,075 |

[a]Because men were selected into the sample by virtue of their marital status, a higher proportion were married at the time of the survey. The reported percentages for the other variables may also vary between men and women because the table summarizes information for all marriages reported in the MDICP2 marriage history module and not just the current marriage.

[b]Percentage of marriages that ended in divorce conditional on the suspicion of an extramarital affair (EMA), and the absence thereof (no EMA), calculated for marriages contracted within five years prior to the survey.

[c]Polygynous marriages are defined as marriages in which the husband already had another wife/wives at the time of marriage and/or as unions in which the husband married an additional wife/wives during marriage.

[d]Percentage of husbands who are more than five years older than their wives.

[e]The reasons for the absence of coresidence (in the same village) are difficult to ascertain. It may be related to polygyny, matriliny, labor migration, and/or a weakening nuptial bond.

assumption, *EMA* and one of the polygyny variables were treated as time-dependent covariates (i.e., they were interacted with marriage duration). The parameter estimates suggest that their effects on the relative divorce hazard increase with marriage duration. Because this is also the period when absolute divorce risks are lowest, it is not of great importance for the current discussion. A refined substantive interpretation of these effects is also problematic because the timing of these events within marriage is unknown. More importantly,

**Table 2. Extended Cox Regression Models of Marriage Dissolution (MDICP2, hazard ratios)**

| | Women | | | Men | | |
|---|---|---|---|---|---|---|
| Variable | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
| District (vs. south) | | | | | | |
| Central | 0.72* (3.59) | 0.73* (3.47) | 0.82* (2.04) | 0.78* (2.63) | 0.78* (2.65) | 0.85 (1.41) |
| North | 0.55* (6.02) | 0.56* (5.94) | 0.76* (2.17) | 0.48* (6.19) | 0.48* (6.19) | 0.62* (3.20) |
| ≥ Second marriage (vs. first) | 0.65* (4.65) | 0.65* (4.72) | 0.64* (3.08) | 0.82* (2.19) | 0.82* (2.18) | 0.69* (2.61) |
| YM89 | 1.06* (3.95) | 1.03† (1.82) | 1.02 (0.80) | 1.02 (1.33) | 1.00 (0.01) | 0.99 (0.45) |
| EMA | 1.60* (5.95) | 1.47* (4.25) | 1.37* (2.05) | 5.28* (18.21) | 4.80* (15.27) | 2.78* (5.74) |
| YM89 × EMA | | 1.05* (2.03) | 1.08* (2.61) | | 1.07† (1.92) | 1.10* (2.52) |
| Control Variables | | | | | | |
| Education | | | 0.94 (0.66) | | | 0.88 (1.40) |
| Age at marriage | | | 1.00 (0.61) | | | 0.99 (1.60) |
| Age difference between the spouses | | | 0.63* (5.35) | | | 0.80* (2.26) |
| Husband had another wife/wives | | | 1.10 (0.83) | | | 1.37† (1.94) |
| Husband married an additional wife/wives | | | 0.54* (3.77) | | | 0.29* (5.67) |
| Ethnic homogamy | | | 0.85* (2.01) | | | 0.78* (2.62) |
| Virilocal residence | | | 0.77* (2.89) | | | 0.89 (1.11) |
| ≥ Second marriage × EMA | | | 0.85 (0.80) | | | 1.42† (1.79) |

*(continued)*

the interaction between marriage period and the suspicion of adultery (*YM89* × *EMA*) seems to have gained strength in the presence of these controls, which reinforces the evidence for the negative selection hypothesis.

The analyses for men lead to similar conclusions: they also penalize extramarital affairs with divorce, and increasingly so in the 1990s. A notable difference is that the parameter estimates for the suspicion of adultery (*EMA*) are at least twice as high as those for women, suggesting that men have more leeway in their extramarital escapades, or that women do not have the same power and authority to enforce a divorce when adultery is suspected. A two-tailed test for the equality of the parameters for *EMA* for men and women in the full model has $z = (b_1 - b_2)/\sqrt{SE(b_1)^2 + SE(b_2)^2} = -3.03$, and points to a highly significant statistical difference (Clogg, Petkova, and Haritou 1995). The interaction effects

*(Table 2, continued)*

| | Women | | | Men | | |
|---|---|---|---|---|---|---|
| Variable | Model 1 | Model 2 | Model 3 | Model 1 | Model 2 | Model 3 |
| Time-Dependent Covariates | | | | | | |
| EMA | | | 1.03† | | | 1.06* |
| | | | (1.78) | | | (2.93) |
| Husband married an additional wife/wives | | | 1.02 | | | 1.06* |
| | | | (1.49) | | | (3.12) |
| *N* (*df*) | 2,096 (5) | 2,096 (6) | 2,048 (16) | 1,707 (5) | 1,707 (6) | 1,673 (16) |
| Log-Likelihood | –4,656.76 | –4,654.88 | –4,525.28 | –3,290.34 | –3,288.64 | –3,192.00 |
| AIC | 9,323.53 | 9,321.77 | 9,082.55 | 6,590.67 | 6,589.28 | 6,419.09 |

*Notes:* The sample is composed of all retrospectively reported marriages by MDICP2 respondents (including new spouses of MDICP1 respondents). Robust *z* statistics (adjusted for clustering on individual) are in parentheses. Variable definitions: ≥ *second marriage* = second or higher-order marriage versus first marriage; *YM89* = marriage year, where ≤ 1989 is set to 0, 1990 is set to 1, 1991 is set to 2, and so on; *EMA* = suspicion that the spouse had extramarital affairs during marriage, measured as yes or no; *education* = three or more years versus less than three years; *age difference between the spouses* = husband is more than five years older than the wife versus less than that; *husband had another wife/wives* and *husband married another wife/wives* were measured as yes or no; *ethnic homogamy* was measured as yes or no; *virilocal residence* = residence after marriage (versus uxorilocal or neolocal). The following alternative model or variable specifications were tested but did not lead to any substantively different results (i.e., a substantial change the effect of YM89 × EMA): regressions for each district separately as well a regression stratified for district; treatment of missing values for EMA as either 0 or 1; shifting the threshold value of YM89 up or down by one or two years; inclusion of self-reported infidelity as a control (not significant); classification of neolocal residence with virilocal residence (vs. uxorilocal residence); inclusion of coresidence as a control (significant negative effect). Absence of coresidence can be due to labor migration, polygyny, matriliny, as well as a weakening nuptial bond, and its effect is thus difficult to interpret. The interaction between district and EMA is significant for women only. It indicates that it is particularly in the north that infidelity is followed by divorce.

