Marital Investment under Uncertainty:
Couples HIV Testing and Marital Stability

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Beginning with the seminal article in 1971 by Lucas and Prescott, economists have examined investments under uncertainty in a variety of contexts. Becker et al. (1977) applied this concept to marriage suggesting that increased uncertainty in marriage (i.e., the likelihood of separation or divorce) reduces the incentive for spouses to invest in marriage-specific capital. Several studies have found that reducing the barriers to marital dissolution, through no-fault divorce laws for example, is associated with lower investments in marriage-specific goods (Landes, 1978; Johnson and Skinner, 1986; Peters, 1986; Lommerud, 1988; Lundberg and Rose, 1999; Stevenson, 2007).[1] Similar studies have found that with greater uncertainty about paternity,

men are less willing to invest in their alleged offspring and more likely to divorce their wives (Alexander, 1974; Anderson et al., 2005). In this paper we examine the relationship between uncertainty and marriage stability in rural Malawi. In particular, we examine how uncertainty about a spouses' HIV status, and thus the risk of HIV exposure, affects the likelihood of divorce.

Perhaps nowhere more than in sub-Saharan Africa, where adult HIV rates reach as high as 25 percent, do individuals face such risk and uncertainty within marriage. Coital frequencies and therefore potential exposures to HIV, among those who are married are greater than among those who are not (Johnson et al., 2009). Additionally, the desire for couples to have children requires unprotected vaginal sex. Within long-term committed relationships, it may be more difficult to adopt preventative behaviors. For example, suggesting abstinence or condom use to a spouse could easily be interpreted as a signal of one's own infidelity or mistrust (Chimbiri, 2007). Relying on a spouse's fidelity may also be risky; individuals in committed relationships in Africa often

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[1] Other papers in economics have examined the impact of outside options in marriage and contracts affecting marital outcomes (Rasul, 2006; Rasul and Mathoushek, 2008; South and Lloyd, 1995).

engage in concurrent sexual partnerships (Helleringer and Kohler, 2007).[2]

Despite the challenges of adopting preventative behaviors within marriage, there is evidence that individuals within committed relationships do have some strategies that can help to reduce their risk. For example, individuals may increase communication within the couple (Zulu and Chepngeno, 2003) engage with others in the community to acquire information about or monitor fidelity (Hirsch et al., 2007), or end the relationship (Reniers, 2008).

We focus on one of these strategies: dissolution of a marriage in response to perceived risk of infection. Previous research on divorce as a coping strategy has shown an association between the dissolution of marriage with increased suspicions about a partners fidelity or when a partner has been found to be HIV-positive (Porter et al., 2004; Reniers, 2008; Smith and Watkins, 2005). While this association is suggestive of a behavioral response to risk, a causal interpretation may be biased by omitted characteristics of the relationship.[3]

This paper contributes to this literature on risk coping strategies within marriage by comparing marital outcomes among men and women who were randomly assigned to be counseled, tested and learn their HIV results either individually, or as a couple. Couples who tested together learned their spouses' HIV results along with their own, thus perfectly informing individuals of the current risk of infection they faced in the marriage. Two years later, we find a 3.5 percentage point reduction (or 250 percent reduction from a base of 1.4 percent) in the likelihood of divorce among couples who learned their HIV results together. Why did couples counseling reduce divorce? One possible mechanism is the reduction in uncertainty about the risk of infection within the marriage. We present results consistent with this. We find that couples counseling significantly reduced reported anxiety about present and future risk of infection.

I. Data

This paper uses data from the Malawi Diffusion and Ideational Change Project (MDICP) and a sub-study, the Malawi Incentives Project (See Kohler and Thornton, 2011). As part of the on-going longitudinal

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[2] While concurrency has been widely documented in Africa, there are debates as to the extent that concurrency contributes to the HIV epidemic (See: Bongaarts 2007; Morris et al., 2010; Harrison and O'Sullivan, 2010; Lourie and Rosenthal, 2010; Halperin and Epstein, 2004; Mah and Halperin, 2010; Mah and Halperin, 2010).

[3] One related study randomly offered participants either HIV testing and health information or health information alone. Married couples who were in the study were encouraged to share their results.

