INTERNATIONAL FOOD
POLICY RESEARCH INSTITUTE
sustainable solutions for ending hunger and poverty
IFPRI®
Supported by the CGIAR

IFPRI Discussion Paper 00691
March 2007

Marriage, Schooling, and Excess Mortality in Prime-Age Adults: Evidence from South Africa

Futoshi Yamauchi

Food Consumption and Nutrition Division

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE.

The International Food Policy Research Institute (IFPRI) was established in 1975. IFPRI is one of 15 agricultural research centers that receive principal funding from governments, private foundations, and international and regional organizations, most of which are members of the Consultative Group on International Agricultural Research.

INTERNATIONAL FOOD
POLICY RESEARCH INSTITUTE
sustainable solutions for ending hunger and poverty

Supported by the CGIAR

IFPRI Discussion Paper 00691

March 2007

Marriage, Schooling, and Excess Mortality in Prime-Age Adults: Evidence from South Africa

Futoshi Yamauchi

Food Consumption and Nutrition Division

PUBLISHED BY

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

2033 K Street, NW
Washington, DC 20006-1002 USA
Tel.: +1-202-862-5600
Fax: +1-202-467-4439
Email: ifpri@cgiar.org

www.ifpri.org

Notices:

[1] Effective January 2007, the Discussion Paper series within each division of IFPRI were merged into one IFPRI-wide Discussion Paper series. The new series begins with number 689, reflecting the prior publication of 688 discussion papers within the dispersed series. The earlier series are available on IFPRI's website at www.ifpri.org/pubs/otherpubs.htm#dp.

[2] IFPRI Discussion Papers contain preliminary material and research results. They have not been subject to formal external reviews managed by IFPRI's Publications Review Committee, but have been reviewed by at least one internal and/or external reviewer. They are circulated in order to stimulate discussion and critical comment

CONTENTS

TABLES

Acknowledgments

I thank Oded Stark for pointing out that HIV/AIDS is an immediate risk, rather than an unknown future risk, to which people want to react by taking immediate actions.

Any remaining shortcomings are mine.

Futoshi Yamauchi
Food Consumption and Nutrition Division (FCND)
International Food Policy Research Institute (IFPRI)

Abstract

The institution of marriage plays some role in determining one's risk of exposure to HIV. Since the transmission of HIV in the population is mainly through sexual activity, avoiding infection depends on risk-avoiding behavior. Consistently, empirical results show that excess mortality is concentrated in not-yet married adults aged 20-39 among both men and women. Therefore, the choice of when and who to marry appears to be related to risk of exposure.

The objective of this paper is to determine the effect that schooling has on HIV/AIDS excess mortality, using panel data from South Africa. This paper tests the hypothesis that schooling affects when and who one marries and thus impacts the risk of mortality from HIV/AIDS. The effect could be negative or positive. On the one hand, since educated agents have incentives to secure returns to their human capital in the future, more education implies earlier marriage, given that the marriage institution effectively decreases the HIV-related mortality risk. On the other hand, education increases the opportunity costs of marriage especially for women, who need to increase their time spent in the household. Thus, schooling may increase mortality risks due to the increased risk of HIV infection.

The empirical analysis of this research uses an identification strategy for mortality shock based on the following observation: before 1980, fertility decisions and mortality incidences in South Africa were not related to the coming AIDS epidemic in the mid 1990s. This condition enables us to argue that cohort-specific factors among those who were ages 20 or above in the mid 1990s (when the first round of our data was collected) are not correlated with the AIDS epidemic. Therefore, after controlling the non-AIDS mortality rate, the cohort-specific mortality changes in the period of 1998-2004 can be mainly attributed to the AIDS epidemic, and are treated as exogenous shocks to the adult population. In the analysis to estimate the cohort-specific schooling effects in the mortality equation, we also control for household-level fixed unobservables and age (cohort)-specific unobservables in order to base our statistical inferences on within-household and within-age group variations in mortality incidence and schooling.

Results show that schooling increases excess mortality among women, but not among men. This gender difference is consistent with their marriage behavior. The probability of marriage decreases among educated women if the direct cost of marriage increases (that is, if *Lobola*—a gift from the groom to the bride's family—payment is the norm in the community). For men the probability of marriage is lower than for women. In contrast to women, educated men are more likely to get married when the direct cost of marriage increases. In sum, schooling increases the opportunity cost of marriage for women, which delays marriage and increases their mortality risks in high HIV-prevalence societies, but has the opposite effect on men.

Our analysis demonstrated the need to integrate our understandings of the marriage market, the labor market, schooling investments, and youth behavior to identify the determinants of AIDS-related excess mortality. The marriage institution potentially protects the youth from excess mortality, but the interactions between marriage and labor markets complicate the role of schooling in determining excess mortality. This finding is also policy relevant as we need to pay special attention to the differentiated mortality risks between women and men to effectively reduce gender-specific AIDS-related excess mortality.

Key Words: marriage, schooling, excess mortality, HIV/AIDS, South Africa

1. Introduction

It is nowadays recognized that the AIDS epidemic has increased the mortality rate in the prime-age adult population and, therefore, has become critical to the accumulation and utilization of human capital in many Sub-Saharan African countries (for example, Epstein 2004). Although an increase in prime-age adult mortality disrupts the incentives to invest in human capital (education) due to the shortened time in which to acquire the returns, agents embodying more human capital have greater incentives to reduce the AIDS risks by taking actions, since they have greater returns in the future.[1,2]

Since the transmission of HIV in the population is mainly through their sexual activities, the infection probability depends on their risk-taking (and risk-avoiding) behavior. This behavioral adjustment includes not only the use of condoms but also the choice of who to date with and when and with whom to marry. Asymmetric information on HIV infection status between potential partners in the presence of high HIV prevalence makes it important to form a safe and stable relationship between couples, since his or her partner can bring risks to the relationship. This paper aims to uncover the role of education in the adult population that faces the AIDS epidemic shocks, by investigating the relationships among schooling, marriage behavior, and excess mortality.

The institution of marriage has a certain role in protecting couples from unnecessary exposure to HIV/AIDS risks. Since educated agents have incentives to secure returns to their human capital in the future, more education (human capital) implies earlier marriage if the marriage institution effectively decreases the HIV-related mortality risk. On the other hand, education may increase the opportunity costs

[1] Another possibility is that schooling improves learning to take optimal actions in the face of HIV/AIDS risks, analogous to the ability to deal with disequilibrium situation, which T.W. Schultz (1975) argued in his seminal work. See empirical works in this line, such as Foster and Rosenzweig (1995) and Yamauchi (2004). In his insightful paper, Rosenzweig (1995) argued that schooling may enhance the capability of agents to learn from new information efficiently, and may provide agents with the initial informational advantage. Though both aspects coexist in the HIV/AIDS context, it is hard to empirically identify one against another. For example, in the very initial stage when the epidemic had received public attention, educated agents could have read newspapers to understand the seriousness of the disease or simply studied in schools with the curriculum on HIV/AIDS epidemic issues. Further, educated agents learn from mortality incidences in their neighborhood about what contributes to HIV transmission and the necessary behavioral adjustment to avoid the risks. Unfortunately, our data do not provide sufficient longitudinal information to identify these different roles of human capital.