†$p \le .10$; *$p \le .05$

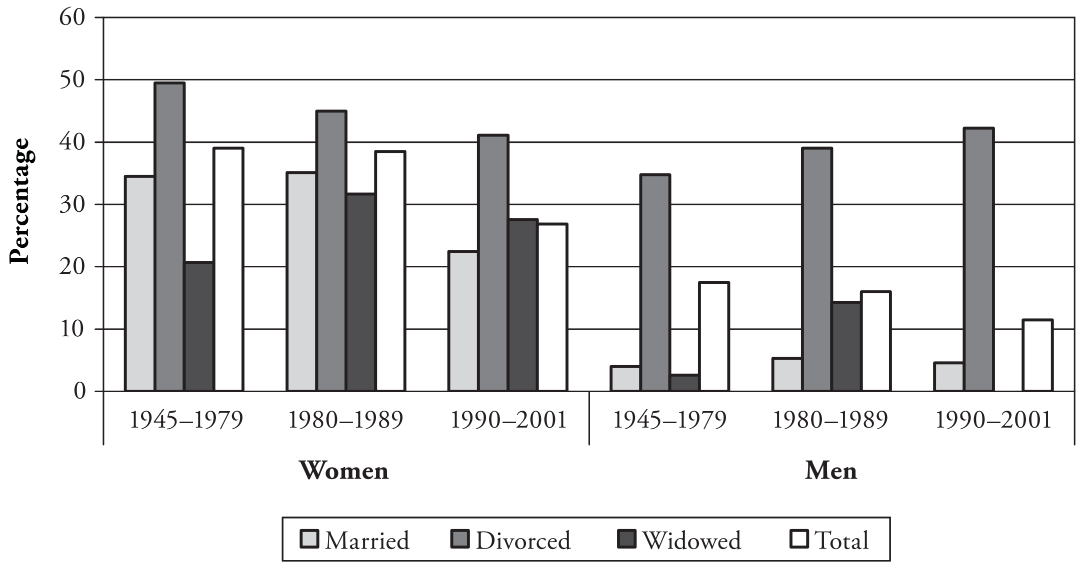
between year of marriage and *EMA* are the same for both sexes ($z = -0.40$), which means that gender differences in the ability to penalize adultery remained constant throughout the period under observation.

The conclusions just presented are liable to retrospective reporting bias in the sense that trends in reported adultery may reflect a normative change in the permissiveness of divorce under the *pretext* of adultery instead of a change in the reaction to adultery itself (i.e., that spousal infidelity has merely become a better excuse for divorce).[12] If that were the case, we would expect the suspicion of adultery to be reported more often for the most recent marriage cohorts and particularly for marriages that ended in divorce. This is not what appears in Figure 2. For women in particular, the suspicion of adultery has decreased in marriages that are still intact as well as in those that ended in divorce. Provided that infidelity is not a simple positive function of marriage duration[13] and to the extent that the suspicion of adultery and adultery itself are correlated, this provides persuasive evidence that some behavioral change—in compliance with the ABC—occurred. In combination with the previous results, it means that adultery has decreased over time, and where it still happens, it is followed more often by divorce. The picture for men is less conclusive: while

12. Some normative change in the permissiveness of divorce under suspicion of infidelity appears to have taken place between survey waves: the percentage of women reporting that a woman could divorce her husband in case of adultery increased from 68.2% in MDICP1 to 75.1% in MDICP2 and 85.0% in MDICP3.

13. In a logistic regression predicting the suspicion of adultery, the effects of both marriage duration and marriage cohort are negative. Adding a control for marriage outcome leads to estimation problems due to multicollinearity.

**Figure 2. Suspicion of Spousal Infidelity by Sex, Marriage Cohort and Marriage Outcome (MDICP2)**




their reported suspicion of infidelity is on average only half that of women and has declined over time, it has increased for marriages that have ended in divorce.

To understand the gender difference in the trend of suspected adultery for marriages that ended in divorce (Figure 2), one should bear in mind that this graph combines two effects—namely, change in the prevalence of suspected adultery by marriage cohort as well as change in the responsiveness of divorce to that suspicion. As can be learned from the data in Table 2, the rate of change in the responsiveness of divorce to the suspicion of adultery is similar for both sexes. This is not true for the level and rate of change in reported rates of infidelity itself: the suspicion of spousal adultery (*EMA*) dropped from 38.5% for the female marriage cohorts of the 1980s to 26.8% for marriages initiated in the 1990s, whereas the share of men suspecting their wives of being unfaithful declined from 16.0% for the marriage cohort of the 1980s to 11.4% for the 1990s.[14] This smaller decline in female infidelity (as reported by their husbands) is the reason why the increasing responsiveness of marital disruption to infidelity dominates the reported trend on the right but not the left side of the graph.

Another avenue to circumvent retrospective reporting bias is to analyze the relationship between the suspicion of adultery and divorce longitudinally. The MDICP data offer that opportunity via an analysis of change in marital status between survey waves. Table 3 presents logit regression results of the determinants of marriage outcome in MDICP3 for all men and women who were married in MDICP2. All variables in this analysis are the

14. While this is a fairly large absolute difference in the decline of reported adultery between men and women, the difference in the rate of change in spousal adultery is small and not statistically significant. A relatively greater decline in reports of male adultery is more explicit when only first marriages are considered: in a logistic regression of EMA on district, marriage cohort (1990s versus 1980s), and gender, the interaction between gender and marriage cohort is significant at the 10% level ($z$ = 1.65). This finding suggests that male adultery (as measured via reports by their wives) has declined more substantially and at a faster rate than female adultery, while the absolute levels of infidelity have remained higher for men than for women.

same as in Table 2. The exception is marriage cohort. In an event-history analysis, marriage duration is part of the dependent variable, and it is possible to separate its effect from that of marriage cohort. In a logit model of change in marital status between survey waves, however, the effect of marriage cohort cannot be separated from that of marriage duration and is therefore not of great substantive interest. Further, the odds of a divorce appear to be greater in higher-order marriages, and that seems to contradict the findings in Table 2. This is due to a compositional change in the sample: the retrospective analysis is based on all first marriages, whereas the analysis here includes only first marriages that have survived until MDICP2. The latter thus represent the more robust first marriages. Hence, the appropriate interpretation is thus that first marriages are less stable than higher-order marriages.

The parameter of greatest interest in this analysis is that of the suspicion of adultery (*EMA*), and it confirms earlier insights: marriages in which women suspect infidelity are only half as likely to survive the survey interval as marriages in which no infidelity is reported. The analysis for men is less convincing, but that is the result of the low power of the statistical tests: only 26 of the current marriages they reported in MDICP2 were affected by the suspicion of betrayal.

Because this analysis does not account for change over time—and to the extent that it does, it is confounded by marriage duration—it does not provide conclusive evidence that divorce is used to reduce exposure to HIV. It is mainly invoked to illustrate that the effects observed in retrospectively reported marriage histories are reproduced in a prospective design. It is worth noting, however, that the suspicion of infidelity in the current marriage is intimately related to worry about becoming infected with HIV (gamma = 0.25 for women and 0.35 for men) and, hence, that containing the risk of infection has become an important rationale for divorcing an adulterous spouse. Smith and Watkins (2005) took this argument further and illustrated that worry about infection is a predictor of divorce and that marriage dissolution, in turn, reduces infection anxiety.