Six months later, those who tested were more likely to have had a divorce or a relationship dissolve, although the differences were not statistically significant (Grinstead et al., 2007).

study data collection, respondents were interviewed and tested for HIV in 2006. A sub-sample of respondents who were married, were randomly offered to test and learn HIV results together as a couple, or separately as individuals. Both spouses were required to individually agree to the couples counseling and testing. Of those offered couples counseling, approximately 85 percent were counseled with their spouse. The others either refused or their spouse was not found and thus tested as an individual. Note that we present the intention to treat estimates comparing those who were assigned couples or individual testing. Our sample in this paper consists of a total of 1095 married individuals.[4]

We use the survey conducted in 2006, before the HIV testing, as our baseline data. In 2008, another survey was conducted and attempted to re-interview respondents from 2006. Table 1 presents some of the baseline summary statistics and tests for balance at baseline across a number of characteristics (Columns 1-3) as well as for differential attrition with respect to these baseline variables (Column 4-6). The average age in the sample was almost 36 years with less than 1 year of education on average.

Column 3 presents the coefficient on the 'Couples Testing' indicator. There are a number of baseline variables that are slightly unbalanced across couples and individual testing. For example, couples are 9 percentage points more likely to have men, be about 5 years older, and have slightly less education. Column 6 presents the p-value testing for differential attrition across couple and individual testing with baseline variables. There is no overall differential attrition nor is attrition correlated to baseline variables.

[Insert Table 1 Here]

A detailed retrospective marital history asked in 2008 allowing us to measure marital dissolution since the 2006 HIV testing. Several questions asked in 2008 allow us to explore potential mechanisms through which couples HIV testing affects marital stability. To measure individuals' uncertainty/certainty about their HIV risk, we use questions asked in 2008 that asked beliefs about current and future HIV infection, how worried individuals were about getting HIV, and worried they were about having their most recent HIV test.[5] Additionally the survey asked questions about

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[4] Note that our sample does not include 'matched' couples, only individuals in our study who are married.

[5] In particular, questions were worded: How likely is it that you are HIV-positive now? How likely is it that you will become HIV-positive in the future? How worried are you about getting HIV? And, How worried were you about your last HIV test result? For all respondents the last HIV test refers to one conducted in early 2008 as part of the Malawi Incentives Project.

general well-being and health. Lastly, we ask about sexual behavior which may also affect marital stability and be influenced by couples counseling.

II. Results

To empirically measure the impact of couples counseling and testing on marital outcomes, we estimate the intention to treat with the following specification:

$$(1)\ Y_i = \alpha + \beta_1 Couple_i + \beta_2 Couple * HIV_i + \beta_3 HIV_i + X_i'\gamma + \varepsilon_i$$

where '*Couple*' indicates that individual *i* was offered to learn HIV results as a couple rather than an individual. The results in equation 1 are consistent with, although somewhat smaller, than the treatment on the treated estimates where actual couples counseling received is instrumented with assignment (not shown). '*HIV*' indicates if individual *i* was HIV-positive in 2006. *X* is a vector of controls that include age, education, expenditures, number of lifetime sexual partners, and number of times of intercourse in the month prior to baseline. None of the results rely on inclusion of controls. Our main outcome variables *Y* include an indicator of marital dissolution in either 2007 or 2008, as well as variables that proxy for certainty about HIV

risk as described above. Our main coefficients of interest are β_1 indicating the impact of couples counseling among HIV-negatives and $\beta_1 + \beta_2$, the effect of couples counseling among HIV-positives. Because couples counseling was randomly assigned, our identification assumption is that β_1 and β_2 are not correlated with the error term. We cluster our standard errors by village. For our analysis we run linear OLS regressions although the specifications are all robust to non-linear probit models (not shown).

Figure 1 presents the rates of divorce among those counseled and tested as a couple and those counseled and tested as an individual. Overall, the average rate of divorce among those tested as an individual was 5.1 percent and 1.4 percent among those who tested as a couple - a difference of 3.7 percentage points significant at the 99 percent level (See also Appendix A).
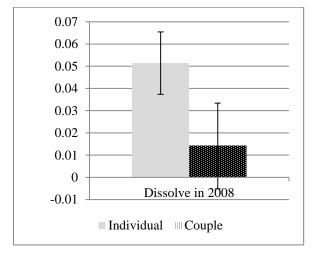

Figure 1

There are several mechanisms through which HIV testing with a spouse may reduce divorce. We found no impact of couples counseling on sexual behavior, which is consistent with the idea that negotiating safer sex within marriage is difficult.[6] However, in our data we find large and persistent effects on perceived risk and worry of HIV infection.

