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Determined to stop? Longitudinal analysis of the desire to have no more children in rural Mozambique

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Abstract

Classic demographic theories conceptualize desired family size as a fixed goal that guides fertility intentions over the childbearing years. However, a growing body of research shows that fertility plans, even nominally long-term plans for completed childbearing, change in response to short-term conditions. Because of data limitations, much of this research has focused on low-fertility contexts, but short-term conditions are likely to be even more important in high-fertility contexts. This paper uses three waves of survey data collected in rural Mozambique to study predictors of the desire to stop childbearing in a context of relatively high fertility and high individual and social instability. We employ fixed-effects models to assess how desires to stop childbearing are shaped by demographic factors, household economic conditions, and health status, controlling for constant individual characteristics. Results show fluctuation in stopping desires and demonstrate meaningful associations between individual and household conditions and fertility goals.

Keywords

fertility; fertility intentions; longitudinal analysis; sub-Saharan Africa

The desire to stop having children should be, by definition, permanent. It implies not just a current state of mind but a long-term commitment over the remainder of the childbearing years. Classic demographic theories made much of the permanence of this decision and devoted considerable attention to operationalizing and measuring the difference between “stopping” and “spacing” behaviour. In contrast, contemporary demographic research has increasingly recognized that fertility plans, like other aspects of human decision-making, are flexible and conditional (Agadjanian 2005; Timaeus and Moultrie 2008; Hayford 2009; Iacovou and Tavares 2011). Even if people believe, at one point, that they will never want a child again, this belief may change in response to changing circumstances. Yet the intention to stop childbearing is strongly predictive of behaviour. The metaphor of a “moving target” has been used to capture both the salience of fertility plans for later behaviour and the potential flexibility of these plans (Lee 1980; Morgan 2001). A key insight of the “moving target” model, as well as of other contemporary theories of fertility intentions (e.g., Ní

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Bhrolcháin and Beaujouan 2012; Bachrach and Morgan 2013), is that fertility plans are responsive to short-term conditions, and that understanding the effect of these conditions on childbearing goals can shed light on both the nature of fertility intentions and their predictive power.

Although many empirical tests of dynamic preferences models have been focused on low-fertility contexts (Heiland, Prskawetz, and Sanderson 2008; Hayford 2009; Liefbroer 2009; Iacovou and Tavares 2011; Gray, Evans, and Reimondos 2013), these models may be particularly relevant for understanding fertility in sub-Saharan Africa. Given the high social, economic, and demographic uncertainties in the region, plans for childbearing may be especially dynamic and sensitive to short-term conditions. But even in this context, measured desires to stop childbearing have meaning: they predict individual-level fertility and contraceptive behaviour in the short- and medium-term and are associated with change over time and cross-national variation at the aggregate level (e.g., Westoff 1990; Bongaarts 1992; Bankole 1995; Kodzi, Johnson, and Casterline 2010; Hayford and Agadjanian 2012). In order to understand fertility outcomes and the prospects for fertility decline in sub-Saharan Africa, it is important to know (1) the degree to which stopping intentions change and (2) the short-term determinants of stopping intentions. These two questions are closely linked because a high level of stability in fertility preferences would suggest that changing contexts have little impact on fertility goals.

In this article, we draw on longitudinal data from rural Mozambique to study consistency in and predictors of the desire to stop childbearing. We first describe the level of change in desires to stop childbearing over the three waves of data collection and the association of fertility desires with parity. We then use fixed-effects models to analyse the association between demographic, economic, and health conditions and the desire to stop childbearing, leveraging change in conditions to identify associations. Results provide evidence that fertility desires both reflect stable underlying goals and evolve in response to individual and social circumstances.

Conceptualizing fertility desires and intentions

For several decades, the most common theoretical approach to studying fertility intentions has been Fishbein and Ajzen's theory of planned behaviour (TPB; see Fishbein and Ajzen 2010). The TPB defines an intention as a commitment to action connected to the belief that the action will result in a desired outcome. Fertility desires are the underlying positive or negative orientation toward children; intentions are a product of desires, but also of perceived ability to carry out desires and other individual and contextual factors. More recent theoretical approaches draw on cognitive science and behavioural economics to further develop the distinction between intentions and desires (Ní Bhrolcháin and Beaujouan 2012; Bachrach and Morgan 2013). These theories share the understanding that specific intentions for action are distinct from general desires for outcomes. They also agree that intentions as reported in surveys are imperfect proxies for the social-psychological processes that determine behaviour, but nonetheless capture many elements of the relevant orientations. In particular, both desires and intentions become more consciously formulated and more specific as women get older and experience transitions such as marriage and first

birth (Ní Bhrolcháin and Beaujouan 2012; Bachrach and Morgan 2013; Rackin and Bachrach 2016). Women may also be more motivated to implement fertility intentions, particularly intentions to stop childbearing, as they get older. As a result, survey reports of fertility expectations are more predictive of behaviour for older women and for married women with children than for women early in their reproductive careers (Thomson 1997; Rackin and Bachrach 2016).

This article is primarily concerned with the factors influencing fertility desires. We analyse desires because we expect that they contribute to intentions, and, eventually, to outcomes, but also because they represent women's ideals for the future. In the demographic literature, the term "intentions" is often used to refer to both desires and intentions. In summarizing past research, we occasionally use "intentions" to refer to a body of work that analyses both intentions and desires. We also use the terms "goals", "plans", or "preferences" to refer to desires and intentions jointly. The measure we use in this analysis asks women whether they want another child; we therefore use "desires" to refer to our outcome.