## POSITIVE SELECTION: REMARRIAGE

In addition to divorcing an adulterous spouse, men and women may also practice partner selection as a conscious HIV-avoidance strategy. These practices are rarely the focus of public health interventions, nor do they often figure in scientific inquiry (Donovan 2000). Despite the lack of attention, local popular culture is replete with examples of partner selection strategies based on qualities and characteristics thought to be associated with HIV infection (Kaler 2004; Watkins 2004). Ideally, one would analyze selection into marriage based on the sexual biographies of the pool of candidates on the marriage market, or even better, their HIV status. That information, however, is difficult to retrieve in a retrospective survey. As an alternative, I use the outcome of the previous marriage (widowed versus divorced) because it is an individual attribute that is easily measured and is likely to correlate with HIV status.[15] If this assumption is valid, and if marriage selection based on the likelihood of infection is indeed taking place, then one would expect widows and widowers to have greater difficulty finding a new spouse than would divorcees. Again, the presumption that this selection occurs in response to the threat of HIV infection implies that we observe change in the remarriage hazard by outcome of the previous marriage and calendar year. To test this hypothesis, a Cox proportional hazards model was chosen, with remarriage hazards by duration since the end of the previous marriage as the outcome (Table 4, left side). To model change in partner selection over time, calendar year at the end of the previous marriage (*YEPM89*) was coded 0 for the period up to 1989 and 1 to 12 for the following years.

15. In the 2004 Malawi DHS, HIV prevalence among the widowed (current status) was 35.5% ($N = 103$), compared with 23.3% among the divorced and separated ($N = 272$) (NSO and ORC Macro 2005). Doctor and Weinreb (2003) estimated that three-quarters of the intersurvey (MDICP1–2) mortality can be attributed to AIDS.

**Table 3. Logit Regression Models of Marriage Dissolution Between MDICP2 and MDICP3 (odds ratios)**

| | Women | | Men | |
|---|---|---|---|---|
| Variable | Model 1 | Model 2 | Model 1 | Model 2 |
| District (vs. south) | | | | |
| Center | 0.64<br>(1.50) | 0.99<br>(0.03) | 0.28*<br>(2.59) | 0.27*<br>(2.16) |
| North | 0.29*<br>(3.21) | 0.47<br>(1.52) | 0.55<br>(1.51) | 0.48<br>(1.26) |
| Marriage Cohort (vs. 1945–1979) | | | | |
| 1980–1989 | 1.73<br>(0.95) | 1.72<br>(0.94) | 5.93†<br>(1.64) | 6.95†<br>(1.75) |
| 1990–2001 | 3.80*<br>(2.70) | 4.95<br>(3.06) | 12.69*<br>(2.44) | 16.32*<br>(2.49) |
| ≥ Second Marriage (vs. first) | 1.92*<br>(2.36) | 1.56<br>(1.13) | 1.33<br>(0.78) | 2.06†<br>(1.70) |
| EMA | 2.15*<br>(2.72) | 1.85†<br>(1.95) | 2.06<br>(0.89) | 1.91<br>(0.81) |
| Control Variables | | | | |
| Education | | 0.83<br>(0.55) | | 0.97<br>(0.08) |
| Age at marriage | | 1.01<br>(0.51) | | 0.97<br>(1.59) |
| Age difference between spouses | | 1.20<br>(0.65) | | 2.38*<br>(2.20) |
| Husband had another wife/wives | | 0.99<br>(0.01) | | 0.64<br>(0.83) |
| Husband married an additional wife/wives | | 1.95*<br>(1.99) | | 1.45<br>(0.60) |
| Ethnic homogamy | | 1.54<br>(1.32) | | 1.39<br>(0.73) |
| Virilocal residence | | 0.49*<br>(2.13) | | 1.30<br>(0.48) |
| *N* (*df*) | 908(6) | 883(13) | 674(6) | 657(13) |
| Log-Likelihood | –210.46 | –193.80 | –117.87 | –113.74 |
| Pseudo-$R^2$ | .09 | .12 | .08 | .11 |
| AIC | 432.92 | 413.60 | 247.73 | 253.48 |

*Notes:* $z$ statistics are in parentheses; for male marriages, these are robust $z$ statistics (adjusted for clustering on the individual). The sample is composed of current marriages in MDICP2 that either remained intact or ended in separation or divorce by MDICP3. Marriages that ended in widowhood were excluded from the analysis. For polygynous men, more than one marriage can be included in the sample. For monogamous men and all women, the sample consists of one marriage per person. Inconsistent marriage histories were omitted from the analysis (6.1% for women and 11.2% for men). About 6.6% of the women who were married in MDICP2 had divorced their spouse by MDICP3. This figure is a little lower for men (4.6%), in part because divorced and widowed men were not consistently followed between survey waves. See the notes to Table 2 for variable definitions. The inclusion of self-reported infidelity (positive and significant for men only) and coresidence (not significant) did not change the effect of EMA, and were omitted.

†$p \leq .10$; *$p \leq .05$

**Table 4. Cox Regression Models of Remarriage (MDICP2, hazard ratios), and Logit Regression Model of Remarriage Between Survey Intervals (MDICP1-2, MDICP2-3, and MDICP3-4, odds ratios)**

| | Cox Models (retrospective) | | | | Logit Model (prospective): Women |
|---|---|---|---|---|---|
| | Women | | Men | | |
| Variable | Model 1 | Model 2 | Model 1 | Model 2 | Model 1 |
| District (vs. south) | | | | | |
| Center | 0.75* (3.74) | 0.75* (3.74) | 0.92 (0.90) | 0.92 (0.85) | 1.27 (0.72) |
| North | 0.55* (6.65) | 0.55* (6.68) | 0.68* (2.89) | 0.67* (3.08) | 0.46* (2.35) |
| Age[a] | 1.06* (2.16) | 1.06* (2.07) | 0.991 (0.65) | 0.991 (0.66) | 0.954* (3.81) |
| Age, Squared | 0.998* (3.18) | 0.999* (3.01) | 1.00 (1.18) | 1.00 (1.18) | — |
| Marriage Order | 0.88† (1.83) | 0.87† (1.88) | 0.86* (1.97) | 0.86* (2.18) | 0.67* (2.40) |
| YEPM89 | 1.04* (3.92) | 1.05* (4.54) | 1.06* (5.12) | 1.08* (6.10) | — |
| Widowed (vs. divorced) | 0.75* (3.21) | 0.91 (0.84) | 0.93 (0.55) | 1.32† (1.78) | 0.38* (3.14) |
| YEPM89 × Widowed | | 0.94* (2.41) | | 0.91* (2.84) | — |
| *N* (*df*) | 817 (7) | 817 (8) | 460(7) | 460 (8) | 386 (5) |
| Log-Likelihood | –3,991.43 | –3,989.16 | –2,089.12 | –2,086.54 | –185.65 |
| Pseudo-$R^2$ | | | | | .14 |
| AIC | 7,996.86 | 7,994.32 | 4,192.24 | 4,189.08 | 381.30 |