[2] In recent literature, Gersovitz (2005), using the Demographic and Health Surveys from several African countries, shows that educated agents are more likely to have correct knowledge on HIV/AIDS and to take HIV tests. Interestingly, married couples are likely to be positively sorted, demonstrating a similar pattern between the couple, either because partners of similar attributes are married or they share information in the marriage. Hallman (2004) and Kaufman et al. (2002) also provide evidence from South Africa that education increases the probability of using condoms and having discussed the ways to avoid HIV with partners.

De Walque (2005) investigated the role of schooling in the efficiency of learning from an HIV/AIDS campaign in rural Tanzanian villages and channels through which schooling changed the infection rate and enhanced risk-avoiding actions. His study confirmed that education decreased the infection rate and encouraged appropriate behavior such as the use of condoms, especially in the female population. However, a potential problem in this study is a lack of control groups in the sample. Therefore, he used two groups of cohorts—those who started sexual activity before and after the campaign started—to identify the effect of education on the effectiveness of the campaign.

of marriage especially for women, who need to spend time in the household. Thus, if singlehood is associated with increased exposure to HIV/AIDS risks than marriage, schooling may increase the mortality risks due to the HIV infection. Hence, it is difficult to predict the effect of schooling on the HIV/AIDS excess mortality.[3]

Investment to increase survival probability is similar to the idea of future-oriented capital, by Becker and Mulligan (1997), which increases time preference (a discount factor). The concept resembles human capital in our setting,[4] but the marriage decision also plays a role in protecting human capital from the HIV/AIDS risks. In dynamic settings, Chakraborty (2004) and Bunzel and Qiao (2005) introduce endogenous lifetime in the analysis of economic growth. The interesting feature of the future-oriented capital is the complementarity with the future utility. Therefore, agents with more human capital (thus higher future earnings) have incentives to invest in the future-oriented capital, such as marriage in our context, which increases their survival probability.[5]

On the other hand, the AIDS epidemic increases the mortality rate in the adult population in general, shortening life expectancy. This factor causes the loss of already-invested human capital, and reduces the expected returns to human capital investments for young generations, which disrupts the incentives to invest in child schooling (for example, Birdsall and Hamoudi 2004). The insight of this observation was confirmed in the role of mortality decline at the early stage of modern economic growth (Kalemli-Ozcan, Ryder and Weil 2000; Boucekkine, De la Croix, and Licandro 2002).

What empirically motivates us is an observation that excess mortality is significantly high among not-yet married individuals, but insignificant among ever-married individuals. One has to be careful about deriving a conclusion from this observation, because self-selection and marriage-market sorting might have led to this observation. For example, healthy individuals are more likely to get married than the less healthy, and the difference in health endowment may explain the observed mortality rate among singles. Though it is generally hard to find exogenous variations in marriage status in our empirical setting, we can use information on the tradition of *Lobola*, a gift from groom to bride, widely observed in South Africa. The custom is common in African communities, although the implementation seems to vary due to urbanization. This offers variations in the direct and indirect costs of marriage across

---

[3] Luke and Munshi (2006) showed from Kenya that, although marriage status seems to reduce non-marital sexual activities, the result is spurious due to the marriage selectivity, which is correlated to unobserved endowment.

[4] In their paper, Becker and Mulligan (1997) also point out the similarity between future-oriented capital and human capital, owning to Boyan Jovanovic's suggestion.

[5] Recently Zheng (2006) showed some evidence from South Africa that women's education increases gains from marriage experience (measured by the length of cohabitation), dynamically changing men's earnings. Thus, the marriage premium for men increases in women's education over time due to the complementarity between women's education and the marriage experience. If the marriage institution protects agents from increased mortality risks in the high HIV/AIDS prevalence society, it is important to investigate not only the pecuniary benefits (studied in Zheng's paper) but also the non-pecuniary benefits such as reduced mortality risks, which affect the expected gain from marriage in the dynamic context.

communities. *Lobola* is a direct cost for men who wish to marry. However, if this monetary transfer implies an increased burden for women to work in the household, *Lobola* also implies an indirect (opportunity) cost for women. As we have information on whether a couple has paid *Lobola* at the time of their marriage, we can compute the frequency of *Lobola* use in past marriages by sample cluster, from which to infer the community-specific costs of marriage.[6] We observe that the education effect on excess mortality differs between men and women, and also differs between *Lobola* and non-*Lobola* communities, especially for women.

The paper is organized as follows. The next section introduces our data and some basic observations. We use the KwaZulu-Natal Income Dynamics Study, from the province of KwaZulu-Natal in South Africa. HIV/AIDS severely hit the prime-age adult population, and the prevalence rate is one of the highest in South Africa as well as Sub-Saharan countries. We confirm that the mortality rate has increased among the prime-age adults above the non-AIDS level, especially among singles (not-yet married). The gap in mortality between the singles and married is the largest among the young.

Section 3 sets up a simple model to describe how education affects mortality and marriage decisions. Marriage, which incurs direct and opportunity costs, is assumed to protect agents (once married) from HIV/AIDS risks, whereas single agents face greater risks. The total effect of education on excess mortality depends on the direct and opportunity costs of marriage (for example, the institution of *Lobola* in South Africa and gender-specific division of labor).

Section 4 discusses the empirical framework. The empirical analysis of excess mortality shock impact uses an identification strategy based on the following observation: before 1980, fertility decisions and mortality incidences were not related to the coming AIDS epidemic in the mid 1990s. This condition enables us to argue that cohort-specific factors among those who were ages 20 or above in the mid 1990s (when the first round of our data was collected) are not correlated with the AIDS epidemic. Therefore, after controlling the non-AIDS mortality rate, the cohort-specific mortality changes in the period of 1998-2004 can be mainly attributed to the AIDS epidemic, and are treated as exogenous shocks to the adult population. In the analysis to estimate the cohort-specific schooling effects in the mortality equation, we also control household-level fixed unobservables and age (cohort)-specific unobservables in order to base our statistical inferences on within-household and within-age group variations in mortality incidence and schooling.

Section 5 summarizes the empirical results, which are consistent with predictions from our model. First, the probability of marriage (exit from singlehood) decreases among educated women if the direct cost of marriage increases, although the probability is lower among men than women per se.

---

[6] In Indian families in KwaZulu-Natal, the bride's family gives a gift to the groom's family.

Second, among the singles, education increases the mortality among women, particularly among those in their twenties. This result on young women is reinforced in communities with higher marriage costs (delaying marriage among educated women). These results are robust to selectivity bias, which may arise from endogenous marriage decisions.

2. Motivation

We use the KwaZulu-Natal Income Dynamics Study (KIDS) waves 2 and 3, conducted in 1998 and 2004, respectively. This period in South Africa corresponds to the time that prime-age adult mortality significantly increased, most likely due to the AIDS epidemic. It is therefore appropriate to identify excess mortality among prime-age adults and the role of human capital in changing the mortality shock.

