Published in final edited form as:

AIDS Behav. 2010 February ; 14(1): 103–112. doi:10.1007/s10461-008-9497-7.

HIV Risk Among Currently Married Couples in Rural Malawi: What Do Spouses Know About Each Other?

Philip A. Anglewicz,

Graduate Group in Demography, Population Studies Center, University of Pennsylvania, 239
McNeil Building, 3718 Locust Walk, Philadelphia, PA 19104-6298, USA

Simona Bignami-Van Assche,

Department of Demography, Université de Montréal, Montreal, QC, Canada

Shelley Clark, and

Department of Sociology, McGill University, Montreal, QC, Canada

James Mkandawire

Malawi Diffusion and Ideational Change Project (MDICP), Mzuzu, Malawi

Philip A. Anglewicz: philipaz@sas.upenn.edu

Abstract

In countries with generalized HIV/AIDS epidemics, married couples have a shared risk of acquiring HIV/AIDS. Yet very little research has adopted a couple-level perspective to investigate perceived risk of HIV infection. In this paper, we used population-based data from 768 married monogamous couples in the 2004 Malawi Diffusion and Ideational Change Project (MDICP) to compare respondents' perceptions about their spouses' HIV status to their spouses' actual HIV status. Using chi-squared and Kappa coefficient statistics, we evaluated how accurately respondents assess their spouse's HIV status, and compared the assessment of their spouse's HIV status with their assessment of their own serostatus. We found that individuals tend to overestimate their spouse's as well as their own risk of having HIV. Husbands were generally more accurate in assessing their own risk of HIV infection than that of their wives, but wives were more accurate in assessing the HIV status of their spouses. In our multivariate logistic regression results, we found that marital infidelity is the most important correlate of overestimating individual and spousal HIV risk.

Keywords

HIV/AIDS; Couple data; Risk perception; VCT; Developing countries; Malawi

Introduction

Among married couples, an individual's perceived and actual risks of being infected with HIV is closely intertwined with his or her spouse's. As the HIV/AIDS epidemic spreads to the general population, a large and increasing proportion of HIV transmissions occurs within marriage (Bongaarts 1996). Indeed, discordant couples (i.e. couples where only one partner is infected with HIV) represent the majority of HIV-infected couples in sub-Saharan Africa (de Walque 2007), and a large proportion of new HIV infections in this region occurs within

discordant couples in long-term stable partnerships (Dunkle et al. 2008; Hudson 1996; Robinson et al. 1999). Although both husbands and wives are at risk of contracting HIV from their spouse, cultural, social and biological gender inequalities render women particularly vulnerable to transmission from their husbands (Gilbert and Walker 2002; Heise and Elias 1995). First, gender-based norms in which it is more permissible for men than for women to have extramarital sexual partners make it more likely that men will bring HIV into the union after marriage. Prospective longitudinal studies of couples have shown that women are most likely to become HIV-infected from their husbands, while men typically become infected through extramarital sexual partnerships (de Zoysa et al. 1996; Heise and Elias 1995; King et al. 1993; McKenna et al. 1997). Second, other studies of stable unions in sub-Saharan Africa have shown that, of individuals with HIV positive spouses, women experience a higher incidence rate than men, suggesting that women may be biologically more susceptible to HIV transmission than men (Carpenter et al. 1999; Hugonnet et al. 2002). Finally, women's relatively weak negotiating power within marriage as well as their limited ability to find social and economic support outside of marriage makes it difficult for wives to curtail their spouses' extramarital sexual activities or to insist on protective measures like condoms with their spouses (Turmen 2003).

Not only married individuals' actual HIV risk but also their *perceived* risk of HIV infection is influenced by their partners' characteristics and sexual behavior. In fact, individuals' perceptions of their spouses' HIV risk are perhaps more influential in affecting their sexual behavior than actual HIV risk, for at least two reasons. First, actual HIV status is not known by many residents of sub-Saharan Africa: in 2004, estimates by UNAIDS and WHO indicated that in low or middle-income countries only 10% of people at risk of HIV infection have access to voluntary counseling and testing (VCT) (UNAIDS 2004). Secondly, even when HIV status is known, individuals may not be willing to share information about their HIV status with their spouse (Anglewicz 2008). Fear of stigma or reprisal from one's spouse is further likely to diminish individuals' willingness to get tested or disclose their results even where VCT services are available (Grinstead et al. 2001; King et al. 2007). Empirical evidence confirms that beliefs about a spouse's behavior strongly shape individuals' worry about having or contracting HIV/AIDS, as well as subsequent behavior related to prevention of HIV infection (Moore et al. 2004; Smith 2003). In addition, studies show that spouses' sexual behavior is a more important factor in determining perceived HIV risk for women than it is for men (Akwara et al. 2003; Clark 2005; Smith and Watkins 2005).

Despite the clear importance in relation to HIV prevention, little is known about spouses' perceptions and knowledge of the risks they may pose to each other. Theoretical and empirical models such as the Health Belief Model tend to examine HIV risk primarily from the individual's perspective, and rely on reports of individual sexual behavior as the main predictors of actual and perceived risk of HIV infection (Rosenstock 1974). Yet studies have consistently found that individuals' self-assessments of their own HIV risk are poorly correlated with their actual HIV status, even when the mechanisms of HIV transmission are well-understood. For example, one case-control study in Tanzania found no statistically significant relationship between perceived HIV risk and actual HIV infection (Quigley et al. 1997). Inaccuracies seem to be largely driven by 'false positives', that is, individuals who perceive themselves to be at an elevated risk of HIV/AIDS, but who are, in fact, uninfected. In another example, 33% of clients at a VCT center in Zambia gave incorrect self reports of their HIV/AIDS status, and 53% of these inaccurate self-reports were for individuals who thought they were HIV positive but were in fact HIV negative (Chintu et al. 1997). Because those seeking VCT may do so because they are already experiencing symptoms of AIDS, it is not surprising that false-positive HIV assessments were slightly more common at a VCT center than in a population-based sample: in rural Malawi, approximately 26% of

respondents incorrectly thought they were HIV positive, and 92.8% of those who thought they were infected were actually HIV negative (Bignami-Van Assche et al. 2007).

