How Many and How Soon?
A Longitudinal Analysis of Fertility Intentions in Rural Mozambique

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Abstract:
Given the unpredictability of social, economic, and demographic outcomes in sub-Saharan Africa, some demographers have argued that women difficulty forming long-term plans for fertility and have challenged the utility of reported desires to stop childbearing. But despite these conceptual challenges, intentions to stop childbearing have predictive power. This paper uses three waves of survey data collected in rural southern Mozambique to study stability and change in fertility intentions. We analyze the effect of births, child deaths, marriage and marital dissolution, and changes in individual and household social and economic conditions on both the desire to stop childbearing and desired fertility timing. Results show that both demographic events and socioeconomic change influence intentions to stop childbearing. Among women who want children, desired timing of childbearing reflects concerns about birth spacing, but also may indicate a tentative desire to stop having children.

Fertility intentions are central to demographic theories of the transition from high to low fertility. According to Coale's (1973) seminal formulation, fertility will fall when childbearing falls within "the calculus of conscious choice"– that is, when fertility becomes something that individuals can make deliberate decisions about. Other formulations of demographic transition theory focus on the content of fertility intentions, rather than their formation. For example, Caldwell's restatements (1976, 1980) revolve around explanations for why people might want few rather than many children. Although there is variation in theoretical scope and emphasis, most demographic theories adopt some version of a "target" model of fertility, under which women (or couples) have a relatively stable desired family size, plan to stop childbearing once they reach that target, and are able to implement their plans with some degree of success. The transition to controlled fertility is assumed to be a transition to this model.

The relevance of the target model of fertility control in sub-Saharan Africa has been questioned. Given the unpredictability of social, economic, and demographic outcomes in the region, it may be difficult for women to make long-term plans for fertility. In contexts of economic or marital uncertainty, women may prefer to "wait" – sometimes indefinitely – for the next child rather than express clear desires to stop childbearing altogether (Agadjanian 2005; Timaeus and Moultrie 2008). Women's reported intentions to stop childbearing and desired family size do not always align with each other or with evidence of parity-specific control (Johnson-Hanks 2007). Where fertility decline has taken place in the region, it appears to occur via longer birth intervals and contraceptive use for spacing across all parities, rather than through parity-specific control (Caldwell, Orubuloye, and Caldwell 1992; Cohen 1998). But despite these conceptual challenges, intentions to stop childbearing have empirical meaning: they predict individual-level fertility and contraceptive behavior, at least in the short term, and are associated

with change over time and cross-national variation at the aggregate level (e.g., Bankole 1995; Bongaarts 1992; Hayford and Agadjanian 2012; Kodzi, Johnson, and Casterline 2010; Westoff 1990). In order to understand fertility change in sub-Saharan Africa, it is necessary to study both the contexts where target models of fertility hold and the limitations of these models.

In this paper, we use data from three waves of survey data collected in rural southern Mozambique to study stability and change in the desire to stop childbearing and in desired timing of the next birth. With a few key exceptions, past research on the determinants of fertility intentions has been cross-sectional. Yet the target model of fertility is inherently a life course model, and a full understanding of the empirical and conceptual utility of the model requires longitudinal data. This paper describes aggregate and individual-level change in fertility intentions over three waves of data collection spanning a five-year period and applies multivariate models to assess the degree to which these changes are shaped by purely demographic factors (age, parity) and by other individual and household characteristics. The analysis devotes special attention to two distinctive components of the social environment, men's migration and concerns about HIV.

Stability and change in fertility intentions

Accounting for the influence of changing conditions on fertility intentions is important because a central criticism of the relevance of intentions to stop having children in sub-Saharan Africa has been the unpredictability of social, economic, and demographic outcomes in the region (e.g., Agadjanian 2005; Johnson-Hanks 2006, 2007; LeGrand et al. 2003). The aftermath of colonization, structural adjustment policies, and incomplete integration into the global economy have led to uneven economic development marked by booms and busts and wide regional variation. Across much of the continent, political regimes gain and lose power under

unpredictable circumstances, and armed conflict further disrupts social and economic functioning. Fast-growing cities, widespread internal and international migration, and technological innovations such as the spread of mobile phones all contribute to massive changes in social structures and relationships. The HIV/AIDS epidemic, especially in southern and eastern Africa, has added another layer of uncertainty: the disease is highly visible at the population level, but individual infection may remain hidden for long periods, and the medical and institutional capacity for testing and treatment is rapidly evolving. Given these multiple dimensions of instability and change, individuals have difficulty predicting the likely course of their lives, and may feel little sense of control over future developments. In this context, holding stable reproductive desires is increasingly problematic.