*Notes:* Robust *z* statistics (adjusted for clustering on respondent) are in parentheses. The sample for the Cox model (retrospective) is all marriage intervals for men and women in MDICP2 with at least one terminated marriage; for men, the sample was restricted to those who were not polygynous at the end of the previous marriage because the definition of a marriage interval in that case is not straightforward. The logit model (prospective) includes all intervals between survey waves for women who were widowed or divorced at the beginning of the interval. Just as women can contribute more than one marriage interval in the Cox regressions, some women contribute more than one interval in the logit model. Standard errors accommodate the nonindependence of observations. The same model with inclusion of only one interval (first occurrence) per woman leads to the same conclusions. In the Cox models, *age* is measured at the end of the previous marriage; *YEPM89* = the calendar year at the end of the previous marriage (≤ 1989 = 0, 1990 = 1, 1992 = 2, and so on); and *marriage order* is treated as a continuous variable. In the logit model, *age* is measured at the beginning of the interval; other variable definitions are the same as in the Cox models. Other effects that were tested and omitted because they were not significant are that of educational status and the interaction between district and widowed. The interaction term was included to test for the potentially differential effect of widow inheritance practices by district. In the logit model, additional controls for a curvilinear effect of age, an identifier for the survey interval, and YEPM89 (this last variable could be defined only for the last two survey intervals) were not significant and were omitted. The prospective analysis is carried out only for women because divorced men and widowers were not consistently followed across survey waves.

†$p \leq .10$; *$p \leq .05$

Women's remarriage hazards differ by district: in the south, where the incidence of divorce is highest, remarriage rates are highest as well. The age effect indicates that older women are, on average, less likely to remarry. The precise interpretation of the quadratic effect is that the remarriage hazard reaches a maximum at age 19 and decreases after that. No such relationship exists for men, indicating that their appeal as potential spouses is not dependent on age. Still, there is an effect of marriage order that indicates that the intervals between marriages lengthen at higher-order unions. The parameter for calendar year suggests that marriage intervals have shortened in the most recent period. Provided that the effect of calendar year is genuine and not the result of retrospective reporting bias, this suggests that rather than resorting to abstinence, men and women increasingly seek refuge in marriage. Although we have no means of verifying the motivation for that, it is possible that they do so to shield themselves from HIV if marriage is considered protective compared with less formally embedded sexual relationships.

These parameters are still tangential to the positive selection hypothesis. To that end, the effect for being widowed is more interesting, and for women it indicates that the remarriage hazard is around 25% lower for widows than for divorcees. This effect exists possibly because divorce is sometimes precipitated by the presence of another partner, whereas widows are likely to respect a mourning interval until the next marriage. However, the effect of widowhood dilutes once an interaction with calendar year (*YEPM89*) is included (Model 2). The interaction between widowhood and calendar year suggests that it is particularly in the 1990s that remarriage rates are lower for widows. The effect for the outcome of the previous marriage is less consistent for men, but the interaction effect between calendar year and widowhood (*YEPM89* × *widowed*) is the same as for women ($z = 0.63$).

The lower remarriage rates among the widowed in the most recent period are also reproduced in a prospective study design. This is illustrated by means of a logistic regression model that compares the likelihood of remarriage for divorcees and widows across the three survey intervals (Table 4, right side). This analysis cannot be repeated for men because widowers and divorced men were not consistently followed between survey waves. After some of the possible confounders used in the previous analysis are controlled for, the remarriage odds for widows across the survey waves are just a little above one-third of those of divorcees.

These analyses thus support the proposition that men and women in Malawi resort to the selection of spouses based on their presumed likelihood of infection. As with the divorce of spouses who engage in risky behavior, positive selection gradually gained momentum as HIV prevalence and AIDS mortality increased.[16] Here, positive selection is illustrated with respect to the outcome of the previous marriage, but it is likely also to operate on other characteristics that correlate with HIV status and to which survey researchers are blind. This thesis is supported by recent findings from the Kisesa cohort study in Tanzania, where remarriage rates are lower among those who are HIV-positive compared with those who are HIV-negative (Gregory et al. 2007).

## THE EFFICACY OF MARITAL STRATEGIES FOR HIV RISK MANAGEMENT

With the insight that men and women in Malawi engage in marital decision-making so as to limit their exposure to HIV, it is worth reflecting on the potential efficacy of these strategies. The MDICP data permit further exploration of this issue because HIV status was collected in the third survey wave. Table 5 presents MDICP2 risk factors for HIV infection in MDICP3 in men and women who have been married once or twice (86% of the sample). The marriage characteristics and outcomes that are included as predictors pertain to first marriages only. A presentation of additional analyses for higher-order marriages is of limited value given the small sample size. Another consideration in reading these results is that it is impossible to exclude potential reverse causal effects because the time of infection is

16. The idea that social customs around widowhood are changing in response to the HIV epidemic is supported by studies that demonstrate profound changes in sexual cleansing rituals and the practice of widow inheritance (Luke 2002; Malungo 2001).

**Table 5. Logit Regression Models of HIV Infection (MDICP2-3, odds ratios)**

| | Women | | Men | | Both Sexes | |
|---|---|---|---|---|---|---|
| Variable | Model 1 | Model 2 | Model 1 | Model 2 | Model 2 | Model 3[a] |
| District (vs. South) | | | | | | |
| Center | 0.90 | 0.99 | 0.86 | 0.94 | 0.97 | 0.62 |
| | (0.34) | (0.04) | (0.32) | (0.13) | (0.12) | (1.24) |
| North | 0.53* | 0.66 | 0.42 | 0.43 | 0.60$^{\dagger}$ | 0.62 |
| | (2.25) | (1.44) | (1.63) | (1.35) | (1.71) | (1.06) |
| Age | 1.17 | 1.14 | 1.26 | 1.27 | 1.11 | 1.07 |
| | (1.53) | (1.29) | (1.35) | (1.48) | (1.40) | (0.84) |
| Age, Squared | 0.997$^{\dagger}$ | 0.998$^{\dagger}$ | 0.997 | 0.997 | 0.998$^{\dagger}$ | 0.999 |
| | (1.81) | (1.65) | (1.45) | (1.60) | (1.82) | (1.34) |
| Male | — | — | — | — | 0.86 | 0.73 |
| | | | | | (0.74) | (1.40) |
| Widowed (first marriage) | 2.18$^{\dagger}$ | 3.32* | 2.37 | 2.37 | 2.82* | 6.65* |
| | (1.81) | (2.69) | (0.78) | (0.73) | (2.10) | (3.29) |
| EMA (first marriage) | 1.38 | 1.64$^{\dagger}$ | 1.73 | 4.07$^{\dagger}$ | 1.72$^{\dagger}$ | 2.04$^{\dagger}$ |
| | (1.38) | (1.77) | (1.02) | (1.91) | (1.91) | (1.90) |
| Divorced (first marriage) | | 3.19* | | 1.93 | 2.76* | 2.90* |
| | | (3.97) | | (0.84) | (3.45) | (2.74) |
| EMA × Divorced (first marriage) | | 0.54 | | 0.14 | 0.49$^{\dagger}$ | 0.49 |
| | | (1.29) | | (1.49) | (1.65) | (1.35) |
| *N* (*df*) | 884 (6) | 884 (8) | 474 (6) | 474 (8) | 1,358 (9) | 951 (9) |
| Log-Likelihood | –248.73 | –242.42 | –96.88 | –95.33 | –341.34 | –214.93 |
| AIC | 509.46 | 500.84 | 205.77 | 206.65 | 700.68 | 447.86 |
| Pseudo-$R^2$ | .03 | .06 | .04 | .05 | .05 | .07 |

