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HIV Infection and Fertility Preferences in Rural Malawi

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Abstract

Although HIV-prevalence and fertility rates in sub-Saharan Africa are among the highest in the world, little is known about how HIV infection affects the fertility preferences of men and women in the region. A quasi-experimental design and in-depth interviews conducted in rural Malawi are employed to examine how and through what pathways learning that one is HIV positive alters a person's childbearing desires. Among rural Malawians, particularly men, the desire to have more children decreases after receiving a positive HIV-test result. The motivations underlying this effect are greatly influenced by gender: women fear the physical health consequences of HIV-positive pregnancies and childbearing, whereas men see childbearing as futile because they anticipate their own early death and the deaths of their future children. Considerable ambivalence remains, nevertheless, particularly among women who strategize to live normal lives in spite of their infection, but whose definitions of "normal" vary.

The consequences of the sub-Saharan African AIDS pandemic are growing—not just in size, but also in complexity. These consequences are social, cultural, economic, and psychological, as well as biological. One often-overlooked consequence of the pandemic is how HIV infection affects the desire to have children in a context where reproduction is highly valued. Early in the pandemic, the relationship between HIV/AIDS and fertility was determined to be largely biological (Zaba and Gregson 1998; Gregson et al. 2002; Lewis et al. 2004). Both male and female fecundity were found to decline, particularly during the advanced stages of infection (Nguyen et al. 2006). As the pandemic matures, however, and people have access to more information, the relationship has the potential to become one of intention. In particular, the recent expansion of HIV testing and counseling services across sub-Saharan Africa offers people information about their HIV status before the signs and symptoms of a more advanced infection emerge. In light of the high HIV-prevalence and fertility rates in the region, intentional changes in fertility due to HIV infection could have considerable epidemiologic (through horizontal and vertical infection transmission), demographic, and programmatic implications. Taking advantage of a unique situation in rural Malawi, where few knew their HIV serostatus before testing was introduced as part of an ongoing longitudinal study, I use a quasi-experimental design and in-depth interviews to examine the evidence for an intentional relationship between HIV/AIDS and fertility.

HIV and Fertility

Just as conflicting theories and scattered evidence have been presented concerning how HIV status affects sexual behavior (Yeatman 2007; Shelton 2008), so too have its effects on fertility desires been explored and discussed. Programs arguing for the integration of family planning clinics and AIDS services are often built on the assumption that women who are

HIV positive will (or should) want to stop having children (Shelton and Peterson 2004; Allen 2005). Upon investigation, the picture that emerges from the research literature is far more complex, however.

Early research found little role for volitional changes in the relationship between HIV and fertility in Africa (Casterline 2002). This finding was certainly accurate at the population level, but also was thought to be the case among HIV-positive women for a number of reasons, not the least of which was that so few knew their HIV status (Gregson et al. 2002b). The considerable cultural, economic, and social importance of childbearing in most of sub-Saharan Africa, particularly in rural areas, was thought to contribute to the robustness of fertility desires, even in the face of HIV/AIDS infection (Setel 1995). In areas where high-fertility norms were dominant and childbearing was central to both female and male identity, early evidence demonstrated that HIV-positive women continued to want more children (Rutenberg et al. 2006). Aka-Dago-Akribi and her colleagues (1999) found in Côte d'Ivoire that the desire to have children surpassed health concerns even among HIV-positive women who knew their serostatus. Similar strong desires to continue childbearing were reiterated in qualitative research in Zambia among women who did not know their status (Baylies 2000; Rutenberg et al. 2000), in South Africa among women who did (Cooper et al. 2007), and in larger surveys in Kenya (Temmerman et al. 1990) and Uganda (Lutalo et al. 2000) where some knew their status.

Child replacement and “hoarding” are common demographic explanations for the link between fertility and mortality (Preston 1978). Some researchers hypothesized that because HIV-positive individuals are more likely to experience the deaths of their children, they might increase their fertility in order to “replace” those children who have died or to ensure that a sufficient number of children survive (Grieser et al. 2001). These processes would not be limited to those who are HIV positive, of course, and might affect individuals who fear infection or who are particularly aware—and fearful—of increasing levels of infant and child mortality. Some have speculated that HIV-positive women may seek to shorten birth-spacing and produce children more quickly in order to establish their fertility before the disease progresses (Gregson 1994; Setel 1995). This hypothesis stems from an understanding of the importance of lineage and reproduction in many African societies. Where having descendants is crucial, people who anticipate dying early may want to have children more quickly to ensure their line continues.

Some weak evidence has been advanced that is based on hypothetical reports¹ of a desire to increase childbearing because of anticipated increases in child mortality associated with HIV/AIDS (Temmerman et al. 1994; Ntozi and Kirunga 1998; Carvalho and Matthews 2006). A study conducted in Zimbabwe, however, found evidence refuting the desire for child replacement; concerns about mortality centered on respondents' perceptions of their own heightened risk of mortality—rather than those of their children—and were associated with the desire to limit family size (Grieser et al. 2001).

Other evidence suggests that HIV-positive individuals will reduce their fertility desires through mechanisms embodied in the health belief model—whereby people who consider themselves susceptible to negative health outcomes will try to avoid them if the benefit of doing so outweighs the barriers (Becker 1974; Janz and Becker 1984). Two qualitative studies from Zambia (Baylies 2000 and Rutenberg et al. 2000) found that female respondents who did not know their HIV status saw no clear relationship between HIV and fertility. Once the signs and symptoms of infection emerged, however, respondents agreed

¹The term “hypothetical” is used here to refer to data from people who are not aware of their HIV status. Thus, their discussion of what they would do if they were positive is considered hypothetical.

that women should stop having children. A dominant theme in these two studies was the notion that, as one Zambian respondent remarked, “You can’t make decisions on the basis of what you don’t know” (Baylies 2000: 83). In other words, before the physical manifestations of disease emerged to suggest that they were HIV positive, women did not know their serostatus and thus could not make childbearing decisions based on it.

Some evidence has been found that infected women fear transmitting their infection to future children and are concerned that childbearing will worsen their own condition (Gregson et al. 1997; Rutenberg et al. 2000; Cooper et al. 2007). Although many early reports are from people who were unaware of their HIV status, a few more recent studies conducted among HIV-positive individuals provide further support for these assumptions. Desgrées-du-Loû and her colleagues (2002) conducted a prospective study of a group of HIV-positive women in Côte d’Ivoire and found high levels of unwanted pregnancies and abortion. More recently, Cooper and her colleagues (2007) interviewed 60 HIV-positive men and women in Cape Town about their fertility desires and intentions. Some of these respondents articulated concerns about infecting their partner or child and preserving their own health; for others, however, the desire to have children remained strong despite their infection.

