FERTILITY IN AN ERA OF HIV/AIDS: THE IMPACT OF PRIME-AGE MORTALITY ON ADOLESCENT REPRODUCTIVE PREFERENCES AND BEHAVIOR

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INTRODUCTION

According to the Joint United Nations Program on HIV/AIDS (UNAIDS 2008), more than two-thirds of the adults and 90 percent of the children living with HIV/AIDS worldwide reside in sub-Saharan Africa. In addition to being a disease that causes widespread suffering and death, HIV/AIDS has important demographic consequences. Perhaps most apparent, mortality is rising steeply, especially among adults in the most economically productive strata of society, all the while increasing the incidence of orphanhood and widowhood. Such changes are already placing marked strains on the economic and social fabric in areas with severe epidemics--strains that will only increase as the disease claims more and more lives. Households bear the brunt of the impact as income is lost due to the morbidity and mortality of economically productive members, and resources are stretched to care for orphaned children and/or sick family members.

Although a great deal of research addresses the impact of HIV/AIDS on mortality, less is known about the impact of HIV/AIDS on fertility: in particular, whether the threat of HIV/AIDS, and its dire economic impact on households, is affecting individual women's reproductive preferences and behavior. Accordingly, the goal of this paper is to explore the relationships between HIV/AIDS-related household shocks, the perceived risk of HIV/AIDS, and reproductive preferences and behaviors of adolescent women in South Africa (see Figure 1). For the purposes of this paper, I use prime-age death as a proxy for AIDS mortality[1] and define HIV/AIDS-related

[1] In the absence of survey results that are linked to sero-status (via testing of each respondent), we are unable to unequivocally attribute mortality and morbidity to HIV/AIDS. However, given that AIDS is currently estimated to be the number one cause of death in South Africa and that it typically strikes those in prime of their lives (ages 15-50), I argue that prime-age morbidity and mortality is an appropriate proxy for HIV/AIDS-related morbidity and mortality

household shock as the death of a parent or other prime-age household member.[2] I utilize data from the Cape Town Area Panel Study (CAPS), a longitudinal survey that follows 4,800 14-22 year olds (both male and female) from 2002-2006. CAPS is an unusually rich source of information on individual perceptions of HIV/AIDS risk, reproductive preferences and behavior, and indicators of household and community well-being.

In particular, I investigate three primary questions among a sub-sample of 1740 adolescent women ages 14-22:

1. Do HIV/AIDS-related household shocks (i.e. parental or other prime-age household mortality) affect perceived risk of HIV/AIDS?

2. Do HIV/AIDS-related household shocks, and the perceived risk of HIV, affect reproductive preferences?

3. Do HIV/AIDS-related household shocks, and the perceived risk of HIV, affect early reproductive behavior?

These issues raise a number of important issues of both policy and academic relevance. A shift in reproductive behavior in response to HIV/AIDS could significantly alter the pattern of fertility change in sub-Saharan Africa. Further, the sexual behavior of the current generation will greatly influence the course of the epidemic over the next decades. Young women in this age group (14-22) account for a disproportionate number of the total HIV infections and, due to the relatively young age of childbearing in sub-Saharan Africa, they are also grappling with the prospect of childbearing.

[2] Although in this paper I only consider the impact of prime-age mortality, this is part of a larger project on the impact of HIV/AIDS-related household shocks on reproductive preferences and behavior. Other on-going work broadens the definition of HIV/AIDS-related household shocks to include the illness of a parent or prime-age family member and/or additional caregiving responsibilities associated with HIV/AIDS morbidity and mortality, including caring for orphans/foster children.

South Africa's extremely high levels of HIV prevalence make it a particularly apt canvas on which to explore these relationships. Although HIV/AIDS took hold later in South Africa than elsewhere in Sub-Saharan Africa, the country is now facing one of the most serious epidemics in the world (U.S. Census Bureau; UNAIDS). Indeed, adult HIV prevalence from antenatal surveys increased from 1 percent in 1990, to 7.6 percent in 1994 and 27.9 in 2003 (Department of Health 2003). Adolescent women are a particularly important sub-population because of their heightened risk of both pregnancy and HIV/AIDS, especially in the South African context. About half of South African adolescents are sexually active by the age of 16 (Eaton et al. 2003); rates of early child bearing are high, with 30 percent of 20-24 year olds giving birth by the age of 20; and finally, although it has only 1 percent of the world's 15-24 year old population, South Africa is home to about 15 percent of the HIV infections in this age group (UNICEF 2002).

The goal of this paper is to further our understanding of the relationship between HIV/AIDS and fertility in two principal ways. First, I hope to add to the relatively small body of literature on the impact of perceived risk of HIV on fertility. Previous studies largely draw on community level HIV/AIDS prevalence or proportions of adults or peers that consider adolescents to be at risk of HIV/AIDS as proxies for perception of risk (i.e. Rutenberg et al. 2003). My study builds on this by incorporating individual-level measures of risk perception and considering the impact of HIV/AIDS-related household shocks, and their economic impact, on the perception of risk. I also benefit from the availability of longitudinal data, which will enable me to better isolate the contribution of risk perception to reproductive preferences and behavior.

Second, I hypothesize that in addition to perceived risk of infection, it is important to consider the role of HIV/AIDS-related household shocks, and their economic impact, in shaping reproductive preferences and behavior. In a setting where high fertility and an early age at first birth is the norm, I hypothesize that young women may be more likely to revise their reproductive preferences and behavior if they experience prime-age mortality at the household level, especially if it has negative economic ramifications. [3] Unlike previous studies, which either lump all household shocks together in one category (i.e. Rutenberg et al. 2003) or limit their analysis to the impact of orphanhood (i.e. Gregson et al. 2005, Thurman et al. 2006), this study will add to our understanding of the impact of HIV/AIDS by distinguishing between the type, timing, and economic impact of HIV/AIDS-related household shocks. Again. availability of longitudinal data is instrumental in better isolating the impact of HIV/AIDS-related household shocks on both perceived risk and reproductive preferences and behavior.

LITERATURE REVIEW: HIV/AIDS AND FERTILITY

Exploring the links between HIV/AIDS and fertility is inherently interesting in that HIV is transmitted in the same way that pregnancy is achieved. Given that the primary proximate determinants of fertility -- sexual exposure and contraceptive practice -- are virtually identical to the factors that increase risk of HIV infection, an empirical association "seems almost unavoidable" (UN 2002). Indeed, researchers have coined the term "fertility conundrum" to

[3] I am especially interested in observing the direction of the relationship between household shocks and reproductive preferences and behavior. Based on the findings of Oster (2007) - that individuals were more likely to reduce their number of sexual partners if they had a higher perceived life expectancy and the promise of higher income - one might expect household shocks to lead to riskier behavior, especially if they negatively impact the economic wellbeing of the household. On the other hand, in line with the health belief model, if a household shock makes an individual more aware of the consequences of HIV/AIDS, they may be more reluctant to engage in risky behaviors.

capture the tension between the desire to become pregnant and the desire to protect oneself from contracting HIV (Preston-Whyte 1999). The long-standing cultural emphasis on fertility makes this tension particularly strong in the sub-Saharan African context (Rutenberg et al 2003). Possible changes in reproductive behavior in response to a high perceived risk of HIV infection could include, among others, changes in fertility desires, changes in sexual behavior and marriage patterns, and changes in contraceptive practice. Further, in light of the historical responsiveness of fertility to economic hardship (i.e. Lesthaeghe 1989, Lloyd and Hewett 2002, Gregson 1994, Friedman et al 1994), the economic consequences of HIV/AIDS morbidity and mortality at the household level could intensify the impact of HIV/AIDS on reproductive behavior.

To date, the most thoroughly researched aspect of the relationship between HIV/AIDS and fertility is the effect of HIV/AIDS on the fertility of those who are HIV-positive. Evidence from a variety of studies from throughout Africa conducted in the early and mid-1990s suggests that the overall fertility of HIV positive women is 25-40 percent lower than that the overall fertility of HIV negative women (Zaba and Gregson, 1998; Allen et al, 1993; Ryder et al, 1991). Thus far, most of this differential has been attributed to biological changes that accompany HIV infection, including lower coital frequency, decreased production of semen in men, higher rates co-infection with STIs, and higher rates of fetal loss (UN, 2002).