Most prior research on the predictors of fertility intentions[1] is cross-sectional, or uses repeated cross-sections to analyze aggregate change over time. Key exceptions to this pattern use longitudinal data from Malawi and from Ghana to illustrate the contribution of changing individual and household circumstances to changes in fertility intentions. For example, Yeatman (2009a, 2009b) uses two waves of survey data from Malawi to examine the impact of learning one's HIV infection status on fertility intentions. She demonstrates that the impact of learning one's HIV status depends on whether the biomedical test results are different from previous subjective assessments of HIV risk – that is, that change in fertility intentions is produced by *change* in understandings of HIV risk. Sennott and Yeatman (2012) use data from young women in Malawi to analyze changes in desired fertility timing over a twenty-month period. (Because

[1] Conceptually, fertility intentions differ from fertility desires. In practice, the distinction between these terms is not always maintained by demographers or recognized by the subjects of demographic research. We use the terms interchangeably in describing previous theory and research.

the women in the sample are at the beginning of their reproductive career, Sennott and Yeatman do not study intentions to stop childbearing.) Reproductive events and changes in economic status have the most consistent impact on changes in fertility intentions, while changes in relationship and health status have less consistent associations. Kodzi and colleagues use eight waves of survey data from Ghana to examine complex patterns of changes in fertility intentions (Kodzi, Casterline, and Aglobitse 2010; Kodzi, Johnson, and Casterline 2012). Analyses of the desire to stop childbearing show that past reproductive events, predictions of economic outcomes, and subjective evaluation of the costs of childbearing (both financial costs and costs to mother's health) all influence fertility intentions (Kodzi, Johnson, and Casterline 2012). Analyses incorporating a wider range of possible intentions (including desired timing as well as undecided responses) found that changes in preferences were largely consistent with desired family size and births between waves; these analyses did not include changes in economic conditions or other non-demographic factors (Kodzi, Casterline, and Aglobitse 2010). Debpuur and Bawah (2002), studying stability of intentions across two survey waves in Ghana, employ a somewhat wider range of individual characteristics associated with change (education, religion, child mortality, contraceptive use), but did not have access to measures of household economic conditions.

The present study

Previous research has shown that intentions to stop childbearing show fairly high levels of consistency over time, but can change in response to economic, demographic, or health conditions and that desired fertility timing is less stable than desires for more children. These findings are important, but limited in their geographic scope. In addition, previous studies vary in the degree to which they incorporate desired timing and in the range of predictor variables. The

present study analyzes change over time in fertility intentions of women in rural Mozambique. We measure both the desire for more children and desired timing and model these outcomes as a function of demographic events and changes in household economic conditions, men's migration, and worries about HIV.

The data used in this analysis were collected in rural areas of Gaza province in southern Mozambique between 2006 and 2011. (Details of data collection are provided in the following section.) The study area might be considered "typical" of sub-Saharan Africa in the level of instability of social and economic conditions. The primary economic activity in the area is subsistence agriculture. Frequent droughts make yields unpredictable, and many households supplement resources with remittances from male labor migrants to neighboring South Africa. Perhaps in part because of the high levels of male migration, Gaza has the highest HIV prevalence level of any province in Mozambique, with an estimated adult prevalence level of 25% in 2009 (Ministry of Health 2010).

Mozambique's high rates of labor migration date to colonial times. Recent years, however, have seen substantial changes in migration systems. Historically, male labor migrants were formally recruited to work in South African mines. This work was highly regulated and produced predictable returns. Increasingly, however, contract work has been replaced by informal labor for migrants to South Africa (de Vletter 2007). Thus, the returns to male labor migration have become more variable and less stable. Importantly, the effect of men's migration on women and other household members is not directly determined by men's earnings but rather by the share of their earnings that women and others receive and by how the amount and frequency of these remittances compare to the household members' expectations. Previous research has found strong associations between men's migration and demographic outcomes –

including fertility intentions and behavior, marital dissolution, and child mortality – that vary depending on the economic success of the migrant as perceived by his spouse and other dependents (Agadjanian and Hayford 2011; Agadjanian, Menjívar, and Cau 2013; Agadjanian, Yabiku, and Cau 2011; Hayford and Agadjanian 2012; Yabiku, Agadjanian, and Cau 2012). This paper analyzes how intentions to stop childbearing vary with men's migration behavior and outcomes.