The desire to stop having children

Classic demographic "target" models of fertility propose that women (or couples) begin their childbearing years with a goal for the number of children they want, have children until they reach this goal, and then stop. Descriptive analyses of intentions to stop childbearing in high-fertility contexts are broadly consistent with this approach: older women and women with more children are more likely to report wanting no more children than younger and lower parity women (Westoff and Bankole 2002). Yet reported intentions to stop childbearing in sub-Saharan Africa also show substantial mismatches with a strict target model of parity-specific fertility control. For example, Johnson-Hanks (2007), drawing on data from several African Demographic and Health Surveys, found that aggregate patterns of past childbearing are virtually identical for women who say they want to stop childbearing and women who say that they want more children; she concluded that the classic demographic distinction between "natural" and "controlled" fertility does not hold in the sub-Saharan context. Johnson-Hanks argued instead that women form short-term plans based on their immediate circumstances and that these plans are frequently modified in response to changes in those circumstances.

Research in low-fertility contexts has proposed a "moving target" model of fertility that incorporates both the potential for change in desires for children and the meaningfulness and predictive power of measures such as desired family size (Lee 1980; Morgan 2001; Hayford 2009). In sub-Saharan Africa, it has been argued, social, economic, and demographic conditions are highly unstable and unpredictable, potentially making it difficult to formulate long-term plans for childbearing (e.g., LeGrand et al. 2003; Agadjanian 2005; Johnson-Hanks 2006, 2007). Dynamic models of preferences should therefore be well-suited to this context. However, these models have only rarely been applied to studies of preferences in high-fertility contexts. This lacuna is particularly large in sub-Saharan Africa, in part because of the limited availability of longitudinal data to examine changes in fertility goals.

The few exceptions to this limitation use longitudinal data from Malawi and from Ghana to illustrate the contribution of changing individual and household circumstances to changes in fertility preferences. For example, Yeatman (2009a, 2009b) used two waves of survey data from Malawi to examine the impact of learning one's HIV infection status on desire to have more children. She demonstrated that the impact of learning one's HIV status depends on whether the HIV test results are different from previous subjective assessments of HIV risk – that is, that change in fertility desires is produced by change in assessment of HIV status. (Because of the modelling strategy, these analyses do not address other predictors of changes in fertility desires.) Sennott and Yeatman (2012) used data from young women in Malawi to analyse changes in desired fertility timing over a twenty-month period. 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. In a related study, Yeatman and colleagues examined fluctuations in desired family size in the same sample of young women, focusing on the relationship between these shifts and demographic events (Yeatman, Sennott, and Culpepper 2013). They found that both partnership formation and partnership dissolution are associated with changes in desired family size, as are child deaths. Machiyama et al. (2015) used data from a demographic surveillance site in northern Malawi to show that about 40% of women who reported wanting to stop childbearing changed their reports over a two-year period, but did not analyse the predictors of stability or change. Kodzi and colleagues used eight waves of survey data from Ghana to examine complex patterns of changes in fertility preferences (Kodzi, Casterline, and Aglobitse 2010; Kodzi, Johnson, and Casterline 2012). Analyses of the desire to stop childbearing showed that past reproductive events, expectations regarding future economic conditions, and subjective evaluation of the costs of childbearing (both financial costs and costs to mother's health) all influence fertility goals (Kodzi, Johnson, and Casterline 2012). Analyses incorporating a wider range of outcomes (including desired fertility 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 stopping intentions and desired family size across two survey waves in northern Ghana, employed a somewhat wider range of individual characteristics associated with change (education, religion, child mortality, contraceptive use) but did not include measures of household economic conditions.

In sum, these studies consistently show that fertility preferences change in response to demographic events and changing women's health status, particularly related to HIV. Some studies also find that poor economic conditions constrain childbearing desires. However, this research literature is quite sparse. Our thorough literature search identified only five studies that address changes in stopping desires in sub-Saharan Africa, and of these, one does not describe predictors and two focus on HIV status as the sole predictor of change. The remaining two studies both use data from Ghana. We add to this scarce literature using longitudinal data from Mozambique to test the association between conditions in demographic, health, and economic domains and the desire to stop childbearing among a sample of women of reproductive age.

Setting

Data were collected in rural areas of Gaza province in southern Mozambique, a setting that is typical of many parts of rural sub-Saharan Africa in terms of instability of social, economic, and demographic conditions. The primary economic activity in the area is subsistence agriculture, but frequent droughts and floods make yields unpredictable. Many households supplement resources with remittances from male labour migrants to neighbouring South Africa, but these returns, too, have become uncertain as regulated and institutionalized migration to work in mines has been replaced by undocumented migration and informal labour (de Vletter 2007). Perhaps in part because of the high levels of migration, Gaza has the highest HIV prevalence level of any province in Mozambique – one of the countries most affected by the HIV epidemic – with an estimated adult prevalence of 25% in 2009 (Ministry of Health 2010; UNAIDS 2013). Because the availability of and protocols for treatment changed rapidly over the period of study, perceptions of the long-term prognosis after diagnosis were likely variable and uncertain.

Fertility rates in Mozambique declined in the 1990s, but, as in many other sub-Saharan African settings, this decline stalled in early 21st century (Bongaarts 2008; Shapiro and Gebreselassie 2008). In Gaza province, the TFR remained stable at about 5.3 children per woman between 2003 and 2011, when the two most recent Demographic and Health Surveys (DHS) were carried out (National Institute for Statistics and Ministry of Health 2005; Ministry of Health, National Institute for Statistics, and ICF International 2011). The median desired family size is slightly lower – about 4 children per woman – suggesting imperfect fertility control. Virtually all women in Gaza province know at least one modern method of contraception, but levels of contraceptive prevalence remain low, around 18% in 2011 (Ministry of Health et al. 2011).