Few large studies have looked at the relationship between HIV status and fertility preferences, and those that do tend to rely on cross-sectional data, which are poorly suited to investigating this relationship. Three studies, however, examined the relationship between HIV infection and fertility over time and are helpful for exploring changes in preferences. The first study, conducted in Rwanda by Allen and her colleagues (1993), found that in the two-year period following HIV testing and counseling, HIV-positive women with four or more children were less likely than HIV-positive women with fewer children to become pregnant. This relationship existed apart from other sociodemographic characteristics and did not emerge among HIV-negative women. The finding suggests that women who learned that they were seropositive still wanted to have children but that the strength of this motivation depended on how many children they already had.

Second, a randomized controlled study in Kenya and Tanzania designed to study changes in sexual behavior following voluntary counseling and testing also examined the incidence of pregnancy, taking prior intentions into account (Forsyth et al. 2002). Six months after testing, HIV-positive women who had not previously planned a pregnancy were more likely to be pregnant, whereas HIV-positive women who had planned a pregnancy were less likely to be pregnant (Forsyth et al. 2002). Based on their survey findings, the authors theorize that the less healthy HIV-positive women sought to have children while they still could, whereas the healthier infected women decided to postpone further childbearing to attend to their own health.

Third, a recent study conducted by Hoffman and his colleagues (2008) examined changes in pregnancy intentions following a positive HIV-test result among urban Malawian women recruited from hospital clinics. They found a reduction in pregnancy intentions over the one-year period of the study. By examining only women who are HIV positive, however, the study had no reference category with which to compare those who had learned that they are positive. This limitation is particularly serious for a study being conducted in a clinic setting where women are receiving regular counseling on family planning and HIV as part of the study.

Recently, more attention has been paid to the fertility desires of HIV-positive individuals in sub-Saharan Africa. Nonetheless, how a person’s HIV status influences his or her fertility desires is not well understood, nor are the pathways that link HIV infection and childbearing

for infected women and men in the region. Casterline (2002) and Rutenberg and her colleagues (2006) conducted meta-analyses that included research on the relationship between HIV status and fertility desires. Both studies concluded that existing research from developing countries was inconclusive, contradictory, and largely plagued by methodological limitations. Rutenberg and her colleagues observed:

While findings from these studies were mixed, where fertility rates were high and individuals achieved social status through having children, it appeared that HIV status did not have a depressing effect on fertility desires. Social, cultural, and health related factors appeared to have a larger influence than HIV status on decisions about childbearing. Research also suggested that fertility desires and intentions in these contexts were often at odds with opinions held by health professionals, as well as the general public that women who are HIV-positive should have no more children. (page 6)

The relationship between HIV infection and fertility preferences is difficult to study. Although the studies mentioned above are informative, they struggle to move the discussion forward because of a number of methodological limitations that occur mainly because an interest in HIV and fertility preferences is an afterthought rather than the main focus of the research design. The common weaknesses can be divided into five problem categories:

- *Accounting for knowledge of HIV status.* Because HIV testing became widely available only recently, most qualitative studies and some large cross-sectional studies (such as those using Demographic and Health Survey data) are based on the reports of individuals who may not know their serostatus.
- *Distinguishing volitional from nonvolitional effects.* Studies of fertility outcomes cannot easily distinguish between changes due to volition and changes due to biology and the consequences of unintentional behavior.
- *Controlling for prior fertility preferences.* Individuals who are at an elevated risk of HIV infection may have basic fertility preferences that differ from those who are at lower risk of HIV infection. For example, individuals who are motivated to have more children or have children sooner might be at greater risk of HIV infection than others as a result of having unprotected sex with greater frequency. Controlling for fertility preferences before HIV testing is important in order to limit the bias that potential prior (and often unobserved) differences might introduce.
- *Comparing HIV-positive with HIV-negative individuals.* Without a comparison group, prospective studies may make the inaccurate assumption that changes in fertility preferences among HIV-positive individuals are due to their positive serostatus rather than to unrelated changes that would occur over time and—importantly—with age.
- *Including men.* Despite the essential role of men in the reproductive process both in terms of biology and through their importance to household decisionmaking, the relationship between HIV and fertility for African men has been almost entirely overlooked in the literature.

In the analyses that follow, I use multiple methods to examine how and through what pathways a person's knowledge of her or his HIV infection influences childbearing desires. Building on the background of accumulated knowledge about fertility preferences and HIV/AIDS in sub-Saharan Africa, I hypothesize that, in the current advanced stage of the pandemic, rural Malawians who receive a positive HIV-test result will decrease their childbearing desires. I anticipate that the strongest effect will be among women, who are more involved than men in reproductive health care and the care of children.

Setting

Malawi offers an appropriate site in which to explore the effects of HIV on childbearing preferences because both HIV prevalence (12 percent of reproductive-aged Malawians are infected with HIV [NSO and ORC Macro 2005]) and fertility (the total fertility rate is six children per woman [NSO and ORC Macro 2005]) are among the highest in the world. Thus, the potential for HIV-positive childbearing and for fertility changes as a response to infection is particularly strong. As in the rest of sub-Saharan Africa, HIV in Malawi is predominately spread through heterosexual sex and mother-to-child transmission. The virus disproportionately affects women, who constitute the majority of new cases and are the primary caregivers for orphans and the sick (Chimwaza and Watkins 2004; Hosegood et al. 2007; White et al. 2007). In Malawi and throughout the AIDS-belt, people are aware that someone who appears to be healthy can be HIV positive.² Still, with people continuously caring for the sick and attending funerals (as many as three or four a month in rural areas [Smith and Watkins 2005]), the awareness is widespread that an HIV-positive diagnosis is a harbinger of ill health (Watkins 2004).

HIV testing and counseling first became available in Malawi in the mid-1990s, but until 2004 these services were accessible only to those who could afford to pay for a test at a private health clinic or were able to join a study at one of a few urban research hospitals. In 2004 and 2005, the Malawi Ministry of Health (MOH) began to scale up the availability of HIV testing and counseling to all 28 district hospitals throughout the country as well as to many rural MOH-operated hospitals and clinics (MOH 2005 and 2006). Antiretroviral therapy (ART) has been available at district hospitals in Malawi since 2005, but as of 2006, when this study was conducted, few rural Malawians in the sample areas knew someone undergoing the ART regimen.

Data and Methods

Because I am interested in causal pathways, I take a quasi-experimental approach and use multiple methods to uncover not only the occurrence of change but also its underlying motivations. First, I identify the direction and size of the influence that a positive HIV diagnosis has on fertility preferences in rural Malawi using panel data from the Malawi Diffusion and Ideational Change Project (MDICP). Second, I draw upon in-depth interview data from a subsample of HIV-positive respondents to explore the motivations behind any identified effect. Throughout, I pay particular attention to differences that exist between men and women and how the sexes differentially experience an HIV-positive diagnosis and its meaning for future reproduction.

The MDICP

The quasi-experimental approach draws on three sequential waves (2001, 2004, and 2006) of the MDICP, an ongoing panel survey conducted in rural Malawi.³ The MDICP was designed to study the role of informal networks on family planning and contraceptive decisionmaking and on the diffusion of HIV knowledge and prevention strategies. The study was conducted in approximately 120 villages in three districts of Malawi, one in each of the three regions of the country: Rumphi (north), Mchinji (central), and Balaka (south). In 1998,

²This finding is confirmed by using Measure DHS STATcompiler for all surveys within the past five years in eastern and southern Africa (<www.statcompiler.com>, accessed on 27 September 2007).

