The Effects of HIV-Related Health Services on the Relationship between HIV Status and Fertility Preferences and Contraceptive Use in Zambia

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Introduction

Recent trends in the increased availability of HIV-related health services in sub-Saharan Africa, the region currently accounting for 67 percent of people living with HIV (UNAIDS and WHO 2009), introduce new questions about how HIV affects people's childbearing desires and reproductive behaviors. The expanded coverage of anti-retroviral therapy (ART) for people living with HIV; in particular, drug treatment for HIV-positive pregnant women to lower the risk of transmission to their babies and anti-retroviral therapy for HIV-positive people to improve their quality of health by reducing the symptoms of the disease and lengthening their life expectancy. As of the end of 2008, an estimated 44 percent of people in sub-Saharan Africa needing ART were receiving it (UNAIDS and WHO 2009), and the percentage of HIV-positive pregnant women who received drug treatment to prevent transmission to their babies increased from 9 percent in 2004 to 45 percent in 2008 (WHO, UNICEF and UNAIDS 2009). While about half the population in need is still without treatment, the implications for people's health and for having children without HIV are very different now in sub-Saharan Africa than they were just a decade ago.

Prior arguments about HIV and childbearing desires and pregnancy prevention, in the absence of widespread prevention of mother-to-child transmission (PMTCT) and antiretroviral therapy (ART) generally, were that the actuality or perception of being HIV-positive could lead people to want to stop childbearing for a variety of reasons, including uncertainty about how long they will live to be able to take care of their children, worry about who will take care of their orphaned children should they die, fear that newborn children will be infected or concerns that pregnancy may negatively affect the mother's health. Other arguments were that social and cultural factors, particularly the need to prove one's fertility and to carry on the family lineage, would have a greater influence on fertility intentions than HIV status (Cooper et al. 2007; Temmerman et al. 1994). As with fertility intentions, expectations about how HIV status would influence contraceptive behavior have also been in both directions: being HIV-positive could make one more likely to use contraception (because of an increased motivation to avoid further childbearing) or less likely to use because of concerns about side effects or interactions with HIV status (Baek and Rutenberg 2005).

Available study evidence has not been conclusive about these associations. For example, longitudinal data from a clinical trial in Malawi showed that HIV-positive women were three times more likely to change from wanting more children to wanting no more children over a 12-

month period compared to HIV negative women, and more than half as likely to change from wanting no more children to continue childbearing (Taulo et al. 2009). Despite these divergent fertility desires, pregnancy rates were comparable among both groups over the 12 month follow-up period. A study in Kenya found that HIV-positive women were less likely to use contraception compared to HIV-negative women, even though HIV positive women were much more likely to say that they did not want any more children (Baek and Rutenberg 2005). A two-year study in Rwanda of HIV and hormonal contraceptive use, one of the most commonly used methods in the country at that time, also found that HIV-positive women were less likely to use hormonal contraceptives after learning their status compared to HIV-negative women, and HIV-positive women with fewer than four children at baseline had a higher pregnancy incidence than women with four or more children (there was no difference among HIV-negative women) (Allen et al. 1993).

However the increased availability of drugs that substantially decrease the probability that HIV is transmitted from mother-to-child and increase the number of years spent in good health for people living with HIV now create questions about the prior arguments about HIV status and fertility preferences and reproductive behavior. Studies that focus on adults receiving ART give some hint as to the possible effects that increasing access to ART may have. For example, a cross-sectional quantitative South African study of HIV-positive patients attending an ART service facility found that the desire to have children increased with duration of ART treatment among females, but not among males attending (Myer et al. 2007). Another cross-sectional study of women attending an HIV clinic in Uganda found greater fertility desire among women on ART compared to those who were not but no evidence of a higher likelihood of pregnancy or live birth in the three years prior to the interview (Maier et al. 2009). A recent prospective study of HIV positive women on ART in rural Uganda showed that while few women desired to have more children throughout the three-year study period, pregnancy incidence increased over the study period as the result of an increasing proportion of women resuming sexual activity over time, few women using permanent or semi-permanent contraceptive methods and inconsistent condom use (Homsy et al. 2009).

While studies of people living with HIV and receiving ART are useful, the fact remains that the majority of adults of reproductive-age in many sub-Saharan African countries still do not know their HIV status (Mishra et al. 2009). Most people may suspect their HIV status but do not know with certainty and are thus making decisions based on their perceived risk. This study utilizes

data from representative community-based survey of adults that reflect this reality of perceived versus known HIV status. The data include information on people's HIV status as reported by them and knowledge of HIV-related services to examine the ways that the spread of HIV-related services modify (or not) associations between HIV status and fertility preferences and contraceptive behavior. This study is one of the first using data from the general household-based population (and not from facility-based studies or people recruited for a clinical trial) to provide insight into whether and in what direction expanding health services may transform women's and men's fertility preferences and contraceptive behavior in the context of HIV.

Data and Methods

Data for this study come from a fairly large community-based survey of women and men conducted in Zambia in 2009. The study received approval from the Guttmacher Institute's IRB as well as from the University of Zambia Biomedical Research Ethics Committee. The survey was carried out in three provinces, Lusaka, Northern and Southern Provinces. The provinces were selected to reflect variations in the levels of HIV, fertility and contraceptive use using the findings from the 2007 Zambia DHS[1]. Various combinations of the measures indicated above were considered to select the three provinces that account for some important variations across Zambia.