The province of KwaZulu-Natal has the highest HIV prevalence rate in South Africa, where its prevalence rate is one of the highest in African countries. This region provides an appropriate empirical setting in which to identify the role of schooling in determining the AIDS excess mortality.

To control the mortality rate before the AIDS epidemic or in the non-AIDS population, we use the 1996 non-AIDS mortality rate estimates for each age and gender group available in the Actuarial Society of South Africa (ASSA) 2002 Model to control the baseline mortality. Cohort-specific excess mortality is defined as the difference between the portion explained by the non-AIDS mortality and the observed mortality in the period. Note that the 1996 non-AIDS ASSA mortality-rate estimates are not mortality rates in 1996, but those of the non-AIDS population as of 1996, which also reflects the conditions that affect mortality rates in general. Therefore, the non-AIDS mortality rates tend to decrease over time.

Table 1 explains our empirical motivations, showing the determinants of death in 1998-2004 in linear probability models.[7] We use the KwaZulu-Natal Income Dynamics Study (KIDS) Rounds 2 and 3. The sample consists of individuals age 15 to 44.

Table 1: Mortality and marital status, 1998-2004

Dependent: 1 if died in 1998-2004; 0 otherwise
Estimation: Linear Probability
Sample: age 15-44 in 1998

	(1)	(2)	(3)
Non-AIDS mortality rate	12.734	12.898	12.063
	(1.71)	(1.73)	(1.62)
Not yet married		0.0422	-0.1470
		(2.63)	(1.26)
Age 20-24	0.0296	0.0313	-0.2314
	(1.60)	(1.69)	(1.86)
* Not yet married			0.2684
			(2.14)
Age 25-29	0.0428	0.0512	-0.1323
	(1.84)	(2.19)	(1.11)
* Not yet married			0.1849
			(1.54)
Age 30-34	0.0541	0.0704	-0.1407
	(2.04)	(2.59)	(1.18)
* Not yet married			0.2261
			(1.89)
Age 35-39	0.0557	0.0763	-0.1255
	(1.80)	(2.39)	(1.05)
* Not yet married			0.0759
			(0.63)
Male	-0.0145	-0.0169	-0.0143
	(0.57)	(0.66)	(0.56)
Household fixed effects	Yes	Yes	Yes
Number of observations	3,792	3,783	3,783

Notes: Numbers in parentheses are absolute t values. Non-AIDS mortality rate is the 1996 rate for each age and gender group in the 2002 ASSA (Actuarially Society of South Africa) model.

[7] To control the non-AIDS mortality rate, I use the 1996 non-AIDS mortality-rate estimates for each age group by gender, available at the Actuarially Society of South Africa (ASSA). Since the period we analyze is 1998-2004, the 1996 estimates provide a good benchmark to control the mortality without the AIDS epidemic. The deviation of our estimates from the non-AIDS estimates is regarded as the excess mortality due to the epidemic.

We use the following basic specification,

$$y_{ijt+1} = \alpha + \beta_m m_{a,s} + \sum_a \beta_a I(a \in A) + \delta\kappa_i + \mu_j + \xi_{ij(t,t+1)}$$

Where y_{ijt+1} is the binary indicator that takes the value of one if individual i in household j has died in the period t to $t+1$, and zero otherwise (alive), $m_{a,s}$ is the 1996 non-AIDS mortality rate estimate for age a and gender s, κ_i is the individual health endowment, μ_j is the household unobserved endowment, and $\xi_{ij(t,t+1)}$ is the mortality shock. We estimate the parameters by probit and linear probability models with fixed or random household effects. $\beta_m m_{a,s}$ controls the non-AIDS mortality rate, so the deviation $y_{ijt+1} - \beta_m m_{a,s}$ is the excess mortality component attributable to the AIDS epidemic.

The set of age-group indicators captures the age-specific mortality shocks in the period t to $t+1$. We treat the age distribution of individuals in the sample as exogenous. The AIDS epidemic in the 1990s apparently did not affect fertility decisions in the 1970s or earlier. We assume that the AIDS epidemic did not affect mortality before the mid 1990s.

Column 1 confirms that excess mortality is concentrated in the population ages 20 to 39. In Column 2, we include an indicator that takes the value of one if an individual has not married yet, and zero otherwise. The result shows a significantly higher mortality among those who have never married. Although we have to be careful about the interpretations of this finding, it indicates that marriage selection and/or the marriage institution contribute to this higher mortality among the not-yet married. Excess mortality in the prime-age of 20 to 39 is robust to the inclusion of the marriage (single) indicator. Column 3 interacts the not-yet married indicator with the age-group dummies. Interestingly, excess mortality concentrated in those aged 20 to 39 are found significant among the singles. The gap between the married and singles seems large among individuals aged 20-24. This clearly motivates us to investigate the role of marriage in determining excess mortality.

Table 2 splits the sample into the married and singles. Columns 1 and 2 show the mortality determinants among the not-yet married and ever married groups, respectively. As we confirmed in Table 1, significant increases in mortality are found among the not-yet married in ages 20 to 39. Estimates from the ever married show no significant effects. In Columns 3 and 4, we try to check the gender-specific effects. First, we do not find any gender difference among the singles. Thus, significant increases in mortality are observed equally among men and women. Second, the decrease in mortality previously observed among the ever married aged 20 to 24 is found among men. Those young men who get married experience lower mortality than teenagers in general. The results imply that (1) timing regarding knowledge about HIV/AIDS seems important, because those young people, who showed a large gap in mortality between the married and singles, are supposed to have learned about the epidemic during their teens, and that (2) the marriage decision is most effective in making a clear difference in mortality (whether it is attributed to selectivity).

The above observations motivate us to link marriage decision to excess mortality, through which human capital may play a certain role. In the next section, we focus on the role of human capital in determining marriage and mortality to derive some empirical predictions. Gender difference is also a key angle in the following exercise.

3. A Simple Model

This section introduces a simple model to describe the effects of schooling on the mortality rate in the situation where the AIDS epidemic hits the prime-age adult population. Agents with more human capital have incentives to secure a sufficiently long period ahead in which they can enjoy returns to human capital. This incentive leads to risk-avoiding actions, one of which is to marry with a safe partner.[8] Although human capital helps agents avoid risks in the situation where a potential partner might be HIV positive, this aspect is not incorporated in the model below. This effect can be easily introduced in the survival probability in both the married and single, which increases the expected life span.