³Detailed descriptions of the Malawi Diffusion and Ideational Change Project (Susan Watkins, Hans-Peter Kohler, and Jere Behrman, principal investigators)—its study design, sample selection, data collection, and data quality—are provided in a Special Collection of the online journal *Demographic Research* devoted to the MDICP (for example, Watkins et al. 2003) and on the project website: <<http://www.malawi.pop.upenn.edu>>. MDICP was approved by the institutional review boards of the Malawi College of Medicine Research Ethics Committee and the University of Pennsylvania.

approximately 1,500 ever-married women and their husbands were randomly selected to participate in the survey; they were drawn from a complete household roster of the selected villages. The MDICP added a sample of adolescents in 2004, but they are not included in this study because the baseline for fertility preferences is drawn from the 2001 data. The sampling strategy was not designed to be representative of the national population, but in 1998 the sample characteristics closely matched those of rural Malawi, as estimated from the 1996 Demographic and Health Survey (Watkins et al. 2003). MDICP data contain information on sociodemographic characteristics, fertility preferences, and a biomarker for HIV collected in 2004.

In order to circumvent some of the limitations of previous work in this area, I exploit a unique situation in rural Malawi, which is that no one knew his or her HIV status prior to participation in the MDICP, for which HIV testing and counseling were offered door-to-door beginning with the 2004 wave. Drawing upon data concerning fertility preferences from 2001 and 2006 (no measure for fertility preferences was included in the 2004 survey), I employ difference-in-differences techniques and propensity score matching to isolate the effect of receiving a positive HIV-test result on the desire to continue childbearing.

As in all panel studies, sample attrition is a concern in the MDICP (Alderman et al. 2001). Non-negligible levels of attrition occur across each wave of the MDICP and may introduce bias into the following analyses and into the conclusions that are drawn from them. Alderman and his colleagues (2001) compare a series of panel studies from less-developed countries and find that attrition in the studies ranged from 6 to 50 percent per survey round. The MDICP falls in the middle of that range, with attrition across waves amounting to approximately 15 to 20 percent (Bignami-Van Assche et al. 2003; Anglewicz et al. 2006). Seventy-two percent of eligible respondents who were interviewed in 2001 were reinterviewed in 2006 and are included in the present study.

The Malawi Childbearing Project

The qualitative data come from the Malawi Childbearing Project⁴ and consist of in-depth interviews specifically focused on HIV and childbearing. In 2006, 58 interviews were conducted in the Mchinji district of central Malawi after the MDICP survey round. Forty-eight interviews were conducted with a random subsample of MDICP respondents stratified by age, sex, and HIV status, and ten were conducted with women at the prevention-of-mother-to-child-transmission clinic at the district hospital. I designed the in-depth interviews to explore how rural Malawians who had recently learned their HIV status perceived the relationship between HIV/AIDS and childbearing. Interviewers were instructed to ask respondents about (1) their family and fertility history; (2) their child-bearing preferences and intentions; (3) their perception of the relationship between HIV and childbearing; (4) their specific HIV-testing experience and its influence on their childbearing decisions (if this did not already come up spontaneously under [3]); and (5) stories from the community about men or women who were HIV positive and who either continued or ceased childbearing.

The survey was conducted by a group of four Malawian interviewers who spoke Chichewa and English, who had had prior experience conducting in-depth interviews, and who were trained in research with human subjects. All were from outside the MDICP sample area and were unknown to the respondents. The interviews were tape-recorded and translated and transcribed word for word from the Chichewa recording into English text by the same interviewer later that day or on the following day. Interviewers were matched to respondents

⁴Details of the data collection for the Malawi Childbearing Project (Sara Yeatman, principal investigator) are described in Yeatman 2008. The Malawi Childbearing Project and the specific analyses here were approved by the University of Texas Institutional Review Board.

by sex and were unaware of the serostatus of respondents and instructed not to probe for this information. All but two of the 48 MDICP respondents initiated the disclosure of their HIV status to the interviewer. The near-universality of this acknowledgment is testament to the rapport that interviewers established with respondents. It also demonstrates the complicated nature of stigma in rural Malawi: people may not usually talk about their HIV status, but they may be more likely to do so with an outsider than with members of their own community.

Quantitative Methods

Using difference-in-differences (DID) models with and without propensity score matching (PSM), I estimate the relationship between receiving a positive HIV-test result and the desire to continue childbearing.⁵ Potentially, DID and PSM can address many of the methodological problems inherent in studying changes that follow from HIV testing. No ethical researcher could randomize the receipt of a positive HIV-test result. The methods employed here provide ways to limit the bias introduced by selection and concerns about endogeneity. DID and PSM use counterfactual frameworks. Their key assumption is that individuals selected for participation in treatment and nontreatment groups have potential outcomes in both states: the one in which they are observed and the one in which they are not (Winship and Morgan 1999).

Difference in Differences—DID approximates a quasi-experimental design with longitudinal data by comparing individuals in a treatment group (here, those who received a positive HIV-test result) with a control group (here, those who did not receive a positive HIV-test result).

Typical panel data analyses fail to account adequately for changes that occur over time and that influence the dependent variable. This problem is particularly acute when the research deals with a dependent variable that is highly age dependent, such as fertility preferences. Difference-in-differences models focus on group-level changes between those who experienced an event and those who did not over the period when the event occurred (Abadie 2005). Testing HIV positive is, of course, not a random event. DID modeling makes a weaker assumption than randomness: it assumes that the two groups are subject to the same unmeasured influences over time, and thus that the average trajectories for the two groups would be parallel over time in the absence of the event (Meyer 1995; Abadie 2005). If no interaction occurs between the likelihood of receiving a positive HIV-test result and changes in fertility preferences over time (a reasonable assumption), this estimation technique should be appropriate (Meyer 1995).

Although HIV infection is not random, it is dispersed throughout communities in mature generalized epidemics such as the one in Malawi (Lopman et al. 2008).⁶ This dispersal is particularly common in rural environments, where greater homogeneity occurs in behavior and risk than in urban or concentrated epidemics. This characteristic of the generalized epidemic in rural Malawi makes a DID approach feasible; those who are infected are not drastically different from those who are not, and some of the differences that exist can be accounted for by adjusting for sociodemographic characteristics in multivariate regression and using propensity score matching.

⁵Both methods are relatively new to the fields of sociology and demography but have a longer history in economics (Rosenbaum and Rubin 1983; Abadie 2005).

⁶Drawing upon their work in Zimbabwe, Lopman and his colleagues conclude: “The proximate determinants did not explain the majority of new infections at the population level. This may be because we have been unable to measure some risks, but identifying risk factors assumes that those acquiring infections are somehow different from others who do not acquire infections. That they are not suggests that in this generalized epidemic there is little difference in readily identifiable characteristics of the individual between those who acquire infection and those who do not” (2008: 89).