The evidence is mixed as to whether HIV-positive status induces behavioral changes that have a noticeable impact on fertility. A review of recent qualitative studies examining fertility intentions among HIV-positive women indicates that women themselves are “deeply conflicted about the proper reproductive response to AIDS” (UN 2002). In some cases, continued

reproduction was seen as a sign of health and way to maintain status as a wife and mother (Aka-Dago-Akribi et al. 1999). For a number of women, social obligations and rewards inherent in childbearing were paramount in weighing the potential risk of pregnancy and/or fear of transmitting the virus to her child (i.e. Temmerman et al. 1990; Lutalo et al. 2000; Rutenberg et al. 2000). In addition, there is some evidence that with the increase in mother-to-child transmission of HIV, women may be under pressure from their spouses or partners to achieve a desired number of surviving children (i.e. Gregson et al. 1998), thereby encouraging higher levels of fertility and/or an increase their pace of childbearing (i.e. Temmerman et al. 1994; Setel 1995).

This paper attempts to push beyond the discussion of fertility among HIV-positive women to investigate whether the threat of HIV/AIDS in and of itself is altering reproductive attitudes and behavior, especially among the younger generation. I argue that this is in fact a more important question than how HIV infection physically affects one's capacity to reproduce, and one with great potential to alter the future course of the epidemic and population growth in the region.

Impact of Perceived Risk of HIV

According to a United Nations Population Division report on HIV/AIDS and fertility, despite the documented drop in fertility among those infected with HIV, "behavioral responses by those who are uninfected (actual or self-perceived) has a far greater potential impact on fertility levels and trends" (2002, 14). Near the beginning of the epidemic, some speculated that HIV/AIDS would transform reproductive regimes in sub-Saharan Africa and that it may even spur a transition to lower levels of childbearing (i.e. Caldwell et al. 1989). Indeed, there is

limited empirical evidence the risk of HIV is beginning to influence childbearing preferences, leading to a decline for the desire and demand for children (i.e. Young 2005a, Young 2005b, Gregson et al. 1997, Rutenberg et al. 2005, Rutenberg et al. 2003).

More recently, some of the same scholars who predicted a drop in fertility in response to the epidemic have warned that by slowing mortality decline and heightening the perception of mortality risk, the HIV/AIDS pandemic may actually hinder the transition to lower levels of fertility in some parts of the region (i.e. Caldwell et al. 1999). For example, research from Kenya suggests that the fertility-enhancing behavioral effect of living in a high prevalence area could outweigh the fertility-suppressing effects of HIV-infection (DeRose 2005). Pathways through which living in an area of high HIV prevalence could motivate higher fertility include: proving health by becoming pregnant (especially among those who are unaware of their status), attempting to have children before becoming infected, replacing children who died, and greater fear of child mortality because of higher rates of mortality in the community (ibid). Other literature suggests that reproductive preferences and behavior are surprisingly resistant to change, and thus unresponsive to HIV prevalence (i.e. Moyo and Mbizvo 2003, Ezeh 2003). Consequently, the relationship between HIV/AIDS and fertility remains somewhat unclear. Indeed, the extant literature is "seriously deficient" on the topic of whether, "and to what extent, those persons who live in societies where the risk of HIV infection is high but who do not perceive themselves to be infected are modifying their reproductive aspirations and behaviors in response to a recognition of HIV risk" (UN 2002, 14). Further, in a setting where high fertility and an early age at first birth are the norm, how responsive are fertility preferences and behavior to perceived risk of HIV?

As stated above, I hypothesize that in addition to perceived risk of infection, it is important to consider the role of HIV/AIDS-related household shocks in shaping reproductive preferences and behavior. In a setting where high fertility and an early age at first birth is the norm, I contend that young women may be more likely to revise their preferences and behavior if they experience a shock at the household level (i.e. death of parent or other prime-age household member), especially if it has dire economic consequences.

Impact of HIV/AIDS- related household shocks

Arguments suggesting that excess morbidity and mortality due to HIV/AIDS may alter the cost-benefit calculus concerning childbearing run in both directions. Arguably the predominant view is that economic strain is a strong incentive for fertility reduction (UN 2002; Lesthaeghe 1989; Lee 1990; Palloni et al. 1993). Findings from Uganda suggest lower fertility among women living in households affected by HIV/AIDS (Carpenter et al. 1997). Further, the surge in orphans is actually causing some to re-evaluate their childbearing intentions as they (or their relatives and neighbors) are forced to care for additional children (Rutenberg et al. 2000).

On the other hand, one could also argue that by closing off "opportunities in the modern sector of the economy," increasing economic pressure on governments and households, and curtailing educational attainment (Lloyd and Hewett 2002), the impact of high levels of HIV/AIDS-related morbidity and mortality may in turn act to increase fertility (Gregson 1994). Theoretical perspectives suggest that in certain situations economic uncertainty may in fact provide an incentive for bearing children (Friedman et al 1994). Further, there is evidence from both developed and developing countries to suggest that, net of other factors, lower socioeconomic status is positively correlated with sexual risk taking, including lower age at first

sex, early pregnancy, number of sexual partners, and condom use (i.e. Hallman 2005, Brooks-Gunn and Furstenberg 1989).

In this paper I focus my attention on the impact of HIV/AIDS-related household shocks on adolescent women. In particular, how does the experience of growing up in a household that is affected by HIV/AIDS, or losing a parent to HIV/AIDS, impact reproductive preferences and behavior? Further, does relationship between HIV/AIDS-related household shocks and preferences and behavior vary according to the type, timing, or economic impact of the shock?

Impact of Parental Mortality

Although a large body of evidence indicates that the loss of one or both parents and the ensuing adjustments required to cope with this shock negatively affects children's educational and health outcomes (see for example, Case et al 2004, Case et al 2005, Case and Ardington 1998, Ainsworth and Semali 1998, Beegle et al 2005, Bicego et al 2003, Ainsworth and Filmer 2002), we have only begun to understand the impact of orphanhood on sexual risk (Thurman et al. 2006). There has been even less research on the reproductive preferences and behavior among orphans and, with the exception of Rutenberg et al. (2003), almost no attention to the impact of HIV risk perception in shaping these attitudes and behaviors. In addition, we know very little about the impact of prime-age household deaths in general, regardless of whether it was a parent who died.

Initial studies point to the fact that there is something unique about being an orphan, apart from other socio-economic factors, that leads to risky sexual behavior. Indeed, a recent finding from a South African study found that in addition to economic and educational risk-factors orphans were one and a half times more likely to have had sex than their non-orphaned peers;

among sexually active youth, orphans reported a younger age at sexual initiation (Thurman et al. 2006). Similarly, Gregson et al. (2005) attributed high proportions of HIV infections, STIs, and pregnancies among teenage girls in Zimbabwe to maternal orphanhood and parental HIV. The authors concluded that "predicted substantial expanded increases in orphanhood could hamper efforts to slow the acquisition of HIV infection in successive generations of young adults, perpetuating the vicious cycle of poverty and disease" (785).

What is unique about orphans and what role does orphanhood play in determining reproductive attitudes and outcomes? Orphans clearly face a number of significant disruptions in their lives. Many are forced to move away from home and/or may be separated from siblings (Foster and Williamson 2000). Those who are fostered may receive less preferable treatment than biological children in the household (Foster et al. 1997). Even when orphans remain in their original household and/or are well cared for they may lack sufficient psychosocial support, supervision and discipline due to the increased demands of adult morbidity and mortality on caregivers (Hunter 1990). Indeed, higher levels of depression have been found among orphans (i.e. Hutton et al. 2001, Makame et al 2002) and some even suggest that depression may be causally linked to an increase in risky sexual behavior (Williams and Larkin 2005).

Further, studies of the relationship between household organization and sexual risk indicate that parental absence may heighten the risk of early sexual activity. In the United States, living in a single-parent household has been clearly linked to earlier sexual debut (i.e. Kirby 1999). Although not as consistent, studies of adolescents in sub-Saharan Africa who are living without one or both parents (due to death, migration or fostering) also point to this relationship (see for instance Ngom, Magadi and Owuor 2003; Magnani et al. 2002; Karim et al. 2003).