Hypotheses

Although fertility intentions and the relationship between desires and intentions have been well theorized, there have been fewer recent developments in understanding the determinants of desires. For instance, Bachrach and Morgan (2013) hypothesize that desires are linked to unconscious emotional responses and to social schemas about children and family (see also Johnson-Hanks et al. 2011), but they do not propose a formal description of which schemas are most relevant in which settings. We therefore draw on longstanding frameworks for modelling the desire for children (e.g., Caldwell 1976; Becker 1981; Bulatao and Lee 1983; Schoen et al. 1997). According to these theories, desires for children are shaped by the perceived costs and benefits of children, both financial and non-monetary, and by the role of children in defining and strengthening social relationships, especially marriage. We propose the following specific hypotheses related to the desire to stop childbearing in this setting. Our hypotheses are primarily centred around the impact of short-term and changeable conditions on long-term fertility desires rather than on the overall level of stability. We assess the level of stability through descriptive analyses and so do not propose formal hypotheses.

According to a strict target model of fertility, or a classic demographic understanding of parity-specific control, the desire to stop childbearing is determined only by a woman's fixed desired family size and the number of living children she has. Thus, our most basic hypothesis is as follows:

H1: Having more living children will increase the likelihood of wanting to stop childbearing.

Dynamic models of fertility preferences agree that having more children should increase the likelihood of being satisfied with one's family size. However, these models propose that desired family size is not fixed, but changes according to a woman's circumstances as theorized by the frameworks cited above. Relevant circumstances include relationship characteristics (including perceived marital stability as well as marital status), the availability of economic resources, and health. We propose three additional hypotheses based on these propositions.

H2: Unmarried women will be more likely to want to stop childbearing than married women.

In the study setting, as in much of sub-Saharan Africa, marriage and childbearing are closely linked. A key function of marriage is to provide a context for childbearing, and children are necessary to secure and solidify a marriage. Among our sample of ever-married women of reproductive age, experiencing divorce or widowhood implies losing a key motivation for childbearing. Related to this hypothesis, we also predict that women who perceive their marriage as less stable will be more likely to want to stop childbearing, because they are less certain about future support for children born in the marriage. Although we do not have direct measures of perceived marital stability, men's migration is associated with marital dissolution in the study context (Agadjanian and Hayford 2017) and thus may serve as a proxy for perceived stability.

H3: Poor household economic conditions will be associated with an increased likelihood of wanting to stop childbearing.

Past research reviewed earlier has found that the poor economic conditions constrain the desire for childbearing (Kodzi, Johnson, and Casterline 2012; Sennott and Yeatman 2012). We hypothesize that economic resources, as measured by both household possessions and subjective perceptions of economic status, will predict fertility desires in this setting as well.

H4: Women who experience or anticipate a worsening in their health will be more likely to want to stop childbearing than women in good health.

Prior qualitative and quantitative research has found that women's concerns about their health reduce their desire for children, both because of worries about the consequences of pregnancy and childbirth for the mother's health and because of worries about the mother's ability to care for future children (Bledsoe 2002; Yeatman 2009b; Hayford, Agadjanian, and Luz 2012). In particular, HIV is likely to be a source of concern about future health in this setting.

Data and methods

Data

Data came from three waves of a population-based survey of rural ever-married women of reproductive age in four contiguous districts (total area 5900 square miles, population 625,000) of Gaza province in southern Mozambique. The survey addressed economic security, childbearing plans and behaviours, and health, with similar but not identical content across survey waves. Data collection was administered by Eduardo Mondlane University (Mozambique), under subcontracts from Arizona State University (USA). The project was approved by the Ethics Board of the Ministry of Health (Mozambique) and the institutional review board at Arizona State University.

The first survey wave interviewed 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. Reflecting an initial interest in the effects of male labour out-migration, in each village all households with at least one married woman were enumerated and divided into two strata – those with women married to a labour migrant and those without. Households were randomly selected from each stratum, and eligible women were randomly sampled within households.

The second wave of the survey took place in 2009 and attempted to reinterview all women from the wave 1 sample. A refresher sample was randomly drawn to replace women lost to attrition. To maximize retention, two follow-up data collection efforts were carried out within a year of the main fieldwork to locate and interview women who had been temporarily absent from their original households at the time of main fieldwork and women who had moved within Mozambique. Both women in the refreshment sample and respondents who were interviewed during follow-up attempts were retained in the sample. As a result, a total of 1868 women were interviewed at wave 2, including 1407 women from the original sample (84%).

Wave 3, conducted in 2011, targeted all women interviewed in either wave 1 or wave 2. As in the previous wave, women not available for interview during the main data collection were replaced with a refreshment sample; some of those women were found and interviewed during subsequent follow-up efforts. A total of 2060 women were interviewed in wave 3.

Overall, 1342 women from the wave 1 sample (80% of the total) were interviewed in the third wave; 1876 women were interviewed at least twice, and 1279 women were interviewed in all three waves. Although overall retention rates were high, attrition was not random. Women lost to follow-up were primarily those who moved out of the study area, in many cases either because they had separated from their husbands or because they had moved to join a migrant husband in South Africa. Thus, the analysis underrepresents women who experienced marital dissolution and those who moved; to the extent that divorce and residential mobility are associated with changes in fertility desires, it may underrepresent these changes as well.

Our analytic sample depended on the specific analysis. Some descriptive analyses were limited to women who were interviewed in all three waves; the primary multivariate analysis included women interviewed at least twice; and supplementary multivariate models analysed women who were interviewed in both wave 2 and wave 3. All descriptive and multivariate analyses excluded women with missing data on outcome or predictor variables. Levels of missing data were very low; most variables had less than 1% missing data. The number of cases dropped from multivariate models due to missing data ranges from about 3% to about 8%. Sample sizes for each analysis are listed in the appropriate table. All descriptive and multivariate analyses are unweighted, because longitudinal weights are not available in the data.

Methods

We began with descriptive analyses of aggregate and individual patterns of change in the desire to have no more children. We present bivariate statistics showing the association between the number of living children and the desire to stop childbearing and the prevalence of changes in demographic, economic, and health conditions between survey waves.