The general idea behind DID is that the difference at pretesting is the “normal” difference between treatment and control groups (“normal” being in the absence of testing positive). The difference at post-testing is the “normal” difference plus the causal effect. The difference between these two differences, then, approximates the causal effect. Because the dependent variable is dichotomous, I use two records for each individual (2001 “pre” and 2006 “post”). The indication of whether the respondent received a positive HIV-test result between 2001 and 2006 is attached to each record. Because the observations are not independent, I control for clustering at the individual level to minimize autocorrelation. The DID logistic regression model takes the following specification:

$$\ln[P/(1 - P)] = \beta_1 + \beta_2 Post + \beta_3 HIV + \beta_4 (Post \times HIV) + \beta_5 Z + \varepsilon, \quad (1)$$

where $\ln[P/(1 - P)]$ = the log odds of desire to have another child; *Post* = 2006 survey data; *HIV* = received a positive HIV-test result between 2001 and 2006; and *Z* = the vector of sociodemographic control variables.

In interpreting the respective coefficients, β_2 identifies whether changes occurred across respondents over the time periods other than as a result of the influence of a positive HIV test. β_3 represents differences in the first time period between respondents who later learn they are HIV positive and those who do not. β_4 is the key inferential coefficient representing the impact on a respondent’s fertility preferences of learning that she or he is HIV positive; this is the effect remaining after controlling for the influence of time. β_5 estimates the influence of sociodemographic variables of interest.

Propensity Score Matching—In the later models, I use PSM with DID to minimize some of the potential bias that could be introduced by the DID assumption that individuals in the treatment and control groups are similar with regard to key covariates. PSM matches the individuals in the treatment group to individuals in the control group who have a similar likelihood of experiencing the treatment as determined by observable characteristics. I use a probit model to estimate the propensity for treatment conditional on the covariates alone, using the *psmatch2* command in STATA (Leuven and Sianesi 2003). Additional covariates that might predict the likelihood of receiving a positive HIV-test result are included in estimating the propensity score because parsimony is not required for this estimation (Harding 2003; Meier 2007). There are many types of matching in PSM; I use kernel matching because of its efficiency.⁷ Kernel matching employs all of the control cases on common support (where overlap is found in the propensities of treatment and control cases), weighted by their propensity (Morgan and Harding 2006). I use bootstrapped standard errors to estimate the propensity scores because control observations contribute to more than one match (Frisco et al. 2007). Finally, I run a parsimonious DID model using the propensity scores and weights. Analyses were performed using STATA 10.0 software (Stata-Corp 2005).

Although counterfactual techniques such as DID and PSM improve on standard longitudinal approaches, they still suffer from the problem of unobserved variables. I cannot discount the possibility that certain unobserved variables that are not adjusted for in these models influence both the propensity for treatment and childbearing desires.

⁷I tried several different matching techniques (Morgan and Harding 2006), and results did not change substantively according to the matching technique used.

Survey Measures

Fertility Preferences—The 2001 and 2006 MDICP surveys contain questions on fertility preferences. The dependent variable—the desire to continue childbearing—was captured using the question: “(After the child you are expecting is born), would you like to have a(nother) child or would you like to stop having children?” Fertility desires as measured with this question are good predictors of future fertility and are the least biased of standard preference measures (Bongaarts 1990; Thomson et al. 1990; Pritchett 1994). Response categories were closed-ended but were not read aloud. They included: (a) *have a(nother) child*; (b) *stop, no more/none*; (c) *partner deceased/left*; (d) *says she/wife can’t get pregnant*; and (e) *too old*. The variable was dichotomized such that zero signifies that the respondent did not want to have another child and one indicates that the respondent wanted to continue childbearing. Respondents who responded that their partner was deceased or had left, that they cannot have children, or that they were too old (but were within the reproductive age range) were coded as zero.⁸

HIV Testing—The key explanatory variable in the analyses is receiving a positive HIV-test result—not simply being HIV positive—because my interest is in changes that are based on the knowledge that one is infected. Respondents are assumed not to have received their HIV-test result before 2001 because HIV testing was not available in rural Malawi until the end of 2004 when voluntary counseling and testing (VCT) centers were gradually rolled out to district hospitals. The rural location of all three MDICP sites made HIV testing logistically and financially out of reach prior to this ongoing rollout except in rare circumstances.

Wave 3 (2004) of the MDICP included tests for HIV and three other STIs. Nurses collected oral swabs from consenting respondents in their homes. Respondents were able to collect their results and receive counseling and treatment for the other STIs at tents set up in a central location five to seven weeks after being tested (Anglewicz et al. 2005; Bignami-Van Assche et al. 2007). Ninety-one percent of respondents who were contacted agreed to be tested in 2004, and 70 percent returned to receive their test result. In the 2006 survey round, VCT counselors visited respondents after they were surveyed. The counselors asked a series of questions related to testing and offered all consenting respondents counseling and HIV testing using rapid HIV blood tests. The brief survey included questions about prior testing experience, where and when prior testing occurred, and whether test results were provided at that time.

Respondents are categorized as having learned that they are HIV positive between 2001 and 2006 if they either (1) tested positive for HIV in 2004 with MDICP and received their results or (2) tested positive for HIV in 2004 and did not receive their test results from MDICP but indicated in the 2006 questionnaire that they had been tested elsewhere between 2004 and 2006 and had received their results.

Other Variables—All models include basic controls for age (in five-year age groups), education (completed primary school), number of living children, marital status (married or formerly married),⁹ site (southern, central, or northern region), and sex. The female sample was restricted to women younger than 45 in 2001. Age, marital status, and number of living children are allowed to vary over the five-year period of study.

⁸This coding algorithm was considered the best at distinguishing those who most desired to continue childbearing. Various coding schemes were compared, such as dropping all responses except (a) and (b), but results did not change substantially when different coding practices were employed.

⁹In rural Malawi, marriage is nearly universal, and divorce and remarriage are common (Reniers 2003 and 2008).

An additional set of variables are included in the propensity score estimations that are not included in the simple DID models because of concerns about parsimony. These variables are markers of sexual risk that were included in the 2001 survey and are associated with HIV infections in the region. They include age at first sex, polygamous marriage, number of times married, suspicion of most recent spouse's infidelity, respondent's infidelity during most recent marriage, nonmarital partners in the past year, metal roof (a marker of household wealth in rural Malawi), and the respondent's estimation of his/her own likelihood of infection in 2001 (dichotomized into some and no likelihood) (Bracher et al. 2003; Glynn et al. 2003; Bignami-Van Assche et al. 2007; Hallett et al. 2007; Reniers and Tfaily 2008; Anglewicz and Kohler 2009)

I use mean substitution to impute missing values of the independent variables employed to estimate propensity scores, and include dummy variables to indicate where data have been imputed. None of the missing indicators was statistically significant, and results were similar to those produced using listwise deletion.