Table 2: Marriage status and excess mortality

Dependent: 1 if died in 1998-2004; 0 otherwise
Estimation: Linear Probability
Sample: age 15-44 in 1998

	(1)	(2)	(3)	(4)
Marriage status	**Not yet married**	**Have ever married**	**Not yet married**	**Have ever married**
Non-AIDS mortality rate	5.2489	19.899	2.6582	16.239
	(0.59)	(2.39)	(0.18)	(1.03)
Age 20-24	0.0459	-0.1240	0.0470	-0.0553
	(2.25)	(2.29)	(1.88)	(0.88)
* Male			0.0059	-0.2026
			(0.16)	(1.85)
Age 25-29	0.0690	-0.0009	0.0792	0.0045
	(2.57)	(0.03)	(2.64)	(0.11)
* Male			-0.0092	0.0130
			(0.20)	(0.19)
Age 30-34	0.1051	-0.0178	0.0947	0.0146
	(3.33)	(0.54)	(2.63)	(0.35)
* Male			0.0371	-0.0357
			(0.70)	(0.61)
Age 35-39	0.1109	-0.0051	0.0865	0.0262
	(2.88)	(0.14)	(1.90)	(0.57)
* Male			0.0727	0.0877
			(1.21)	(1.52)
Age 40-44	0.0299	0.0286	0.0714	0.0491
	(0.54)	(0.59)	(1.07)	(0.78)
* Male			-0.0582	-0.0082
			(0.74)	(0.12)
Male	-0.0027	-0.0281	-0.0022	-0.0238
	(0.09)	(1.00)	(0.07)	(0.77)
Household fixed effects	Yes	Yes	Yes	Yes
Number of observations	2,916	1,755	2,916	1,755

Notes: Columns 2 and 4 use as the omitted group the individuals of ages 15-19 both single and married. Note that there are only 9 married individuals in this age range.

We introduce the direct and opportunity costs of marriage. For example, a man pays a gift (for example, cattle) to his marriage partner's family, and the woman is expected to spend more time in the household than the man. In this case, the direct cost is high among men, while the opportunity cost is high among women.

8

$$u(c) + \beta(x;\theta)v(h)$$

subject to $y = c + x$, where y is income, c is current consumption, and x is future-oriented capital. $v(h)$ is future utility, as a function of human capital h. The first order condition is

$$u^{'}(c) = \beta^{'}(x;\theta)v(h).$$

From this, an increase in human capital (future earnings) raises the optimal level of future-oriented capital. Therefore, we observe the complementarity between future-oriented capital and human capital.

The optimization problem involves whether to marry or not in each period. Marriage incurs direct cost c and opportunity cost $\alpha W(h)$ where $W(h)$ is the labor earning and $\alpha \in (0,1)$. As discussed, c can be larger among men than women, while α can be greater among women and men. Assume that the labor earning is increasing in human capital h. We also introduce the transferable value of the spouse when getting married, $v' \sim F(v)$.

The stationary dynamic problem is summarized in the Bellman equation,

$$V(h,v) = \max_{\text{marry, single}} \left\{ -c_s + V_M(h,v), V_S(h) \right\},$$

where $V_M(v)$ and $V_S(v)$ are the values of marriage and singlehood, given v, respectively. Given that marriage is assumed to be a permanent decision, the value is

$$V_M(h,v) = (1-\alpha_s)W(h) + v + \beta^* V_M(h,v),$$

and the value of singlehood does not depend on v:

$$V_S(h) = W(h) + \beta EV(h,v').$$

Assume that $\beta^* \geq \beta$. The survival probability in marriage is larger than that of singlehood. HIV/AIDS mortality shock is expressed as levels of β^* and β as well as the gap between β^* and β. This gap in the survival probability gives an incentive to take action to protect one's human capital.

The marriage decision is given as the following optimization,

$$V(h,v) = \max_{\text{marry, single}} \left\{ -c + \frac{1}{1-\beta^*}\left[(1-\alpha)W(h) + v\right], W(h) + \beta EV(h,v') \right\}. \quad (1)$$

From equation (1), the threshold point for spouse value v_h^* (v above, which implies marriage) is

$$v_h^* = m^* \left[\beta EV(h, \sim v) + c\right] + (\alpha - \beta^*)W(h)$$

and v_h^* defines the mortality (survival) rate in the single population m^e,

$$m^e = m^* + \left(m - m^*\right) F\left(v_h^*\right),$$

where $F(.)$ is the cumulative distribution function of v, and mortality rates $m = 1 - \beta$ and $m^* = 1 - \beta^*$. The agent chooses to marry with a partner of v greater than v_h^*. The higher the direct and opportunity costs, the less likely the agent will choose to marry.

Human capital augments both the values of marriage and singlehood, which makes the net effect ambiguous in a general situation. An increase in the survival probability in marriage β^* increases the incentive to marry. When β^* is close to unity, an increase in human capital encourages marriage (that is, $\alpha < \beta^*$, $v_h^* < 0$).

Suppose that in traditional societies, the direct cost is large for men while the opportunity cost is large for women. The transfer payment from men to women at marriage may compensate for the increased women's commitment in household work. In this situation, an increase in human capital increases the incentive to marry for men, but decreases the incentive for women. As a result, the mortality rate for men decreases while that for women increases. The evidence shown in Section 5 is consistent with this interpretation.

To summarize, we have three key predictions: (1) with a sufficiently large opportunity cost, an increase in schooling decreases the marriage probability, and therefore increases the mortality rate; (2) an increase in the direct cost decreases the marriage probability and increases the mortality rate; and (3) an increase in the survival probability in marriage regime β^* (or an increase in the mortality rate between the married: protected and singles: unprotected) increases the incentive to marry, and therefore decreases the average mortality rate. For women, it is relevant to think about a situation where the direct cost is low and the opportunity cost could be large. For men, however, the direct cost is large while the opportunity cost is low. Thus, we predict different comparative statics of the schooling effect on mortality between women and men.

The next section discusses the econometric concerns in the empirical analysis, and Section 5 provides some empirical evidence consistent and interpretable with the model of this section.

4. Framework

In our main analysis, we estimate gender-specific returns to schooling in the excess mortality determination by interacting cohort indicators and schooling to capture the variation of cohort-specific excess mortality attributable to different levels of schooling.[9]

$$y^s_{ijt+1} = \alpha + \omega_{a,s} + \sum_a \beta_{a,s} h_{ij} I(a \in A) + f(h_{ij}) + \delta\kappa_i + \mu_j + \xi_{ij(t,t+1)}\,, \tag{2}$$

where y^s_{ijt+1} is the binary indicator that takes the value of one if individual i (gender s) in household j has died in the period t to $t + 1$, and zero otherwise (alive), ω^s_a is the gender-specific age fixed effect (age a), h_{ij} is the years of schooling, $f(h_{ij})$ is a nonlinear function of schooling, κ_i is the individual health endowment, μ_j is the household unobserved endowment, and $\xi_{ij(t,t+1)}$ is the mortality shock. As discussed,

[9] The age fixed effects are perfectly correlated with the non-AIDS mortality rate $m_{a,s}$ when we estimate the mortality equation separately for females and males, and thus control the component of $\beta_m m_{a,s} + \sum_a \beta_a I(a \in A)$ in the estimated equation in Tables 1 and 2. The age fixed effects are also important since educational attainment was highly correlated with cohorts.