1. Lusaka Province - with high HIV prevalence (20.8% in 2007), medium TFR (4.1 in 2007) and medium contraceptive use (39.6% contraceptive prevalence rate in 2007)
2. Southern Province - with medium HIV prevalence (14.5% in 2007), high TFR (6.7 in 2007) and medium contraceptive use (39.1% contraceptive prevalence rate).
3. Northern Province - with the lowest HIV prevalence (6.8% in 2007), high TFR (7.9) and low contraceptive use (16.9% contraceptive prevalence rate).

The goal of selecting the three provinces was also to include urban and rural diversity and capture regional or ethnic variation although not necessary to the goals of this study. Besides, the HIV epidemic in Zambia was more or less evenly spread in major population groupings.

A target sample of 2600 females (aged 18-49 years) and males (aged 18-59 years) of reproductive age was selected. The 2,600 sample size estimate was based on an overall proportion of 30% (the approximate proportion of women who want no more children or women who are currently using any method in the 2007 Zambia Demographic and Health Survey (ZDHS) and a detectable difference of 5% (the approximate difference on these two outcomes

between those who, in answer to a survey question, perceive themselves at high risk of HIV and those who perceive themselves at lower risk). An alpha of 0.05 and statistical power of 80% yields an approximate sample size of 2,600.

This sample was sub-sampled from the sample for the 2007 ZDHS. This minimized costs and optimised the usage of survey amenities in Zambia. The 2007 ZDHS sample was designed to provide estimates of population and health indicators at the national and provincial levels. The sample was designed to provide specific indicators including reproductive health indicators and HIV prevalence for each of the nine provinces in Zambia. The sampling frame of the 2007 ZDHS was the listing of enumeration areas (EAs) from the 2000 Census of Population and Housing. In the 2000 Census program, the whole Zambia was divided into EAs of about the same size. Therefore, all households in Zambia had a chance of being selected into the ZDHS sample excluding those omitted purposively from restricted areas such as military barracks. There were 16,757 EAs in the 2000 Census of Population and Housing out of which 320 were selected for the 2007 ZDHS with probability proportional to the size of the EA. However, permission to access one was not given[1].

The sample for the 2007 ZDHS was stratified by separating every province into urban and rural areas. Therefore, the nine provinces were stratified into 18 sampling strata. EAs were selected independently in every stratum, first at the Census Supervisory Area (CSA) level and then at the EA level. The Central Statistical Office demarcated all political administrative areas such as provinces into CSAs. CSAs were either in rural or urban areas. CSAs were then divided into EAs. Implicit stratifications and proportional allocation was achieved by sorting the sample frame according to the geographical/administrative order and by using a probability proportional to size. Households in the 319 EAs were listed. Out of the listed households, 25 on average were selected for each EA by equal probability systematic sampling. Out of these EAs, those in Southern, Northern and Lusaka provinces were sub-sampled for the HIV status and achieving fertility desires community survey.

The sample was selected indirectly by first selecting the households. The number of households to be selected was determined by the ratio of households to completed interviews of the population 15 years and older observed in the 2007 Zambia Demographic and health Survey. The ratio of interviewed males and females to the number of selected households was found to be 1.8 in Southern Province, 2.2 in Lusaka Province and 1.6 in Northern Province in the 2007 ZDHS[1]. In order to yield the sample size of 2600 women and men, the number of EAs to be

selected if 25 households on average were selected from each EA by equal probability systematic sampling was 60 of which 38 were in rural areas and 22 in urban areas. This also took into account a response rate of 96.4 among women and 88.7 per cent among women. In Lusaka Province, 17 EAs were allocated out of which 5 were in rural areas and 12 in urban areas. In Southern province, a total of 18 were allocated, 14 in rural areas and 4 in urban areas. In Northern Province, 25 were allocated, 19 in rural areas and 6 in urban areas. The total sample of 2,600 was allocated to the provinces proportional to its projected population of 2009 distributed by urban and rural areas. The projected populations were obtained from the Central Statistical Office[2]. Two of the three provinces included in the study, Northern and Southern Province were predominantly rural while Lusaka was predominantly urban. At the end of the survey, a total of 2,401 respondents, 1,280 women and 1,121 men, were successfully interviewed. The current paper used information for the 1234 women and 1070 men who reported ever heard about HIV.

Since the survey used probability sampling approach to select the respondents, two sets of weights were developed and applied to the data namely households weights and individual weights for males and for females. The household weight for a particular household is the inverse of its household selection probability multiplied by the inverse of the household response rate of the EA and by the adjusted base weight obtained from the ZDHS. The individual weight of a respondent's case is the household weight multiplied by the inverse of the individual response rate of the EA. The individual weights were done separately for each EA. The weights were normalised for the total number of women or men successfully interviewed in the strata.

We examine two outcome variables for both women and men. The first outcome variable is desire for a/another birth, which is obtained from responses to a DHS type question "Would you like to have a/another child, or would you prefer not to have any (more) children?" (If pregnant, the question was prefaced by "After this pregnancy …") and is defined as a two-category variable taking on the value of 1 if the respondent wants more children and 0 otherwise. Those who said they were unsure were treated as wanting more.