*Notes:* Robust *z* statistics (adjusted for clustering at the village level) are in parentheses. The sample is composed of all men and women in MDICP2 for whom the MDICP3 HIV test result is known, but is restricted to men and women who are in their first or second marriage (82% and 90% of the total sample for men and women, respectively). Model 3 excludes all men and women who have been in a polygynous union at any time during their first or second marriage. Marriage characteristics and outcomes (*EMA*, *widowed*, and *divorced*) pertain to first marriages. The effect of self-reported infidelity during the first marriage was not significant and was omitted.

$^{\dagger}p \leq .10$; $^{*}p \leq .05$

unknown. However, one should also keep in mind that HIV status was measured three years after the enumeration of the risk factors.

From Model 1, we learn that HIV prevalence is highest in the southern district and that HIV infection follows a typical inverse U-shaped age pattern, with prevalence peaking at 29 years for women and 40 years for men. Women whose first spouse has died have more than twice the odds of nonwidows to be HIV-positive. While not quite statistically significant, the effect of *EMA* suggests that women who had an adulterous first spouse are more likely to be infected with HIV. The pattern for men is similar. These results suggest that the suspicion of infidelity and widowhood status may be useful criteria for informing HIV risk-avoidance strategies. In the case of adultery, this proposition can be more explicitly tested by including a parameter for divorce and by interacting it with the suspicion of adultery (Model 2). In Model 2, the direct effect of *EMA* has gained strength and indicates that sticking to a spouse suspected of adultery increases a woman's risks of infection by 64%. Divorce in the absence of perceived adultery (i.e., the direct effect of divorce) increases exposure to HIV more than threefold. The interaction effect (*EMA* × *divorced*), on the other hand, is negative, which indicates that divorcing an unfaithful spouse acts as a buffer against infection. The parameter estimates for men all point in the same direction as for women. Overall, it seems that divorcing an adulterous spouse and taking one's chances on the marriage market may be counterproductive, resulting in increased rather than diminished exposure to HIV (particularly for women). The latter can be learned from multiplying the effects of *EMA*, divorce, and their interaction and comparing that to the direct effect of *EMA*. The model in which both sexes are combined confirms the pattern described so far. Some of these effects, however, are not significant, and this interpretation also demands much refinement from a relatively small sample. These findings thus merely serve as an invitation for a confirmatory analysis using alternative data sources. Because polygyny is possibly an independent risk factor for HIV infection, the sample in Model 3 excludes all men and women who were in a polygynous union in their first or second marriage. It does not lead to any substantial changes in the parameters of interest. The parameters for *widowed* in Models 2 and 3 are not significantly different ($z = -1.12$).

In conclusion, this analysis confirms that avoiding widows and widowers is indeed an efficacious risk-avoidance strategy because they are more likely to be infected with HIV. The findings with respect to adultery are more complex. Remaining with an adulterous spouse may be undesirable for many reasons; it also increases one's exposure to HIV. Divorcing an unfaithful spouse therefore seems to be a sensible HIV risk-avoidance strategy. However, it is likely that such short-term risk-avoidance behavior has adverse medium- to long-term effects if it implies that the divorced have to search for and select a new spouse from a pool of candidates with higher than average prevalence rates.

## DISCUSSION

Many AIDS advocacy dollars in Africa have been channeled into programs that focus on abstinence, on faithfulness, and—sometimes grudgingly[17]—on promoting condom use. While some behavioral change along the guidelines of the ABC seems to be taking place in several countries, including Malawi (e.g., a reduction in reported adultery), the coping mechanisms are not restricted to these prescripts. The focus in this article has been on the control of infection by regulating exposure to HIV within marriage, where much of the transmission occurs.[18] The understanding that women and, to a lesser extent, men lack control over the fidelity of their partner or may not be in a position to insist on condom use within marriage is not new in the literature. Yet, what is overlooked is that marriage itself is a resource with which individuals can manage their exposure to HIV, either through mechanisms of negative or positive selection. Divorcing a spouse who might bring HIV into the household is the most obvious strategy, and evidence for that is found in the increasing responsiveness of divorce to the suspicion of infidelity as the threat of AIDS materialized. Even more interesting is that adultery is increasingly followed by divorce, while reported adultery itself is declining.

Just as spouses are selected out of marriage based on behavior associated with the risk of infection, positive selection mechanisms ensure that those who remarry are, on average, less likely to be infected than those who remain unmarried. This is suggested by

17. Presumably because AIDS advocacy programs have not always embraced condom use to the same extent as abstinence and faithfulness, the ABC in Uganda is also sarcastically referred to as "Anything But Condoms" (Allen 2006).

18. See Glynn et al. (2003) and Bongaarts (2007) for a discussion of the relative importance of HIV infections within marriage compared with the acquisition of HIV in extramarital and premarital relationships. At least for women, the evidence is compelling that most HIV infections occur within marriage, even though the incidence rates might be lower than in the period that precedes marriage. The reason is that women spend a greater share of their active sexual lives in marriage (Bongaarts 2007).

the lower remarriage rates of widows and widowers than of divorcees. Again, that relationship tightens in the 1990s, the period when an increasing share of widows and widowers is composed of surviving spouses of AIDS victims. In this article, I demonstrate positive selection only in higher-order marriages and with respect to the outcome of the previous marriage, but it is likely also to operate for first marriages or less formal unions, and for characteristics that are less easily measured in a survey (e.g., the reputation or sexual biography of potential partners).

The evidence presented here is circumstantial in the sense that the interpretation in terms of proactive risk-avoidance strategies has to be read into trends in marital formation and dissolution that coincide with developments in HIV prevalence and AIDS mortality. They are fully consistent, however, with a rich variety of qualitative evidence, ranging from in-depth interviews, transcripts of court cases, and the diaries of men and women living in the areas where the survey data were collected (Kaler 2004; Poulin 2007; Schatz 2005; Smith and Watkins 2005; Trinitapoli 2007; Watkins 2004). Longitudinal analyses confirm that marital choices respond to and anticipate perceived exposure to HIV.