Control Group—The control group consists of panel respondents who were interviewed in 2001 and 2006 and had either tested negative for HIV or had not received their HIV-test result in 2004. This group includes HIV-negative respondents, respondents whose HIV status was unknown, and a few HIV-positive respondents who had never received their results. The starting hypothesis was that people who learned that they were HIV positive would reduce their fertility desires. Thus, the bias introduced with such a varied control group—some of whom may not have known that they were seronegative or who may have seroconverted between 2004 and 2006—should, if anything, minimize the size of the effects, on average, rather than lead to an overestimated effect.

Qualitative Methods

The qualitative analysis draws principally upon the 23 interviews with HIV-positive men and women, focusing specifically on the discussion of how learning their serostatus influenced their thinking about childbearing. I coded the in-depth interview texts for dominant themes. Initially, I coded a subsample of ten interviews based on a preliminary coding scheme developed through my discussions in the field and on a preliminary reading of the transcripts. I refined the coding scheme and used the new scheme to code all the interviews using QSR Nvivo (7.0) software. Particularly illustrative quotes (lightly edited for clarity) are highlighted and used in the text to elucidate the prominent themes.

Findings

Quantitative Analyses

The final analytic sample consists of 899 women and 622 men who were surveyed by MDICP interviewers in both 2001 and 2006, who meet the age criteria, and for whom no responses were missing for the dependent variable. Table 1 presents descriptive characteristics of the male and female samples in 2001 and 2006. Respondents are evenly distributed across the three regions of Malawi. HIV prevalence for this rural longitudinal sample is relatively low: only 5.5 percent of women and 3.0 percent of men received a positive HIV-test result between 2001 and 2006.¹⁰ Because the sample used in these analyses—the MDICP's random sample population of ever-married women and their

¹⁰HIV prevalence for the entire 2004 MDICP sample was 6.7 percent—5.7 percent of men and 7.6 percent of women. The longitudinal sample has a lower HIV prevalence rate than the entire 2004 sample because of disproportionate attrition among HIV-positive individuals. HIV-positive individuals in 2004 were more likely to have died and less likely to have been located for the survey in 2006.

partners—was selected in 1998, it tends to include those in the later stages of reproduction. The average age for women and men in 2001 is 32 and 40, respectively. Nevertheless, almost half of the women are in their twenties at the first time period (with a median age of 31), and almost half of the men are younger than 40.

The main assumption of difference-in-differences models—that the two groups are subject to the same unmeasured influences over time—is less likely to be violated when the treatment and control groups are similar in terms of covariates. Table 2 presents the characteristics of the respondents according to whether they received a positive HIV-test result between 2001 and 2006. In 2001, those who subsequently receive a positive test result are more likely than those who did not to be women, to be not married, to have fewer children, to have been married more times, and to suspect that their most recent spouse has had an extramarital relationship. They do not differ significantly along other traits (for example, age, education, region, having a metal roof, being in a polygamous marriage, and having nonmarital relationships) or along the dependent variable (desire for another child). Many of the differences that exist in 2001 can be controlled for in a DID logistic regression. A more thorough approach, however, is to use PSM to match treatment and control cases and to weight the control cases based on their similarity in propensity to the treatment cases. With propensity score matching, no differences were found at the $p \leq 0.05$ level. When the sample is divided by sex (not shown), no differences are observed for covariates for men or for women after PSM, although this result may be influenced by the smaller sample sizes.

Table 2 also shows how the desire to have another child changes over time in the treatment (tested-positive) and control (no-positive-test) groups. As expected, the desire to have another child falls in both groups over the five-year period. The treatment group had a 41 percentage point reduction (from 60.0 to 18.5) in the desire to have children, compared with a 21 percentage point decline in the control group.

Table 3 presents the results from the DID models. The first column contains results from the multivariate DID models for the entire sample, for women alone, and for men alone. In the combined model, controlling for sex, the proportion of individuals who received a positive test result and reported that they wanted to continue child-bearing is roughly one-third of what it would be expected to be in the absence of the positive test result. Using Ai and Norton's (2003) technique for interpreting interaction terms in logit models, this difference translates into a 17 percentage point reduction (not shown) in the desire to have another child as a consequence of receiving a positive HIV-test result.

When the sample is divided by sex, the influence is in the same direction but not statistically significant for women ($p = 0.12$). In contrast, men who received a positive test result drastically reduced their desire to continue childbearing. The sample size of men in the treatment group, however, is small, so this result should be interpreted with some caution.

The findings from the PSM models were similar to those from the multivariate DID models. One difference was that after matching propensity scores, the reduction in women's desire to bear children was marginally significant ($p = 0.07$). According to subgroup analysis (not shown) (Altman and Bland 2003), sizes of the effect were not found to differ significantly for men and women with either modeling technique, a result that may be due to the relatively small sample sizes of men and women who received a positive test result.

Qualitative Analysis

What is motivating these reductions in childbearing preferences? Interview data from a subsample of these same respondents closely support the survey findings. Both men and women in rural Malawi see a relationship between HIV infection and childbearing, and

those who know that they are HIV positive have already considered what their infection means for their own childbearing. The nature of their reaction, however, is highly influenced by gender: the motivations for wanting to stop having children differ systematically for men and women. Women also express greater ambivalence than men as well as conflicting emotions, affirming the weaker survey results.

Women—The dominant theme for women is a desire for normalcy. For most HIV-positive women, obtaining this desire means stopping childbearing because of concerns about physical health; for a small minority, however, normalcy means continuing to have children as usual.

Normalcy: Maintaining Physical Health: In their conversations about childbearing and being tested for HIV, rural Malawian women reveal deep concerns about the physical effects of pregnancy and childbirth on their health and, secondarily, about the potential health consequences for a new baby. These concerns about their own health during pregnancy stand out in the interviews with HIV-positive women as the main catalyst for their desire to stop having children. In particular, these women fear that pregnancy will give life to what may be a dormant infection and elicit full-blown AIDS, by which they mean serious illness and the visible signs of infection. Similar concerns are voiced by men and uninfected individuals, but they are particularly salient for women who are infected. These fears are akin to those reported elsewhere in the region by women who are unaware of their HIV status (for example, see Rutenberg et al. 2000 for Zambia and Grieser et al. 2001 for Zimbabwe).

One 29-year-old woman with two children illustrates this concern when she is asked by the interviewer how her test results changed the way she thinks about childbearing.

R: They really changed me because they found me with the virus, so when I thought about it, I thought that if I continue bearing, it means the virus will start its activeness soon.

Another woman had been seeing a traditional healer to help her have a child before she learned that she was HIV positive. During the interview, she says with emotion:

R: I do not want to have another child, but my spouse insists on having children. But I said, “No, I already have a problem. I cannot continue taking medicine that will make me have children; maybe they will also add some disease in my body. I can give birth to a weak child who will not live longer. And if the child is dead, I will also be worried and I can die because of stress.”