[Insert Table 2 Here]

Men and women who learned their results as a couple were significantly less likely to believe they were HIV-positive, and less likely to believe they would become HIV-positive in the future. They were also significantly less worried about getting HIV and about the last HIV test they took.

Consistent with this, we find that couples counseling leads to increases in well-being, both in general, and specific to health. However, there is no impact on beliefs about the fidelity of the spouse.

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[6] There are two other randomized trials, to our knowledge, of couple's counseling. El-Bassel et al. (2010) studied 535 African American HIV sero-discordant couples in which half were randomized to couple-focused risk reduction interventions. One year later, condom use was higher and number of unprotected sexual acts was lower among those in the couples intervention, but there was no impact on concurrency or sexually transmitted diseases. Becker et al. (2010) studied women in Tanzania who were randomized into receiving either individual or couples counseling and testing. However, differential compliance across each arm in that study prevented making statistical inference about the causal effect of couples counseling.

III. Conclusion

In contrast to counseling alone, couples counseling has at least two additional features. First, because each member of the couple learns each other's HIV test results, it provides credible evidence of a spouse's HIV status. Qualitative evidence suggests the potential of dishonesty between spouses when disclosing HIV results. Gipson et al. (2010) hear from one woman in a focus group what she would do if she were to be found HIV-positive during individual testing: *"There would be lies. We won't tell each other the truth. After testing, I would tell my husband that I'm negative even if it's not true. I would smile when he is around and cry when he is absent. I wouldn't like to disappoint him"*

The information provided through couples counseling could provide some evidence of a spouse's faithfulness, either confirming or rejecting prior beliefs, which in turn, could reduce worry or anxiety about future HIV risk. This may directly improve the marriage, or could reduce the need to dissolve the marriage to protect oneself from HIV.

A second feature of couples counseling is that it could provide a forum for increased communication between spouses about sex or HIV. The importance of spousal communication is often emphasized in family planning programs and there have been

numerous cross-sectional studies and randomized trials that show positive correlations between spousal communication and contraceptive use (Zulu and Chepngeno, 2003). Increased spousal communication may also be effective in providing information useful for evaluating one's own risk of infection (Gregson et al. 1998; Schatz 2005; Zulu and Chepngeno 2003). However, spousal communication about sex and contraception still remains relatively rare (Becker 1996). Unfortunately we lack data on spousal communication in order to test this mechanism.

In this setting, individuals lack perfect information about the risk they face from their spouse. Given the inability to know for certain it is not surprising that individuals worry about their spouse's fidelity and their own risk of HIV infection. Couples counseling helps resolve some of the uncertainty – not only about a spouse's HIV status, but that this also reflects on greater confidence about one's own HIV status and risk of infection in the future. Couple's counseling is one credibly way in which an outside test can either refute or confirm suspicions about infidelity.

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Table 1: Baseline Summary Statistics