Perceptions of a spouse's HIV risk are expected to be even more inaccurate than self-perceptions of risk, since the sexual behavior of one's spouse is typically not known with certainty. However, data confirming this intuition are sparse and have been collected only in developed countries. For example, patients with gonorrhea and chlamydia in Seattle, Washington, reported relatively poor knowledge of their sexual partners' involvement in commercial sexual activity or multiple partnerships (Stoner et al. 2003). Only one unpublished article examines the difference between perceived partner risks and the partner's self-reported risk of HIV in stable heterosexual couples, using data from Florida (Moore et al. 2004). This study, however, does not compare perceptions of partners' risk to partners' actual HIV status.

In this paper, we use currently married couples' data collected in rural Malawi to determine how accurately spouses assess each other's HIV risks, compared to their own risk. We begin by evaluating whether married individuals over- or under-estimate their spouses' risk of HIV, and we then compare this assessment with that of their own HIV risk. Lastly, we examine whether individual or spousal behaviors and characteristics are associated with how accurately respondents assess their spouses' and their own risk of HIV infection.

Methods

Study Setting

Malawi is one of the poorest countries in Africa and has among the highest HIV prevalence rates in the world (UNAIDS 2008). As in most countries in sub-Saharan Africa, in Malawi, HIV prevalence tends to be higher in urban areas than in rural areas. According to the 2004 Malawi Demographic Health Survey, among men and women age 15–49 who were tested, HIV prevalence was 17.1% for those who lived in urban areas, compared to 10.8% for rural residents (National Statistical Office and ORC Macro 2005). Urban-rural differentials in HIV risk are partly explained by cyclical migration between rural areas and urban centers both within Malawi and neighboring countries such as Zambia, Zimbabwe and South Africa (Anarfi 1993; Chirwa 1997). Another important factor to explain urban-rural differentials in HIV risk is sexual behavior, since rural residents tend to report fewer premarital and extramarital sexual partnerships than their urban counterparts (National Statistical Office and ORC Macro 2005). HIV risk in Malawi differs also along another dimension, that is, region of residence. HIV/AIDS prevalence rates tend to be higher in the southern than in the northern region of Malawi. In 2004, HIV prevalence for people who were living in the southern region was 17.6% compared to 8.1% for individuals who were living in the northern region. Both men and women in the southern region of Malawi also report more lifetime sexual partners than Malawians living in the northern part of the country (National Statistical Office and ORC Macro 2005).

For our analyses, we use population-based survey and biomarker data collected as part of the Malawi Diffusion and Ideational Change Project (MDICP). Since 1998, the MDICP has collected longitudinal data from married men and women in three rural sites in Malawi: Rumphi (in the northern region), Mchinji (in the central region) and Balaka (in the southern region). The variation found among these three sites in terms of language, ethnicity, kinship and lineage systems, and religion captures much of the diversity found in rural Malawi.

Sample Selection

The MDICP was designed as a couples' survey, targeting a population-based representative sample of approximately 1,500 ever-married women and 1,000 of their husbands in the three

rural sites of Malawi described above (Watkins et al. 2003). After household enumeration of the three survey sites was conducted, a random sample of approximately 500 ever-married women aged 15–49 were selected to be interviewed in each site. If these women were currently married, their spouses were also eligible to participate in the survey. As there are different definitions of “marriage” across and within countries in sub-Saharan Africa (Meekers 1992; van de Walle 1968), the MDICP relied on respondents’ self-reported descriptions of their status as “married” regardless of whether there had been any sort of public marriage ceremony. Moreover, by design, fewer men than women were interviewed either because the sampled ever-married woman was no longer married or because her current husband was unable to be interviewed. High levels of male migration as well as long or irregular work schedules away from home resulted in fewer husbands than wives being interviewed (Anglewicz 2007).

Each successive wave of the MDICP followed-up with the original MDICP-1998 respondents and also interviewed any new spouses if the respondent had remarried between survey waves. In the third wave, conducted in 2004, the MDICP interviewed 2,279 ever-married respondents, of whom 1,149 women (89%) and 951 men (98%) were married at the time of the survey. Of the currently married respondents, the MDICP-2004 interviewed both spouses in 768 monogamous couples, which represents the sample for the present analysis. Respondents in polygamous unions (corresponding to 17% and 11%, respectively, of interviewed women and men currently married to a co-resident spouse) were excluded for the purposes of the present analysis because it is not possible to identify which wife’s HIV status the polygamous husband is assessing.

In addition to collecting basic socio-demographic data on these 768 monogamous couples, the MDICP-2004 has three critical features that make our analyses possible. First, in the survey component of the MDICP-2004, all respondents were asked to estimate both (1) the likelihood that they were infected with HIV and (2) the likelihood that their spouse was infected with HIV (husbands and wives were interviewed separately in a private location, in order to ensure confidentiality of survey responses). Second, the MDICP-2004 provided HIV tests to all respondents who consented (as described below). Third, although HIV testing was carried out anonymously to ensure confidentiality, it is possible to link survey and biomarker information collected by the MDICP-2004, and thus to link husbands’ and wives’ self-reported perceptions about their HIV risk to their and their spouses’ actual HIV status.