Multivariate analyses used fixed-effects logistic regression models (Allison 2005) to estimate the association between these conditions and the desire to stop childbearing. Fixed-effects models pool data from multiple waves of data collection and treat each person-wave of data as a single observation “nested” within each woman. These models control for all time-invariant woman-level characteristics, both measured and unmeasured. In particular, if women have a stable desired family size as proposed by target models of fertility, it is controlled for in these models. Fixed-effects models can only use information from women who are observed at multiple waves and experience change in the outcome variable across waves. These models leverage change over time in predictor and outcome variables to provide unbiased estimates of cross-sectional associations without making assumptions about correlations between measured and unmeasured characteristics. Thus, although fixed-effects models may be inefficient in the use of data, they are well-suited to our research questions.

Like other regression approaches, fixed-effects models assume that an increase in a predictor produces an equal and opposite change in the outcome as a decrease in that predictor. Because fixed-effects models use repeated within-person measures to draw conclusions about between-person differences, they also assume that changes do not depend on the starting condition. Specifically, in our analysis, if predictors have different effects depending on whether women initially want to stop childbearing or not, our models will not capture this variation. In exploratory analyses, we tested these assumptions by directly modelling the impact of different between-wave changes (e.g., increase vs. decrease in household wealth) on fertility desires and by comparing the predictors of between-wave changes in fertility desires for women with different initial desires; results from these models are presented in the Appendix. We also estimated cross-sectional models of fertility desires (results available on request). Results were generally consistent across all specifications; we present here the fixed-effects models, which provide a more parsimonious estimation of associations. We

note exceptions in the presentation of results and more fully describe differences in the Appendix.

Measures

The dependent variable was a measure of whether women wanted to stop childbearing. All women were asked “Would you like to have (more) children in the future, even if it is not right away?” 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” or those who responded “don’t know” (approximately 5% of women in each wave) were combined in the reference category; in discussing results, we refer to this group of women as “wanting more.” The survey did not ask about desired family size, so we are unable to directly measure whether the desire to stop childbearing is related to having reached a “target” or whether desired family size is consistent across waves.

To test our hypotheses, we examined the impact of demographic factors, economic conditions, and health status on reproductive preferences. Demographic factors are the number of living children and marital status. The first wave of the survey was limited to married women; women could experience marital dissolution and, in some cases, remarriage between the first and second and second and third waves.

Economic conditions were measured using two primary variables. First, an index of household possessions measured the household’s access to durable goods. The household wealth index, constructed based on exploratory analyses and ethnographic observation in the study area, indicates whether the household owns selected consumer goods (radio, bicycle, car or motorcycle) and takes on possible values of 1 (respondent’s household owns none of the selected goods), 2 (household owns a radio only), 3 (household owns a radio and a bicycle), or 4 (household owns a car or motorcycle). Second, we included a dichotomous indicator of whether the household owns cattle, a traditional marker of household economic status in this context. In waves 2 and 3, but not in wave 1, women were also asked to provide a subjective report of whether their household was economically better off, worse off, or about the same as other nearby households. We estimated supplemental models using only data from the second and third survey waves and included this measure in those models.

In addition to questions about marital status and household wealth, we also accounted for husband’s migration status. Following previous research in the area, we distinguished between “successful” and “unsuccessful” migrants on the basis of a woman’s perceptions of her migrant husband’s contributions to the household. Women with migrant husbands were asked whether their household was better off, worse off, or the same since their husband had migrated. “Successful” migrants were those whose wives report that the household is better off; men whose migration, in their wives’ assessment, worsened the household’s material conditions or did not change them were classified as “unsuccessful” migrants. This variable captures the economic impact of migration but also, indirectly, women’s perceptions of marital quality and stability, and is predictive of demographic and health-related outcomes (Agadjanian, Arnaldo, and Cau 2011; Agadjanian, Yabiku, and Cau 2011; Yabiku,

Agadjanian and Cau 2012). Because we also controlled for marital status, these dummy variables effectively treat women married to non-migrants as the reference category.

To account for changes in health status, we included two measures of health. The most general measure of overall health was a whether women considered themselves to be in good vs. poor or so-so health. This measure was only asked in waves 2 and 3; we include it in the supplemental models using those two waves. We also included a measure of worry about HIV because HIV is a highly salient factor affecting adult health in this context and also because HIV-related perceptions can change over a relatively short time. Women were asked how worried they were about contracting HIV from their husband or another man; possible responses were very worried, a little worried, and not at all worried. Because of the distribution of responses, we dichotomized answers as very worried vs. not very worried. We also tested models including women's perceived likelihood of being HIV+ (respondents were not asked directly about their HIV status nor were they tested for HIV); these measures, which were available only in waves 2 and 3, were not significantly associated with fertility desires. Because they did not provide additional explanatory power beyond the measure of HIV-related worry, which is available in all three survey waves, we did not include them in the final models..

Because fixed-effects models control for all stable characteristics, we did not include controls for education, marital duration, or age at baseline. Models did include a control variable for the number of years elapsed since the first wave of data collection in order to account for the effects of aging.

Results

Descriptive results

The average age was 27.8 years in wave 1 (not shown). Average parity and distribution of desires to stop childbearing across the three survey waves are shown in Table 1; these statistics only include women who were interviewed in all three waves. At wave 1, the average woman had 2.8 living children (including current pregnancies), and about 28% of women wanted no more children. Both parity and the desire to stop childbearing increased across survey waves. By wave 3, the average woman had 3.8 living children, and just over half of the sample reported wanting no more children. The aggregate increase in reported desires to stop childbearing is substantial given the relatively short time period covered, the relatively young age of the sample, and the fact that the average number of living children increased by only about one child per woman over the three survey waves. 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 or who were not sure.