$\omega_{a,s}$ is correlated with h_{ij} due to the expansion of public education over time, especially after 1994. Note also that $\omega_{a,s}$ captures the effect of the non-AIDS age/gender specific mortality rate.

The set of age-group indicators captures age-specific mortality shocks in the period t to $t + 1$. We treat the age distribution of the individuals in the sample as exogenous. The AIDS epidemic in the 1990s apparently did not affect fertility decisions in the 1970s or earlier. We assume that the AIDS epidemic did not affect mortality before the mid 1990s. Therefore, the size of each cohort is orthogonal to the error term, that is, $I(a \in A) \perp \left[\kappa_i, \xi_{ij(t,t+1)}\right]$, and $\beta_{a,s}$ is estimated consistently.

We have a few reservations in assessing returns to schooling in the context of mortality determination. Schooling is correlated with health, captured by κ_i: individual-level unobserved endowment, which biases schooling-effect estimates. First, health capital can be a basis for schooling investment in dynamic human capital production. Second, more returns in the future creates an incentive to well-maintained health. Third, knowledge (from schooling or not, but correlated with schooling) helps maintain good health. Finally, unobserved factors such as mother's knowledge and household income affect both child schooling and health. However, in our empirical setting, it is quite challenging to find any exogeneity in schooling variations (within or across cohorts) to prepare an instrument that wipes out the above correlations.

Second, family formation is thought to be endogenous for various reasons such as marriage, fertility (reproduction), migration and household splits (or merges), and mortality that alters the composition of household members. Although household fixed effects capture this factor, the endogenous choice of partner(s) for marriage or during singlehood is not controlled for, even with the fixed effects.

There are two opposite cases of positive and negative sorting of partner matching. These cases provide different implications on the effect of schooling on survival probability. In the case of positive sorting, men and women of similar attributes, both observable and unobservable, are matched. For example, the schooling (health) of a man and that of his partner are positively correlated. If (1) schooling is positively correlated with health capital (status), (2) health capital increases the survival probability, and (3) schooling (and/or health) is positively correlated between the couple, then the positive sorting causes another bias that is attributed to this unobserved factor. Thus, the education effect (if positive) on the survival probability is magnified.

On the other hand, negative sorting causes downward bias in the effect of schooling on the survival probability. Even if the education effect is positive at the individual level, both agents in the couple would face similar risk, since the risk would be high even when one behaves safely, if the partner brings risk. Therefore, the average risk in the society is expected to be high.

In Section 5, we confirm that the excess mortality shock is not significant among the married. This finding justifies our focus on singles (not-yet married), who are found to face significant mortality shocks. In this setting, since we cannot identify their partners from our data, it is impossible to control the effect of partners' schooling in the mortality equation. We think that the sorting effects, as described above, are less important among singles than the married.

Third, given that we find a negative effect of singlehood on mortality rate, it is important to know how marriage-related self-selection affects the schooling effect estimates if (1) the healthier are more likely to get married than the less healthy, and (2) schooling is positively correlated with health status. The use of a single sample means that, if singles are less healthy than the married, we expect a downward bias in the schooling effect on mortality, because the lower health endowment among singles (compared with the population average) increases mortality but is associated with a lower level of schooling.

To solve this problem, we use a measure for marriage cost to improve our inferences. In the empirical context of this paper, a groom often pays *Lobola* to a bride's family when they get married. However, this depends on ethnic groups (for example, African or Indian) and often urbanization. The data captured (1) whether a husband paid *Lobola* to his wife's family, and (2) the composition in monetary values—cash, cattle, livestock, and so forth. In a preliminary analysis, although the monetary values had a significant time trend (correlated with inflation), the likelihood of whether or not the groom paid *Lobola* does not have significant changes over time. We then compute the frequency of *Lobola* use in past marriages by cluster to approximate the cost of marriage in the community. In the high marriage cost situation, we expect the schooling effect on mortality to differ between men and women (see Section 2).

5. Empirical Evidence

In this section, we first investigate marriage decisions with a particular attention to the roles of schooling and marriage costs. In our study, human capital is represented by educational attainment, measured by the highest years of schooling completed as of the 1998 round. In the KIDS-2 survey, three initial levels in the early stage of primary school education—sub A, sub B, and standard 1—are categorized as one group. These are transformed to grades 1 to 3 in the South African education system. Grades continue up to grade 12 (12 years of schooling up to high school graduation). Therefore, we convert the three levels of schooling into two years of schooling. Standard 2 (grade 4) to standard 10 (grade 12) are converted into years 4 to 12, respectively.

As discussed, we use a unique feature of South African marriage to correct for selectivity bias that may arise from the sample of singles (not-yet married). It is common that African men provide

Lobola to their partners' family at the time of marriage. They used to give cattle and livestock, but nowadays can also pay in cash for this purpose. Our sample contains predominantly African and Indian clusters, by which the use of *Lobola* varies. Even in African communities, rural areas are more dominant with this custom. To capture the direct cost of marriage, we compute the proportion of marriages having used *Lobola* in the total number of past marriages by cluster.[10,11] This measure, the *Lobola* frequency, represents the direct cost of marriage, which can be also correlated with the opportunity cost.[12]

Columns 1 and 2 in Table 3 show the Probit estimation results with cluster-level fixed effects. Men have a significantly higher probability of singlehood. Among men, the more frequent use of *Lobola* at the community level (implying a higher direct cost of marriage), the more likely education is to increase the marriage probability. In those communities that impose a higher direct cost of marriage, the difference between educated (more earnings) and uneducated (less earnings) men increases. However, these estimates are subject to bias due to a correlation between schooling and household-level fixed unobservables.

In Columns 3 and 4, we control household-level unobservables with household fixed effects in the linear probability model. The above findings are reinforced in the sense that (1) schooling tends to decrease the singlehood probability, and (2) in communities that frequently use *Lobola*, schooling decreases the probability of marriage among women, whereas this effect is weaker for men. Since *Lobola* is the direct cost that men have to pay, education (more earnings) helps men reduce this financial burden. However, with this custom, it is also (even more) difficult for educated women to get married because educated women (or their families) may require a larger amount of *Lobola* and the larger direct cost also means more work that women are asked to perform at home. This finding is quite stable in both 1998 and 2004, where the explanatory variables are taken from the 1998 round in both cases. Column 5 uses the sample of individuals who had never married in 1998 to see how schooling affects marriage behavior among the singles, and shows that the above finding remains robust.

Based on Columns 3 and 4, the marginal effect of schooling on marriage is negative among women while it is slightly positive or close to zero among men, if *Lobola* is frequently used in their communities. It is conjectured that in those communities, schooling may affect the mortality rate among singles but asymmetrically between men and women. However, in communities that use no *Lobola*, schooling always increase the marriage probability for both men and women, which implies a decrease in

---

[10] In a preliminary analysis, the probability of giving *Lobola* did not depend on calendar years (that is, insignificant year effects).

[11] See also Rao (1993) and Schultz (1994) for the empirical attempt to identify the costs of marriage.