While these results testify to the resourcefulness of rural Malawians in their response to HIV/AIDS, the flip side of this generally empowering story is that men appear better equipped than women to apply strategies to limit their risk of infection. Extramarital sex is not only more typical for men, but women do not penalize infidelity to the same extent as men do—most likely because there is greater tolerance of male infidelity or because women are in a weaker position to initiate or enforce a divorce. In that sense, these findings concur with an early concern in the literature that women lack the necessary control over their own as well as their partner's practice of (un)safe sex (e.g., Heise and Elias 1995; Ulin 1992). However, the findings from this study also suggest that this assessment demands more nuance: decline in reported adultery appears faster for men than for women, and the rate of change in the responsiveness of divorce to adultery is the same for both sexes. In terms of partner selection strategies, no gender bias could be identified.

A thorough evaluation of the efficacy of these coping mechanisms is beyond the scope of this study. The evidence suggests that divorcing an adulterous spouse or the selection of a spouse based on characteristics associated with the likelihood of infection is protective, but other, possibly offsetting effects should be considered as well. For example, a divorced woman's choices on the marriage market may be limited to potential partners whose prevalence levels are higher than average, even if they are carefully filtered through positive selection mechanisms. If, after a divorce, she ends up having to exchange sex for material gain, it is clear that strategies for providing her day-to-day livelihood and those for avoiding HIV infection may become mutually exclusive.

Just as short- and long-term effects of a divorce may offset each other, it is worth investigating further whether risk-reducing strategies at the individual level have counterproductive effects at the population level. For example, provided that most of the divorced eventually remarry, a widespread application of negative selection will inevitably lead to higher levels of sexual mixing of those who are most likely to be infected and thus contribute to the spread of HIV. Worth noting, however, is that the offsetting effects of risk-reduction strategies pertain only to the ones that are here qualified as negative selection strategies and not to positive selection strategies. The logic of positive selection further suggests that unmarried men and women will try to optimize the health status of their future partner or spouse. That induces a system of assortative mating on HIV status and possibly the exclusion from the marriage market of those who are least desirable (e.g., AIDS widows and widowers). Compared with a marriage market in which mating is random, that process will contain rather than increase the spread of HIV in a population. Of course, this assertion goes beyond the evidence presented here, but illustrates how interactions between individual-level risk-avoidance strategies and marriage-market dynamics may offer a key to further our understanding of the spread of HIV in populations.

An inevitable question concerns the external validity of these findings for other settings. There is no good reason to suspect that Malawians would be unique in their choice to resort to marital selection mechanisms for regulating exposure to HIV, but Malawi is perhaps a particularly conducive environment because marriage and divorce rates are traditionally high, and men and women move in and out of unions quite liberally. How this affects the selection effects studied here is unclear, but it is possible that these dynamics differently impact the spread of HIV in more rigid marriage markets with more substantial marriage payments.[19] Extending these conjectures further would lead us to query the role of marriage regimes in the heterogeneous distribution of HIV in sub-Saharan Africa. While some of the differences between the districts in this study do point in that direction, the focus in this article has been the identification of patterns that are common to the three regions.

It is worth entertaining the idea that these union-based adaptive strategies have been undervalued not only in scientific work but in HIV/AIDS prevention programs as well. The recognition that men and women are prepared to make marital decisions based on their implied risk of infection is an invitation for policy interventions to exploit that inclination and support it both normatively and materially. This could be done by providing counseling and testing services on a large enough scale to maximize the efficacy of positive selection in partner choice. Another avenue is to provide support for women who are convinced—perhaps rightly—that divorce is their best option. That could take the form of programs to boost women's economic resilience and make livelihoods more independent from partnerships. Importantly, such interventions may turn out to be more empowering than the moralistic lectures of the ABC.

## REFERENCES

Alderman, H., J. Behrman, H.-P. Kohler, J. Maluccio, and S. Watkins. 2001. "Attrition in Longitudinal Household Survey Data." *Demographic Research,* Volume 5, article 4:79–124. Available online at http://www.demographic-research.org/volumes/vol5/4/5-4.pdf.

Allen, T. 2006. "AIDS and Evidence: Interrogating Some Ugandan Myths." *Journal of Biosocial Science* 38:7–28.

Bignami-Van Assche, S., G. Reniers, and A.A. Weinreb. 2003. "An Assessment of the KDICP and MDICP Data Quality." *Demographic Research,* Special collection 1, article 2:29–76. Available online at http://www.demographic-research.org/special/1/2/s1-2.pdf.

Bignami-Van Assche, S., K. Smith, G. Reniers, P. Anglewicz, R. Thornton, L.W. Chao, A.A. Weinreb, S. Watkins, and I. Hoffman. 2004. "Protocol for Biomarker Testing in the 2004 Malawi Diffusion and Ideational Change Project." Social Networks Project Working Paper 6. Population Studies Center, University of Pennsylvania, Philadelphia.

Bloom, S.S., C. Banda, G. Songolo, S. Mulendema, A.E. Cunningham, and J.T. Boerma. 2000. "Looking for Change in Response to the AIDS Epidemic: Trends in AIDS Knowledge and Sexual Behavior in Zambia, 1990 Through 1998." *Journal of Acquired Immune Deficiency Syndromes* 25:77–85.

Boerma, J.T. and S.S. Weir. 2005. "Integrating Demographic and Epidemiological Approaches to Research on HIV/AIDS: The Proximate-Determinants Framework." *Journal of Infectious Diseases* 191(Suppl. 1):61–67.

Bongaarts, J. 2007. "Late Marriage and the HIV Epidemic in Sub-Saharan Africa." *Population Studies* 61:73–83.

Booth, A. and D.R. Johnson. 1994. "Declining Health and Marital Quality." *Journal of Marriage and the Family* 56:218–23.

19. The debate on the relationship between marriage payments and the spread of HIV is underway, in spite of any systematic evidence (Esen 2004; Wendo 2004).

Bracher, M., G. Santow, and S. Watkins. 2003. "A Microsimulation Study of the Effects of Marriage, Divorce and Remarriage on Lifetime Risks of HIV/AIDS in Rural Malawi." Presented at annual meeting of the Population Association of America, May 1–3, Minneapolis, MN.

Caldwell, J.C. 2000. "Rethinking the African AIDS Epidemic." *Population and Development Review* 26:117–35.

Caldwell, J.C., P. Caldwell, J. Anarfi, K. Awusabo-Asare, J. Ntozi, I.O. Orubuloye, J. Marck, W. Cosford, R. Colombo, and E. Hollings, eds. 1999. *Resistances to Behavioural Change to Reduce HIV/AIDS Infection in Predominantly Heterosexual Epidemics in Third World Countries.* Canberra, Australia: Australian National University, Health Transition Centre.