I: Did your spouse agree with you?

R: It is difficult for him to agree because he wants to have a child. So I just pretend as if I really want to have a child, but I know for sure that I cannot have another child.

I: Mmmh ... you pretend as if you also want to have a child?

R: [Yes] but I do not want to have a child. (HIV-positive woman, 29, one child)

The respondent articulates how her HIV status directly affects her desire to have another child. She fears for a future child's health, but she fears even more for her own health. She believes that her husband wants to have more children despite her HIV status, but that does not sway her from her determination not to do anything that would increase her chances of having another child.

Women repeatedly refer to their fears for their health when discussing the possibility of childbearing after they hear that they are HIV positive. Some women discuss concerns about passing the disease along to a new child, but the dominant concern is for their own health, a concern grown out of observations of, or stories about, other women who became ill during or shortly after pregnancy. This fear is very strong for HIV-positive women, and for many it overpowers their own desire and the pressure from others to have children. The danger that HIV-positive women associate with childbearing is threatening, but it is also seen as avoidable. By avoiding pregnancy, women believe they can keep the virus from “starting its activeness” and live longer, healthier lives.

Normalcy: Maintaining a Reproductive Life: A smaller group of women report that they want to have children in spite of their HIV infection. For them, childbearing and the normalcy it signifies eclipses fears related to HIV/AIDS. One of the women in the sample who does not reveal her HIV status to the interviewer expresses this point of view:

I: What did you do after hearing your HIV results?

R: I did something.

I: What did you do?

R: I just said it is none of my business.

I: I beg your pardon?

R: I just left this aside; I have got nothing to do with this. The most important thing to me is I will still have children. (HIV-positive woman, 25, three children)

Women who are infected with HIV want, above all, to continue living a normal life until they become ill. For some, this means avoiding pregnancy to stave off illness. For others, a normal life means bearing children. The woman cited above does not reveal her serostatus during the interview, but she also gives the impression that she hides it even from herself as she focuses on the overarching goal of having children. She may also believe the widely held idea that having children while infected is especially dangerous, and for her, having children is too important to consider the other potential consequences.

HIV-positive women in rural Malawi live with an internal conflict: they must choose between ending their childbearing out of fear that the disease will harm them or their children and bowing to cultural pressure, both internally and externally imposed, to bear children. Such a conflict may be particularly strong among women who have not yet had children (possibly because of the biological effects of HIV/AIDS). One 28-year-old HIV-positive woman and her husband, married for five years and with no children, speak about being ostracized by their communities—not because of their HIV status but because of their inability to have a child. Although the infection is potentially a private affliction (at least until symptoms become visible), childlessness is invariably a public one, the shame of which extends beyond the couple themselves. The wife describes how her husband was told to leave her because they failed to have children:

They used to insult him, to say just leave her and marry another one who will bear you children. There is nothing that you will do there [you will never be able to have children together]. But my husband loves me a lot. Had it been that he obeys that, that he obeys what his mother says, we would be divorced already. But because a man is a man, he doesn't fail to talk about this issue. So I just say, “What should I do? Should I steal a baby in the hospital? Should I steal? If I am not conceiving, what should I do? Should I steal? If you want, you can marry another wife and bear children with her. I am not able to bear.” (HIV-positive woman, 28, no children)

This woman knows that she is physically unable to bear children. She is often ill. Before she knew her HIV status, she had a number of pregnancies that ended in miscarriages or infants' deaths. Even her mother advises her to stop trying to become pregnant because it will only "encourage the virus which is hiding in you to start its duties." Still, more than anything, she wants to have children, and she mentions extreme ways of obtaining them, such as stealing or having her husband marry another woman. She knows she is HIV positive but her fears about being ill and pregnant pale in comparison to her distress about not having children. She would be delighted to have a child, and her HIV status barely influences this desire.

Her husband was also interviewed. When asked how his thoughts on childbearing have changed after learning that he and his wife are HIV positive, he replies, "My understanding of childbearing is that whether I will have children or not, that's how God created me." Like his wife, he wants to have children. This desire decreased but did not disappear when he learned he was infected with the virus. His response to the question is one of resignation. He wants children, but at the same time he has accepted that he will probably not have them, and he is not nearly as consumed as his wife is by that likelihood.

Men—As with most women, men in rural Malawi plan to have fewer children when they learn that they are HIV positive. Their motivation, however, differs considerably from that of women. Men anticipate death—both their own and that of their future children. This anticipation erodes the main motivators for having children in rural Malawi. If a man will not live long enough to benefit from his children through their labor or old-age support, why continue to have them? If his children will not grow strong enough to be a source of pride, affirm his virility, or contribute to his lineage, why continue to have them? The language men use is distinct from that used by women. This language and the consistency with which similar ideas and words emerge in the in-depth interviews present a picture of how men see the relationship between HIV and childbearing.

One 47-year-old man already has eight children but recently remarried and has only one child with his 31-year-old wife. In the interview, he says that when he remarried he had intended to have a number of children with her because that was expected from each new union. "But we received this disease," he says, "so there is nothing we can do about childbearing There is no reason to continue bearing if my body is damaged." Upon receiving his positive test result, he abandoned his original plan. His choice of words describes the futility of having children when one is ill with HIV. He is clear that his plan to have more children changed completely when he learned that he was infected with the virus.

Another male respondent reiterates this idea:

I: Now, you said that you wanted four children here. But at the moment you have had only three and one died.

R: Mmmh.

I: What are your thoughts?

R: My thoughts are that now it's over since I also contracted Kadeyo [meaning a small insect, referring to HIV]. It won't be beneficial if I am to [have a child] again.

I: Why is it that you cannot have children again?

R: Because I cannot care for those children. I can leave them very soon.

I: Who told you that you can leave them very soon?

R: I alone, as I have been seeing how people die when they have this disease. (HIV-positive man, 42, two children)

This respondent uses language similar to that of the previous respondent, declaring that it “won’t be beneficial” to have more children. His childbearing plans changed as a consequence of the infection. Drawing on his own observations of the people in his community with HIV/AIDS, he expects to die soon, which makes having more children, whom he cannot benefit from or care for, seem pointless. This sentiment is widely expressed in the interviews with men. HIV-positive men associate learning of their infection with impending death. They do not necessarily think that they will die within the year but that they will die before they can benefit from future children and before they can provide for those children.

Men also feel that having children when HIV positive is pointless because the children will also die. Both infected and uninfected men identify this outcome as a key problem, using phrases such as “you bear bad fruit,” “you bear without any profit,” and “the child shall be of no use.” Rural Malawians seem to overestimate the probability of HIV spreading from sexual encounters (Santow et al. 2008) and from mother-to-child transmission. They assume that if a man is HIV positive, his children will be HIV positive and will die within a few years.