In short, orphans are at greater risk a number of factors that have been associated with earlier ages of sexual initiation, including: increased stress (Harvey and Spigner 1995), lower levels of monitoring due to parental absence or preoccupation with other caregiving responsibilities (Harvey and Spigner 1995, Romer et al. 1999), a lack of parent-family connectedness (Resnick et al., 1997), as well as lower levels of school attendance and educational attainment (i.e. Case et al 2004, Case et al 2005, Beegle et al 2005, Bicego et al 2003, Ainsworth and Filmer 2002). Given the demonstrated linear relationship between cumulative risk and the likelihood of sexual debut (i.e. Small and Luster 1994), it is not hard to conceive of the possibility that orphans (as well as those who experience HIV-related household shocks more broadly defined) are exposed to a greater number of risks that could lead to earlier sexual onset. Indeed, a growing body of research demonstrates that adolescents' connectedness to their schools, communities, and families (not in any particular order) may be important protective factors that act to suppress risk (Macintyre et al. 2004).[4]

However, there is some question as to whether these relationships necessarily hold in the African context, where family structures are historically fluid and connectedness may take on different forms. The history of apartheid with its enforced circular migration flows as well as the increased migration in the post-apartheid era make this especially true in the South African context.[5] Indeed, there is evidence that communities and extended family are very capable of

[4] Interestingly, in a study conducted in Lusaka, Zambia, Magnani et al (2001) found smaller than expected associations between adolescent sexual risk taking and behavior and connection to their parents. The authors hypothesized that the extremely high levels of HIV infection and the resulting high level of disruption within and among households, may in fact be working to dampen the otherwise protective effects of connections in the household.

[5] Due to intense migration flows and the legacy of apartheid, families in South Africa are spatially divided units (Spiegel, Watson and Wilkinson 1996), relatives disperse to make a living (Russel 2003), and absent members who have migrated to urban areas often retain membership in their rural households, including as household heads

absorbing orphans and that the tradition of fostering children predates the onset of HIV/AIDS. In particular, Bray (2003) suggests that parental death (especially paternal) was "part of many children's experiences prior to the spread of HIV/AIDS" and further that" informal fosterage was a prevalent strategy even before AIDS-related pressures entered the dynamic care arrangements for children" (18). Barbarin and Richter (2001) point out that the pensions of grandparents have historically supplemented household incomes in South Africa, often directly contributing to child wellbeing by paying school feels and the costs of uniforms and books.

Accordingly, in addition to controlling for HIV/AIDS-related household shocks, my analysis will add to our current understanding by including information on the economic impact of HIV/AIDS-related household shocks. The economic impact of the shock is measured via a question about the level of economic impact of the death or illness (none, small, moderate or large) in terms of lost income, medical/caregiving expenses, or funeral expenses. On the other hand, recognizing that non-resident household members often help mitigate the impact of shocks, I also control for the receipt of remittances for non-resident household members.

DATA AND METHODS

Data

The Cape Area Panel Study (CAPS) affords an unprecedented opportunity to examine the relationship between HIV/AIDS-related household shocks, perceptions of HIV risk, and reproductive preferences and behavior. CAPS is a longitudinal study 4,800 young adults ages

(Budlender 2003). Indeed, children may "lose a parent" from migration or divorce as well as death (Bray 2003, Ramphele 2002). Conditions requiring the extended family to take in and support children include: childbearing outside marriage (Kaufman et al. 2000, Garenne et al. 1999); remarriage and divorce, where daughters leave children from a previous union to live with the grandparents in the event of remarriage or a union with another man (Burman 1996); and parents' absence due to labor migration (Smit 2001, Russell 2003).

14-22 in 2002, re-interviewed in 2003-04, 2005 and 2006. The sample was randomly selected from all areas and population groups in metropolitan Cape Town, South Africa. I utilize a sub-sample of 1740 women who were interviewed in wave 1 (2002) and again in wave 3 (2005).

The CAPS data is unique and particularly well suited to my study in that it contains rich data on reproductive preferences and behavior, household shocks, the economic impact of these shocks, remittances from non-household family members, and individual perceptions of HIV risk. To my knowledge, this particular combination of variables is not present in other longitudinal or cross-sectional surveys.[6] For instance, in addition to providing indicators of parental mortality, CAPS also contains more detailed information on illness of parents and the illness or death of other resident and non-resident family members.[7] Another novel feature is the ability to determine the timing of the household shock as well as the economic impact of the shock (i.e. the financial impact of death or illness in the household on the one hand, and assistance from extended family to mitigate negative shocks on the other). Further, I am able to observe the timing of key events such as first sex and pregnancy in relation to household shocks. A comprehensive analysis of the interplay among this set of variables will enable me to paint a more complete picture of the relatively unexplored relationship between HIV/AIDS-related household shocks, perception of HIV risk, and reproductive preferences and behavior.

[6] The other key survey that has been used to look at reproductive behavior and HIV/AIDS in South Africa is Transitions to Adulthood. Although this study contains information on attitudes towards pregnancy and community measures of perceived risk, they are unable to include individual measures of risk in their analysis. They are also unable to distinguish between types of household shocks or the timing of the shock. Although a second wave of this data will be released soon, existing research has relied on findings from a single wave of data (i.e. Rutenberg et al 2003).

[7] Although in this paper I only analyze indicators of parental and other prime-age mortality, other on-going work investigates the impact of HIV/AIDS morbidity and additional caregiving responsibilities as a result of illness and death of household member or the presence of orphans/foster children in the hosuehold.

I utilize wave 1 and wave 3 of the study, collected in 2002 and 2005 respectively. Wave 1, administered in 2002, is a representative sample of 5,250 households in Cape Town and included both a young adult (YA) and a household questionnaire. This is a two-stage clustered sample drawn from 440 census enumeration areas. African and white households were oversampled. Up to three household members aged 14-22 were asked to complete the YA questionnaire. [8] In the end, the YA questionnaire was administered to 4,752 young adults living in 3,300 households and covered on a range of topics including: education, employment, sexual activity, childbearing and health, and a retrospective life history calendar detailing employment history, school attendance, living arrangements, and pregnancy history. The household questionnaire collected information on each member of the household[9], including basic social and demographic variables, education, migration to Cape Town, and income.

In the third wave of the study, the researchers attempted to re-interview all CAPS youth respondents who were still living in Cape Town. Attrition between Wave 1 and Wave 3 was about 20 percent, largely due to respondents who left the area. As in wave 1, both young adult and household questionnaires were administered as well as a new questionnaire for parents/guardians of the young adult. The primary focus of wave 3 was to update information on education, employment, pregnancies and births, and personal health. Additional information on sexual activity, time allocation and relationships with parents and guardians was also gathered. The household questionnaire was expanded to include questions regarding family support and

[8] If more than three young adults lived in the household, the three with the most recent birthdays were selected to complete the young adult questionnaire.

[9] Household membership was defined as "usually" living in the household, meaning that "the person lived here for more than 15 days of the last 30 days. After a household was selected into the sample, one person over the age of 18 was designated to complete the household questionnaire. Ideally, this was the person who had the greatest knowledge of all household members.

remittances from (or to) non-resident kin. Perhaps most importantly, the questionnaire included a more in-depth examination of methods used by individuals and households to respond to the "negative" shocks of poor health. They also asked about expected obligations in the event of a "positive" shock such as an increase in income or receipt of a grant (Lam et al. 2006).

Dependent Variables

Perceived Risk of HIV

Perceived risk of HIV is measured at the individual level through a questions that asks respondents whether they believe they are at no, very small, some, moderate, or large risk of HIV/AIDS. For ease of interpretation, I construct a dummy variable which is equal to one if they perceive themselves to be at risk of HIV and zero if they don't in order to assess whether the occurrence of an HIV/AIDS-related household shocks impacts the perception of risk.[10]

Reproductive Preferences

I employ two measures of reproductive preferences. The first is a dichotomous variable designating whether they expect to have a child or (if already a parent) another child in the next three years. Descriptive statistics point to a large increase in the number of women who answer "what god wills" in response to the question of how many children they eventually expect to have. As such, I also created a dummy variable which is equal to one if they answered "what god wills" or "don't know" and zero if they provided a numerical concrete answer. In this way, I hope to paint a clearer picture of the characteristics of young women who prefer to leave their fertility decisions to fate and investigate whether there is variation according to the presence or absence of a household shock and/or the level of risk perception.