Worries about future HIV infection, perceptions of current risk of infection, and actual serostatus (i.e. biomedical test results) are all associated on average with an increased desire to stop childbearing (Aka-Dago-Akribi et al. 1999; Cooper et al. 2007; Grieser et al. 2001). In particular, *changes* in perceived HIV status are associated with *changes* in fertility intentions (Yeatman 2009a, 2009b). But this association is complex, and not universal. Among women who continue to want children, HIV infection can be associated with a desire for more rapid childbearing (Hayford, Agadjanian, and Luz 2012; Yeatman 2009b). And both of these associations are likely to change as antiretroviral treatment and prevention of mother-to-child transmission become more widely available. The study area experienced a dramatic increase in the availability of HIV testing and treatment services during the period of data collection (Agadjanian and Hayford 2009; Hayford and Agadjanian 2010; Hayford, Agadjanian, and Luz 2012). Thus, both women's knowledge of their own serostatus and the medical resources available for HIV+ women evolved rapidly. Analyses account for the influence of changes in women's perceptions of the impact of HIV on fertility intentions.

Data and methods

Data

Data come from three waves of a population-based survey of rural ever-married women of reproductive age conducted in 56 villages of four contiguous districts (total area 5900 square miles, population 625,000) of Gaza province in southern Mozambique. The survey collected detailed demographic and socioeconomic information, including pregnancy histories, reproductive intentions, husband's migration history, household economic status, and HIV/AIDS awareness and prevention. Questions were largely, but not perfectly, comparable across waves. The first wave of data collection surveyed 1678 married women age 18-40 in June-July 2006. In each district, 14 villages were selected with probability proportional to size, and approximately 30 women were interviewed in each village. Households were randomly selected in each village, with stratified sampling to produce equal numbers of women married to migrants and non-migrants, and eligible women were randomly sampled within households. In June-July 2009, the survey team attempted to relocate and reinterview all women from the original sample, regardless of current marital status or residence. To maximize retention, followup data collection efforts were carried out in October 2009 and in June-July 2010. In all, 1411 women from the original sample (84%) were reinterviewed. A refresher sample was randomly selected to replace women lost to attrition, for a total sample in 2009 of 1868 women[2]. In 2011, all women interviewed in either 2006 or 2009 – including women from the original sample who were not located in wave 2 as well as women from the wave 2 refresher sample – were eligible for the third wave of data collection. As in 2009, the primary data collection took place in June-July,

[2] Because of the timing of interviews for the refresher sample and followup data collection waves, the total sample size in 2009 was larger than the sample size in 2006.

with followup data collection efforts a few months later and one year later to seek out women not reached in the main data collection. Including additional sample refreshment, a total of 2072 women were interviewed in 2011. Overall, 77% of women from the 2006 sample were relocated and interviewed in the third wave.

Methods

We begin by presenting descriptive statistics illustrating basic levels and trends in the desire to stop childbearing. These descriptive analyses are limited to women who were interviewed at all three survey waves and who have non-missing data for fertility intentions at all waves (N=1196).

Multivariate analyses use a hybrid approach combining elements from change score and lagged dependent variable models (Johnson 2005). Fertility intentions at one wave are modeled as the product of fertility intentions at the first wave, between-wave changes in sociodemographic characteristics, and baseline measures of factors expected to be associated with both intentions and changes in intentions. Although models do not account for unmeasured characteristics, they control for key predictors of fertility intentions and explicitly describe associations between intentions at one time period and intentions at the subsequent survey wave. In exploratory analyses, we also estimated fixed effects models (Allison 2005); results for key sociodemographic characteristics were largely similar across specifications, suggesting that results in the models presented here are not strongly biased by omitted variables. Women with missing values on independent or dependent variables are excluded from all models. We estimate separate models for changes between wave 1 and wave 2 (N=1346) and changes between waves 2 and 3 (N=1453).

Dependent variable

The dependent variable in this analysis is a measure of whether women wanted to stop childbearing, have a child right away (in two years or less), or have a child later (in two years or more). In descriptive analyses, this variable is dichotomized as want to stop or not. In multivariate analyses, all three categories are used. All women were asked "Would you like to have (more) children in the future, even if it is not right away?" (That is, the survey asked about positive intentions for more children.) Women who were pregnant at the time of the survey were asked about the desire for more children after the birth of the child they were carrying. Response options were yes, no, and don't know. Women who responded "no" were considered not to want more children. Women who responded "yes" were asked how long they would prefer to wait before having a child. Response options were right away, within two years, in more than two years, depends on husband, up to God, and don't know. Don't know, depends on husband, and up to God responses were included with "more than two years."