The second outcome variable, current use of any method among sexually-active women and men, is measured from survey responses to another DHS type question "Are you currently doing something or using any method to delay or avoid getting pregnant?" This variable is defined as 1 if a married person or an unmarried individual who is sexually active (i.e. has had sex in the

three months prior to the survey) responded affirmatively to the question, otherwise it assumes the value of 0.

HIV status, the key independent variable, is based on self reports of status emanating from a series of questions beginning with "Have you ever been tested to see if you have the AIDS virus?" Those who said "yes" were asked follow-up questions, including "How long ago were you last tested for the AIDS virus? "Did you get the results of that test? Those who responded affirmatively to this last question were then asked "Would you tell me your HIV test results?" with a noted that says that "Please know that I will keep this information confidential". From the responses to these questions, the HIV status variable was created with the following three categories 1) HIV positive; 2) HIV negative; 3) HIV status unknown.

The HIV/AIDS related service variables considered in this paper are 1) knowledge about antiretroviral drug (simply referred to in the paper as knowledge of ART) and 2) knowledge about prevention of mother to child transmission drug (referred to here as knowledge of PMTCT). Each of these variables was constructed from respondents' answers to two questions on the respondents' awareness of the existence of a drug for this purpose and what they think about the efficacy of the drug.

*Knowledge of Antiretroviral Therapy (ART)***:** First each respondent who has heard of HIV was asked "Have you heard about special antiretroviral drugs (USE LOCAL NAME) that people infected with the AIDS virus can get from a doctor or nurse to help them live longer? Those who said "yes" to this question were asked a series of follow-up questions including, "Do you know of any place that gives these drugs to people with the virus that causes AIDS?" and "Do you think that these drugs work all of the time, some of the time or none of the time?" We used responses to the first and the last questions indicated above to create the knowledge of ART variable with four categories, namely 1) Know a drug, works all of the time; 2) Know a drug, works some of the time; 3) Don't know a drug and 4) Know a drug, does not work/there is no drug. In the multivatiate analysis of the effects of the HIV related variables on fertility preference and contraceptive use this variable was defined as a dichotomous factor with a value of 1 if the respondent knew an antiretroviral drug that works all of the time or 0 otherwise.

Prevention of Mother-to-Child Transmission (PMTCT): The knowledge of PMTCT was similarly created based on direct responses to questions in the survey that reflect both their

awareness of a drug for PMTCT and their perception of its efficacy. First the respondent was asked "Can the AIDS virus be transmitted from a mother to a child?: (a) During pregnancy? (b) During delivery (c) During breastfeeding?" The respondent was also asked "Are there any special drugs that a doctor or nurse can give to a woman infected with the AIDS virus to reduce the risk of transmission to the baby" Those who answered 'yes" were then asked the following question "Do you think that these drugs prevent the baby from getting the virus that causes AIDS all of the time, some of the time or none of the time. As we did in the case of knowledge of ART we used the responses to this and the penultimate question (above) to construct the knowledge of PMTCT variable with the following four categories: 1) Know a drug, works all of the time; 2) Know a drug, works some of the time; 3) Don't know a drug and 4) Know a drug, does not work/there is no drug. In the multivatiate analysis of the effects of the HIV related variables on fertility preference and contraceptive use this variable was defined as a dichotomous factor with a value of 1 if the respondent knew a drug for preventing mother to child transmission of HIV that works all of the time or 0 otherwise.

Other demographic and socioeconomic variables included in the models are age, rural-urban residence, education, number of living children and union status. These covariates are selected because they all have been shown by previous studies to be strongly correlated with desire for more children and current contraceptive use (Adair 2007). All covariates are employed as categorical variables in the analysis and were measured at the time of the survey.

To explore the effects of knowledge of the HIV related services on the association between HIV status and the reproductive outcomes (fertility preference and contraceptive use) we needed to specify our analysis to answer two questions. First, does adding the HIV related health service variables of interest into a regression model of the effects of HIV status on each of the outcome variables alter the observed relationship between HIV status and the dependent variables? Second, does the relationship between HIV status and each of the two outcome variables depend on which category of the HIV related variables the respondent belongs? In other words, are interactions between HIV status and the HIV related health services significant in models of predictors of the outcome variables? To achieve this goal we ran a set of logistic regression models for women and men separately. First, for each sex, we fitted a regression equation modeling the effects of the six background characteristics specified in Table 1 - age, residence, education, union status, number of living children and religion – on the outcome variables (result not shown). Then we added to this equation the respondents HIV status to explore whether HIV

status has an effect on the dependent variables net of the effects of the characteristics of the respondents (Model 1 in Tables 4 and 5). In the next equation we included all of the variables in Model 2 plus the two knowledge of HIV related services variables namely, knowledge of ART and knowledge of PMTCT (Model 2 in Tables 4 and 5). Results from this model should help us answer the first question posed earlier in this paragraph. The final model incorporates into the equation in Model 2 interaction terms between HIV status and the knowledge of HIV related services variables (Model 3 in Tables 4 and 5). We look to findings from this model to answer the second question raised in this paragraph.