As is the case with women, the desire to stop childbearing is not universal among infected men. For some, the choice between stopping and continuing childbearing is not clear. An interview with one polygamous man illustrates this point. He is HIV positive, his first wife (to whom he is still married) is HIV negative, and his second wife has refused to be tested. He begins the interview by saying that he wants no more children from his first wife but “if I can have one, then that’s all” from his second wife. After he explains how the children’s expenses keep him from wanting more than six children (four with his first wife and potentially two with his second wife), the interviewer asks what he would decide if his income increased—would he have more? He pauses and replies, “No. When the Let’s Chat group¹¹ tested me, I tested positive, so there is no reason for me to have more children.” This is the first time HIV infection is mentioned in this man’s interview. He initiates the discussion about HIV and uses it to explain why he does not want more children, although earlier in the interview he had said that having one more would be acceptable. Later in their discussion, the interviewer asks whether his test result affected his thinking about having more children:

R: Yes.

I: How?

R: I just thought of completely stopping.

I: Before you were tested you wanted to continue having children?

R: Yes.

I: Ok. Fine. Are the test results for your second wife, with whom you said earlier that you might have another child, similar to yours?

R: No, my second wife refused to be tested.

I: Have you told her your results?

R: Yes.

I: But you think you will bear more children.

R: My second wife wants to but I don’t want to.

¹¹“Let’s Chat” is the local name for the MDICP research project.

I: Assuming she doesn't have the virus, do you think she should bear children?

R: What I am saying is that I don't want to bear children anymore.

I: Fine. You don't want to but your wife wants to, so if she coaxes you to have another child, what can you do to protect the child?

R: We hear that preventive measures are [available from] hospitals, provided you tell medical people the way you are [HIV positive]. That's what we hear.

His own clear preference is to have no more children, but he might acquiesce to having one more because his wife wants more. This example illustrates the complicated relationship between preferences, intention, and action. His preference may be clear, but his intention is less so, and the ultimate decision and outcome will depend on both partners. His first wife is using injec contraceptives to avoid having more children, and he reports that he uses condoms with her. He also uses condoms with his second wife, but by the end of the interview his intention to resist her desire for more children is uncertain.

Study Limitations

The present study goes beyond previous research on the relationship between HIV status and fertility desires by incorporating change over time and using in-depth interview data to support the survey findings and to identify pathways linking infection and the desire to have children in rural Malawi. Nonetheless, these analyses have limitations. First, the MDICP sample does not reflect the normal reproductive age distribution in rural Malawi. The original MDICP sample began as a random sample of ever-married women and their husbands in rural Malawi in 1998. Thus, at the time of interview in 2001 and 2006, the respondents were older and tended to be near the end rather than the beginning of their reproductive lives. This limitation does not affect internal validity but limits the generalizability of the findings because conclusions cannot be drawn about how a positive HIV-test result affects the fertility desires of the young or of those who have recently been married for the first time.

Second, the period between 2001 and 2006 is a long one in the reproductive lives of respondents, and a variety of external influences may affect fertility preferences during this period. I minimize this limitation by adjusting for three of the main influences on fertility desires over the five-year period—age, number of living children, and marital status—and by using propensity score matching. The direction of bias introduced by such a long gap will most likely be to minimize the effect of a positive HIV-test result because of statistical noise that increases with the length of the time period under study. The consistency of the quantitative and qualitative findings presented here, despite this sizable gap, is reassuring.

Third, as in any panel study, attrition is a factor in the MDICP, particularly where it is selective for certain characteristics. Of particular concern for this study are high levels of attrition among respondents who tested positive in 2004. Sixty-four percent of HIV-positive individuals (who were tested in 2004) were successfully reinterviewed in 2006, compared with 84 percent of respondents who tested negative (Anglewicz et al. 2006). Respondents who tested positive and received their results in 2004 were more likely to be reinterviewed (66 percent) than respondents who tested positive but did not receive their results (57 percent) (Anglewicz et al. 2006). This finding suggests that the main reason for the difference in levels of attrition is not a simple reluctance to participate because of knowing one is infected. Apparently, high attrition among HIV-positive individuals is driven by elevated mortality, hospitalization, and illness-related migration for reasons related directly to the infection rather than by knowledge of their serostatus or by the experience of HIV testing per se. The disproportionate loss to follow up due to the physical manifestations of

the disease suggests that the HIV-positive respondents who were re-interviewed are different from those not reinterviewed mainly in that they are healthier. Thus, to the extent that we can assume that those who are more debilitated by infection will be more likely to lower their fertility objectives, and that such changes are less relevant to fertility for some because they are more likely to be subfecund, the study findings probably underestimate rather than overestimate the depressive effect of receiving a positive HIV-test result on the desire for having children. We cannot rule out that some unmeasured characteristic is disproportionately represented in the HIV-positive sample that is lost to follow up and that is associated with changes in fertility preferences. Nevertheless, this possibility should not affect the study's internal validity; it may affect external validity if the sample population is not fully representative of the general population of rural Malawi.

Discussion and Conclusion

Rural Malawians adjust their fertility preferences in response to receiving information about their HIV serostatus. Although some early speculations were advanced that awareness of HIV infection would increase childbearing desires (Gregson 1994; Temmerman et al. 1994; Setel 1995; Ntozi and Kirunga 1998), no evidence is found of such an effect in this study. Rather, the study's results show that among this older, ever-married rural Malawian sample, learning that one is HIV positive prompts a reconsideration of childbearing and a desire to stop having children. The direction of the relationship between HIV infection and fertility preferences is the same for men and for women, but the size of the impact and the motivations underlying it are greatly influenced by gender. Contrary to my hypothesis—and despite cross-sectional research findings that fertility desires are higher among HIV-positive men than among infected women (Nakayiwa et al. 2006; Myer et al. 2007)—this longitudinal study found that a positive HIV-test result reduced the fertility desires of men at least as much as it did those of women.

HIV-positive men in this sample saw little point in continuing to have children in light of their infection. The explanations voiced by these men were less tied to the proximate (reproductive) processes of pregnancy and childbirth, but rather had to do with the ultimate consequences of the infection. Upon learning they were HIV positive, men tended to anticipate their own premature death. As a result, their thoughts about childbearing were focused on the future care of their children and the futility of continuing to bear children in light of their own and their children's shortened life expectancy.

In contrast, HIV-positive women in the sample were deeply concerned about the direct impact of pregnancy and childbirth on their own health. They repeated over and over the fears stated by HIV-negative women in the sample that the physical demands of pregnancy and childbirth would elicit the outward symptoms of AIDS from a latent HIV infection. When women spoke of their plans to have fewer children, their reasoning was tied to their physical health and was largely unrelated to the cultural, social, and economic rationales for having children articulated by men in the sample. Despite these fears, the relationship between HIV infection and fertility preferences was weak for women, a finding that reflects the complexities of reproduction in rural Malawi. Even HIV-positive women often feel pressure to bear children. Contraceptive use in rural Malawi is no longer uncommon, but the desire to stop childbearing altogether remains rare for women (and men), regardless of their HIV status. As Caldwell and Caldwell wrote in 1987, "A woman capable of reproduction, or anticipating that she will reproduce again, is regarded in quite a different way from a woman who can no longer reproduce or is unlikely to do so again" (page 412). The extent to which physical-health concerns overrule the desire for the normalcy of childbearing vary greatly according to the woman, her situation, and the stage of her disease.