Reproductive Behavior

I measure of early reproductive behavior by looking at the transition to first birth, specifically whether the respondent had their first birth during the 3-year interval between the two waves of study, and whether this varies according to perceived risk of HIV, and/or whether there was a household shock during, or prior to, the three year interval.

Independent Variables

HIV/AIDS-Related Household Shocks

As discussed above, for the purposes of this paper, I define HIV/AIDS-related household shock as the death of a parent or prime-age household member. Although we are not able to determine definitively whether a death is attributable to HIV/AIDS, given that AIDS is the number one cause of death in the region and also that it primarily strikes those in the prime years of their life (ages 15-50), prime-age death/illness is the best available proxy for the impact of HIV/AIDS. Prime-age death is measured through questions about deaths in the household over the past three years (i.e. between 2002 and 2005) as well as through questions (asked in both 2002 and 2005) about whether or not their mother and/or father are alive.

I test the significance of several different types of HIV/AIDS-related household shocks in each set of models, including: prime-age death in the household (between ages 15-50), loss of a mother, loss of a father, or loss of both parents. I also include an indicator of whether there was a prime-age death in the respondent's immediate cluster of households (there are 25 households per cluster). To capture variations in the odds of the dependent variable according to the timing of the HIV/AIDS-related shock, I constructed dichotomous variables depicting whether the adolescent experienced a shock within the past 3 years (i.e between wave 1 and wave 3 of the

study) and whether they experienced a shock prior to the initiation of the study (for the parental mortality variables).[11] In order to assess whether the impact of household shocks varies according to their economic impact, I draw upon information of the economic impact of prime-age household deaths in the past three years. In particular, respondents are asked if the event had an economic impact on the household (none, small, moderate, or large) due to lost income, medical/caregiving expenses, or funeral expenses.

Remittances

On the other hand, to estimate the potential buffering effect of assistance from non-resident members in mitigating the impact of the epidemic, I control for whether the household received remittances non-resident members over the past year. Indeed, recent literature suggests that non-resident members and/or extended family may be playing a key role in assisting households cope with the effects of HIV/AIDS (i.e. Lundberg and Over 2000). Controlling for outside income and material support is integral to gaining an accurate understanding of the net impact of the shock on household economic well-being, and will provide a more accurate picture of the impact of HIV/AIDS-related household shocks on reproductive preferences and behavior.

Controls

In each set of models, I include controls for background characteristics at wave 1 that could also influence risk perception, reproductive preferences or reproductive behavior, including population group, age, whether they were in school, mother's education, father's education, and log of household per capita income. I also include controls for whether the

[11] For the present analysis, I include indicators of parental death between the two waves or prior to 2002 and household mortality between the two waves. prime-ageIn later studies, I will attempt to disentangle the timing more comprehensively through the use of survival analysis techniques.

respondent has ever had sex, ever been married or ever given birth (both of which could influence responses to questions about risk perception, reproductive preferences, and/or whether they had a first birth during the interval between wave 1 and wave 3). Finally, in an attempt to more accurately assess the relative impact of HIV/AIDS-related shocks, I include indicators for the presence or absence of other types of household shocks, including the loss of a job, loss of pension, failure of a business, divorce/separation, or damage of property.

Methods

Using the sample of young women who responded to both wave 1 and wave 3 of the survey (N=1740), I employ logistic regression to assess the impact of HIV/AIDS-related households shocks on perceived risk, reproductive preferences, and reproductive behavior, respectively. The model is in the form:

$\ln (p/1–p) = a + S(b_k)(x_k)$

where p is the probability of the dependent variable occurring (i.e. perceiving themselves to be at risk of HIV, expecting a child in the next three years, answering "what god wills" to number of children expected, or having a first birth in the interval), p/(1–p) is the odds of the aforementioned event, x_k represents the explanatory variables, b_k represents the effects parameters associated with the explanatory variables, and a is a constant.

In each set of models, I estimate the odds of the dependent variable in wave 3 (2005) as a result of a household shock between wave 1 and wave 3, conditional on a set of background conditions measured at wave 1 (2002) and other relevant controls measured at both wave 1 and wave 3 (see Table 1 for means and proportions of key dependent and independent variables). In particular, perception of HIV risk at wave 3 is estimated conditional on background conditions at

wave 1 and measures of household shocks between waves 1 and 3 and prior to wave 1. Similarly, whether the young woman expects to have a child in the next three years (and whether she answers "what god wills" when asked about her expected family size) at wave 3 is estimated conditional on background conditions at wave 1 and measures of household shocks between waves 1 and 3 and prior to wave 1. To these models, I also add controls for perceived risk in wave 1 and wave 3 to determine whether risk perception is a significant predictor of preferences. Finally, whether or not the young woman had her first birth between waves 1 and 3 is estimated conditional on background conditions at wave 1 and measures of household shocks between waves 1 and 3 and prior to wave 1. Indicators of risk perception as well reproductive preferences at time 1 are integrated into the models of transition to first birth.

RESULTS

Perceived risk of HIV

As one would expect, knowing someone who is living with HIV or who died of AIDS is a strong predictor of the odds of risk perception (see Table 2 for complete results). Those who report knowing someone who is living with HIV in 2005 have 70% higher odds of perceiving themselves to be at risk of infection in 2005 (.001 level of significance), controlling for risk perception in 2002, than those who don't. This relationship remains after controlling for background characteristics in 2002, prime-age household deaths between 2002 and 2005, and other types of household shocks during that time period. Knowing someone who died of AIDS is also significantly related (at the .01 level) to risk perception, but this effect disappears once we

control for knowing someone with HIV. Analysis of the BIC fits statistics shows that the fit of all of my models improves when controlling for knowing someone with HIV at wave 3.

Further, controlling for risk perception in 2002, the results of my models indicate that the death of a prime-age household member between 2002 and 2005 is also a significant predictor the odds of risk perception in 2005. The significance of this relationship is strengthened if the shock has a large economic impact and holds even after controlling for other types of household shocks. However, somewhat surprisingly, I find that instead of increasing the odds of perceived risk of infection (as is the case with knowing someone living with HIV or who has died of AIDS), the occurrence of a prime-age household death is associated with lower odds of perceiving a risk of infection. In particular, those who experience a prime-age household death between 2002 and 2005 have approximately 50% lower odds of perceiving themselves to be at risk of HIV in 2005 (relative to those who didn't experience a shock), holding other factors constant. If the prime-age death had an economic impact (in terms of loss of income or increased medical, caregiving, or funeral expenses), they have about 65% lower odds of perceiving themselves to be at risk. Those who live in a neighborhood cluster with a prime-age household death had 30% lower odds of perceiving themselves to be at risk of infection. This effect remains even after controlling for a prime-age death in their household, albeit with a slightly lower magnitude and level of significance. Finally, the receipt of remittances from non-resident household members over the past year was significantly associated with 50% higher odds of perceiving a risk of HIV infection.

All of the aforementioned relationships are robust to controls for background characteristics and other types of household shocks. In fact, no other types of household shocks are significantly related to the level of risk perception. The only background characteristics

showing significance are whether they had sex by 2005 (in which case they have twice the odds of perceiving an HIV risk) and population group (wherein those in the colored, versus white, population group had almost 50% lower odds of perceiving themselves to be at risk of HIV). Finally, despite the significance of prime-age household deaths, models testing the relationship of parental death in particular (i.e. losing one or both parents between 2002 and 2005 or prior to 2002) were not significant.

Using BIC statistics as a measure of fit, the most powerful model I estimated included both knowing someone with HIV in 2005 (70% higher odds of risk perception) and experiencing prime-age household with an economic impact (65% lower odds of risk perception), controlling for whether they had had sex by 2005 (over twice of odds of risk perception), and other background characteristics. What is most interesting about these results is that experiencing a prime-age household death (the closest proxy I have for the impact of HIV/AIDS on households) has a highly significant negative impact on the odds of risk perception, even more so if the death had an economic impact. On the other hand, knowing someone with HIV or who has died of AIDS has a positive effect on risk perception. This result is counter-intuitive and suggests that there is something unique about the experience of deaths in the household that is influencing perception of risk.