Since the models indicated above are nested models, with each successive model containing additional explanatory factor(s) we conducted the adjusted Wald test to examine whether inclusion of the additional parameters contributes significantly to the model. If the Wald test shows that the effects of the additional parameters is zero, it means that the model including them does not provide a better fit to the data compared to the model that excludes them, and the model with fewer parameters should be preferred as it is more parsimonious.

We begin with analysis of the distribution of respondents by background characteristics, their fertility preference and contraceptive use (Table 1) We followed this descriptive analysis with the analysis of the distribution of respondents HIV status and knowledge of the HIV related services as well as these variables gross association with the two outcome variables (Tables 2 and 3). All estimates presented in this paper are weighted national estimates. For the regression results, statistical significance is indicated at the .05, .01 and .001 levels, using two-tailed tests. The standard errors of the estimates were computed using the "svy" procedure in STATA 11 to account for the complex nature of the sampling method used in selecting respondents for the surveys (Stata Corporation, 2007).

Results

Background characteristics of respondents: The socio-demographic profiles of the female and male respondents are presented in Table 1. Almost one-third of women were under age 25 and about the same proportion were 35 years and older. The majority of women lived in rural areas. Less than 10% reported to have had no schooling and about 4 in ten had a secondary education or more. About one-third were in union and close to the same proportion have had 4 or more living children. Over 90% of women were Christians, with 51% reporting being Protestant and 25% were Catholic. Slightly more than one-third wanted to stop childbearing and about the same

proportion were using a method of family planning. The majority of the male respondents were under age 35 years and lived in rural areas. Education attainment is higher among men than among their women counterparts, with 57% of them reporting having had a secondary or higher level of education. About the same proportion of men as women were in union and close to two-thirds have had 4 or more living children. The distribution of men according to religion is similar to that of women, except that slightly more men reported being non Christians than women. Fewer men than women reported wanting to stop childbearing, but a higher proportion of men than women were currently using contraception.

HIV related variables among women: Tables 2 shows the percentage distribution of women's HIV status, knowledge of ART drugs and knowledge of PMTCT drugs and percent of women in each category of these HIV related variables that wanted more children and percent that were using contraception.

HIV Status: About 5% of women reported themselves as HIV positive, slightly over one half (54%) said they were HIV negative and the rest did not know their status (Table 2). Self reporting of HIV status is expected to be associated with under-reporting of the proportion of women (and men) who are HIV positive. Thus, while 3-5% prevalence rate is reported in the survey, the rate based on HIV biomarker obtained by the DHS in 2007 was 14.5%, about three times as high as the self reported rate. When examined in relation to desire for more children without considering the influence of any other variable, HIV status is significantly associated with desire for more children among women (Table 2). Women who were HIV positive were the least likely to want more children: 36% expressed this desire compared to 62% and 69% of HIV negative women and those who did not know their status, respectively. Women's HIV status is also significantly related to current use of contraception in the absence of any other variable. Only 31% of women who did not know their status are using a method compared to 44% and 48% of HIV positive and HIV negative women, respectively.

Knowledge of ART drugs: Sixty-one percent of women reported that they knew an antiretroviral drug and believed that it works always. Another 20% knew a drug and they perceived it works some of the time. Thirteen percent did not know that there is such a drug and 7% believed there is no such drug or knew there is one but did not think it works. When considered in relation to desire for more children in the absence of any other variable, knowledge of ART drugs did not seem to be associated with the outcome variable: 62-68% of women in all four categories wanted

more children. With respect to current use of contraception, knowledge of ART drugs is related to this outcome variable gross of the effect of other factors. While 30% of women who said there is no such drug or that the drug does not work are using a method, 45% of those who knew a drug that works always are.

Knowledge of PMTCT drugs: With respect to a drug for preventing mother to child transmission of HIV, 41% of women knew there is such drug and perceived it to be very effective (works always). About one third knew a drug and believe that it works some of the time, while almost equal proportions, 12% and 13% respectively, did not know that such a drug exists or they believed there is no such drug or that it does not work. In terms of its relationship with the two outcome variables when other factors are not considered, knowledge of PMTCT drugs does seem to be associated with desire for more children: 60-67% of the women in all categories indicated that they wanted more children. However, knowledge of PMTCT shows a significant gross association with current use of a method of family planning. The least likely group to be using a method are those who said they knew a drug but it does not work always (34%) while the most likely group to the using are the ones who said they knew a drug that worked always (47%).

HIV related variables among men: Tables 3 presents the percentage distribution of men's HIV status, knowledge of ART drugs and knowledge of PMTCT drugs and percent of men in each category of these HIV related variables that wanted more children and percent that were using contraception.

HIV status: Three percent of men reported being HIV positive. Slightly over one-third said they were HIV negative and the vast majority did not know their HIV status (Table 3). As noted above, this is definitely an underestimate as often evident from self reporting on sensitive and stigmatized behaviors and statuses and when compared with the prevalence reported from the DHS that includes HIV biomarker. With respect to the bi-variate association with desire for more children, while the pattern of the relationship is similar to that found among women whereby those who were HIV positive were the least likely to want more children, the association is not significant among men (Table 3). The same story presents itself in terms of the gross association between men's HIV status and their current contraceptive behavior.