Independent variables

We model the impact of changes in demographic factors, household economic status, husband's migration, and HIV-related worries. We also control for age and parity at baseline, factors expected to be associated with both fertility intentions and changes in intentions. Demographic changes relevant to fertility intentions are the birth of a child, the death of a child, and a change in marital status. Because the original sample frame was limited to married women, all women were married in the first wave, and the only possible change in marital status was a divorce or separation. (We do not distinguish between divorce and separation, or between formal and informal marriage.) Between the second and third waves of the survey, both separation and remarriage were possible.

Changes in household economic status are measured through both subjective reports and objective measures. In the second and third survey waves, women were asked, "In your opinion, over the past [two/three] years (since our last conversation with you), have living conditions in your household improved, gotten worse, or stayed the same?" We used this measure as a direct measure of subjective perceptions of changes in economic status between waves. In addition, a series of questions were asked about household possessions and conditions, including whether the household owned cattle (a traditional medium of wealth); whether the household had electricity, either from a generator or from the grid; what material the roof of the respondent's home was made of; and whether the household owned material goods like a bicycle, a radio, and a television. We compared these variables across waves to construct measures of objective changes in household economic status. Based on exploratory analyses, we include only the subjective measure and the measure of change in cattle ownership in the final models.

Change in husband's migration status is based on a subjective measure of how migration affects the household. In each survey wave, women who reported that their husband was a migrant were asked whether their household was economically better off, worse off, or about the same since their husband had migrated. Husbands whose wives reported than their household was better off were classified as "successful" migrants, and all other migrants were classified as "unsuccessful" migrants. We created three categories of change in migration status: transition to successful migrant (from unsuccessful migrant or non-migrant), transition to unsuccessful migrant (from successful migrant or non-migrant), and returned migrant.

In all three survey waves, women were asked how worried they were about contracting HIV from their husband; possible responses were very worried, a little worried, and not at all worried. Because of the distribution of responses, we focus on the "very worried" category. We

created a variable for change in worry about HIV that was coded as "more worried" for women who shifted into the "very worried" category between waves and "less worried" for women who shifted out of the "very worried" category. Because not all questions were asked in all survey waves, we are unable to test the impact of changes in other elements of HIV attitudes, such as perceived risk or self-rated health.

Results

Descriptive results

The average age in the sample was 27.8 years in wave 1 (not shown); for most women, there were three years between wave 1 and wave 2 and two years between wave 2 and wave 3, for a total of five years spanned by the three survey waves. Average parity and distribution of intentions to stop childbearing across the three waves of data collection are shown in Table 1. In 2006, the average woman had 2.5 living children, and about 28% of women wanted no more children. As might be expected, both parity and the desire to stop childbearing increased across survey waves, with a larger increase between waves 1 and 2 than between waves 2 and 3, likely because of the longer time span. By wave 3, the average woman had 3.6 living children, and just over half of the sample reported wanting no more children. In all three survey waves, the average number of living children was higher among women who wanted to stop childbearing than among women who wanted more children.

<Table 1 about here>

While aggregate intentions to stop childbearing increased monotonically across waves, individual trajectories of change showed more variation. Table 2 presents the distribution of women across individual patterns of change. For this table, we consider any monotonic shift from wanting more children to not wanting more children as a "consistent" trajectory, i.e., a

trajectory consistent with target models of fertility. Women who report wanting to stop childbearing at only one wave are described as "temporary stoppers," and women who reported wanting to stop at more than one wave while also experiencing a transition from wanting to stop to wanting more children are labeled as "disordered trajectories."

<Table 2 about here>

The consistent trajectories are the most common patterns. The largest proportion of women, 36%, wanted more children at all three survey waves; the next largest group, about 19%, wanted to stop childbearing at all three survey waves. In total, just over one in four women in the sample experienced a transition to wanting no more children (that was not reversed) during the period under study, about 13% between waves 1 and 2 and about 15% between waves 2 and 3. These trajectories follow the orderly pathway predicted by target models of fertility, where women meet a reproductive goal and enter a stable state of wanting no more children. A minority of women go through less orderly transitions. These women reported wanting to stop childbearing in at least one wave but later changed their minds and wanted more children.