Reproductive Preferences

The expectation of having a child in the next three years (assessed in 2005 and controlling for background characteristics measured in 2002) was remarkably invariant to the occurrence of prime-age deaths between 2002 and 2005 (either at the household or cluster level), or losing one or both parents either between 2002 or 2005 or prior to 2002 (see Table 3 for

complete results). Nor was there a relationship between knowing someone living with or who had died from HIV/AIDS and the expectation of a birth.[12] The perception of HIV risk in 2002 and 2005 were also not statistically significant. Across the board, the strongest predictors of expecting to have a child in the next three years were: whether they had already had a birth by 2005 (in which case they had about 4 times the odds of expecting a child); whether they were had been married by 2005 (in which case they had over 5 times the odds of expecting a child in the next three years); and whether they had had sex by 2005 (in which case they actually had a 60% lower odds of expecting a child in the next three years). As expected, for each additional year of age the odds of expecting a child in the next three years increased by about 12%. None of the background characteristics measured in 2002 were significant in these models, nor was the occurrence of other types of household shocks or the receipt of remittances from non-household members in the past year.

I also tested the relationship between HIV/AIDS-related household shocks and responding "what god wills" to a question about the number of children they would choose to have in their lifetime. Descriptive results point to a significant increase in the number of young women answering "what god wills" between 2002 and 2005 that cannot be explained by age.[13] The results from these models were quite different from the fist set of reproductive preference models presented above (see Table 4 for complete results). First of all, in every model that I estimated, perceived risk of HIV in 2005 was significantly related to the odds of answering

[12] Although there was a significant bivariate association between knowing someone living with or who died from HIV/AIDS or the mortality of a parent in both 2002 and 2005, the significance disappeared after controlling for background characteristics in 2002.

[13] One question I have is whether this was a possible response provided by the surveyors in one or both waves, and/or whether they provided this answer on their own. The difference in the two waves could perhaps be explained (at least in part) by different strategies on the part of the interviewers.

"what god wills." Depending on the exact specification of the model, those who perceived themselves to be at risk of HIV in 2005 had approximately 62% lower odds of answering "what god wills" in 2005 than those who did not perceive themselves to be at risk. Risk perception in 2002 was not significantly related to answering "what god wills," nor was answering "what god wills" to the same question about desired number of children when posed 2002. This relationship is robust to controls for background characteristics in 2002 (none of which are significant) and the occurrence of other household shocks between 2002 and 2005 (which, again, were not significant). Whereas having a birth or being married by 2005 were highly significant predictors of the odds of expecting to have a child in the next three years, with respect to answering "what god wills" when asked about desired number of children, neither of these factors were significant. Those who had had sex by 2005 had about 50% lower odds of answering "what god wills," relative to those who had not yet had sex.

Similar to the first set of preference models (i.e. expectation of having a child in the next three years) knowing someone who is living with or has died of AIDS in 2005, or experiencing a prime-age death (either in the household or cluster) between 2002 and 2005 were not significantly related to answering "what god wills."[14] However, those who reported knowing someone living with HIV in 2002 had about 50% lower odds of answering "what god wills." Perhaps most interesting, when I ran the models separately by type of parental mortality, I found that becoming a paternal orphan between 2002 and 2005 was significantly related (albeit at the .10 level) to the odds of responding "what god wills." In fact, those who lost their father between 2002 and 2005 had 70% higher odds of providing this response. This was robust to

controls for background characteristics in 2002 and other types of household shocks in the interval between the two waves.[15]

Early Reproductive Behavior

Similar to the findings reported above in the "what god wills" models, prime age mortality (either at the household or cluster level), knowing someone with HIV/AIDS, or risk perception at time 1 were not significant predictors of transition to first birth between 2002 and 2005 (see Table 5 for complete results). However, controlling for other factors, paternal orphanhood was significantly related to having a first birth between 2002 and 2005. This time, not only was losing a father between the two waves significant, but so was losing a father prior to wave 1. Interestingly, the timing of paternal orphanhood mattered in determining the direction of the effect. Those who lost their father before 2002 had about 30% *lower* odds of having a first birth 2002 and 2005 (relative to those who hadn't lost a father), yet those who lost their father between 2002 and 2005 had 50% *higher* odds of having a first birth during this period. Similarly, those who lost both parents prior to 2002 had about 55% *lower* odds of to having their first birth between 2002 and 2005, whereas those who became dual orphans during the interval had over twice the odds. Controls for having sex by 2002 or being married by 2002 are insignificant and don't change the significance or direction of the impact of paternal orphanhood. Although being married by 2005 has a strongly predictive of the odd of having a first birth, it does not diminish the impact of paternal orphanhood. Further, these findings are remarkably robust to controls for background characteristics in 2002. Controlling for other types of household shocks between 2002 and 2005 does not change the significance or direction of the odds ratios. In fact, the only

[15] I also included controls for whether or not the mother and/or father was resident in the household. Neither variable was significant, nor did adding them to my models change the significance of other key variables.

other type of household shock that proves to be significant (and then only at the 0.10 level) is losing a job (those who lived in a household where someone unexpectedly lost a job in the last three years were about 40% *higher* odds of having a first birth during the interval).

In addition, those who reported an expectation, in 2002, that they would have a child in the next 3 years, had nearly twice the odds of having a birth in the interval between 2002 and 2005. Although those who were married by 2002 had almost 70% lower odds of reported a birth, those who married between 2002 and 2005 had 2.6 times the odds of reporting a birth than those who were not married. Significant background characteristics include: population group (Africans have about 8 times the odds of having a birth relative to whites and those in the colored group had about 5 times the odds relative to whites); school enrollment in 2002 (those who were enrolled had almost 50% lower odds of having a birth); and father's education (for each unit of father's education the odds of having a first birth between 2002 and 2005 fell by about 8%).

DISCUSSION

In short, my results suggest that HIV/AIDS-related household shocks do matter in predicting the odds of both perceived risk of HIV infection and reproductive preferences and behavior. In the case of perceived risk, prime-age household deaths are especially important, whereas for reproductive preferences and behavior it is the experience of losing a father, in particular, that proves to be significant. The results are mixed as to whether perceived risk of HIV infection, in turn, works to shape preferences and behavior.

More specifically, controlling for risk perception at time 1, the occurrence of a prime-age death (in the household or cluster) significantly decreases the odds of perceiving a risk of HIV,

relative to those who have not experienced prime-age mortality. The odds decline the most (about 55%) for those who experience prime-age household mortality that has an economic impact. On the other hand, knowing someone who is living with HIV or has died of AIDS increases the odds of perceiving risk by about 70% and 50%, respectively. Thus, there is something inherently different about experiencing prime-age mortality in the household that works to shape perceptions of risk. It is counter-intuitive, however, that the more immediate experience with AIDS mortality leads to a lower odds of risk perception. Perhaps witnessing prime-age mortality (presumably due to AIDS) first hand leads one to adopt safer sexual behaviors with respect to HIV prevention. Alternatively, those who experience prime-age household mortality may have other pressing concerns than their perceived risk of HIV that decrease the odds of considering HIV to be a risk. Could it be that the more immediate need to cope with a household death (in terms of lost resources and increased expenses), and the heightened strain that this causes on the household, eclipses the perception of the risk of HIV?

Further research will attempt to more completely model other factors that could determine risk perception. For example, perhaps there is something about those who live in households with prime-age mortality that makes them more impervious to risk. The fact that those who perceive risk at time 1 have about 45% higher odds of perceiving risk at time 3, lends support to the hypothesis that perhaps there is something about being risk averse or acceptant in general that also works in the case of HIV risk perception.

Results from the two sets of models estimating reproductive preferences suggest that prime-age mortality has little bearing on preferences. With respect to the expectation of having another child in the next 3 years (assessed at time 1), the occurrence of prime-age mortality or

loss of a parent is not significantly related to reproductive preferences. Nor are knowing someone who is living with or who has died of HIV/AIDS or perceived risk at wave 1 or wave 3.

However, when looking at whether a young woman answered "what god wills" in response to a question in time 3 about her desired family size, perceiving HIV risk in time 3 is highly significant, and reduces the odds of answering "what god wills" by a little more than 60%. Further, although prime-age mortality in general is not significant, those who lost a father between 2002 and 2005 have more than 60% higher odds of answering "when god wills," suggesting that there is something unique about recently losing a father that is related to leaving fertility decisions up to fate.