HIV Testing Procedures

According to the MDICP-2004 biomarker protocol (Bignami-Van Assche et al. 2004), after the survey interview was administered by locally-hired interviewers, all interviewed respondents were approached by a biomarker testing team. Written informed consent (either a signature or thumbprint) was obtained from all respondents who agreed to be tested. Nurses trained in biomarker collection carried out the HIV test by taking saliva samples from respondents who consented (Orasure Technologies Inc, Bethlehem, Pennsylvania, USA). The biomarker samples were sent to a laboratory in Lilongwe, Malawi, where HIV antibody status was assessed using enzyme-linked immunosorbent assays (ELISA) kits for initial screening, and positive results were confirmed by a Western Blot test. After fieldwork, all respondents tested were given the opportunity to receive their results, which were made available in temporary counseling centers set up in central locations within MDICP sample villages (Thornton 2005). HIV test results were presented with post-test counseling by a trained nurse within four months of testing (Thornton 2005).

Because HIV testing was voluntary, not all husbands and wives in the 768 couples chosen for the present analysis were both interviewed by the survey and tested for HIV. In addition,

it is possible that, if interviewed, the respondents did not give an assessment of their spouse's likelihood of current HIV infection. Variations in these sub-samples are displayed in Table 1. Of the 768 monogamous married couples chosen for the analysis, 622 husbands and 660 wives were both interviewed and tested for HIV. Among the 622 husbands who were interviewed and tested, 612 of their wives provided assessments of whether they thought their husbands were infected.

Measurement

We begin by estimating the accuracy of rural Malawians in assessing the HIV status of their spouse as well as themselves. To do so, we compare respondents' actual serostatus to their perceived risk of HIV infection for themselves and their spouses. We measure agreement between actual and perceived HIV risk by calculating chi-square and Kappa statistics. Kappa statistics assess the level of agreement beyond what would be expected by chance agreement alone. For both these measures, higher values represent greater accuracy in assessing HIV status (one's spouse's or one's own). We determine respondents' perception of their spouses' HIV status from responses to the question: 'In your opinion, what is the likelihood (chance) that your spouse is infected with HIV now?' Similarly, respondents' perception of their own likelihood of HIV infection is assessed from responses to the corresponding survey question: 'In your opinion, what is the likelihood (chance) that you are infected with HIV now?' For both questions, the options of answers are: 'No likelihood', 'Low likelihood', 'Medium likelihood', 'High likelihood', and 'Don't know'. For the analysis, we dichotomize perceived HIV risk assessments into low likelihood (including the original responses 'no likelihood' and 'low likelihood') and high likelihood (including the original responses 'medium likelihood' and 'high likelihood'). An alternative dichotomization (no likelihood vs. some likelihood, the latter including low, medium and high) did not yield results that change the conclusions reached in this paper. In dichotomizing the four-category measure of risk perception, we assume that respondent's perception of a high likelihood of being HIV positive corresponds to a relatively high probability (i.e., above 50%) of being infected with HIV; similarly, we assume that a no or low likelihood corresponds to a fairly low probability of HIV infection, below 5%. An analysis that compares categorical self-assessments with numerical probabilities for the same study population supports the validity of this assumption (see Delavande et al. 2007 for more details).

Next, we identify which individual and spousal characteristics are associated with accurately assessing HIV risk for one's spouse and oneself. We focus on 'false positives' (self-assessments of a high likelihood of HIV infection given by HIV negative respondents) for both empirical as well as substantive reasons. First, 'false positives' are by far the most common type of incorrect assessment. Indeed, the number of 'false negatives' (HIV positive individuals reporting a low likelihood of HIV infection) is too small (36 cases) for any meaningful statistical analysis. Second, by focusing on false positives, we aim to identify the reasons why individuals overestimate their spouses' and their own HIV risk. Therefore, we exclude the small number of HIV positive respondents (44 men and 37 women) from the multivariate regressions of HIV assessment. We fit two multivariate logistic regressions to the data, where the dependent variables are: (1) the respondent's assessment of his/her spouse's HIV status; (2) the respondent's assessment of his/her own HIV status. Since all respondents in the analysis are HIV negative, the results reveal predictors of overestimating (rather than accurately assessing) the likelihood of current HIV infection. Results of ordered logistic regressions with risk perception as a four-category variable were not substantively different from the results presented in the next section.

Results

Descriptive statistics of spouses' characteristics and behaviors for the couples selected for the analysis are displayed in Table 2. On average, husbands in our sample are older and more educated than their wives. HIV prevalence is 5.6% for wives and 7.1% for husbands. Most couples included in the analysis (91.7%) are concordant, and the vast majority of concordant couples are HIV negative (89.4%). With respect to sexual exclusivity, husbands are more likely than wives to report that they have extramarital sexual partners, and wives are more likely than husbands to suspect that their spouse has been unfaithful. Finally, 13% of husbands reported that they had been tested for HIV prior to MDICP-2004 compared to 8% of wives, and husbands were also more likely to have discussed their HIV status with their spouse than wives were.