Trajectories that are "consistent" in terms of the direction of change in intentions are also consistent with classic demographic theories in terms of their association with women's number of living children. Women who wanted more children in all three waves had the lowest average number of living children at both wave 1 and wave 3, while women who wanted to stop childbearing in all three waves had the highest average number of living children. These trajectories are not necessarily consistent with future fertility behavior, however – on average, women who wanted to stop childbearing at all three waves had slightly *more* additional children over the study period than women who wanted to have more children at all three waves (1.1 vs. 1.0). (Note that this difference might represent differences either in additional births or in child

mortality, or both.) Less ordered pathways show associations with parity that are not readily interpretable – women in the "temporary stopper" category had slightly fewer than average living children at wave 1, while women in the "disordered" group had slightly higher than average parity.

These descriptive statistics provide a basic estimate of the level of change in fertility intentions across the three survey waves and the most common patterns of change. However, they are limited to analysis of whether women want children or not, without taking into account desired timing. Table 3 shows wave-to-wave transitions between wanting to stop childbearing, wanting a child soon (within two years or less), and wanting a child later (in more than two years). Patterns between survey waves are largely the same in the two pairs of waves (2006-2009 and 2009-2011). In both pairs, the large majority of women who wanted to stop childbearing in the earlier wave also reported wanting to stop in the next wave (73.2%, 2006-2009, and 75.0%, 2009-2011). Among women who wanted a child soon in the first wave, the modal group also wanted a child soon in the next wave, while approximately equal proportions shifted to wanting a child later and wanting to stop childbearing. Among women who wanted a child later in the earlier wave, the majority changed intentions between waves. These women were slightly more likely to switch to wanting to stop childbearing than to switch to wanting a child soon. (Note that both of these transitions are "logical," depending on whether women had a child between waves or not.)

<Table 3 about here>

Table 4 displays the percent of women who had a child between waves, along with other demographic, economic, and social changes. In general, there were fewer changes between 2009 and 2011 than between 2006 and 2009, probably because there was less time elapsed between

the later two survey waves. By far the most common between-wave change is having another child – nearly three quarters of women in the sample had a child between the 2006 and 2009 survey waves, and more than half had a child between the 2009 and 2011 waves. Substantial minorities of women reported an increase in household economic conditions between waves (36.9% and 41.1%) and reported becoming less worried about contracting HIV from their husband (41.2% and 32.9%). Smaller proportions of women, between 5 and 10%, experienced other types of changes between waves.

<Table 4 about here>

Multivariate results

Multivariate models predict women's desires to have no more children, have a child soon (within two years), or have a child later (in two years or more) based on changes in demographic and economic conditions. Table 5 shows log-odds associated with three contrasts: wanting a child soon vs. wanting no more children, wanting to postpone childbearing vs. wanting no more children, and wanting a child soon vs. later. For all three contrasts, fertility intentions in the previous wave are statistically significant and relatively strong predictors of current fertility intentions. Women who report in 2006 that they want no more children are less likely to want children (either soon or in more than two years) than to want no more children in 2009 as well. However, wanting to stop childbearing in 2006 is not significantly associated with desired timing of childbearing among women who want children in 2009.

<Table 5 about here>

We might expect that women who report in 2006 that they would like to have another child, but want to wait at least two years before having another child, would transition after a three year waiting period to wanting a child soon. However, women who report wanting to

postpone childbearing in 2006 are less likely to want a child soon in 2009 (compared to both wanting to stop childbearing and wanting a child later). It is possible that women who want to postpone childbearing in 2006 have another child between waves and therefore transition to wanting no more children. However, the relationship between wanting to postpone in 2006 and 2009 fertility intentions is fairly stable across models; it is positive and statistically significant in unconditional models and in models with and without controls for 2006 characteristics (not shown). In particular, the association is robust to controls for childbearing between waves. The pattern that women who want to postpone childbearing in 2006 are more likely to want to stop or postpone childbearing than to want to have children soon in 2009 is consistent with the interpretation of intentions to postpone as "waiting" or as a transitional stage before deciding to stop childbearing.