| | Testing Balanced Randomization | | | Testing Balanced Attrition | | |
| | Respondents Assigned to 'Individual Testing' | | Coefficient estimate on 'Couple Testing' Indicator | Coefficient estimate on 'Couple Testing' Indicator | Coefficient estimate on 'Couple Testing Indicator * Baseline Variable' | Joint Test |
	Mean of Baseline Variable	SD of Baseline Variable				p-value
Demographics:	(1)	(2)	(3)	(4)	(5)	(6)
Male	0.411	[0.492]	0.0904***	0.011	-0.0629*	0.100
Age	35.849	[12.536]	5.195***	-0.059	0.001	0.518
Years of schooling	0.899	[0.495]	-0.0740*	-0.032	0.031	0.954
Expenditures	3410.177	[6300.78]	-444.900	-0.033	0.000	0.221
Ethnicity:						
Chewa	0.277	[0.448]	0.038	0.005	-0.004	0.980
Lomwe	0.053	[0.225]	-0.012	0.004	0.021	0.816
Tumbuka	0.310	[0.463]	-0.027	0.014	-0.036	0.672
Yao	0.289	[0.454]	-0.012	-0.011	0.053	0.365
Other tribe	0.070	[0.256]	0.012	0.008	-0.049	0.543
Religion:						
Christian	0.711	[0.454]	0.008	0.045	-0.061	0.601
Muslim	0.285	[0.452]	-0.010	-0.011	0.041	0.498
Other/None	0.004	[0.064]	0.001	-0.016	0.683**	0.017
# Lifetime partners	3.146	[3.214]	-0.111	0.011	-0.002	0.754
# Partners in last 12 months	1.174	[1.299]	-0.0671	-0.067	0.059	0.778
HIV related:						
HIV+ in 2006	0.096	[0.295]	-0.0384**	-0.011	0.059	0.699
Some future likelihood of HIV	0.597	[0.491]	-0.033	0.009	-0.038	0.313
Don't know HIV risk	0.047	[0.213]	-0.006	0.008	-0.088	0.360
High likelihood of HIV in future	0.083	[0.277]	-0.018	-0.002	0.113	0.387
Marital Perceptions						
Worried about getting HIV	0.164	[0.370]	-0.016	0.005	-0.001	0.945
Worried get HIV from spouse	0.362	[0.481]	-0.0568**	0.019	-0.047	0.464
Spouse has at least 1 or more other partners	0.959	[0.198]	-0.008	0.002	-0.001	0.962
# of extra-marital partners of spouse	1.283	[0.746]	-0.049	0.014	-0.009	0.844
Don't know if spouse is cheating	0.025	[0.156]	0.005	0.002	0.063	0.720

Notes: The total sample includes 1095 married respondents who were interviewed and tested for HIV at baseline. Columns 1 and 2 present the average and standard deviation of each variable among those who tested as an individual. Each row in Column 3 presents estimates from separate regression of the baseline variable on an indicator of being assigned to couples testing. Each row in Column 4 and 5 present estimates from separate regressions of having attrited on the baseline variable, an indicator of being assigned to couples testing, and the interaction of couples testing and the baseline variable. Column 6 presents the p-value of an F-test that the coefficient in Column 5 + coefficient in Column 4 = 0. Robust standard errors in brackets.

Table 2: Effects of Couples Counseling on worries and uncertainty

	Likelihood HIV+ now (0 = No likelihood, 3= High Likelihood)	Likelihood HIV+ future (0 = No likelihood, 3= High Likelihood)	Worried about getting HIV (1 = not worried; 3 = very worried)	Worried about last HIV test (1=not worried, 3 = very worried)	General well-being (1 = very satisfied; 5 = not satisfied)	Thinks spouse is cheating (or DK)
	(1)	(2)	(3)	(4)	(5)	(6)
Couple	-0.160**	-0.142*	-0.150**	-0.070**	-0.152**	0.002
	[0.063]	[0.074]	[0.065]	[0.031]	[0.068]	[0.021]
Couple * HIV+	0.01	-0.063	0.159	0.385*	0.409	-0.126
	[0.297]	[0.302]	[0.233]	[0.218]	[0.330]	[0.092]
HIV+	0.631***	0.346*	0.116	-0.031	0.06	0.066***
	[0.191]	[0.200]	[0.131]	[0.071]	[0.148]	[0.024]
Constant	0.929***	1.734***	1.633***	1.228***	1.690***	0.976***
	[0.144]	[0.130]	[0.121]	[0.077]	[0.141]	[0.038]
Additional Controls?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	797	792	804	740	742	772
R-squared	0.060	0.080	0.030	0.030	0.040	0.010
Mean of the dep variable among those assigned to individual testing	0.852	1.277	1.783	1.159	1.930	0.923
p-value of Couple + Couple * HIV+=0	0.604	0.505	0.970	0.130	0.429	0.168

Notes:

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table A: Effect of Couples Counseling on Divorce

Dependent variable:	Dissolved in 2008	
	(1)	(2)
Couple	-0.035***	-0.034***
	[0.012]	[0.012]
Couple * HIV+	-0.013	-0.021
	[0.081]	[0.081]
HIV+	0.073	0.078
	[0.050]	[0.050]
Constant	0.046***	0.072**
	[0.009]	[0.032]
Additional Controls?	No	Yes
Observations	847	847
R-squared	0.016	0.020
Mean of the dep variable among those assigned to individual testing	0.014	
p-value of Couple + Couple * HIV+ = 0	0.562	0.504

Notes:

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%