Table 3 compares respondents' assessments of their spouses' risk of having HIV to their spouses' actual HIV status, and also shows how accurately MDICP-2004 respondents assess their own risk of having HIV. We find that there is considerable inaccuracy among respondents concerning their spouses' as well as their own HIV status. Specifically, both men and women overestimate their own HIV risk as well as their spouses'. Of the 72 women who reported that there was a high likelihood that their husband had HIV, 89% were HIV negative and therefore inaccurate in their assessment. Similarly, of the 31 men who reported that there was a high likelihood their wife had HIV, 91% of their wives were HIV negative. Respondents were even more likely to overestimate their own HIV risk: among men and women who reported a high likelihood that they themselves were HIV positive, 95% of women and 96% of men were not actually infected. Overall, respondents were thus more accurate in assessing their spouse' likelihood of HIV infection than their own. It is interesting to note that both female and male respondents reporting that they did not know the likelihood of their spouses having HIV were about as likely to have an HIV positive spouse as respondents who reported a high likelihood that their spouse was HIV positive. In addition, when assessing the likelihood of their own HIV status, both female and male respondents answering 'don't know' were approximately twice as likely to be HIV positive as respondents assessing a high likelihood of infection. In other words, it seems that respondents were often not comfortable in admitting to an unknown interviewer that they or their spouse might be HIV positive, and that they were more hesitant in the former case.

Although the overall accuracy of respondents' assessments of their spouses' and their own HIV status is quite low, Table 3 shows that wives are better than husbands at assessing the HIV status of their spouses. Women who thought their husband was highly likely to be HIV positive were significantly more likely to actually have an HIV positive husband than women who thought their spouse had a low likelihood of HIV infection. In addition, of the four tests of HIV risk assessment accuracy, only the chi-squared and kappa tests for wives' assessments of their husbands' HIV status are significant at the 5% level.

Why do individuals frequently overestimate the likelihood of HIV infection for their spouses as well as themselves? To answer this question we evaluate whether individual or spousal characteristics and behaviors are associated with the observed inaccuracies. Results for the multivariate regression analysis of false positives are shown in Table 4.

First, the results of the multivariate regression analysis allow us to identify the factors associated with believing one's spouse to be infected with HIV when, in fact, he or she is HIV negative (Table 4, left panel). Self-reported infidelity and suspected spousal infidelity stand out as the dominant correlates of overestimating one's spouse's HIV risk. For women, it is their suspicion that their husbands had extramarital partners rather than their own self-reported number of extramarital partners that influence whether they believe their husbands

are at risk. Women who suspect their husband had an extramarital relationship are 10.2 times more likely to believe that their (uninfected) husband is HIV positive than women who do not suspect their husband of infidelity. However, the small number of women who report having had an extramarital relationship themselves do not perceive their husbands to be at significantly greater risk. Women with more education are also significantly more likely to overestimate the HIV status of their husband. For men, both their own self-reported infidelities and their suspicions about their wives' infidelities contribute to overestimating their wives' risk of having HIV. Men's marital history is also an important covariate of the observed inaccuracies: men who have been previously married are significantly more likely to overestimate their wife's HIV status.

Predictors of overestimating one's own HIV risk differ from those of overestimating one's spouse's HIV risk (Table 4, right panel). Women who have been married for a longer period of time, whose husband was previously married, or who suspect their husband of having extramarital partners tend to think they are infected with HIV while they are not, although their own infidelities have no significant effect on these perceptions. In contrast, men tend to overestimate their likelihood of having HIV only the basis of their own self-reported infidelity, not on the basis of their marital history or background characteristics.

Discussion

The present study is the first one to show that rural Malawians are frequently inaccurate when assessing their own or their spouses' HIV status. Among the incorrect assessments, overestimating one's own and one's spouse's HIV risk is far more common than underestimating risk of HIV infection. In addition, both men and women are more likely to overestimate their own risk of HIV than their spouses'. Women, in particular, appear to be better at assessing their husbands' risk than their own. They are also better at assessing their husbands' risks than men are at estimating their own HIV status. Since our analysis is limited to monogamous couples, we cannot determine where accuracy improves or diminishes in polygamous unions.

With respect to the significant predictors of the observed inaccuracies for HIV negative respondents, we find that husbands' suspected and self-reported behaviors, specifically with respect to their extramarital sexual partnerships, are associated with a higher perceived HIV risk among men who are HIV negative. Both men and women appear to believe that not only do husbands' extramarital relationships increase husbands' HIV risk, but that they also place their wives at greater risk of infection. In contrast, women's infidelities are not significantly associated with wives' perceptions of their own or their husbands' risk (although only very few women admit to infidelity). While husbands seem to believe that their wives' extramarital relationships will significantly increase the probability that their wives are HIV-infected, they do not perceive their wives' behaviors as a significant factor in assessing their own risk. Thus, for women, characteristics and behaviors of their husbands are significantly associated both with self-assessed HIV status, as well as perceptions about the HIV status of their spouse; whereas women's own characteristics are not significantly associated with women's assessment of their own or their spouses' risk. These findings are thus an important contribution to previous research emphasizing the perceived vulnerability of wives to HIV infection via their husbands' sexual behavior.

In summary, our findings indicate that married men and women see their own and their spouses' risks as linked, but also as dominated by husbands' characteristics and behaviors. Since husbands' behaviors may be unknown and uncontrollable from the perspective of their wives, they may engender a particularly high level of anxiety and worry about contracting

HIV among wives. Indeed, according to the MDICP data, a larger percentage of women than men are worried about HIV infection (Smith and Watkins 2005).

Study Limitations

It is important to emphasize that research involving self-reported sexual behaviors, particularly marital infidelity, is prone to biases resulting from inaccuracies in survey reports. For example, in the present analysis spouse's infidelity may be more strongly associated with perceived risk than own infidelity for women than for men because women in sub-Saharan Africa are more likely than men to underreport their own infidelity (Buvé et al. 2001; Nnko et al. 2004). In contrast, suspected infidelity of a spouse is likely to be more accurately reported than one's own infidelity. For example, according to MDICP-2004 data, women are more likely to report that their married "best friends" have had extramarital partnerships than to report that they have had sexual partners other than their husbands. In addition, in rural setting respondents frequently learn about their spouse's infidelity through gossip by other members in that small community (Watkins 2004; Watkins and Swidler 2008).