As predicted, demographic events between waves are strongly associated with later fertility intentions. Women who have a birth between 2006 and 2009 are less likely to want a child right away in 2009 than to want to stop childbearing and more likely to want to postpone additional fertility than to want a child right away. (That is, wanting to wait to have a child is not only a step toward wanting to stop, but also reflects desires for child spacing.) Women who experience a child death between 2006 and 2009 are more likely to report wanting a child soon vs. wanting to stop in 2009, but this association is only marginally statistically significant ($p=.08$). Child death is not significantly associated with desired timing among women who want more children in 2009. Thus, there is only weak support for theories about infant mortality as a motivator for additional childbearing. Women who experience marital dissolution between survey waves are less likely to want a child soon vs. wanting no more children in 2009, controlling for 2006 intentions. Marital dissolution is positively associated with wanting to

postpone childbearing vs. wanting a child soon in 2009 (p=.07). (Because many women who experience marital dissolution leave the study area and are lost to followup, the subset of women who experience dissolution and are retained in the sample is a highly selective sample. Thus, results for this coefficient should be interpreted with caution.)

Women who reported that their household was better off economically in 2009 than in 2006 are significantly more likely to want a child soon and marginally more likely to want a child later (p=.07) than to want to stop childbearing. Subjective reports of changing economic conditions are not associated with desired timing among women who want more children. Interestingly, perceptions of *declining* household economic conditions are not associated with changes in fertility intentions. Objective changes in household economic conditions, as measured by changes in cattle ownership, are not associated with changes in fertility intentions. Exploratory models tested additional objective measures of household economic conditions (household possessions index, roof material, whether household has electricity or a generator) and tested models without the subjective measure of economic change; in no specification were objective measures of change in household economic conditions significantly associated with fertility intentions.

Changes in husband's migration status are not significantly associated with changes in fertility intentions. In some exploratory models (not shown), there were significant associations between changes in migration behavior and intentions, such that women whose husbands became successful migrants between waves were more likely to want a child soon in 2009 (vs. wanting to stop or postpone childbearing). However, these associations were substantially reduced when controlling for changes in household economic conditions, suggesting that changes in migration are associated with fertility intentions primarily through their economic impact and not as a

measure of marital quality or stability. Changes in worry about HIV transmission were not associated with fertility intentions. (This result held in fixed effects models, which control for all stable measured and unmeasured characteristics, as well.)

Results for changes between 2009 and 2011, presented in Table 6, are largely similar to those for 2006 and 2009; we discuss these results only where they differ from the earlier time point. The coefficients for intentions in the previous wave are slightly larger in these models, perhaps because less time elapsed between survey waves, resulting in a closer relationship between intentions at the two time points. Neither subjective perceptions nor objective measures of *improvement* in household economic conditions are associated with changes in fertility intentions between 2009 and 2011. However, there is some suggestion that *worsening* economic conditions are associated with intentions in this time period. Women who report that their household was worse off in 2011 than in 2009 are less likely to want to postpone childbearing vs. wanting to have no more children; this association is moderate in size and approaches conventional levels of statistical significance (p=.07). In addition, women living in households that owned cattle in 2009 but not in 2011 are more likely to report wanting to postpone childbearing vs. wanting children soon.

<Table 6 about here>

Discussion and conclusions

Despite concerns about the relevance of target models of fertility in sub-Saharan Africa, these analyses show that women's intentions to stop childbearing are relatively consistent over a five year period. Our findings thus add to a small body of research showing that intentions to stop childbearing can be stable measures of fertility goals (Debpuur and Bawah 2002; Kodzi, Casterline, and Aglobitse 2010; Kodzi, Johnson, and Casterline 2012). At the same time, results

also identify substantial subgroups of women who change reported intentions to stop childbearing, postpone childbearing, or have children soon. Consistent with previous research (Debpuur and Bawah 2002; Kodzi, Casterline, and Aglobitse 2010; Kodzi, Johnson, and Casterline 2012; Sennott and Yeatman 2012), we find that having another birth is a strong predictor of changes in fertility intentions. In contrast, experiencing the death of a child is only weakly associated with intentions.

Previous research has pointed to the difficulty of forming long-term fertility goals in sub-Saharan Africa because of the unpredictability of economic conditions (e.g., Agadjanian 2005; Johnson-Hanks 2006). As predicted by this research, we find that changes in economic conditions are associated with changes in fertility intentions. Subjective perceptions of improvements in household economic conditions are associated with higher odds of wanting another child, but only between the first two survey waves. Between the second and third survey waves, perceptions of improvement are not associated with intentions, but perceived worsening is negatively associated with wanting another child. Differences in the effects of positive and negative changes in economic well-being at different stages in the reproductive career suggest possible pathways for further research on the role of economic uncertainty in shaping fertility goals.