Knowledge of ART drugs: More men than women reported knowledge of antiretroviral drugs. Sixty-four percent knew a drug and claimed that it works always and another 29% said they knew a drug and believe that it works some of the time. A very small proportion (1%) did not know there is such a drug and 6% believed there is no such drug or that it does not work. When the influence of no other factor is taken into account, knowledge of ART drugs is associated with neither desire for more children nor current use of contraception;

Knowledge of PMTCT drugs: Fewer men than women reported knowledge of a PMTCT drug that works at least some of the time (55% of men compared to 76% of women). Twenty-five percent of men did not know that such a drug exist compared to only 12% among women. In the absence of the influence of any other factor, knowledge of a PMTCT drug is significantly associated with desire for more children. About 66% of men who knew a drug that works all of the time and 71% of those who said they knew a drug that works some of the time reported wanting more children compared to 80% of those who believed there is no such drug or that it does not work. On the other hand, in the absence of any other variable, no significant relationship is detected between knowledge of this HIV related service and current use of a family planning method among men.

Effects of HIV status and availability of HIV/AIDS related services on fertility preferences

Desire for more children among women: When the effects of women's socio-demographic background variables (age, residence, education, union status, number of living children and religion) were controlled for in a logistic regression model, the effects of HIV status exerted a significant effect on desire for more children (Table 4, Model 1). Women who did not know their HIV status were about 40% more likely than HIV negative women to desire more children The adjusted Wald test of significance of the added parameters (p=005) also shows that the inclusion of the HIV status variable significantly improves the fit of the model compared to the model (not shown) that included only the socio-demographic explanatory variables. To examine the impact of knowledge of the two HIV related health services on desire for more children and their effects on the association between HIV status and desire for more children we included these variables in the next model. Neither of the two variables, knowledge of ART drugs and knowledge of PMTCT drugs, appeared as a significant predictor of the likelihood that a woman would desire more children (Table 4, Model 2). As shown by the adjusted Wald test (p = 198), inclusion of the two variables does not improved the fit of the model compared to Model 1.

To further explore whether the effects of HIV status on desire for more depends on women's knowledge of the HIV related health services, we included the interaction terms between HIV status and the HIV related health variables in the model. Although one of the interaction terms between HIV status and knowledge of PMTCT drugs emerged as a significant predictor of desire for more children, all of the interaction terms taken together did not improve the fit if the model compared to Model 2 as indicated by the adjusted Wald test (p = 344). Therefore, the most parsimonious model remains model 1. We, therefore, conclude that HIV status affects desires for more children and women who do not know their status are more likely to desire more children than HIV negative women. This relationship does not seem to be affected by women's knowledge of ART drugs or knowledge of PMTCT drugs.

Desire for more children among men: Although the introduction of the HIV status variable into a model that included men's socio-demographic characteristics as predictors of desire for more children constituted a slight improvement to the model (adjusted Wald test shows that p = 067), HIV status did not emerge as a significant determinant of desire for more children among men (Table 5, Model 1). This finding did not change when knowledge of HIV related health services variables as explanatory factors (Table 5, Model 2). Similarly, none of the HIV related factors emerged as a significant predictor of desire for more children among men when the effects of other variable are controlled. To explore whether the effect of HIV status on men's desire for more children depends on their knowledge of the HIV related health services, we ran a third model with all variables in Model 2 plus the interactions between HIV status and the two HIV related service variables. The results showed no main or interaction effect on desire for more children (Table 5, Model 3). Thus, we conclude that men's desire for more children does not seem to be determined by their HIV status. Also, there is no evidence that this conclusion is altered by men's knowledge of either ART drugs or knowledge of PMTCT drugs.

HIV status and knowledge of HIV/AIDS related health services on contraceptive behavior

Current use of contraception among women: Table 4 presents the association between this outcome and the explanatory variables of interest among women. In a model that includes women's characteristic variables and HIV status, HIV status emerged as a significant predictor of current use of contraception net of the effects of the characteristic variables (Table 4, Model

1). Women who did not know their status are about 44% less likely to be using a method than their HIV negative women. Compared to the model that includes women's background characteristics alone as predictors of current use of contraception, this model constitutes an improvement with respect to its fit to the data (adjusted Wald test indicates p = 0.002). The situation with the relationship between HIV status and current contraceptive use remained virtually the same when the effects of women's knowledge of the HIV related health services were further controlled for (Table 4, Model 2). Net of the effects of all controls, women who did not know their HIV status were about 60% as likely as HIV negative women to be using contraception. Knowledge of ART drugs also exerts an independent effect on current use of a method (Table 4, Model 2). When the effects of HIV status and the characteristic variables were controlled for, women who knew an antiretroviral drug and believed that it is effective all of the times were 40% more likely to be using a method compared to women who did not know a drug or knew one but believed that it does not work all of the time. This model also constitutes an improvement to Model 2 as shown by the adjusted Wald test (p = 0.020).