The strong association between suspected spousal infidelity and perceived risk of HIV infection may also be due to the fact that most rural Malawians overestimate the likelihood of HIV transmission per sexual act. While the actual likelihood of infection, in the absence of an increased viral load or other sexually transmitted infection, is approximately one in a thousand (95% confidence interval: 0.0008–0.0015 per act of intercourse; Gray et al 2001), more than 95% of MDICP-2004 respondents believe AIDS is "highly likely" or "certain" to be transmitted from one act of unprotected intercourse with an HIV-infected person (Anglewicz 2007). Because the risk of HIV transmission is overestimated, individuals are likely to believe that infidelity will inevitably lead to infection of their spouse, who will subsequently pass the infection to the respondents themselves. Further evidence for the overestimated risk of HIV transmission is found in qualitative reports, which show that many rural Malawians find it highly unlikely for married couples to be HIV discordant (Santow et al. 2008), despite the fact that only 8.3% of MDICP-2004 currently married monogamous couples are discordant, compared to 2.3% of couples that are concordant HIV positive (see Table 2).

Our use the term "accuracy" to describe self-assessed risk of HIV infection requires additional qualification. Due to the stochastic element in HIV transmission, it is possible at the individual level to estimate a high likelihood of HIV infection but nonetheless be HIV negative. For example, an individual may have engaged in risky activity but nonetheless be HIV negative merely due to chance. In this case, the individual is not "incorrect" if they assess a high likelihood of current infection with HIV. However, for a population that understands that HIV is transmitted sexually and perceives extramarital sexual activity to be the major source of their risk (Anglewicz and Kohler 2006; Watkins 2004), we expect a correspondence between subjective risks and actual HIV infection at the aggregate level. Thus, our description of subjective beliefs as "correct" and "incorrect" refers to the population-level assessment.

Policy Implications

The observed gender differences in assessing the HIV risk of one's spouse have important implications for developing effective HIV/AIDS prevention interventions. In particular, since both husbands and wives perceive their HIV risks as tightly intertwined, couple counseling and testing may be viewed as highly acceptable and effective. Given that both husbands and wives tend to substantially overestimate the probability that they or their spouses are infected, knowing their own and their spouses' HIV status may come as a relief

for many married couples. For the large majority of couples who are HIV negative, couple testing and counseling can provide an excellent opportunity to discuss and develop appropriate strategies to jointly avoid HIV. In particular, our findings that both men and women identify men's extramarital sexual partnerships as a primary source of perceived risk both for themselves and their spouses, suggest that greater encouragement of male sexual fidelity through couples' counseling, media outreach, and community groups would greatly reduce both men's and women's sense of vulnerability. Couples who are sero-discordant or who do not intend to remain sexually exclusive may consider using condoms with their spouse. The possibility of using condoms within marriage has been widely debated (Adetunji 2002), but there is some emerging evidence that condoms may be an acceptable alternative for couples who perceive themselves to be at substantial risk.

This research also reinforces the importance of expanded access to voluntary counseling and testing facilities throughout sub-Saharan Africa. While access to VCT has increased in recent years, many residents of rural areas of sub-Saharan Africa still do not have adequate access to HIV testing (WHO 2007). In this research, we show that men and women in rural Malawi are often incorrect in estimating their and their spouse's HIV status. It is reasonable to believe that in the absence of testing facilities, subjective assessments are likely to drive behavior. If so, then for many Malawians their sexual behaviors are being guided by faulty assumptions. Given that access to VCT has increased in sub-Saharan Africa since 2004, it would be useful to examine how the accuracy of individual and spousal perceived HIV risk changes after receiving an HIV test result, as well as the relationships between perceived risk, risk behavior, and HIV testing.

Future Research

The present study thus highlights the need not only to reconsider the counseling component of VCT programs, but also to re-orient our theoretical and conceptual models of HIV risk, as they both currently primarily address *individual* behavior modification rather than couple-based protection strategies. Focusing on individuals' behaviors to reduce the spread of HIV may prove inadequate in sub-Saharan African countries, such as Malawi, where infection within marriage is becoming increasingly common. Interestingly, evidence from rural Malawi suggests that many individuals have begun to develop their own couple-level protection strategies. For example, rural Malawian women who perceive themselves to be at risk of HIV because of their husbands' behavior are increasingly turning to divorce as a protection method (Reniers 2008). Suitors perceived to be at high risk of having HIV are also increasingly rejected as marriage partners (Watkins 2004). More research is required to determine how effective these strategies are in protecting couples from HIV infection. Given the large discrepancies between spouses' risk perception and actual HIV status, couples may be turning to divorce or declining marriage and remarriage opportunities prematurely. Overall, our findings highlight the shared HIV risk of married couples, and the necessity of considering HIV risk from the couple, rather than the individual, perspective when planning HIV interventions and policies in sub-Saharan African countries with generalized epidemics.

Acknowledgments

The Malawi Diffusion and Ideational Change Project is supported by grants from the Rockefeller Foundation; NICHD (R01-HD4173, R01 HD372-276); NIA (AG1236-S3); and the Center for AIDS Research and the Center on the Demography of Aging, both at the University of Pennsylvania. This paper benefited from suggestions by Susan Watkins, Jere Behrman and two anonymous reviewers.