Because desired fertility timing is by definition temporally specific, desired fertility timing changes more across waves than desires to stop childbearing. Our results, like previous studies, show that desired timing changes in part in response to demographic events, such as the birth of a child or marital dissolution. These associations show that the reported desire to postpone childbearing can reflect norms for child spacing or a reaction to specific life circumstances that are unsuited for childbearing. However, both descriptive and multivariate

results show patterns of transition from wanting to postpone childbearing in one survey wave to wanting to stop childbearing in the next survey wave. These quantitative findings provide further evidence to support qualitative research arguing that reported desires to have another child later may also represent a more nebulous desire to "wait" that can serve as a preliminary step toward deciding to stop childbearing (Agadjanian 2005).

The models presented here analyze women's fertility intentions as predicted by intentions at an earlier survey wave and changes between survey waves. These models provide a relatively simple way of analyzing changes in both desired quantum and desired tempo and allow for direct modeling of associations between fertility intentions and both stable and changing characteristics. However, this strategy does not take full advantage of the three waves of data collection to understand long-term change and to account for unmeasured characteristics. Further analyzes will test additional modeling approaches that may better balance ease of interpretation, flexibility of models, and explanatory power. In addition, subsequent research will expand to consider consistent and inconsistent intentions as predictors of contraceptive and reproductive behaviors as well as outcomes.

We also hope to extend our analysis to incorporate measures of change at levels beyond the individual and household levels. For instance, changes in the availability of health services may influence how women assess the potential impact of HIV and thus how the epidemic affects fertility intentions. Measures of health services are available from a survey of government maternal and child health clinics carried out along with the individual-level survey. In addition, it may be possible to add measures of rainfall or other ecological indicators as a reflection of general agricultural conditions.

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Table 1, Number of living children and fertility intentions across survey waves

	W1	W2	W3
Women who want to stop childbearing			
N	346	529	606
%	28.7	43.9	50.7
Average number of living children			
All women	2.5	3.3	3.6
Women who want to stop childbearing	3.7	4.2	4.5
Women who do not want to stop childbearing	2.0	2.5	2.7

N=1205 women interviewed in all three survey waves.

Table 2, Trajectories of fertility intentions across survey waves

	N	%	W1 parity	W3 parity
Consistent trajectories				
More-More-More	430	36.0	1.5	2.5
More-More-Stop	151	12.6	2.4	3.8
More-Stop-Stop	175	14.6	2.7	4.2
Stop-Stop-Stop	227	19.0	4.3	5.4
Temporary stoppers				
More-Stop-More	97	8.1	2.1	3.3
Stop-More-More	39	3.3	2.2	2.9
Disordered trajectories				
Stop-Stop-More	24	2.0	2.9	4.2
Stop-More-Stop	53	4.4	3.0	4.2

N=1196 women interviewed in all three survey years with non-missing data for intentions. "More" indicates wants more children; "stop" indicates wants to stop childbearing.

Table 3, Between-wave changes in fertility intentions

2006 intentions (N=1345)	% of sample, 2006	Intentions in 2009 (%)		
		Stop	Soon	Later
Want to stop childbearing	28.0	73.2	15.4	11.4
Want a child within two years	26.1	27.6	46.5	25.9
Want a child in more than two years	45.9	38.5	31.3	30.2
2009 intentions (N=1452)	% of sample, 2009	Intentions in 2011 (%)		
		Stop	Soon	Later
Want to stop childbearing	41.9	75.0	12.3	12.6
Want a child within two years	23.9	22.8	52.8	24.4
Want a child in more than two years	34.2	40.9	34.6	24.5

Women who were interviewed in two adjacent waves of data collection, non-missing data on all measures.

Table 4, Between-wave changes in individual and household characteristics

	2006 wave – 2009 wave	2009 wave – 2011 wave
Sample size	1345	1452
Characteristics in earlier wave		
Number of living children (mean)	2.4	3.2
Age 25 and under	41.0	24.7
Age 26-30	28.5	28.7
Age 31 and older	30.5	46.6
Demographic change		
Birth	73.6	55.7
Child death	11.8	7.6
Marital dissolution	9.7	4.7
New marriage	--	1.9
Change in husband's migration status		
To successful migrant	11.7	9.0
To unsuccessful migrant	11.3	10.1
Returned migrant	16.1	18.5
Change in worry about HIV		
More worried	8.8	16.3
Less worried	41.2	32.9
Change in economic conditions		
Subjective improvement	36.9	41.1
Subjective worsening	11.4	8.4
New cattle ownership	10.6	8.5
Loss of cattle ownership	8.0	5.4

Women who were interviewed in two adjacent waves of data collection, non-missing data on all measures. Percent of women in each category.