While aggregate desires to stop childbearing increased monotonically across waves, individual trajectories of change showed more variation. Table 2 presents the distribution of women across patterns of change. For this table, we label trajectories that exhibit only a shift from wanting more children to not wanting more as "fixed target" trajectories. These trajectories follow the pathway predicted by target models of fertility, where women meet a reproductive goal and enter a stable state of wanting no more children. Women who report

wanting to stop childbearing in one wave and report wanting more children in a following wave are defined as having “dynamic preferences” trajectories (i.e., trajectories that involve a reversal of the desire to stop childbearing). Our labels reflect a rough classification rather than a precise identification. For instance, a transition from wanting more children to not wanting more without having a birth would be labelled a “fixed target” trajectory, although it is not strictly consistent with the theory, while a transition from wanting to stop childbearing to wanting more children could be consistent with a target model of fertility if a woman experienced the death of a child, a fairly common event in this context (see Table 3).

The fixed target 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 18%, 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 2 and 3 and about 14% between waves 1 and 2. A minority of women changed their mind about wanting to stop childbearing. These women reported wanting to stop childbearing at one or two waves but later wanted more children. Although fixed target trajectories are the modal pattern in this sample, our results also imply a high level of instability in the desire to stop childbearing. Of women who reported in the first survey wave that they wanted no more children, about one-third changed their responses at least once by the third survey wave (dynamic preferences trajectories / women who wanted to stop at wave 1 = $(42 + 27 + 57) / (42 + 27 + 57 + 234) = 0.35$).

Trajectories that are consistent with the target model in terms of the direction of change in desires 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 fertility behaviour during the study period, however – on average, women who wanted to stop childbearing at all three waves had the same number of additional births between wave 1 and wave 3 as women who wanted to have more children at all three waves (1.1). (Note that, because of child mortality, the number of additional births between waves is not equal to the change in the number of living children. The strength and direction of associations between trajectories and the number of living children are similar to those for births.) Dynamic preferences trajectories show associations with parity that are not readily interpretable at the aggregate level – overall, women with these trajectories have slightly higher parity (at both wave 1 and wave 3) than women who consistently want more children, but lower fertility than those who consistently want to stop childbearing. The lack of a clear association with the number of living children suggests that other factors may explain changes in fertility desires.

Before presenting multivariate analysis of factors that are associated with change in the desire to stop childbearing, we first briefly describe the between-wave changes in demographic, economic, and health conditions that might predict changes in fertility desires (Table 3). In general, there were fewer changes between waves 2 and 3 than between waves 1 and 2, 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 – about 71.4% of women had a child between the first two waves or were pregnant at the second wave, and about half had a child between the second and third waves or were pregnant at the third wave. Fewer women experienced a child death (7.0% between waves 1 and 2; 4.1% between waves 2 and 3). The most common change in economic conditions between waves was an improvement in the household possessions index – 36.7% of women gained household possessions between the first two survey waves, and 42.3% between the second and third survey waves. Women were more likely to report that households gained cattle ownership than lost it, although changes in this measure are less common than changes in the possessions index. Consistent with the objective measures, more women reported higher household economic status relative to neighbours in wave 3 vs. wave 2 than lower. Between waves 2 and 3, women were about equally likely to report improving self-rated health as declining self-rated health. Substantial minorities of women reported becoming less worried about contracting HIV (41.4% between the first and second survey waves and 31.5% between the second and third).

Multivariate results

Table 4 shows results from fixed-effects models of the desire to stop childbearing. Model 1 includes data from all three waves; Model 2 uses data from only waves 2 and 3 and includes a larger set of variables. (In exploratory analyses, we also tested Model 1 using only observations from waves 2 and 3. The magnitude of coefficients was essentially the same as in Model 2.) The coefficients produced by fixed-effects models are estimated by comparing differences across waves, but interpreted in the same way as cross-sectional coefficient estimates. For example, the coefficient for the number of living children in Model 1 is 1.11, which means that every additional living child is associated with an increase of 1.11 in the log-odds (odds ratio = $\exp(1.11) = 3.03$) of wanting to stop childbearing. This result also implies that the death of a child (a decrease in the number of living children) would be negatively associated with wanting to stop childbearing. (Models separating births from child deaths suggest that the positive impact of a birth is slightly larger and more consistent than the negative impact of a child death; see Appendix.) Thus, hypothesis 1 is supported. Marital dissolution is also associated with an increased likelihood of wanting to stop childbearing, as proposed by hypothesis 2. (Robustness tests suggest that this association is largely driven by a positive impact of marital dissolution on the transition to wanting to stop among women who do not want to stop childbearing; see Appendix.)

We find mixed support for hypothesis 3, regarding the association between household economic conditions and wanting to stop childbearing. The coefficients for the household wealth index are negative in sign, as predicted, in Model 1 but positive in Model 2; however, in both models, they are very small in magnitude and not statistically significant. The coefficients for household ownership of cattle are negative in sign, as predicted, but similarly not statistically significant. However, results from Model 2 show that women who report that their households are economically better off than neighbouring households are less likely to want to stop childbearing. According to this subjective measure, then, higher economic status is associated with an increased desire for children, as predicted. We also found some evidence that women married to successful migrants were less likely to want to stop

childbearing, paralleling the findings of an earlier cross-sectional study (Agadjanian, Yabiku, and Cau 2011). The coefficient for this measure is negative and relatively large in both models, and statistically significant in Model 1 ($p < .05$). Because this variable is a proxy for economic conditions, this result lends some support to Hypothesis 3.