References

- Adetunji J. Condom use in marital and nonmarital relationships in Zimbabwe. *International Family Planning Perspectives*. 2002; 26(4):196-200.10.2307/2648258

- Akwara P, Madise N, Hinde A. Perception of risk of HIV/AIDS and sexual behaviour in Kenya. *Journal of Biosocial Science*. 2003; 35:385–411.10.1017/S0021932003003857 [PubMed: 12887220]
- Anarfi JK. Sexuality, migration and AIDS in Ghana-A socio-behavioral study. *Health Transition Review*. 1993; 7(supplement 3):1–22. 1997. [PubMed: 10148688]
- Anglewicz, P. PhD Dissertation. University of Pennsylvania; 2007. Migration, risk perception and HIV infection in rural Malawi.
- Anglewicz, P. Disclosure of HIV status among rural Malawians. Presented at the annual meeting of the Population Association of America; Louisiana. 2008.
- Anglewicz, P.; Kohler, HP. Overestimating HIV infection: The construction and accuracy of subjective probabilities of HIV infection in rural Malawi. Presented at the annual meeting of the Population Association of America; California. 2006.
- Bignami-Van Assche S, Chao LW, Anglewicz P, et al. The validity of self-reported likelihood of HIV infection among the general population in rural Malawi. *Sexually Transmitted Infections*. 2007; 83:35–40.10.1136/sti.2006.020545 [PubMed: 16790561]
- Bignami-Van Assche, S.; Smith, KP.; Reniers, G., et al. Protocol for biomarker testing in the 2004 Malawi diffusion and ideational change project. University of Pennsylvania; 2004. SNP Working Paper No.7
- Bignami-Van Assche, S.; Tandon, A. Husband-wife disagreement in rural Malawi: A longitudinal analysis. 2008. Review and resubmit with sociological methods and research
- Bongaarts J. Global trends in AIDS mortality. *Population and Development Review*. 1996; 22(1):21–45.10.2307/2137685
- Buvé A, Lagarde E, Carael M, et al. Interpreting sexual behaviour data: Validity issues in the multicentre study on factors determining the differential spread of HIV in four African cities. *AIDS (London, England)*. 2001; 15(S4):S117–S126.10.1097/00002030-200108004-00013
- Carpenter L, Kamali M, Ruberantwari A, et al. Rates of HIV-1 transmission within marriage in rural Uganda in relation to the HIV sero-status of the partners. *AIDS (London, England)*. 1999; 13:1083–1089.10.1097/00002030-199906180-00012
- Chintu C, Baboo KS, Gould SS, et al. False-positive self-reports of HIV infection. *Lancet*. 1997; 349:650.10.1016/S0140-6736(05)61595-4 [PubMed: 9057752]
- Chirwa WC. “No TEBA ... Forget TEBA”: The plight of Malawian ex-migrant workers to South Africa, 1988–1994. *The International Migration Review*. 1997; 3(31):628–654.10.2307/2547289 [PubMed: 12292956]
- Clark, S. Perceptions of HIV risks among married couples in Malawi: Why do wives worry more?. Presented at the annual meeting of the Population Association of America; Pennsylvania. 2005.
- de Walque D. Sero-discordant couples in five African countries: Implications for prevention strategies. *Population and Development Review*. 2007; 33(3):501–523.10.1111/j.1728-4457.2007.00182.x
- de Zoysa I, Sweat MD, Denison JA. Faithful but fearful: Reducing HIV transmission in stable relationships. *AIDS*. 1996; S10A:S197–S203. [PubMed: 8883630]
- Delavande, A.; Kohler, HP.; Anglewicz, P. Unpublished working paper. Population Studies Center, University of Pennsylvania; Philadelphia, PA: 2007. Subjective risk perceptions about HIV infection: An interactive approach.
- Dunkle K, Stephenson R, Karita E, Chomba E, Kayitenkore K, Vwalika C, et al. New heterosexually transmitted HIV infections in married or cohabiting couples in urban Zambia and Rwanda: An analysis of survey and clinical data. *Lancet*. 2008; 371(9631):2183–2191.10.1016/S0140-6736(08)60953-8 [PubMed: 18586173]
- Gilbert L, Walker L. Treading the path of least resistance: HIV/AIDS and social inequalities—A South African case study. *Social Science and Medicine*. 2002; 54(7):1093–1110.10.1016/S0277-9536(01)00083-1 [PubMed: 11999505]
- Gray R, et al. Probability of HIV-1 transmission per coital act in monogamous, heterosexual, HIV-1 discordant couples in Rakai, Uganda. *Lancet*. 2001; 357:1149–1153. [PubMed: 11323041]
- Grinstead OA, Gregorich SE, Choi K, Coates T. the Voluntary HIV-1 Counselling, Testing Efficacy Study Group. Positive and negative life events after counselling and testing: The voluntary HIV-1 counselling and testing efficacy study. *AIDS*. 2001; 15:1045–1052. [PubMed: 11399987]