Table 5, Logistic regression predicting intentions in 2009 from intentions in 2006 and between-wave changes

	Soon vs. stop			Later vs. stop			Later vs. soon		
Intercept	2.57	0.25	***	1.03	0.27	***	-1.54	0.25	***
Characteristics in previous wave									
Number of living children	-0.48	0.06	***	-0.31	0.07	***	0.17	0.07	*
Age 26-30	-0.28	0.19		-0.29	0.20		-0.01	0.19	
Age 31 and older	-0.79	0.22	***	-0.71	0.23	**	0.08	0.24	
Intentions in previous wave									
Want no more	-1.34	0.20	***	-1.17	0.22	***	0.17	0.24	
Want later	-0.38	0.18	*	-0.01	0.18		0.37	0.17	*
Demographic change									
Birth	-1.34	0.18	***	-0.34	0.20	+	0.99	0.19	***
Child death	0.41	0.23	+	0.28	0.24		-0.13	0.23	
Marital dissolution	-0.93	0.28	***	-0.39	0.28		0.55	0.30	+
Change in husband's migration status									
To successful migrant	0.27	0.24		-0.02	0.26		-0.28	0.24	
To unsuccessful migrant	-0.13	0.24		0.01	0.25		0.13	0.25	
Returned migrant	0.11	0.20		-0.15	0.22		-0.26	0.21	
Change in worry about HIV									
More worried	-0.29	0.27		0.05	0.27		0.34	0.28	
Less worried	-0.04	0.15		-0.11	0.16		-0.07	0.16	
Change in economic conditions									
Subjective improvement	0.34	0.16	*	0.32	0.17	+	-0.02	0.16	
Subjective worsening	-0.13	0.25		-0.18	0.27		-0.05	0.28	
New cattle ownership	-0.09	0.24		0.12	0.25		0.21	0.24	
Loss of cattle ownership	-0.36	0.28		-0.19	0.28		0.18	0.29	

Women who were interviewed in two adjacent waves of data collection, non-missing data on all measures. N=1345. +: p<.10; *: p<.05; **: p<.01; ***: p<.001.

Table 6, Logistic regression predicting intentions in 2011 from intentions in 2009 and between-wave changes

	Soon vs. stop			Later vs. stop			Later vs. soon		
Intercept	3.28	0.27	***	1.44	0.29	***	-1.84	0.26	***
Characteristics in previous wave									
Number of living children	-0.70	0.07	***	-0.46	0.07	***	0.24	0.07	**
Age 26-30	-0.25	0.21		-0.31	0.21		-0.06	0.20	
Age 31 and older	-0.16	0.22		-0.72	0.23	**	-0.56	0.23	*
Intentions in previous wave									
Want no more	-1.75	0.19	***	-1.08	0.20	***	0.68	0.22	**
Want later	-0.63	0.19	***	-0.41	0.20	*	0.22	0.19	
Demographic change									
Birth	-1.11	0.16	***	0.05	0.17		1.16	0.18	***
Child death	0.23	0.28		-0.11	0.30		-0.35	0.30	
Marital dissolution	-1.49	0.45	**	0.17	0.35		1.66	0.47	***
New marriage	0.47	0.51		0.33	0.57		-0.14	0.60	
Change in husband's migration status									
To successful migrant	0.37	0.26		-0.23	0.30		-0.60	0.28	*
To unsuccessful migrant	0.36	0.24		0.29	0.26		-0.07	0.25	
Returned migrant	-0.19	0.20		-0.22	0.21		-0.04	0.22	
Change in worry about HIV									
More worried	0.07	0.21		0.03	0.23		-0.04	0.23	
Less worried	-0.07	0.17		0.18	0.17		0.25	0.18	
Change in economic conditions									
Subjective improvement	0.08	0.16		0.19	0.16		0.12	0.17	
Subjective worsening	-0.42	0.30		-0.62	0.33	+	-0.20	0.36	
New cattle ownership	0.01	0.27		0.17	0.27		0.16	0.29	
Loss of cattle ownership	-0.30	0.35		0.39	0.31		0.68	0.34	*

Women who were interviewed in two adjacent waves of data collection, non-missing data on all measures. N=1452. +: p<.10; *: p<.05; **: p<.01; ***: p<.001.