Hypothesis 4 is supported to some extent. Women with better self-rated health are significantly less likely to want to stop childbearing (Model 2). Contrary to hypothesis 4, women who are very worried about HIV are *less* likely to want to stop childbearing. The coefficient is similar in magnitude in models with and without measures of self-rated health, recent HIV testing, and perceived likelihood of being HIV+ (not shown), and the coefficient for self-rated health is not sensitive to the inclusion of HIV-specific measures. However, unlike our other results, the association of HIV worry with fertility desires is not robust to alternative specifications of the models (such as cross-sectional models or change models). Because perceptions of HIV risk are directly tied to sex and marital stability, as well as the rapidly evolving societal meaning of HIV/AIDS, changes in HIV worry may be confounded with changes in other conditions relevant to reproduction or to the epidemiological context; we expand on these possibilities in the discussion section.

As described in the methods section, we also estimated models of changes in fertility desires, separating women according to their initial desires and directly estimating the impact of increases and decreases in covariates. The full results of these models are displayed in the Appendix. For the most part, they are consistent with the results of the fixed effects models: changes in demographic factors (births, child deaths, marriage and separation) predict changes in desires, while changes in economic conditions do not. The magnitude of associations appears somewhat larger for women who do not want to stop childbearing than for women who do want to stop, but because the sample of women who want to stop is smaller, estimates are less precise and it is difficult to draw robust conclusions.

Discussion and conclusions

In this research, we used longitudinal survey data collected in rural Mozambique – a region rife with the social and economic uncertainty that challenges fixed fertility plans – to examine the stability of women’s desires to stop childbearing and the predictors of these desires. Our results showed substantial stability in the reported desire to stop childbearing: most women in the sample report trajectories of fertility desires that are consistent with classic demographic models (i.e., changes only from wanting more children to wanting no more children, and not the reverse). However, we also found substantial instability. Among women who wanted to stop childbearing in the first survey wave (27.8% of the sample), about one-third of those interviewed in the next two waves reported at least once that they wanted more children. These changes in fertility desires are at least to some extent associated with easily measurable individual and family characteristics. Women are more likely to want to stop childbearing when they have more children or experience marital dissolution, and less likely to want to stop childbearing when they are in better health.

Some models offer indications that improvements in household economic status might increase women's desire for children. For the most part, however, our results do not indicate a strong relationship between economic conditions and fertility desires. Our measures may not capture the true degree of instability in economic resources. The associations that were largest in magnitude in our models were with subjective perceptions of economic standing, rather than objective measures of durable goods; it is possible that more detailed questions about women's perceptions of economic conditions would have yielded stronger associations with the desire to stop childbearing. Other research also finds an important role for subjective measures of economic conditions – for example, Kodzi and colleagues (2012), using longitudinal data from Ghana, found that women's predictions of future household conditions are associated with the desire to stop childbearing. These findings point to the difficulty of identifying the appropriate time frame and level of analysis for measuring the economic predictors of fertility desires. Classic demographic transition theories posit that economic development should reduce the demand for children, in part because as economies shift away from agricultural production children become less productive and demand more investment (e.g., Coale 1973; Caldwell 1976). At the population level, then, more economic resources should be associated with lower demand for children. At the household level, children are productive over the long term in some contexts, but almost invariably costly (in both time and material resources) in the short term. If current perceptions or future expectations of scarcity increase the desire to stop childbearing even in the least economically developed sub-Saharan settings, this association would suggest that short-term economic pressures may outweigh the potential long-term benefits of childbearing in individual decision-making even at the early stages of the demographic transition. These attitudes are likely strengthened by the intense antinatalist efforts by many African governments.

Somewhat surprisingly, fixed-effects models show that women who were more worried about HIV were less likely to want to stop childbearing. This association, which is robust to controls for self-rated health, illustrates the complexity of interpreting worry about HIV. In this context, HIV testing is closely tied to prenatal care, and changes in worry may be linked to recent childbearing. There may also be reverse causation between worry and reproductive goals, if women feel that continued sexual activity will put them at risk for contracting the disease. Further, it is possible that rapid expansion of access to HIV testing and treatment over the project period changed the way all women thought about HIV, and thus change in HIV worry is confounded with duration in our models. These results call for further research on the dynamics of fertility preferences in settings with high HIV prevalence and evolving treatment regimes.

Fixed-effects models control for all stable individual characteristics, both measured and unmeasured. In particular, if women do have a consistent desired family size, as proposed by target models of fertility preferences, it would be accounted for in the fixed-effects models. That is, the models examine whether a woman wants to stop childbearing conditional on the number of living children she has and her desired family size. A strict interpretation of the target model of fertility would imply that no other characteristics should be associated with the desire to stop childbearing. However, our models do show significant effects of several factors, and adding more variables beyond the number of living children significantly

improves model fit (based on comparison with a model including only the number of living children, not shown). Thus, our overall results demonstrate that a pure target model is not sufficient for understanding the desire to stop childbearing in this context, and analyses of the predictors or consequences of fertility desires should account for the potential for change in these desires.

Demographers have expressed concern about survey measures of fertility preferences in sub-Saharan Africa, particularly measures of long-term plans like the desire to stop childbearing (Johnson-Hanks 2007; Timaeus and Moultrie 2008). Recent theoretical work on fertility preferences has raised more fundamental questions about the inherent difficulty of forming plans for having children – a behaviour that, on the one hand, results from a series of rapid, in-the-moment decisions (having sex or not; using contraception or not) and yet, on the other hand, implies decades worth of commitment and social support for children (see, e.g., Johnson-Hanks et al. 2011; Ní Bhrolcháin and Beaujouan 2012; Bachrach and Morgan 2013). In its most extreme form, the question here is not just whether demographers can measure desires to stop childbearing, but whether these long-term preferences even exist in a meaningful way (Ní Bhrolcháin and Beaujouan 2012).