Similarly, with respect to having a first birth during 2002 and 2005, I find that those who lost a father or both parents during the interval have almost 50% and more than 2 time the odds, respectively, of transitioning to first birth during the interval that those who did not. This finding is in line with recent research that there is something about orphanhood in and of itself, apart from other socioeconomic factors, that is associated with riskier sexual behavior (i.e. Thurman et al. 2006, Gregson et al. 2005). My findings add to this body of work by looking beyond sexual behavior to the transition to first birth, again finding that there is something unique about orphanhood (in this case losing a father or both parents) that leads to earlier first births.[16]

I also build on previous work by investigating whether the timing of orphanhood matters in determining outcomes. Testament to the hypothesis that the timing of orphanhood is in fact important, those who lost a father or both parents prior to 2002 had about 30% and 55% *lower*

[16] Although I did not find a similar effect among maternal orphans, this may be because of the extremely small sample size. Indeed, whereas 144 young women lost their father between 2002 and 2005, only 46 lost their mother. Prior to 2002, there were 338 paternal orphans versus 137 maternal orphans.

odds, respectively, of transitioning to first birth in the interval (this is in opposition to those who lost their parent during the interval who had significantly *higher* odds of transition to first birth). Thus, in addition to their being something unique about orphanhood (especially paternal orphanhood) in structuring reproductive preferences and behavior, there is also something distinctive about the timing of the death.

A primary limitation of these findings is that we are unable to definitively determine which came first during the interval – the loss of a parent or prime-household member or the birth. Future analyses will attempt to address these weaknesses by utilizing survival analysis techniques which will enable me to pinpoint the timing of the household shock vis-à-vis the timing of the birth. In order to get a better sense of the role of sources outside of the immediate household in mitigating the impact of the epidemic, I will include additional controls for remittances from non-household members as well as the receipt of pensions or other governmental assistance.

In future work, I will also investigate whether there are any significant interaction effects between risk perception and household shocks or reproductive preferences and household shock. Does the relationship between perceived risk and reproductive preferences and/or behavior differ when there is an HIV/AIDS-related household shock, or according to the type, timing or economic impact of the shock? Further, is there variation in the relationship between reproductive preferences and behavior according to level of risk perception and/or the occurrence of a household shock? In short, in addition to understanding *whether* HIV/AIDS-related household shocks impact perceived risk and reproductive preferences and behavior, I hope to

gain further insight into the *pathways* through which HIV/AIDS-related household shocks work to shift perceived risk and reproductive preferences and behavior.

FIGURE 1. Model of Relationships Between HIV/AIDS-Related Household Shocks, Perceived Risk of HIV, and Reproductive Preferences and Behaviors

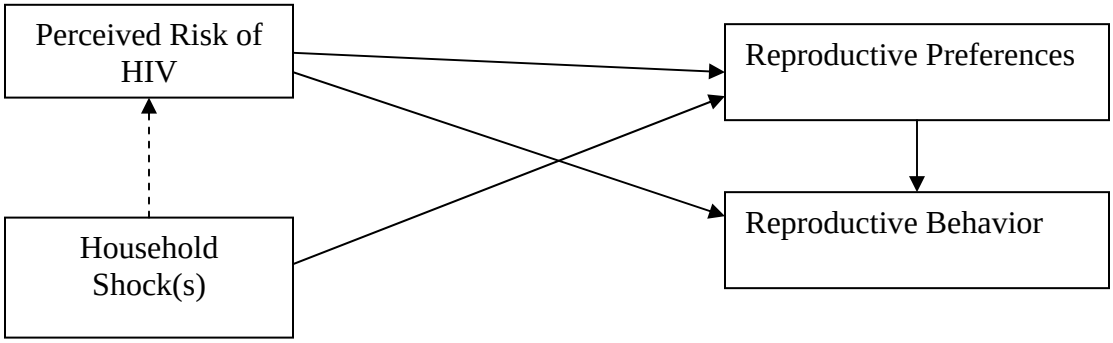

TABLE 1. MEANS OR PROPORTIONS OF VARIABLES, MEASURED IN 2002 AND 2005

	2002	2005
Perceived risk of HIV	0.43	0.52
Expect child in next 3 years	0.0839	0.2057
Average number children expect to have	2.12(.989)	2.49(1.27)
Number of children - what god wills	0.0241	0.1322
Ever had a birth	0.1299	0.3023
First birth between 2002 and 2005		0.1736
Household death/illness in last 3 years		0.2069
Death/illness had economic impact		0.1661
Death/illness had large economic impact		0.1086
Prime age death in last 3 years		0.0649
Prime age death had econ impact		0.0552
Prime age death had large econ impact		0.0466
One/both parents died	0.2293	0.2701
Paternal orphan	0.1943	0.246
Maternal orphan	0.0575	0.0787
Dual orphan	0.0224	0.0333
Know someone with HIV	0.1632	0.3259
Know someone who died of AIDS	0.2299	0.3494
Ever been married	0.0253	0.0764
Received remittances in last year		0.1184
Age (mean)	17.63(2.44)	
Population group		
African	0.4264	
Coloured	0.4747	
White	0.0989	
In school (proportion)	0.6787	
Father's years of schooling (mean)	8.77 (3.14)	
Mother's years of schooling (mean)	8.61(3.08)	
Quintile per capita income		
First	0.2768	
Second	0.2434	
Third	0.1766	
Fourth	0.1697	
Fifth	0.1335	
Shock: Divorce/Sep last 3 years		0.0207
Shock: Loss of job last 3 years		0.1557
Shock: Fire, theft, damage last 3 years		0.0385
Shock: Loss of pension last 3 years		0.0132
Shock: Loss of non-hh support last 3 years		0.0069
Shock: Other last 3 years		0.0004
N	1740	1740

TABLE 2. ODDS RATIOS AND ROBUST STANDARD ERRORS, PERCEIVED RISK OF HIV INFECTION IN 2005 (WAVE 3)

	M1	M2	M3	M4	M5	M6	M7	M8
Perceived risk (2005)								
Perceived risk (2002)	1.4705***	1.4273**	1.4504**	1.4342**	1.4359**	1.4455**	1.4427**	1.4435**
	(0.1703)	(0.1660)	(0.1687)	(0.1672)	(0.1676)	(0.1689)	(0.1688)	(0.1690)
Know HIV (2005)		1.7262***		1.7603***	1.7101***	1.7026***	1.6962***	1.7251***
		(0.2210)		(0.2266)	(0.2201)	(0.2197)	(0.2195)	(0.2241)
Know died AIDS (2005)			1.5024**					
			(0.1893)					
Prime-age death in cluster (2002-2005)				0.6979**				0.7689*
				(0.0885)				(0.1024)
Prime-age death in household (2002-2005)					0.5031**			
					(0.1086)			
Prime-age death econ impact (2002-2005)						0.4431***	0.4358***	0.5141**
						(0.1006)	(0.1012)	(0.1262)
Remittances last year (2005)							1.5042*	1.5050*
							(0.2678)	(0.2667)
Ever had sex (2005)	2.0290***	1.9768***	1.9811***	2.0069***	2.0132***	2.0239***	1.9823***	1.9937***
	(0.2797)	(0.2727)	(0.2745)	(0.2781)	(0.2781)	(0.2791)	(0.2735)	(0.2760)
Background variables measured in 2002								
African	0.9415	0.7353	0.7778	0.8627	0.7994	0.8002	0.8106	0.8953
(Reference: White)	(0.2500)	(0.2003)	(0.2124)	(0.2405)	(0.2192)	(0.2195)	(0.2226)	(0.2502)
Colored	0.5358**	0.5022**	0.5122**	0.5371**	0.5133**	0.5131**	0.5269**	0.5509*
	(0.1243)	(0.1170)	(0.1194)	(0.1260)	(0.1196)	(0.1196)	(0.1225)	(0.1289)
Age	1.0425	1.0459	1.0412	1.0453	1.0444	1.0442	1.0470	1.0469
	(0.0319)	(0.0322)	(0.0321)	(0.0322)	(0.0322)	(0.0323)	(0.0324)	(0.0324)
Enrolled in school	1.2835	1.3002	1.2801	1.3020	1.3027	1.3076	1.3080	1.3075
	(0.2013)	(0.2026)	(0.2009)	(0.2032)	(0.2038)	(0.2048)	(0.2049)	(0.2049)
Mother's years education	1.0311	1.0287	1.0296	1.0289	1.0309	1.0330	1.0325	1.0317
	(0.0246)	(0.0247)	(0.0246)	(0.0248)	(0.0247)	(0.0248)	(0.0246)	(0.0247)
Father's years education	0.9792	0.9754	0.9786	0.9750	0.9758	0.9745	0.9741	0.9740
	(0.0225)	(0.0224)	(0.0225)	(0.0225)	(0.0226)	(0.0225)	(0.0225)	(0.0225)
Log household per capita income	1.0203	1.0235	1.0258	1.0188	1.0177	1.0148	1.0138	1.0121
	(0.0698)	(0.0701)	(0.0701)	(0.0701)	(0.0700)	(0.0699)	(0.0699)	(0.0700)
Log Likelihood	-1144.72	-1134.86	-1139.19	-1130.66	-1130.64	-1129.76	-1126.64	-1124.62
LR Chi Square	100.25	115.06	109.47	123.56	122.73	126.72	127.90	132.41
BIC	2364.06	2351.81	2360.47	2350.86	2350.83	2349.07	2350.28	2353.70
N	1740	1740	1740	1740	1740	1740	1740	1740