To examine the possibility that the association between current use of contraception and HIV status among women may depend on knowledge of the HIV related health services, we introduced interactions between HIV status and the HIV related services in the next model. This step resulted in non significant main effects of the HIV related health services and their interactions with HIV status (Table 4, Model 3). However, HIV status on its own remains a significant predictor of current use of contraception. Since Model 3 does not show an improvement on Model 2 (adjusted Wald test returns a p-value = 0.450), we adopt Model 2 as the most parsimonious and conclude that the effects of HIV status on women current use of contraceptive among women does not depend on their knowledge of ART drugs or PMTCT drugs.

Current use of contraception among men: Among men who had sex in the three months prior to the survey, HIV status exerts only a marginal effect on current use of contraception when the effects of their socio-demographic variables are controlled for (Table 5, Model 1). Men who did not know their HIV status were slightly less likely to be using a method of family planning compared to HIV negative men. When knowledge of ART drugs and knowledge of PMTCT drugs were added to the model, the marginal effect of HIV status disappeared (Table 5, Model 2). But neither knowledge of ART drugs nor knowledge of PMTCT drugs emerged as an important determinant of current use of a method of family planning. To check whether the

effect of HIV status on contraceptive use depends on men's knowledge of the HIV related health services added interaction terms between HIV status and the two variables. This step did not return any significant main or interaction effect of any of the HIV related variables, including HIV status (Table 5, Model 3). Given that there is no indication to suggest that Model 2 and Model 3 are superior to Model 1 in terms of their fit to the data (as indicated by the adjusted Wald test), we conclude that HIV status has only a marginal effect on men's current contraceptive use and their knowledge of ART drugs or PMTCT drugs on this relationship does not exert any impact on this relationship.

Conclusion

This study provides new information about how knowledge of availability of two HIV-related health services might mediate the impact of HIV status on women's and men's fertility preferences and contraceptive behavior. We examined this issue through multivariate analyses that explore the effects of HIV status and knowledge of antiretroviral drugs and drugs for preventing mother to child transmission of HIV among women and men in Zambia. Two reproductive preferences and behavior variables, desire for more children and current use of contraception, were examined for both sexes

The results were vastly different for women and men. Among women, HIV status is found to be a strong determinant of both their desire for more children and current use of contraception. With respect to desire for more children, women who did not know their HIV status were significantly more likely to desire more children than their HIV negative counterparts net of the effects of women's socio-demographic characteristics. This is probably because not knowing their status imposes on them the urgency to have as many children as they want before they become positive, in the event that this may happen. Although the coefficient of the effects of being HIV positive suggests that women in this category tend to be less likely to desire more children than HIV negative women, the difference is not statistically significant. The none significance of this relationship may be associated with the possibility that the HIV positive group is a mixture of two groups of women with respect to desire for more children: those who want to stop childbearing because of fear of having an HIV positive child or a child that would be orphaned and those who want to have more children so that they can have a child or many children to survive them when they die. When we examined whether the effects of HIV status on desire for more children depends on women's knowledge of two HIV related health services (ART and PMTCT) the result suggest that this is not the case. The models that include the main effects of

the HIV health services and their interactions with HIV status do not provide a better fit to the data compared to the model without them.

The results for current use of contraception among women mirrors what some other studies have found with respect to the impact of HIV status on use of a method of family planning and on unmet need for contraceptive use. Essentially, while more HIV positive women tend to desire to limit their family size compared to HIV negative women, this desire often does not translate into contraceptive use. Thus, in the current situation of Zambia, HIV positive women are not different in their current use of contraception than their HIV negative counterparts. Some have argued that this is probably because HIV positive people are afraid of the potential that contraception may independently or through interaction with their antiretroviral drugs further the progression of their illness. On the other hand, women who did not know their HIV status were significantly less likely to be using a method of family planning than women who were HIV negative. This suggests that women who did not know their HIV status tend to be successful in translating their desire for more children (compared to HIV negative women) into action by being less likely to use a method than HIV negative women. With respect to whether or not the association between HIV status and contraceptive use is influenced by women's knowledge of HIV related health services, the results show that neither knowledge of ART drugs nor knowledge of PMTCT drugs shapes this relationship. Although knowledge of ART drugs exerts an independent effect on current use of contraception, it does not in any way alter the earlier observed relationship between HIV status and current use of contraception.

With respect to Zambian men, their desire for more children was not significantly affected by their HIV status. When the effects of other variables were controlled for, the outcome variable does not differ significantly by men's HIV status. In terms of contraceptive use, the analysis shows only a marginal effect of HIV status on men's current use of contraception. This again tends to support the findings by previous studies that men's reproductive preferences and behaviors changes little, if at all, by whether or not they are HIV positive (Bankole et al, 2011). This could be due to the fact that HIV in sub-Saharan Africa is seen more as a woman's syndrome as far less men seem affected by it than women, a situation that may be due to the fact that fewer men than women know their HIV status. These factors may be responsible for men's indifference attitudes about the impact of HIV resulting in none or little consideration of it in their calculus of conscious choice regarding reproductive outcomes. While there is some evidence that the relationship between men's HIV status and desire for more children may be

influenced by their knowledge of a PMTCT drug, there is not such evidence in the case of the relationship between their HIV status and current use of contraception.