We acknowledge the peculiarity of demographic measures of fertility intentions and desires and the distance of the survey interview from the lived reality of survey respondents. It is questionable whether respondents in their daily lives would discuss their feelings about childbearing using the language or the categories proposed to them by demographic surveys. But, given the long history of these demographic measures, the most directly relevant question may not be, are these measures *perfect*, but rather, are they *useful*. Based on the analyses in this article, we would answer “yes” to this second question. These measures help us understand the factors that contribute to women’s considerations about childbearing and the elements of the environment that are salient to this process. We have focused here primarily on the internal validity and reliability of survey measures of fertility desires – whether survey questions about fertility desires produce responses that are consistent over time and consistent with other survey measures. In other research using the same data, we also find evidence of predictive power: the desire to stop childbearing measured at wave 1 is strongly, even if imperfectly, associated with childbearing between waves 1 and 2 (Hayford and Agadjanian 2012).

Our findings also have implications for the provision of family planning services in contexts of high variability in short-term conditions. Substantial program effort has been devoted to the provision of long-acting methods of contraception. But if women feel that their desires to limit fertility, even supposedly permanent desires to stop childbearing, may change as circumstances change, they may be reluctant to use long-term methods, particularly IUDs and implants that require medical intervention to reverse. Our research thus adds to a growing body of evidence that concerns about future fecundity and preserving the option to have additional children are an important barrier to increased contraceptive uptake in sub-Saharan Africa and points to a need for contraceptive counselling and methods that recognize the need for flexibility.

On the whole, our analyses of fertility desires and behaviour in rural southern Mozambique show that survey measures of the desire to stop childbearing in this context neither neatly follow nor completely diverge from classic demographic models of fertility preferences. Although standardized longitudinal surveys cannot capture all the variability of attitudes toward childbearing in sub-Saharan settings, they do allow for sound analyses of the essential contours of these attitudes and their consequences.

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Appendix: Results from direct models of between-wave changes in characteristics on changes in fertility desires

To supplement the fixed-effects models, we estimated logistic regression models that analyze between-wave changes in fertility desires using measured changes in predictor variables across waves, treating increases and decreases in predictors as distinct independent variables. (We thank an anonymous reviewer for suggesting this analytic approach.) We estimate two separate models: one for women who want to stop childbearing at the first wave and another for women who do not want to stop at the first wave. These models thus test the assumptions of fixed-effects models of equal and opposite effects of increases and decreases in predictors (linear effects) and equal effects regardless of initial intentions.

The models presented in Table A1 are pooled models combining change from W1-W2 and change from W2-W3; we tested single-wave models as well, but the sample sizes were too small to provide meaningful estimates. We are therefore unable to include variables that only appear in two waves – subjective household economic status and self-rated health. In both models, the outcome is whether the woman wants to stop at time 2. (These models are mathematically equivalent to models predicting change, but using the same outcome makes it easier to compare coefficients across models.) In addition to the predictors of theoretical

interest, we have included some basic control variables (age, education) because these models do not control for fixed characteristics. The models use robust standard errors to correct for the non-independence of multiple observations from some women.

These models address two separate questions: (a) whether the effect of changes is the same for women with different fertility desires at time 1; and (b) whether the effect of increases in independent variables is equal and opposite to the effect of decreases. We discuss the results as they relate to these questions. These models also provide substantive information on the evolution of stopping desires beyond that presented in the body of the paper.

Effect of changes depending on initial fertility desires

Overall, these models suggest that the impact of most changes in characteristics on fertility desires is similar for women who want more children and women who report wanting to stop childbearing. (Of course, women who already want to stop cannot “decide” to stop in response to life events in the same way as women who do not yet want to stop; for women who want no more children at time 1, these models can be thought of as describing factors that increase the consistency or strength of the desire to stop.) Although the coefficients for women who want to stop are not identical to the coefficients for women who do not want to stop at time 1, the two sets of estimates are generally within each other’s confidence intervals. The very large standard errors on coefficients in both models make it difficult to come to robust conclusions. We estimated a combined model including both women who wanted to stop childbearing at time 1 and women who did not want to stop and testing interactions between time 1 desires and other predictors. The interaction terms were significant for births, marital dissolution, and remarriage between waves. Other interaction terms were not individually statistically significant, and a fully interacted model did not improve model fit relative to the main effects model (complete results of the interacted model are available on request). As suggested by the magnitude of the coefficients, having another child has a larger effect on desires for women who do not want to stop than it does on stability of desires for women who want to stop. Marital dissolution has a larger impact for women who do not want to stop, while remarriage is more salient for women who want to stop than for women who want to continue childbearing.

Effect of increases vs. effect of decreases

Results for women who do not want to stop childbearing at time 1 are largely consistent with the assumption that changes in opposite directions produce opposite results. The coefficients for remarriage and separation are not opposite in sign, but the coefficient for remarriage is very imprecisely estimated, making it difficult to interpret this comparison. Similarly, the coefficient for having one’s husband return from a migration spell is not opposite in sign to the coefficients for having one’s husband become a new migrant, but given the large standard errors for all of these coefficients we cannot make strong conclusions. For women who want to stop childbearing at time 1, the results are even noisier, due presumably to the smaller sample size. Although the results do not definitively confirm equal and opposite effects for changes in different directions, they also do not clearly reject that assumption.

Other results

Unlike the fixed effects models, these regressions include explicit controls for measured characteristics. Education is positively associated with wanting to stop childbearing at time 2 for women who did not want to stop at time 1. The magnitude of coefficients for some primary education (1–4 years) and complete primary education (5 years) is similar, suggesting that, in this setting and this age cohort of women, having any education at all makes it more likely that women will want to stop childbearing. Among women who want to stop childbearing at time 1, education is not significantly associated with desires at wave 2.