†p<.10, *p<.05, **p<.01, ***p<.001

TABLE 3. ODDS RATIOS AND ROBUST STANDARD ERRORS, EXPECT CHILD IN NEXT 3 YEARS, ASSESSED IN 2005 (WAVE 3)

	M1	M2	M3	M4	M5	M6	M7	M8	M9
Expect child (2005)									
Expect child (2002)	1.3753	1.3749	1.3921	1.3795	1.3841	1.3731	1.3730	1.3714	1.3976
	(0.3205)	(0.3213)	(0.3242)	(0.3219)	(0.3226)	(0.3199)	(0.3195)	(0.3190)	(0.3263)
Perceived risk (2002)	0.9973								
	(0.1491)								
Perceived risk (2005)		0.9962							1.0000
		(0.1442)							(0.1467)
Know HIV (2005)			1.1865						1.1790
			(0.1960)						(0.1978)
Know died AIDS (2005)				1.0317					
				(0.1669)					
Prime-age death in cluster (2002-2005)					1.2778				1.2531
					(0.1959)				(0.2060)
Prime-age death in household (2002-2005)						1.1144			
						(0.2773)			
Prime-age death econ impact (2002-2005)							1.2264	1.2250	1.0865
							(0.3292)	(0.3292)	(0.3089)
Remittances last year (2005)								1.0369	1.0306
								(0.2268)	(0.2254)
Ever had birth (2005)	3.9996***	4.0032***	3.9523***	3.9914***	3.9507***	3.9892***	3.9807***	0.3758***	0.3799***
	(0.8552)	(0.8699)	(0.8510)	(0.8606)	(0.8545)	(0.8629)	(0.8613)	(0.0694)	(0.0703)
Ever had sex (2005)	0.3758***	0.3757***	0.3786***	0.3757***	0.3771***	0.3759***	0.3754***	3.9705***	3.8937***
	(0.0695)	(0.0694)	(0.0700)	(0.0695)	(0.0699)	(0.0695)	(0.0694)	(0.8634)	(0.8470)
Ever been married (2005)	5.3402***	5.3384***	5.3334***	5.3431***	5.3831***	5.3585***	5.3713***	5.3933***	5.4029***
	(1.2891)	(1.2909)	(1.2825)	(1.2886)	(1.3049)	(1.2937)	(1.2972)	(1.3109)	(1.3188)
Background variables measured in 2002									
African	1.8948	1.8959	1.7503	1.8665	1.6677	1.8699	1.8573	1.8597	1.5490
(Reference: White)	(0.6463)	(0.6338)	(0.6038)	(0.6461)	(0.5816)	(0.6298)	(0.6248)	(0.6273)	(0.5546)
Colored	1.3055	1.3055	1.2783	1.3005	1.2268	1.2994	1.2969	1.3009	1.2077
	(0.3990)	(0.3940)	(0.3840)	(0.3911)	(0.3762)	(0.3910)	(0.3899)	(0.3949)	(0.3751)
Age	1.1203**	1.1203**	1.1201**	1.1200**	1.1205**	1.1205**	1.1207**	1.1208**	1.1206**
	(0.0466)	(0.0461)	(0.0463)	(0.0463)	(0.0463)	(0.0462)	(0.0462)	(0.0462)	(0.0461)
Enrolled in School	0.7403	0.7404	0.7426	0.7400	0.7384	0.7403	0.7400	0.7403	0.7406
	(0.1425)	(0.1422)	(0.1429)	(0.1424)	(0.1423)	(0.1423)	(0.1422)	(0.1422)	(0.1422)
Mother's years education	0.9910	0.9911	0.9898	0.9909	0.9907	0.9908	0.9898	0.9898	0.9890
	(0.0281)	(0.0281)	(0.0282)	(0.0281)	(0.0282)	(0.0281)	(0.0282)	(0.0282)	(0.0284)
Father's years education	1.0010	1.0009	0.9995	1.0009	1.0004	1.0008	1.0013	1.0013	0.9992
	(0.0287)	(0.0288)	(0.0288)	(0.0288)	(0.0289)	(0.0288)	(0.0288)	(0.0288)	(0.0289)
Log household per capita income	0.9876	0.9876	0.9896	0.9878	0.9893	0.9880	0.9894	0.9890	0.9917
	(0.0859)	(0.0858)	(0.0863)	(0.0858)	(0.0865)	(0.0858)	(0.0860)	(0.0860)	(0.0869)
Log Likelihood	-725.31	-725.31	-724.71	-725.29	-724.06	-725.24	-725.09	-725.07	-723.47
LR Chi Square	171.45	169.82	170.08	169.68	171.14	169.58	169.84	169.96	172.61
BIC	1547.63	1547.63	1546.41	1547.59	1545.12	1547.48	1547.17	1554.60	1573.79
N	1740	1740	1740	1740	1740	1740	1740	1740	1740

†p<.10, *p<.05, **p<.01, ***p<.001

TABLE 4. ODDS RATIOS AND ROBUST STANDARD ERRORS, WHAT GOD WILLS, ASSESSED IN 2005 (WAVE 3)