- Heise LL, Elias C. Transforming AIDS prevention to meet women's needs. A focus on developing countries. *Social Science and Medicine*. 1995; 40(7):931–943.10.1016/0277-9536(94)00165-P [PubMed: 7792632]
- Hudson CP. The importance of transmission of HIV-1 in discordant couples in the population dynamics of HIV-1 infection in rural Africa. *International Journal of STD and AIDS*. 1996; 7:302–304.10.1258/0956462961917906 [PubMed: 8876369]
- Hugonnet S, Mosha F, Todd J, Mugeye K, Klokke A, et al. Incidence of HIV infection in stable sexual partnerships: A retrospective cohort study of 1802 couples in Mwanza region, Tanzania. *Journal of Acquired Immune Deficiency Syndromes*. 2002; 30:73–80.10.1097/00126334-200205010-00010 [PubMed: 12048366]
- King R, Allen S, Serufilira A, Karita E, Van de Perre P. Voluntary confidential HIV testing for couples in Kigali, Rwanda. *AIDS (London, England)*. 1993; 7(10):1393–1394.10.1097/00002030-199310000-00018
- King R, Katuntu D, Lifhay J, Packel L, Batamwita R, Nakaviwa S, et al. Processes and outcomes of HIV serostatus disclosure to sexual partners among people living with HIV in Uganda. *AIDS and Behavior*. 2007; 12:232–243.10.1007/s10461-007-9307-7 [PubMed: 17828450]
- McKenna SL, Muyinda GK, Roth D, Mwali M, Ng'andu N, et al. Rapid HIV testing and counseling for voluntary testing centers in Africa. *AIDS (London, England)*. 1997; 11(S1):S103–S110.
- Meekers D. The process of marriage in African societies: A multiple indicator approach. *Population and Development Review*. 1992; 18(1):61–78.10.2307/1971859
- Moore, T.; Sly, D.; Harrison, D. Partner awareness risk and perceived HIV vulnerability among seronegative heterosexual couples. Presented at the annual meeting of the Population Association of America; Massachusetts. 2004.
- National Statistical Office (NSO) [Malawi], and ORC Macro. Malawi demographic and health survey. Calverton: NSO and ORC Macro; 2005.
- Nnko S, Boerma JT, Urassa M, et al. Secretive females or swaggering males? An assessment of the quality of sexual partnership reporting in rural Tanzania. *Social Science and Medicine*. 2004; 59:299–310.10.1016/j.socscimed.2003.10.031 [PubMed: 15110421]
- Quigley M, Munguti K, Grosskurth H, et al. Sexual behavior patterns and other risk factors for HIV infection in rural Tanzania: A case-control study. *AIDS (London, England)*. 1997; 11:237–248.10.1097/00002030-199702000-00015
- Reniers G. Nuptial strategies for managing the risk of HIV infection in rural Malawi. *Demography*. 2008; 45(2):417–438.10.1353/dem.0.0002 [PubMed: 18613488]
- Robinson NJ, Mulder V, Auvert B, Whiworth AG, Hayes RJ. Type of partnership and heterosexual spread of HIV infection in rural Uganda: Results from simulation modelling. *International Journal of STD and AIDS*. 1999; 10:718–725.10.1258/0956462991913394 [PubMed: 10563557]
- Rosenstock I. Historical origins of the health and belief model. *Health Education Monographs*. 1974; 2(4):328–335.
- Santow, G.; Bracher, M.; Watkins, S. Implications for behavioural change in rural Malawi of popular understandings of the epidemiology of AIDS. Paper presented at the IUSSP seminar on potential and actual contributions of behavioural change to curbing the spread of HIV; Entebbe, Uganda. 2008.
- Smith KP. Why are they worried? Concern about HIV/AIDS in rural Malawi. *Demographic Research*. 2003; S1(9):277–318.
- Smith KP, Watkins SC. Perceptions of risk and strategies of prevention: Responses to HIV/AIDS in rural Malawi. *Social Science and Medicine*. 2005; 60:649–660.10.1016/j.socscimed.2004.06.009 [PubMed: 15550312]
- Stoner BP, Whittington WLH, Aral SO, et al. Avoiding risky sex partners: Perception of partners risks vs partners self reported risks. *Sexually Transmitted Infections*. 2003; 79:197–201.10.1136/sti.79.3.197 [PubMed: 12794201]
- Thornton, R. The impact of incentives on learning HIV results. Paper presented at the Eric M. Mindich Conference on experimental social science; March 1; Cambridge, USA. 2005.

- Turmen T. Gender and HIV/AIDS. *International Journal of Gynaecology and Obstetrics: The Official Organ of the International Federation of Gynaecology and Obstetrics*. 2003; 82(3):411–418.10.1016/S0020-7292(03)00202-9 [PubMed: 14499987]
- UNAIDS. Report on the global HIV/AIDS epidemic. Washington, DC: 2008.
- UNAIDS/WHO. UNAIDS/WHO policy on HIV testing. 2004. Available at: http://data.unaids.org/una-docs/hivtestingpolicy_en.pdf
- Van de Walle, E. Marriage in African censuses and inquiries. In: Brass, W., editor. *The demography of tropical Africa*. Princeton: Princeton University Press; 1968. p. 183-238.
- Watkins S. Navigating AIDS in rural Malawi. *Population and Development Review*. 2004; 30(4):70–673.10.1111/j.1728-4457.2004.00037.x
- Watkins S, Behrman JR, Kohler HP, Zulu EM. Introduction to “research on demographic aspects of HIV/AIDS in rural Africa”. *Demographic Research*. 2003; S1(1):1–30.
- Watkins, S.; Swidler, A. Unpublished working paper. Population Studies Center, University of Pennsylvania; Philadelphia, PA: 2008. *Conversations into Texts: A method for studying socially composed meanings*.
- World Health Organization. *Guidance on provider-initiated HIV testing and counseling in health facilities*. Geneva, Switzerland: WHO Press; 2007.