Appendix Table A1

Logistic regression models of between-wave changes as predictors of wanting to stop childbearing at T2, separately by desire at T1 (parameter estimates and standard errors)

	Do not want to stop		Want to stop			
	b	SE	b	SE		
Intercept	-3.53	0.26	***	-0.95	0.35	**
Changes in number of living children						
Birth(s) between waves ^a	1.25	0.14	***	0.51	0.18	**
Child death(s) between waves	-0.78	0.27	**	-0.10	0.49	
Changes in marital status						
Marital dissolution	1.27	0.20	***	0.16	0.30	
Remarriage	0.96	0.73		-1.22	0.58	*
Changes in household wealth						
Improved household wealth scale	-0.02	0.14		0.06	0.22	
Worse household wealth scale	-0.01	0.14		0.20	0.20	
Gained cattle ownership	-0.22	0.19		0.11	0.27	
Lost cattle ownership	0.21	0.22		-0.01	0.37	
Changes in husband's migration						
Became successful migrant	-0.22	0.18		-0.33	0.28	
Became unsuccessful migrant	-0.05	0.19		-0.35	0.25	
Returned migrant	0.03	0.15		-0.06	0.22	
Changes in worry about HIV						
More worried	0.06	0.17		-0.23	0.24	
Less worried	0.05	0.12		0.01	0.17	
Fixed controls						
Age 25 and under	-0.36	0.14	**	-0.43	0.23	+
Age 31 and over	0.24	0.15		0.67	0.19	***
1–4 years of education	0.51	0.15	***	-0.24	0.21	
5 or more years of education	0.61	0.16	***	-0.16	0.24	
Number of living children at time 1 ^b	0.53	0.05	***	0.42	0.06	***
Time						
W1-W2 (vs W2-W3)	0.15	0.12		0.01	0.16	

	Do not want to stop		Want to stop	
	b	SE	b	SE
N	1885		1027	
-2 LL	1952		1002	

^aFor women pregnant at time 2, includes pregnancy.

^bFor women pregnant at time 1, includes pregnancy.

Women with non-missing data on predictors and outcome variables. Models pool changes between Waves 1 and 2 and between Waves 2 and 3; standard errors are adjusted to account for non-independence of women observed at both times.

⁺: p<0.10;

*: p<0.05;

** p<0.01;

*** p<0.001.

Table 1

Number of living children and fertility desires across survey waves

	W1	W2	W3
Women who want to stop childbearing (%)	28.3	43.2	50.4
Average number of living children ^a			
All women	2.8	3.5	3.8
Women who do not want to stop childbearing	2.3	2.7	2.9
Women who want to stop childbearing	4.2	4.4	4.8

^aFor pregnant women, includes current pregnancy.

N=1274 women interviewed in all three survey waves with non-missing data for desires.

Table 2

Trajectories of fertility desires across survey waves

	N	%	Living children: W1 ^a	Living children: W3 ^a	Births W1-W3 ^b
Fixed target trajectories					
More-More-More	458	36.0	1.7	2.6	1.2
More-More-Stop	167	13.1	2.7	4.0	1.6
More-Stop-Stop	184	14.4	3.2	4.4	1.5
Stop-Stop-Stop	234	18.4	4.7	5.6	1.2
Dynamic preferences trajectories					
More-Stop-More	105	8.2	2.3	3.5	1.4
Stop-More-More	42	3.3	2.5	3.1	0.7
Stop-Stop-More	27	2.1	3.6	4.5	1.4
Stop-More-Stop	57	4.5	3.5	4.5	1.2

^aFor pregnant women, includes current pregnancy.

^bFor women pregnant at wave 3, includes current pregnancy.

N=1274 women interviewed in all three survey years with non-missing data for desires. "More" indicates wants more children; "stop" indicates wants to stop childbearing.

Table 3

Between-wave changes in individual and household characteristics

	W1 – W2	W2 – W3
Women interviewed in two adjacent waves	1366	1548
Demographic change		
Birth or current pregnancy at time 2	71.4	51.3
Child death	7.0	4.1
Marital dissolution	10.5	6.9
New marriage	--	1.2
Change in husband's migration status		
Becomes successful migrant	11.4	9.5
Becomes unsuccessful migrant	11.1	10.3
Returns from migration	12.5	11.3
Change in economic conditions		
Increase in household possessions index	36.7	42.3
Decrease in household possessions index	11.8	8.3
New cattle ownership	10.4	8.3
Loss of cattle ownership	7.9	5.7
Household becomes better off than other nearby households	--	17.0
Household no longer better off than other nearby households	--	12.7
Change in health status		
Transition to good self-rated health	--	15.1
Transition to poor/so-so self-rated health	--	15.2
More worried about HIV	8.8	17.2
Less worried about HIV	41.4	31.5

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

Fixed-effects models of the desire to stop childbearing as predicted by demographic, economic, and health conditions (parameter estimates and standard errors)

Table 4

	Model 1: All waves		Model 2: Waves 2 and 3			
	b	SE	b	SE		
Number of living children ^a	1.11	0.12	***	1.18	0.19	***
Not married	0.64	0.25	**	0.52	0.34	
Household wealth index	-0.01	0.07		0.06	0.10	
Household owns cattle	-0.21	0.19		-0.12	0.28	
Household better off than nearby households	--	--		-0.52	0.20	*
Husband is a successful migrant	-0.40	0.17	*	-0.29	0.23	
Husband is an unsuccessful migrant	-0.19	0.17		-0.23	0.23	
Very worried about contracting HIV	-0.28	0.12	*	-0.31	0.16	*
Good self-rated health	--	--		-0.46	0.18	*
Years elapsed since W1 interview	0.05	0.04		-0.01	0.06	
N (total observations)	5575		3896			
N (informative observations)	2070		928			
-2 Log likelihood	1144		549			

^aFor pregnant women, includes current pregnancy.

Women who were interviewed in at least two survey waves (Model 1) or in waves 2 and 3 (Model 2) with non-missing data on outcome and predictor variables.

⁺ p<0.10;

* p<0.05;

** p<0.01;

*** p<0.001.