	M1	M2	M3	M4	M5	M6	M7	M8	M9
What god wills (2005)									
What god wills (2002)	0.9451	0.9230	0.9278	0.9419	0.9308	0.9298	0.9360	0.9242	0.9228
	(0.5299)	(0.5385)	(0.5405)	(0.5472)	(0.5493)	(0.5453)	(0.5498)	(0.5465)	(0.5380)
Perceived risk (2002)	1.1494								
	(0.1856)								
Perceived risk (2005)		0.3755***	0.3793***	0.3817***	0.3686***	0.3693***	0.3676***	0.3664***	0.3779***
		(0.0648)	(0.0652)	(0.0661)	(0.0639)	(0.0641)	(0.0638)	(0.0633)	(0.0655)
Know HIV (2005)			0.9067						
			(0.1819)						
Know died AIDS (2005)				0.7460					
				(0.1429)					
Prime-age death in cluster (2002-2005)					0.6852				
					(0.1369)				
Prime-age death in household (2002-2005)						0.5509			
						(0.2342)			
Prime-age death econ impact (2002-2005)							0.4507	0.6051	
							(0.2350)	(0.3195)	
Remittances last year (2005)								1.1376	
								(0.3179)	
Paternal orphan (2002-2005)									1.6627†
									(0.4563)
Ever had sex (2005)	0.4266***	0.4925***	0.4947***	0.4998***	0.4994***	0.5014**	0.5040**	0.4910***	0.4895***
	(0.0885)	(0.1028)	(0.1036)	(0.1044)	(0.1044)	(0.1052)	(0.1058)	(0.1029)	(0.1022)
Ever had birth (2005)	1.2544	1.2641	1.2589	1.2693	1.2538	1.2580	1.2649	1.3031	1.2611
	(0.2845)	(0.2862)	(0.2849)	(0.2871)	(0.2832)	(0.2849)	(0.2863)	(0.2956)	(0.2852)
Ever been married (2005)	0.5893	0.5178	0.5196	0.5130	0.5098	0.5088	0.5070	0.5064	0.5195
	(0.2073)	(0.1817)	(0.1822)	(0.1793)	(0.1783)	(0.1788)	(0.1783)	(0.1794)	(0.1838)
Background variables measured in 2002									
African	0.9652	0.9021	0.9402	1.0197	1.0514	0.9546	0.9597	1.2143	0.8689
(Reference: White)	(0.3505)	(0.3269)	(0.3371)	(0.3687)	(0.3930)	(0.3457)	(0.3471)	(0.4499)	(0.3155)
Colored	1.6245	1.3745	1.3850	1.4019	1.4508	1.3991	1.4016	1.5847	1.3624
	(0.5082)	(0.4353)	(0.4365)	(0.4423)	(0.4618)	(0.4431)	(0.4432)	(0.5050)	(0.4326)
Age	0.9708	0.9874	0.9868	0.9881	0.9866	0.9863	0.9865	0.9864	0.9863
	(0.0405)	(0.0425)	(0.0426)	(0.0424)	(0.0427)	(0.0425)	(0.0426)	(0.0426)	(0.0423)
Enrolled in school	0.7168	0.7616	0.7582	0.7584	0.7517	0.7598	0.7664	0.7480	0.7581
	(0.1481)	(0.1617)	(0.1615)	(0.1606)	(0.1603)	(0.1618)	(0.1634)	(0.1598)	(0.1607)
Mother's years education	1.0489	1.0572	1.0571	1.0584	1.0574	1.0595	1.0603	1.0541	1.0583
	(0.0370)	(0.0379)	(0.0378)	(0.0378)	(0.0378)	(0.0380)	(0.0380)	(0.0377)	(0.0378)
Father's years education	0.9758	0.9711	0.9716	0.9714	0.9701	0.9706	0.9698	0.9688	0.9728
	(0.0309)	(0.0321)	(0.0322)	(0.0322)	(0.0318)	(0.0321)	(0.0320)	(0.0317)	(0.0322)
Log household per capita income	1.1066	1.1212	1.1199	1.1142	1.1104	1.1183	1.1194	1.0752	1.1274
	(0.1124)	(0.1162)	(0.1164)	(0.1155)	(0.1152)	(0.1162)	(0.1163)	(0.1111)	(0.1176)
Log Likelihood	-700.89	-679.35	-679.21	-678.15	-677.19	-678.18	-677.71	-670.60	-677.61
LR Chi Square	57.87	83.74	84.29	85.20	86.46	84.99	86.21	95.08	88.56
BIC	1498.78	1455.69	1462.89	1460.77	1458.84	1460.82	1459.89	1460.59	1459.69
N	1740	1740	1740	1740	1740	1740	1740	1740	1740

†p<.10, *p<.05, **p<.01, ***p<.001

TABLE 5. ODDS RATIOS AND ROBUST STANDARD ERRORS, HAD FIRST BIRTH BETWEEN 2002-2005

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
Had first birth (2002-2005)										
Expect child (2002)	1.8662**	1.8732**	1.8644**	1.8620**	1.8603**	1.8349*	1.8558*	1.8471*	1.8403*	1.8190*
	(0.4481)	(0.4508)	(0.4472)	(0.4472)	(0.4466)	(0.4423)	(0.4458)	(0.4467)	(0.4467)	(0.4427)
Perceived risk (2002)	0.9187	0.9151	0.9189	0.9186	0.9164	0.9164	0.9248	0.9272	0.9308	0.9214
	(0.1394)	(0.1383)	(0.1394)	(0.1394)	(0.1393)	(0.1392)	(0.1412)	(0.1412)	(0.1419)	(0.1404)
Know died AIDS (2005)		1.0495								
		(0.1978)								
Know HIV (2005)		1.0097								
		(0.2011)								
Prime-age death in cluster (2002-2005)			0.9735							
			(0.1491)							
Prime-age death in household (2002-2005)				1.1900						
				(0.3080)						
Prime-age death econ impact (2002-2005)					1.3647	1.3549				
					(0.3698)	(0.3653)				
Remittances last year (2005)						1.3382				
						(0.2908)				
Paternal orphan (2002)							0.7092†			
							(0.1405)			
Paternal orphan (2002-2005)								1.5025†		
								(0.3605)		
Dual orphan (2002)									0.5329†	
									(0.2318)	
Dual orphan (2002-2005)										2.1282†
										(0.9065)
Shock: Job loss (2002-2005)							1.4179†	1.4303†	1.4165†	1.4259†
							(0.2733)	(0.2740)	(0.2715)	(0.2746)
Ever had sex (2002)	0.9023	0.8886	0.9029	0.9023	0.9002	0.8951	0.9068	0.9018	0.8918	0.8947
	(0.1751)	(0.1743)	(0.1753)	(0.1751)	(0.1749)	(0.1741)	(0.1753)	(0.1752)	(0.1726)	(0.1740)
Ever been married (2002)	0.2886*	0.2964*	0.2886*	0.2883*	0.2872*	0.2899*	0.2869*	0.2907*	0.2932*	0.2893*
	(0.1468)	(0.1502)	(0.1467)	(0.1465)	(0.1458)	(0.1466)	(0.1478)	(0.1477)	(0.1499)	(0.1475)
Ever been married (2005)	2.6052***	2.6097***	2.6038***	2.6170***	2.6254***	2.7089***	2.7052***	2.6538***	2.6184***	2.6708***
	(0.7101)	(0.7073)	(0.7104)	(0.7142)	(0.7161)	(0.7412)	(0.7335)	(0.7267)	(0.7146)	(0.7289)
Background variables measured in 2002										
African	8.5226***	7.7233***	8.6360***	8.3302***	8.2218***	8.2816***	8.5961***	8.0300***	8.2211***	8.1275***
(Reference: White)	(5.1366)	(4.7303)	(5.2515)	(5.0370)	(4.9744)	(5.0299)	(5.1546)	(4.8336)	(4.9416)	(4.8926)
Colored	5.0281**	4.8256**	5.0579**	4.9925**	4.9693**	5.0905**	4.9824**	4.8984**	4.8872**	4.9364**
	(2.9135)	(2.8000)	(2.9394)	(2.8955)	(2.8828)	(2.9712)	(2.8783)	(2.8310)	(2.8252)	(2.8542)
Age	1.0578	1.0573	1.0577	1.0580	1.0584	1.0590	1.0619	1.0596	1.0603	1.0584
	(0.0431)	(0.0435)	(0.0431)	(0.0430)	(0.0430)	(0.0431)	(0.0430)	(0.0428)	(0.0430)	(0.0430)
Enrolled in school	0.5570**	0.5597**	0.5569**	0.5572**	0.5563**	0.5570**	0.5623**	0.5663**	0.5615**	0.5594**
	(0.1169)	(0.1184)	(0.1170)	(0.1169)	(0.1168)	(0.1170)	(0.1189)	(0.1193)	(0.1177)	(0.1175)
Mother's years education	1.0084	1.0060	1.0084	1.0079	1.0067	1.0063	1.0106	1.0107	1.0127	1.0112
	(0.0294)	(0.0293)	(0.0294)	(0.0295)	(0.0295)	(0.0295)	(0.0302)	(0.0300)	(0.0301)	(0.0303)
Father's years education	0.9201**	0.9182**	0.9202**	0.9198**	0.9200**	0.9199**	0.9256**	0.9221**	0.9224**	0.9217**
	(0.0257)	(0.0258)	(0.0257)	(0.0257)	(0.0257)	(0.0257)	(0.0258)	(0.0256)	(0.0257)	(0.0255)
Log household per capita income	0.9401	0.9450	0.9399	0.9414	0.9432	0.9412	0.9203	0.9439	0.9289	0.9448
	(0.0862)	(0.0873)	(0.0862)	(0.0862)	(0.0865)	(0.0864)	(0.0874)	(0.0878)	(0.0868)	(0.0880)
Log Likelihood	-664.68	-663.86	-664.66	-664.49	-664.15	-663.31	-661.13	-661.44	-662.13	-661.56
LR Chi Square	110.89	115.16	111.06	111.07	112.44	112.17	118.66	114.79	117.47	115.29
BIC	1426.36	1454.57	1433.79	1433.45	1432.76	1438.54	1434.18	1434.80	1436.19	1435.04
N	1740	1740	1740	1740	1740	1740	1740	1740	1740	1740

†p<.10, *p<.05, **p<.01, ***p<.001

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