[12] Though men can pay *Lobola* over time, this institution imposes a substantial financial burden on them. The medium of payment used to be 12 cows, but it is also common to pay the equivalent in cash nowadays. In Indian communities, however, women's families have the obligation to pay men's families.

excess mortality (based on Table 2). The above findings are consistent with the predictions of our model in Section 2.

Table 3: Single status: Have not yet married

Dependent: 1 if not yet married; 0 otherwise (have-ever married)
Sample: age 15-39 in 1998

Years for single status	(1) 1998 Probit	(2) 1995 Probit	(3) 1998 Linear	(4) 2004 Linear	(5) 2004 Linear
Male	0.6450	0.6824	0.1583	0.1419	0.0709
	(4.85)	(4.92)	(5.57)	(4.51)	(2.08)
Years of schooling	0.0234	-0.0052	-0.0156	-0.0196	-0.0297
	(1.84)	(0.15)	(1.69)	(1.94)	(2.14)
Years of schooling * Male	-0.0343	-0.0144	-0.0034	-0.0053	0.0002
	(2.29)	(0.91)	(0.89)	(1.25)	(0.04)
Frequency *Lobola* * Years of schooling		0.0339	0.0250	0.0280	0.0345
		(0.88)	(2.58)	(2.64)	(2.40)
Frequency *Lobola* * Years of schooling * Male		-0.0292	-0.0092	-0.0087	-0.0089
		(2.03)	(2.73)	(2.37)	(1.65)
Age fixed effects	Yes	Yes	Yes	Yes	Yes
Cluster fixed effects	Yes	Yes			
Household fixed effects			Yes	Yes	Yes
Number of observations	4,395	4,395	4,885	4,835	3,776
Pseudo R squared	0.3567	0.3574			
R squared (within)			0.2887	0.1461	0.0538

Notes: Numbers in parentheses are absolute t values. Have-ever married includes those who are currently married (including separated), divorced, and whose spouse died. Columns 4 and 5 use as dependent variable the indicator of not-yet married or have-ever married in 2004. In Column 5, the sample consists of individuals not-yet married in 1998.

In Table 4, we investigate whether schooling may alter the mortality among prime-age adults age 15 to 44, who faced the age (cohort)-specific mortality shocks due to the AIDS epidemic. Strictly speaking, schooling is not taken as exogenous in the analysis, but cohort-specific shocks could be taken as exogenous, which mitigates the endogeneity problem of schooling. In the estimation below, we include age and household fixed effects. Therefore, the family background effect such as parents' education (as a proxy for child ability) is wiped out from the estimation. Similarly, age-specific mortality is controlled by the age fixed effects.

Column 1 shows a benchmark result pooling both samples of men and women. It uses age-band indicators, as in Tables 1 and 2, to control prime-age excess mortality, given the non-AIDS 1996 mortality rate (ASSA 2002 model). We do not see any significant estimates on schooling. Column 2 uses age fixed effects, and interacts age-band indicators and years of schooling. As in Column 1, there is no significant effect of schooling.

Columns 3 to 5 focus on the female sample. The specification in Column 3 is the same as that of Column 2. Interestingly, we observe a significant increasing but diminishing schooling effect on excess mortality. The marginal effect approaches to zero when they are college graduates. Second, in the group of ages 20 to 24, schooling also increases excess mortality.

Table 4: Mortality and schooling effects

Dependent: 1 if died in 1998-2004; 0 otherwise
Sample: Single: not-yet married, age 15-44 in 1998

			Female			Male		
			100% *Lobola* communities			100% *Lobola* communities		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-AIDS 1996 mortality rate	4.6521	8.1779						
	(0.50)	(0.72)						
Years of schooling	0.0047	0.0092	0.0351	0.0442	0.0352	-0.0066	-0.0023	-0.0065
	(0.40)	(0.74)	(1.83)	(1.87)	(2.47)	(0.29)	(0.08)	(0.39)
Squared years of schooling	-0.0043	-0.0007	-0.0023	-0.0029	-0.0023	0.0003	-0.0002	0.0003
	(0.90)	(0.90)	(2.05)	(2.12)	(2.75)	(0.21)	(0.09)	(0.28)
Age 20-24 * Years of schooling		0.0072	0.0148	0.0232	0.0147	0.0030	0.0074	0.0032
		(1.05)	(1.46)	(1.92)	(1.96)	(0.23)	(0.46)	(0.34)
Age 25-29 * Years of schooling		-0.0002	0.0087	0.0185	0.0087	-0.0077	-0.0034	-0.0074
		(0.03)	(0.78)	(1.36)	(1.03)	(0.64)	(0.23)	(0.85)
Age 30-34 * Years of schooling		-0.0113	-0.0007	-0.0057	-0.0007	-0.0233	-0.0160	-0.0229
		(1.51)	(0.06)	(0.40)	(0.08)	(1.72)	(0.92)	(2.34)
Age 35-39 * Years of schooling		-0.0100	-0.0067	-0.0211	-0.0067	-0.0087	0.0084	-0.0084
		(0.91)	(0.54)	(1.28)	(0.72)	(0.53)	(0.41)	(0.71)
Age 40-44 * Years of schooling		-0.0103	-0.0001	0.0015	-0.0003	0.0305	0.0371	0.0296
		(0.91)	(0.01)	(0.08)	(0.02)	(1.37)	(1.24)	(1.84)
Male	-0.0025	-0.0129						
	(0.08)	(0.37)						
Ages band indicators	Yes							
Selection correction term					-0.0196			-0.0581
					(0.23)			(0.65)
Age fixed effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	2,814	2,814	1,466	1,049	1,989	1,348	962	1,837
Censored observations					523			489
R squared (within)	0.0245	0.0461	0.0772	0.1134		0.0771	0.0790	
Wald					1,484.39			1,191.8

Notes: Numbers in parentheses are absolute t values. Non-AIDS mortality rate is the 1996 rate for each age and gender group in the 2002 Actuarially Society of South Africa (ASSA) model. The estimation uses individuals with some schooling.

To get more insights on the relationship between marriage cost and the above schooling effect, we select clusters that show 100 percent of *Lobola* use in past marriages in the cluster. In those communities, we suppose that both the direct and indirect (opportunity) costs are high. Interestingly, the above findings are reinforced in this sample. An increase in schooling among women increases excess mortality, especially for those age 20 to 24. This finding is consistent with our theoretical prediction and the previous finding from Table 3. In those communities, we observed that schooling tends to delay marriage among women (but not so for men).

To use our results on marriage equations in Table 3, we attempt to correct the possible selection bias that may arise from a correlation between unobservables specific to the single population (not-yet married) and the explanatory variables (especially schooling). In the selection equation, we use the years of schooling and age-group indicators times schooling, and all these variables interacted with the cluster-specific *Lobola* frequency measure in addition to age and household fixed effects. However, the result shows an insignificant correction term and confirms our previous finding in Column 3.