Surprisingly, knowledge of antiretroviral drugs and knowledge of drugs that are used to prevent mother to child transmission of HIV tend to play little or no independent role in determining women's and men's fertility preference and contraceptive behavior. In the currently analysis, the only significant relationship we found is between knowledge of ART drugs and current use of contraception among women. The results suggest that women who knew an ART drug and believed that it works all of the time is more likely to be using contraception. This finding seems counter intuitive. One would think that women who knew a drug and perceived it to be very effective (i.e. works all of the time) would be less likely to be using a method of family planning than their counterparts who were not aware of such drug or believed that the drug does not work all of the time or at all.

In conclusion, there is no evidence that knowledge of ART drugs or knowledge of PMTCT drugs has any effects on the relationship between HIV status and fertility preference or contraceptive use among women and men in Zambia. In the case of women in particular, where desire for more children and contraceptive use vary by HIV status the relationships do not depend on women's knowledge of the HIV related services considered in this paper. In addition, there is little evidence that knowledge of HIV related health services significantly impact women's and men's reproductive preferences and contraceptive behavior. The only indication of this potential relationship is observed between knowledge of ART drugs and women's current use of contraception. It is not clear to what extent the lack of relationship between knowledge of HIV related services and fertility preference and contraceptive behavior is a function of the fact that the vast improving access to ART and PMTCT in sub-Saharan Africa is a relatively of recent occurrence so that it is not yet entered into men's and women's calculus of conscious choice with respect to reproductive decision making. Alternatively, it is possible that women and men are not yet well familiar with these services as to properly assess their availability and effectiveness, so that their responses may contain biases that are likely to reflect the observed results. These factors may also contribute to the absence of significant interaction effects of HIV status and any of the HIV related services on the outcome variables. Given the importance of these HIV related services and their increasing availability, there is need to continue research on these relationships with a view to understanding how access to these services may shape the course of event of how

people, women and men, negotiate the terrace of living with or preventing HIV and achieving their reproductive goals.

While the data used for this study have the strength of coming from a fairly large scale community based survey with respondents selected through a probability process, and while the data include several information that are rare to come by in a DHS type of survey there are some limitations that may impact on the results. First is the fact that the information on HIV status is respondents' self report of status. We know that like other sensitive issues, HIV status is mostly likely to be underreported in a face-to-face interview. Second, the measure of knowledge of the two HIV related health services combined information from respondents' indicating that they know a drug that is given by doctors or nurses for ART and PMTCT and that they know whether the drug works all of the time, some of the time and none of the time. Apart from not being sure how factual the information about knowledge of the drug is, the information on its efficacy is at best a guess for many of the respondents. Lastly, the small size of the proportion of respondents, especially men, who reported being HIV positive and also not knowing an antiretroviral drug or knew one that does not work, may cause some of the estimates to be unreliable, especially in the models that include interactions.

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TABLE 1. Percentage distribution of respondents by basic socio-demographic characteristics according to sex, Zambia 2010

Socio-demographic Characteristics	Female %	Male %
Age		
15-24	31.35	27.12
25-34	36.79	32.50
35-49	31.86	25.57
50 & over	n.a	14.82
Residence		
Urban	46.15	41.95
Rural	53.85	58.05
Highest level of school attended		
None	9.25	4.70
Primary	49.54	37.82
Secondary or higher	41.21	57.49
Union status		
In union	65.93	65.89
Not in union	34.07	34.11
Number of living children		
0-1	32.78	41.06
2-3	30.68	21.89
4-5	19.25	17.45
6 & over	17.29	19.59
Religion		
Catholic	25.21	22.40
Protestant	50.78	46.62
Pentecostal	14.12	16.53
Others	9.88	14.45
Desire for more children		
Want more	63.43	72.19
Want no more	36.57	27.81
Current use of contraception		
Using	34.29	44.88
Not using	65.71	55.12
N of cases	1234	1070
%	100.00	100.00

TABLE 2. Percentage distribution of HIV status and knowledge of HIV related services and distribution by by desire for more children and current use of contraception among women , Zambia 2010

Characteristic	Percentage distribution	Distribution by desire for more children			Distribution by current contraceptive use		
		Want more	Total (%)	Significance	Using	Total (%)	Significance
HIV status				***			***
HIV positive	5.3	35.6	100.0		43.92	100.0	
HIV negative	53.9	61.9	100.0		47.89	100.0	
Does not know status	40.8	69.0	100.0		30.97	100.0	
Knowledge of ART							
Know a drug, works always	60.9	61.7	100.0		45.38	100.0	**
Know a drug, works sometimes	19.9	65.6	100.0		36.22	100.0	
Not sure there is a drug	12.7	67.7	100.0		37.07	100.0	
There is no drug/drug does not work	6.5	64.6	100.0		30.41	100.0	
Knowledge of PMTCT							
Know a drug, works always	41.1	59.7	100.0		47.34	100.0	**
Know a drug, works sometimes	34.8	65.7	100.0		34.05	100.0	
Not sure there is a drug	11.6	65.0	100.0		44.32	100.0	
There is no drug/drug does not work	12.5	67.8	100.0		38.48	100.0	
N of cases	1234	1234			1234		
%	100.0						

*p<=0.1 **p<=.05 ***p<=.01

Notes:

ART = Antiretroviral therapy.

PMTCT = Prevention of mother to child transmission (of HIV).