Table 1

Survey and HIV testing status of monogamous husbands and wives interviewed by the MDICP-2004

	Husbands	Wives
Total number interviewed	768	768
Tested for HIV	622	660
Tested and wife assessed husband's HIV status ^a	612	648
Tested and husband assessed wife's HIV status ^a	602	642

^a Respondents are considered as having assessed their spouse's HIV status if they gave a non-missing answer to the survey question: 'In your opinion, what is the likelihood (chance) that your spouse is infected with HIV now?' Non-missing answers include 'don't know' responses

Table 2

Descriptive statistics for individuals' characteristics and behaviors among currently married monogamous couples interviewed by the MDICP-2004

Variable	Percent/mean
Sample size	768
HIV status	
Individual	
H+	7.1%
W+	5.6%
Discordant couples	8.3%
H+, W−	4.9%
H−, W+	3.4%
Concordant couples	91.7%
H+, W+	2.3%
H−, W−	89.4%
Respondent characteristics	
Age (mean)	
W age	35.8
H age	42.4
Education (mean number of completed years)	
W education	3.7
H education	5.1
Region of residence	
Central	35%
North	27%
South	38%
Household wealth ^a	
House has iron sheet roof	19%
Household owns radio	74%
Household owns bicycle	58%
Number of children (mean) ^a	5.7
Marital duration (mean number of years) ^a	16.2
Marriage history	
W previously married	32%
H previously married	48%
Own infidelity reported	
W unfaithful to H	2%
H unfaithful to W	20%
Spouse's unfaithfulness suspected	
W suspects H unfaithful	33%
H suspects W unfaithful	11%
Tested for HIV prior to MDICP-2004	

Variable	Percent/mean
W tested	8%
H tested	13%
Discussed HIV with spouse	
W discussed HIV with spouse	74%
H discussed HIV with spouse	85%

H husband, *W* wife

^a Although both husband and wife reported on these characteristics, we use only wife's reports since they tend to be more reliable (Bignami-Van Assche and Tandon 2008)

Table 3

Accuracy of individual reports of one's spouse's HIV status and one's own HIV status

Husband's actual HIV status					
	HIV+ (%)	HIV- (%)	N	χ^2 test	Kappa
Wife's survey report of husband's HIV status				7.13 [0.01] ^b	0.11 [0.00] ^b
High likelihood (medium or high)	11	89	72		
Low likelihood (none or low)	4	96	361		
Don't know ^a	12	88	179		
Total sample			612		
Husband's survey report of own HIV status				0.14 [0.71] ^b	-0.02 [0.65] ^b
High likelihood (medium or high)	4	96	43		
Low likelihood (none or low)	6	94	460		
Don't know ^a	12	88	119		
Total sample			622		

Wife's actual HIV status					
	HIV+ (%)	HIV- (%)	N	χ^2 test	Kappa
Husband's survey report of wife's HIV status				1.51 [0.22] ^b	0.06 [0.10] ^b
High likelihood (medium or high)	9	91	31		
Low likelihood (none or low)	5	95	462		
Don't know ^a	8	92	149		
Total sample			642		
Wife's survey report of own HIV status				0.01 [0.95] ^b	-0.00 [0.53] ^b
High likelihood (medium or high)	5	95	100		
Low likelihood (none or low)	5	95	445		
Don't know ^a	8	92	115		
Total sample			660		

^aDon't know' responses are excluded when calculating chi-squared statistics^bP-values ($P > z$) in brackets for χ^2 tests

Table 4

Results of multivariate logistic regression analysis of false positive responses: assessment of spouse's and own HIV status

Sample size	Assessment of spouse's HIV status			Assessment of own HIV status		
	Wife	Husband		Wife	Husband	
	407	456		505	468	
	Odds	95% CI	Odds	95% CI	Odds	95% CI
Wife's age	1.02	(0.95, 1.09)	0.93	(0.84, 1.02)	0.95	(0.90, 1.00)
Husband's age	0.98	(0.92, 1.02)	0.99	(0.92, 1.06)	0.99	(0.95, 1.02)
Wife's education	1.22*	(1.04, 1.40)	0.98	(0.83, 1.20)	1.04	(0.93, 1.16)
Husband's education	0.96	(0.85, 1.06)	1.06	(0.88, 1.19)	1.07	(0.98, 1.17)
Region						
South	0.96	(0.42, 2.48)	0.73	(0.27, 2.84)	0.53	(0.27, 1.05)
Central	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
North	0.70	(0.32, 2.19)	1.10	(0.41, 5.09)	0.49	(0.23, 1.03)
Household wealth						
Has iron sheet roof	0.99	(0.42, 2.44)	0.55	(0.14, 2.17)	1.64	(0.83, 3.24)
Owens radio	0.44	(0.23, 1.09)	0.63	(0.24, 1.65)	1.06	(0.59, 1.89)
Owens bicycle	1.23	(0.60, 2.26)	0.66	(0.27, 1.61)	0.91	(0.55, 1.53)
Number of children	1.13	(0.97, 1.33)	1.16	(0.97, 1.42)	1.04	(0.93, 1.17)
Marital duration	0.96	(0.28, 1.80)	1.08	(0.28, 2.99)	1.05*	(0.74, 2.78)
Marriage history						
W previously married	0.75	(0.91, 1.02)	0.87	(0.99, 1.18)	1.43	(1.01, 1.10)
H previously married	1.28	(0.32, 1.29)	2.25	(0.34, 4.67)	2.70**	(0.41, 1.22)
Extramarital partnerships						
Self-reported infidelity	1.12	(0.20, 6.85)	2.64	(0.96, 6.33)	0.87	(0.21, 3.62)
Suspected spousal infidelity	10.22**	(5.01, 18.58)	5.45**	(1.92, 11.90)	1.90*	(1.15, 3.13)
Tested for HIV						
Respondent tested	0.41	(0.09, 2.07)	1.26	(0.29, 4.88)	1.24	(0.43, 3.54)
Spouse tested	0.70	(0.17, 3.08)	0.55	(0.09, 4.05)	0.37	(0.10, 1.44)
Discussed HIV with spouse	0.65	(0.66, 2.90)	1.17	(0.91, 6.32)	0.71	(1.57, 4.64)

* Value significant, $P < 0.05$
 ** Value significant, $P < 0.01$