Columns 6 to 8 use the male sample. The result is very different from those of the female sample. First, we do not observe a significant effect of schooling on excess mortality. From this result, we conjecture that the insignificant estimates in the pooled sample are attributed to the heterogeneity between female and male samples. Second, only for ages 30 to 34 do we find a significant negative effect of schooling. An increase in schooling implies a decrease in mortality in this age group, probably due to the higher marriage probability. This finding is robust to the selectivity correction in Column 8.

On our finding of a positive schooling effect, there could be a few alternative possibilities that may explain the finding. First, more schooling means higher income, which implies more social activities in general. This factor should contribute to more exposure to the HIV/AIDS risks. However, we do not find this positive effect among men, which poses a question to us. Similarly, if positive sorting in the marriage market implies a positive correlation of schooling between couples, then educated women are likely to be with educated men who have more social activities than the uneducated, which increases the HIV/AIDS risks.

Second, as we discussed, schooling is positively correlated with health capital in general. Then, we expect to observe a lower mortality rate among the group of educated individuals. If schooling and health capital are negatively correlated, schooling implies a higher mortality rate. However, this relationship should be also observed among men.

To understand the gender difference in the relationship between schooling and excess mortality, it is meaningful to go back to the findings in Table 3. We found that schooling tends to delay marriage for women, probably due to a higher opportunity cost among educated women. This was evident in communities that impose *Lobola* on their members. This observation is also consistent with our earlier findings on the gap in excess mortality between the married and singles (Tables 1 and 2), which indicates that a longer period of singlehood increases excess mortality.

6. Conclusion

This paper shows some consistent observations on the relationship between schooling, marriage behavior, and the HIV/AIDS excess mortality. Our key finding is that schooling decreases marriage probability among women, which implies a delay in marriage. Thus, schooling may increase mortality risks, given that singlehood is closely related to a higher mortality rate in situations of high HIV/AIDS prevalence. This channel was found to be significant among women, and is especially evident among those aged 20 to 24.

Our analysis demonstrated the need to integrate our understandings of the marriage market, the labor market, schooling investments, and youth behavior to identify the determinants of AIDS-related excess mortality. The marriage institution potentially protects the youth from excess mortality, but the interactions between marriage and labor markets complicate the role of schooling in determining excess mortality.

One interesting finding from our analysis is a clear gender difference in the effects of schooling on marriage decisions and excess mortality. This finding is also policy relevant as we need to pay special attention to the differentiated mortality risks between women and men to effectively reduce gender-specific AIDS-related excess mortality.

References

Becker, G., and C. Mulligan. 1997. The endogenous determination of time preference. *Quarterly Journal of Economics* 112 (3): 729-758.

Birdsall, N., and A. Hamoudi. 2004. AIDS and the accumulation and utilization of human capital in Africa. In *The macroeconomics of HIV/AIDS*, ed. M. Haacker. Washington, D.C.: International Monetary Fund.

Boucekkine, R., D. De la Croix, and O. Licandro. 2002. Early mortality decline at the dawn of modern growth. Manuscript. Universite catholique de Louvain, Brussels.

Boulier, B. L., and M. R. Rosenzweig. 1984. Schooling, search, and spouse selection: Testing economic theories of marriage and household behavior. *Journal of Political Economy* 92 (4): 712-732.

Bunzel, H., and X. Qiao. 2005. Endogenous lifetime and economic growth: Revisted. *Economics Bulletin* 15 (8): 1-8.

Chakraborty, S. 2004. Endogenous lifetime and economic growth. *Journal of Economic Theory* 116 (1): 119-137.

De Walque, D. 2005. How does the impact of an HIV/AIDS information campaign vary with educational attainment? Evidence from rural Uganda. Manuscript. World Bank, Washington, D.C.

Epstein, B. G. 2004. The demographic impact of HIV/AIDS. In *The macroeconomics of HIV/AIDS*, ed. M. Haacker. Washington, D.C.: International Monetary Fund.

Foster, A. D., and M. R. Rosenzweig. 1995. Learning by doing and learning from others: Human capital and technical change in agriculture. *Journal of Political Economy* 103 (6): 1176-1209.

Gersovitz, M. 2005. The HIV epidemic in four African countries seen through the Demographic and Health Surveys. *Journal of African Economies* 14 (2): 191-246.

Hallman, K. 2004. *Socioeconomic disadvantage and unsafe sexual behaviors among young women and men in South Africa*. Working Paper No.190. New York: Population Council.

Kalemli-Ozcan, S., H. Ryder, and D. N. Weil. 2000. Mortality decline, human capital investment and economic growth. *Journal of Development Economics* 62 (1): 1-23.

Kaufman, C. E., S. Clark, N. Manzini, and J. May. 2002. *How community structures of time and opportunity shape adolescent sexual behavior in South Africa*. Working Paper No.159. New York: Population Council.

Luke, N., and K. Munshi. 2006. New roles for marriage in urban Africa: Kinship networks and the labor market in Kenya. *Review of Economics and Statistics* 88 (2): 264-282.

Rao, V. 1993. The rising price of husbands: A hedonic analysis of dowry increases in rural India. *Journal of Political Economy* 101 (4): 666-677.

Rosenzweig, M. R. 1995. Why are there returns to schooling? *American Economic Review* 85 (2): 153-158.

Schultz, P. T. 1994. Marital status and fertility in the United States: Welfare and labor market effects. *Journal of Human Resources* 29 (2): 637-669.

Schultz, T. W. 1975. The ability to deal with disequilibria. *Journal of Economic Literature* 13 (3): 827-846.

Yamauchi, F. 2004. Are experience and schooling complementary? Evidence from migrants' assimilation in the Bangkok labor market. *Journal of Development Economics* 74 (2): 489-513.

Zheng, H. 2006. Benefits of women's education within marriage: Evidence from South Africa. Manuscript. Department of Applied Economics, University of Minnesota, Minneapolis-St. Paul, Minn., U.S.A.

Recent FCND Discussion Papers

213 *Micronutrient Malnutrition, Obesity, and Chronic Disease in Countries Undergoing the Nutrition Transition: Potential Links and Program/Policy Implications*, Cara L. Eckhardt, December 2006

212 *A Global Hunger Index: Measurement Concept, Ranking of Countries, and Trends*, Doris Wiesmann, December 2006

211 *Poverty Comparisons with Absolute Poverty Lines Estimated from Survey Data*, Kenneth R. Simler and Channing Arndt, November 2006

210 *From "Best Practice" to "Best Fit": A Framework for Analyzing Pluralistic Agricultural Advisory Services Worldwide*, Regina Birner, Kristin Davis, John Pender, Ephraim Nkonya, Ponniah Anandajayasekeram, Javier Ekboir, Adiel Mbabu, David Spielman, Daniela Horna, Samuel Benin, and Marc Cohen, July 2006 [Published with the Development Strategy and Governance Division (DSGD), the International Service for National Agricultural Research (ISNAR), and the Environment and Production Technology Division (EPTD)]

209 *Is There Persistence in the Impact of Emergency Food Aid? Evidence on Consumption, Food Security, and Assets in Rural Ethiopia*, Daniel O. Gilligan and John Hoddinott, forthcoming