TABLE 3. Percentage distribution of HIV status and knowledge of HIV related services and distribution by desire for more children and current use of contraception among men, Zambia 2010

Characteristic	Percentage distribution		Distribution by desire for more children				Distribution by current contraceptive use		
			Want more	Total	Significance		Using	Total	Significance
HIV status									
HIV positive	3.1		58.6	100.0			46.9	100.0	
HIV negative	36.5		69.7	100.0			57.3	100.0	
Does not know status	60.4		74.4	100.0			51.7	100.0	
				100.0				100.0	
Knowledge of ART				100.0				100.0	
Know a drug, works always	64.2		70.1	100.0			56.2	100.0	
Know a drug, works sometimes	29.0		75.1	100.0			49.8	100.0	
Not sure there is a drug	1.1		65.1	100.0			79.1	100.0	
There is no drug/drug does not work	5.7		81.7	100.0			41.2	100.0	
				100.0				100.0	
Knowledge of PMTCT				100.0				100.0	
Know a drug, works always	32.5		65.5	100.0	**		57.1	100.0	
Know a drug, works sometimes	22.5		71.3	100.0			49.5	100.0	
Not sure there is a drug	24.8		75.5	100.0			55.7	100.0	
There is no drug/drug does not work	20.2		79.9	100.0			50.4	100.0	
N of cases	1070			1070				1070	
%	100.0			1.00.0				100.0	

*p<=0.1 **p<=.05 ***p<=.01

Notes:

ART = Antiretroviral therapy.

PMTCT = Prevention of mother to child transmission of HIV

Table 4. Odds ratios of the effects of HIV status and HIV related services on desire for more children and current use of contraception among women, Zambia, 2010

	Relative odds ratio of the effects of explanatory variables on desire for more children				Odds ratio of the effects of explanatory variables on current use of contraception[#]		
Explanatory variables[+]	Model 1	Model 2	Model 3		Model 1	Model 2	Model3
HIV Status							
HIV positive	0.415	0.415*	0.118**		0.747	0.741	1.397
HIV negative	R.C.	R.C.	R.C.		R.C.	R.C.	R.C.
Does not know status	1.407**	1.341	1.190		0.558***	0.595***	0.568**
Knowledge of ART[++]							
Know a drug that works always		0.765	0.780			1.395**	1.376
Know a drug, does not work always/ know no drug		R.C.	R.C.				
Knowledge of PMTCT[++]							
Know a drug that works always		0.818	0.654			1.285	1.32
Know a drug, does not work always/ know no drug		R.C.	R.C.			R.C.	R.C.
HIV status*Knowledge of art							
HIV positive* Know a drug, works always			4.113**				0.972
HIV status unknown*Know a drug that works always			1.518				1.031
HIV status* Knowledge of PMTCT							
HIV positive*Know a drug that works always			1.983				0.301
HIV status unknown*Know a drug that works always			0.900				1.069
Adjusted Wald test (Prob > F)	0.005	0.198	0.344		0.002	0.020	0.450
Number of cases	1234	1234	1234		950	950	950

R.C. = Reference Category

*p<=0.1 **p<=.05 ***p<=.01

Notes: Ns are unweighted

+ The socioeconomic variables included in Models 1 through Model 3 are age, residence, education, union status number of living children and religion (results not shown).

Model was estimated for women who had sex in the last 3 months.

++ For the regression analysis we combined the last three categories of the HIV related services variables in Table 2 into one category.

Table 5. Odds ratios of the effects of HIV status and HIV related services on desire for more children and current use of contraception among men, Zambia, 2010

	Relative odds ratio of the effects of explanatory variables on desire for more children				Odds ratio of the effects of explanatory variables on current use of contraception[+]		
Explanatory variables[+]	Model 1	Model 2	Model 3		Model 1	Model 2	Model 3
HIV Status							
HIV positive	0.496	0.528	0.861		0.750	0.720	4.411
HIV negative	R.C.	R.C.	R.C.		R.C.	R.C.	R.C.
Does not know status	1.254	1.199	1.572		0.767*	0.792	0.761
Knowledge of ART[++]							
Know a drug that works always		0.781	0.773			1.174	1.262
Know a drug, does not work always/ know no drug		R.C.	R.C.			R.C.	R.C.
Knowledge of PMTCT[++]							
Know a drug that works always		0.867	1.388			1.096	0.954
Know a drug, does not work always/ know no drug		R.C.	R.C.			R.C.	
HIV status*Knowledge of ART							
HIV positive* Know a drug, works always			1.611				0.198
HIV status unknown*Know a drug that works always			1.006				0.929
HIV status* Knowledge of PMTCT							
HIV positive*Know a drug that works always			0.216				0.528
HIV status unknown*Know a drug that works always			0.471				1.347
Adjusted Wald test (Prob > F)	0.067	0.533	0.172		0.171	0.600	0.474
Number of cases	1070	1070	1070		847	847	847

R.C. = Reference Category
*p<=0.1 **p<=.05 ***p<=.01
Notes: Ns are unweighted
+ The socioeconomic variables included in Models 1 through Model 3 are age, residence, education, union status number of living children and religion (results not shown).
# Model was estimated for men who had sex in the last 3 months.
++ For the regression analysis we combined the last three categories of the HIV related services variables in Table 2 into one category.