The medical context of the HIV/AIDS pandemic is changing rapidly in Malawi and throughout the sub-Saharan region; the findings of this study, therefore, should be interpreted within the particular context in which the study took place. HIV testing and drugs to prevent the vertical transmission of HIV were recent introductions in rural Malawi toward the end of the study period. The spread of the ART regimen for HIV-positive individuals was still more recent. Nonetheless, the study provides a good framework for predicting how changes in the medical environment will influence fertility preferences in the future—for example, how the increased distribution of ART and medicines to prevent the transmission of HIV from mother to child will affect the relationship between HIV status and preferences. This study's findings suggest that the spread of ART, more than the spread of medicines to prevent mother-to-child transmission, will restore the depressed fertility of HIV-positive men and women. Improved access to—and greater faith in—the effectiveness of ART will influence the pathways that link infection with a reduced desire to have children for both men and women, particularly as the health of people with symptoms improves and they seek to resume normal childbearing lives. Early evidence suggests that this outcome is already occurring in urban Nigeria (Smith and Mbakwem 2007) and urban South Africa (Cooper et al. 2007; Myer et al. 2007).

For years no shift in childbearing desires was perceptible as a direct consequence of HIV/AIDS in sub-Saharan Africa. Fertility rates were robust despite the early consequences of the pandemic, and too few people knew their HIV serostatus for test results to factor into their choices about childbearing. This study suggests that the situation has changed, at least among an older population, most of whom already have children. Millions of men and women of childbearing age across sub-Saharan Africa are unaware of their infection. As opportunities for HIV testing spread, and to the extent that the findings from this study can be generalized, many of these men and women may plan to have fewer children or decide to stop childbearing altogether. With this change in plans, the desire for effective and locally available contraceptives will also increase. How these changes in fertility preferences are translated into actual fertility remains to be seen. In the high-fertility, high-HIV-prevalence context of rural sub-Saharan Africa, if HIV-positive men and women increasingly limit their childbearing because of their infection, this shift will have large demographic, epidemiological, and reproductive health implications.

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Table 1

Percentage of MDICP survey respondents, by selected variables, according to sex and survey year, Malawi, 2001 and 2006

Variable	Women		Men	
	2001	2006	2001	2006
Dependent variable				
Wants a(nother) child	52.7	28.0	49.5	31.0
Independent variable				
Positive test result ^a	na	5.5	na	2.6
Age (mean years)	31.9	36.9	40.3	45.3
Age (median years)	31.0	36.0	39.0	44.0
<25	20.1	2.0	1.9	0.2
25–29	20.8	18.1	14.8	1.8
30–34	19.6	20.8	20.1	14.8
35–39	20.7	19.6	15.0	20.1
40–44	18.8	20.7	14.0	15.0
45–49	0.0	18.8	13.8	14.0
50+ years	–	–	20.4	34.2
Children ever born (mean)	4.7	5.8	6.1	6.9
Living children (mean)	3.6	4.5	4.6	5.5
Completed primary education	17.6	17.6	38.7	38.7
Currently married	93.7	91.3	97.9	97.3
Times married (mean)	1.5	na	1.7	na
Age at first sex (mean years)	16.3	na	18.2	na
Some likelihood of infection	33.0	na	24.9	na
In a polygamous marriage	25.6	na	11.6	na
Had extramarital relationship	2.1	na	16.6	na
Suspects spouse had extramarital relationship	26.3	na	3.9	na
Had nonmarital relationship in past year	2.8	na	8.7	na
Metal roof on house	9.1	na	9.0	na
Residence				
Southern region	33.7	33.7	28.6	28.6
Central region	33.8	33.8	36.3	36.3
Northern region	32.5	32.5	35.0	35.0
(N)	(899)	(899)	(622)	(622)

na = Not available. – = Not applicable.

^a Figure refers to a positive HIV-test result received between 2001 and 2006.

Percentage of MDICP survey respondents who received and did not receive a positive HIV-test result between 2001 and 2006 and t-tests for significant differences, by selected characteristics, according to survey year, Malawi, 2001 and 2006

Table 2

Characteristic	Received a positive HIV-test result between 2001 and 2006				T-test for differences in 2001 (n = 1,521)	
	Yes (treatment) (n = 65)		No (control) (n = 1,456)		Before PSM	After PSM
	2001	2006	2001	2006		
Wants a(nother) child	60.0	18.5	51.0	29.9	1.42	0.67
Male	24.6		41.6		-2.73**	-1.44
Age (mean years)	33.7	38.7	35.4	40.4	-1.38	-0.71
Number of living children (mean)	3.0	3.8	4.1	5.0	-3.54**	-1.89
Currently married	87.7	78.5	95.7	94.4	-3.04**	-1.11
Completed primary education	29.2		26.1		0.56	0.25
Residence						
Southern region	35.4		31.5		0.67	0.31
Central region	35.4		34.8		0.09	0.04
Northern region	29.2		33.7		-0.75	-0.36
Some likelihood of infection	32.3		29.6		0.47	0.16
Metal roof on house	13.9		8.9		1.37	0.65
Age at first sex (mean years)	16.4		17.1		-1.41	0.70
Times married (mean)	1.9		1.5		3.36**	1.69
In a polygamous marriage	20.0		19.8		0.03	0.03
Had extramarital relationship	10.8		7.9		0.83	0.36
Suspects spouse had extramarital relationship	26.2		16.7		1.98*	0.84
Had nonmarital relationship in past year	7.7		5.1		0.93	0.32

* Difference significant at $p \leq 0.05$;

** $p \leq 0.01$.

PSM = Propensity score matching.

Table 3

Odds ratios for MDICP survey respondents' likelihood of reporting that they want to have another child after they have received a positive HIV-test result, using difference-in-differences (DID) models with and without propensity score matching, Malawi

Desire for another child	DID logistic regression ^a	(n)	DID with propensity score matching ^b	(n)
All respondents				
Control observations	1.000	(65)	1.000	(65)
Treatment observations	0.321 **	(1,456)	0.389 **	(1,456)
Women				
Control observations	1.000	(49)	1.000	(49)
Treatment observations	0.457	(850)	0.489	(850)
Men				
Control observations	1.000	(16)	1.000	(16)
Treatment observations	0.117 *	(606)	0.185 *	(606)

* Difference significant $p \leq 0.05$;

** $p \leq 0.01$.

^a Adjusts for differences in 2001, time period, age (2001 (2006), marital status (2001 (2006), living children (2001 (2006), sex, education, and region.

^b Propensity scores matched on variables listed in footnote ^a in 2001 and on having a metal roof, age at first sex, number of times married, likelihood of being infected, being in a polygamous marriage, having had extramarital partners, suspecting spouse has had extramarital partners, and having had nonmarital partner(s) in past year.