208 *Gender, Labor, and Prime-Age Mortality: Evidence from South Africa*, Futoshi Yamauchi, Thabani Buthelezi, and Myriam Velia, June 2006

207 *The Impact of an Experimental Nutritional Intervention in Childhood on Education among Guatemalan Adults*, John A. Maluccio, John Hoddinott, Jere R. Behrman, Reynaldo Martorell, Agnes R. Quisumbing, and Aryeh D. Stein, June 2006

206 *Conflict, Food Insecurity, and Globalization*, Ellen Messer and Marc J. Cohen, May 2006

205 *Insights from Poverty Maps for Development and Food Relief Program Targeting: An Application to Malawi*, Todd Benson, April 2006

204 *Nutrition Mapping in Tanzania: An Exploratory Analysis*, Kenneth R. Simler, March 2006

203 *Early Childhood Nutrition, Schooling, and Sibling Inequality in a Dynamic Context: Evidence from South Africa*, Futoshi Yamauchi, January 2006

202 *Has Economic Growth in Mozambique Been Pro-Poor?* Robert C. James, Channing Arndt, and Kenneth R. Simler, December 2005

201 *Community, Inequality, and Local Public Goods: Evidence from School Financing in South Africa*, Futoshi Yamauchi and Shinichi Nishiyama, September 2005

200 *Is Greater Decisionmaking Power of Women Associated with Reduced Gender Discrimination in South Asia?* Lisa C. Smith and Elizabeth M. Byron, August 2005

199 *Evaluating the Cost of Poverty Alleviation Transfer Programs: An Illustration Based on PROGRESA in Mexico*, David Coady, Raul Perez, and Hadid Vera-Ilamas, July 2005

198 *Why the Poor in Rural Malawi Are Where They Are: An Analysis of the Spatial Determinants of the Local Prevalence of Poverty*, Todd Benson, Jordan Chamberlin, and Ingrid Rhinehart, July 2005

194 *Livelihoods, Growth, and Links to Market Towns in 15 Ethiopian Villages*, Stefan Dercon and John Hoddinott, July 2005

193 *Livelihood Diversification and Rural-Urban Linkages in Vietnam's Red River Delta*, Hoang Xuan Thanh, Dang Nguyen Anh, and Ceclila Tacoli, June 2005

192 *Poverty, Inequality, and Geographic Targeting: Evidence from Small-Area Estimates in Mozambique*, Kenneth R. Simler and Virgulino Nhate, June 2005

191 *Program Participation Under Means-Testing and Self-Selection Targeting Methods*, David P. Coady and Susan W. Parker, April 2005

190 *Social Learning, Neighborhood Effects, and Investment in Human Capital: Evidence from Green-Revolution India*, Futoshi Yamauchi, April 2005

189 *Estimating Utility-Consistent Poverty Lines*, Channing Arndt and Kenneth R. Simler, March 2005

188 *Coping with the "Coffee Crisis" in Central America: The Role of the Nicaraguan* Red de Protección Social *(RPS)*, John A. Maluccio, February 2005

187 *The Use of Operations Research as a Tool for Monitoring and Managing Food-Assisted Maternal/Child Health and Nutrition (MCHN) Programs: An Example from Haiti*, Cornelia Loechl, Marie T. Ruel, Gretel Pelto, and Purnima Menon, February 2005

186 *Are Wealth Transfers Biased Against Girls? Gender Differences in Land Inheritance and Schooling Investment in Ghana's Western Region*, Agnes R. Quisumbing, Ellen M. Payongayong, and Keijiro Otsuka, August 2004

185 *Assets at Marriage in Rural Ethiopia*, Marcel Fafchamps and Agnes Quisumbing, August 2004

184 *Impact Evaluation of a Conditional Cash Transfer Program: The Nicaraguan* Red de Protección Social, John A. Maluccio and Rafael Flores, July 2004

183 *Poverty in Malawi, 1998*, Todd Benson, Charles Machinjili, and Lawrence Kachikopa, July 2004

182 *Race, Equity, and Public Schools in Post-Apartheid South Africa: Is Opportunity Equal for All Kids?* Futoshi Yamauchi, June 2004

181 *Scaling Up Community-Driven Development: A Synthesis of Experience*, Stuart Gillespie, June 2004

180 *Kudumbashree—Collective Action for Poverty Alleviation and Women's Employment*, Suneetha Kadiyala, May 2004

179 *Scaling Up HIV/AIDS Interventions Through Expanded Partnerships (STEPs) in Malawi*, Suneetha Kadiyala, May 2004

178 *Community-Driven Development and Scaling Up of Microfinance Services: Case Studies from Nepal and India*, Manohar P. Sharma, April 2004

177 *Community Empowerment and Scaling Up in Urban Areas: The Evolution of PUSH/PROSPECT in Zambia*, James Garrett, April 2004

176 *Why Is Child Malnutrition Lower in Urban than Rural Areas? Evidence from 36 Developing Countries*, Lisa C. Smith, Marie T. Ruel, and Aida Ndiaye, March 2004

175 *Consumption Smoothing and Vulnerability in the Zone Lacustre, Mali*, Sarah Harrower and John Hoddinott, March 2004

174 *The Cost of Poverty Alleviation Transfer Programs: A Comparative Analysis of Three Programs in Latin America*, Natàlia Caldés, David Coady, and John A. Maluccio, February 2004

173 *Food Aid Distribution in Bangladesh: Leakage and Operational Performance*, Akhter U. Ahmed, Shahidur Rashid, Manohar Sharma, and Sajjad Zohir in collaboration with Mohammed Khaliquzzaman, Sayedur Rahman, and the Data Analysis and Technical Assistance Limited, February 2004

172 *Designing and Evaluating Social Safety Nets: Theory, Evidence, and Policy Conclusions*, David P. Coady, January 2004

171 *Living Life: Overlooked Aspects of Urban Employment*, James Garrett, January 2004

170 *From Research to Program Design: Use of Formative Research in Haiti to Develop a Behavior Change Communication Program to Prevent Malnutrition*, Purnima Menon, Marie T. Ruel, Cornelia Loechl, and Gretel Pelto, December 2003

169 *Nonmarket Networks Among Migrants: Evidence from Metropolitan Bangkok, Thailand*, Futoshi Yamauchi and Sakiko Tanabe, December 2003

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

www.ifpri.org

IFPRI HEADQUARTERS

2033 K Street, NW
Washington, DC 20006-1002 USA
Tel.: +1202-862-5600
Fax: +1202-467-4439
Email: ifpri@cgiar.org

IFPRI ADDIS ABABA

P. O. Box 5689
Addis Ababa, Ethiopia
Tel.: +251 11 6463215
Fax: +251 11 6462927
Email: ifpri-addisababa@cgiar.org

IFPRI NEW DELHI

CG Block, NASC Complex, PUSA
New Delhi 110-012 India
Tel.: 91 11 2584-6565
Fax: 91 11 2584-8008 / 2584-6572
Email: ifpri-newdelhi@cgiar.org