Caraël, M., J. Cleland, J.-C. Deheneffe, L. Adeokun, and T. Dyson. 1992. "Research on Sexual Behavior That Transmits HIV: The GPA/WHO Collaborative Surveys—Preliminary Findings." Pp. 65–87 in *Sexual Behaviour and Networking: Anthropological and Socio-Cultural Studies on the Transmission of HIV,* edited by T. Dyson. Liege: S. Derouaux-Ordina.

Carpenter, L.M., A. Kamali, A. Ruberantwari, S.S. Malamba, and J.A.G. Whitworth. 1999. "Rates of HIV-1 Transmission Within Marriage in Rural Uganda in Relation to the HIV Sero-Status of the Partners." *AIDS* 13:1083–89.

Clark, S. 2004. "Early Marriage and HIV Risks in Sub-Saharan Africa." *Studies in Family Planning* 35:149–60.

Cleland, J.G., M.M. Ali, and V. Capo-Chichi. 1999. "Post-Partum Sexual Abstinence in West Africa: Implications for AIDS-Control and Family Planning Programmes." *AIDS* 13:125–31.

Clogg, C.C., E. Petkova, and A. Haritou. 1995. "Statistical Methods for Comparing Regression Coefficients Between Models." *American Journal of Sociology* 100:1261–93.

Crampin, A.C., S. Floyd, J.R. Glynn, F. Sibande, D. Mulawa, A. Nyondo, P. Broadbent, L. Bliss, B. Ngwira, and P.E. Fine. 2002. "Long-Term Follow-up of HIV-Positive and HIV-Negative Individuals in Rural Malawi." *AIDS* 16:1545–50.

Crampin, A.C., J.R. Glynn, B.M. Ngwira, F.D. Mwaungulu, J.M. Ponnighaus, D.K. Warndorff, and P.E. Fine. 2003. "Trends and Measurement of HIV Prevalence in Northern Malawi." *AIDS* 17:1817–25.

Decosas, J., F. Kane, J.K. Anarfi, K.D. Sodji, and H.U. Wagner. 1995. "Migration and AIDS." *Lancet* 346:826–28.

Doctor, H.V. and A.A. Weinreb. 2003. "Estimation of AIDS Adult Mortality by Verbal Autopsy in Rural Malawi." *AIDS* 17:2509–13.

Donovan, B. 2000. "The Repertoire of Human Efforts to Avoid Sexually Transmissible Diseases: Past and Present. Part 1: Strategies Used Before or Instead of Sex." *Sexually Transmitted Infections* 76:7–12.

Douglas, M.T. 1950. *Peoples of the Lake Nyasa Region*. London: Oxford University Press.

Eaton, L., A.J. Flisher, and L.E. Aaro. 2003. "Unsafe Sexual Behaviour in South African Youth." *Social Science and Medicine* 56:149–65.

Esen, U.I. 2004. "African Women, Bride Price, and AIDS." *Lancet* 363:1734.

Farr, W. 1858. "The Influence of Marriage on the Mortality of the French People." Pp. 504–13 in *Transactions of the National Association for the Promotion of Social Sciences,* edited by G.W. Hastings. London: John W. Parker and Son.

Fu, H. and N. Goldman. 1996. "Incorporating Health Into Models of Marriage Choice: Demographic and Sociological Perspectives." *Journal of Marriage and the Family* 58:740–58.

Fylkesnes, K., R.M. Musonda, M. Sichone, Z. Ndhlovu, F. Tembo, and M. Monze. 2001. "Declining HIV Prevalence and Risk Behaviours in Zambia: Evidence From Surveillance and Population-Based Surveys." *AIDS* 15:907–16.

Glynn, J.R., M. Caraël, A. Buvé, R.M. Musonda, and M. Kahindo. 2003. "HIV Risk in Relation to Marriage in Areas With High Prevalence of HIV Infection." *Journal of Acquired Immune Deficiency Syndromes* 33:526–35.

Goldman, N. 1993a. "Marriage Selection and Mortality Patterns: Inferences and Fallacies." *Demography* 30:189–208.

———. 1993b. "The Perils of Single Life in Contemporary Japan." *Journal of Marriage and the Family* 55:191–204.

Green, E.C. 2003. *Rethinking AIDS Prevention: Learning From Successes in Developing Countries*. Westport, CT: Praeger.

Gregory, R., R. Isingo, M. Marston, M. Urassa, J. Changalucha, M. Ndege, Y. Kumuloga, and B. Zaba. 2007. "HIV and Marital Outcomes: Dissolution and Remarriage in Kisesa, Tanzania." Presented at the annual meeting of the Population Association of America, March 29–31, New York.

Gregson, S., T. Zhuwau, R.M. Anderson, and S.K. Chandiwana. 1998. "Is There Evidence for Behaviour Change in Response to AIDS in Rural Zimbabwe?" *Social Science and Medicine* 46:321–30.

Heise, L.L. and C. Elias. 1995. "Transforming AIDS Prevention to Meet Women's Needs: A Focus on Developing Countries." *Social Science and Medicine* 40:931–43.

Huselid, R.F. and M.L. Cooper. 1992. "Gender Roles as Mediators of Sex Differences in Adolescent Alcohol Use and Abuse." *Journal of Health and Social Behavior* 33:348–62.

Kaler, A. 2001. "'Many Divorces and Many Spinsters': Marriage as an Invented Tradition in Southern Malawi, 1946–1999." *Journal of Family History* 26:529–56.

———. 2004. "AIDS-Talk in Everyday Life: The Presence of HIV/AIDS in Men's Informal Conversation in Southern Malawi." *Social Science and Medicine* 59:285–97.

Kamali, A., L.M. Carpenter, J.A. Whitworth, R. Pool, A. Ruberantwari, and A. Ojwiya. 2000. "Seven-Year Trends in HIV-1 Infection Rates, and Changes in Sexual Behaviour, Among Adults in Rural Uganda." *AIDS* 14:427–34.

Lillard, L.A. and C.W. Panis. 1996. "Marital Status and Mortality: The Role of Health." *Demography* 33:313–27.

Lillard, L.A. and L.J. Waite. 1995. "Til Death Do Us Part: Marital Disruption and Mortality." *American Journal of Sociology* 100:1131–56.

Locoh, T. and M.-P. Thiriat. 1995. "Divorce et Remariage des Femmes en Afrique de l'Ouest. Le Cas du Togo" [Divorce and remarriage of women in West Africa. The case of Togo]. *Population* 50(1):61–93.

Luke, N. 2002. "Widows and 'Professional Inheritors': Understanding AIDS Risk Perceptions in Kenya." Presented at the annual meeting of the Population Association of America, May 8–11, Atlanta, GA.

Macintyre, K., L. Brown, and S. Sosler. 2001. "'It's Not What You Know, But Who You Knew': Examining the Relationship Between Behavior Change and AIDS Mortality in Africa." *AIDS Education and Prevention* 13:160–74.

Malungo, J.R.S. 2001. "Sexual Cleansing (*Kusalazya*) and Levirate Marriage (*Kunjilila mung'anda*) in the Era of AIDS: Changes in Perceptions and Practices in Zambia." *Social Science and Medicine* 53:371–82.

Mitchell, C.J. 1956. *The Yao Village; a Study in the Social Structure of a Nyasaland Tribe*. Manchester: Manchester University Press.

Mukiza-Gapere, J. and J.P. Ntozi. 1995. "Impact of AIDS on Marriage Patterns, Customs and Practices in Uganda." *Health Transition Review* 5(Suppl.):201–208.

Murray, J.E. 2000. "Marital Protection and Marital Selection: Evidence From a Historical-Prospective Sample of American Men." *Demography* 37:511–21.

Mwaluko, G., M. Urassa, R. Isingo, B. Zaba, and J.T. Boerma. 2003. "Trends in HIV and Sexual Behaviour in a Longitudinal Study in a Rural Population in Tanzania, 1994–2000." *AIDS* 17:2645–51.

NSO and ORC Macro. 1994. *Malawi Demographic and Health Survey 1992*. Zomba, Malawi and Calverton, MD: National Statistical Office and ORC Macro.

———. 2001. *Malawi Demographic and Health Survey 2000*. Zomba, Malawi and Calverton, MD: National Statistical Office and ORC Macro.

———. 2005. *Malawi Demographic and Health Survey 2004*. Zomba, Malawi and Calverton, MD: National Statistical Office and ORC Macro.

Ogbu, J.U. 1978. "African Bridewealth and Women's Status." *American Ethnologist* 5:241–62.
Orubuloye, O., J.C. Caldwell, and P. Caldwell. 1997. "Men's Sexual Behaviour in Urban and Rural Southwest Nigeria: Its Cultural, Social and Attitudinal Context." *Health Transition Review* 7(Suppl.):315–28.
Parker, R. 2001. "Sexuality, Culture and Power in HIV/AIDS Research." *Annual Review of Anthropology* 30:183–79.
Phiri, K.M. 1983. "Some Changes in the Matrilineal Family System Among the Chewa of Malawi Since the Nineteenth Century." *Journal of African History* 24:257–74.
Porter, L., L. Hao, D. Bishai, D. Serwadda, M.J. Wawer, T. Lutalo, and R. Gray. 2004. "HIV Status and Union Dissolution in Sub-Saharan Africa: The Case of Rakai, Uganda." *Demography* 41:465–82.
Porter, K. and B. Zaba. 2004. "The Empirical Evidence for the Impact of HIV on Adult Mortality in the Developing World: Data From Serological Studies." *AIDS* 18(Suppl. 2):S9–S17.
Poulin, M. 2007. "Sex, Money and Premarital Partnerships in Southern Malawi." *Social Science and Medicine* 65:2383–93.
Reniers, G. 2003. "Divorce and Remarriage in Rural Malawi." *Demographic Research,* Special collection 1, article 6:175–206. Available online at http://www.demographic-research.org/special/1/6/S1-6.pdf.
Schatz, E. 2002. *Numbers and Narratives: Making Sense of Gender and Context in Rural Malawi*. Unpublished doctoral dissertation. Graduate Group in Demography, University of Pennsylvania, Philadelphia.
———. 2005. "'Take Your Mat and Go!': Rural Malawian Women's Strategies in the HIV/AIDS Era." *Culture, Health and Sexuality* 7:479–92.
Schoepf, B.G. 2001. "International AIDS Research in Anthropology. Taking a Critical Perspective on the Crisis." *Annual Review of Anthropology* 30:335–61.
Smith, K.P. and S.C. Watkins. 2005. "Perceptions of Risk and Strategies for Prevention: Responses to HIV/AIDS in Rural Malawi." *Social Science and Medicine* 60:649–60.
Stoneburner, R.L. and D. Low-Beer. 2004. "Population-Level HIV Declines and Behavioral Risk Avoidance in Uganda." *Science* 304:714–18.
Swidler, A. and S. Watkins. 2005. "Hearsay Ethnography." Presented at the annual meeting of the Population Association of America, March 31–April 2, Philadelphia, PA.
Trinitapoli, J. 2007. *The Role of Religious Organizations in the HIV Crisis of Sub-Saharan Africa*. Unpublished doctoral dissertation. Department of Sociology, University of Texas–Austin.
Ulin, P.R. 1992. "African Women and AIDS: Negotiating Behavioral Change." *Social Science and Medicine* 34:63–73.
Umberson, D. 1987. "Family Status and Health Behaviors: Social Control as a Dimension of Social Integration." *Journal of Health and Social Behavior* 28:306–19.
UNAIDS. 2004. *Report on the Global AIDS Epidemic*. Geneva: UNAIDS.
UNAIDS/WHO. 2004. "Epidemiological Fact Sheet on HIV/AIDS and Sexually Transmitted Infections: Malawi (2004 Update)." Geneva: UNAIDS/WHO.
UNDP. 2004. "Human Development Report 2004: Cultural Liberty in Today's Diverse World." New York: United Nations Development Programme.
United Nations. 2007. "World Population Prospects: The 2007 Revision. Population Database." New York: United Nations, Population Division. Available online at http://esa.un.org/unpp/.
Van de Walle, E. and D. Meekers. 1994. "Marriage Drinks and Kola Nuts." Pp. 57–73 in *Nuptiality in Sub-Saharan Africa: Contemporary Anthropological and Demographic Perspectives,* edited by C. Bledsoe and G. Pison. Oxford: Clarendon Press.
Waite, L.J. 1995. "Does Marriage Matter?" *Demography* 32:483–507.
Waldron, I., M.E. Hughes, and T.L. Brooks. 1996. "Marriage Protection and Marriage Selection—Prospective Evidence for Reciprocal Effects of Marital Status and Health." *Social Science and Medicine* 43:113–23.

Watkins, S. 2004. "Navigating AIDS in Rural Malawi." *Population and Development Review* 30:673–705.

Watkins, S., E.M. Zulu, H.-P. Kohler, and J. Behrman, eds. 2003. "Social Interactions and HIV/AIDS in Rural Africa." *Demographic Research,* Special collection 1. Available online at http://www.demographic-research.org/special/.

Wendo, C. 2004. "African Women Denounce Bride Price. Campaigners Claim Payment for Wives Damages Sexual Health and Contributes to AIDS Spread." *Lancet* 363:716.

Wyke, S. and G. Ford. 1992. "Competing Explanations for Associations Between Marital Status and Health." *Social Science and Medicine* 34:523–32.

Zulu, E.M. 1996. *Social and Cultural Factors Affecting Reproductive Behavior in Malawi*. Unpublished doctoral dissertation. Graduate Group in Demography, University of Pennsylvania, Philadelphia.

Zulu, E.M. and G. Chepngeno. 2003. "Spousal Communication About the Risk of Contracting HIV/AIDS in Rural Malawi." *Demographic Research,* Special collection 1, article 8:245–77. Available online at http://www.demographic-research.org/special/1/8/S1-8.pdf.