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Uncertain future, non-numeric preferences, and the fertility transition: A case study of rural Mozambique

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Abstract

In many high-fertility countries, and especially in sub-Saharan Africa, substantial proportions of women give non-numeric responses when asked about desired family size. Demographic transition theory has interpreted responses of "don't know" or "up to God" as evidence of fatalistic attitudes toward childbearing. Alternatively, these responses can be understood as meaningful reactions to uncertainty about the future. Following this latter approach, we use data from rural Mozambique to test the hypothesis that non-numeric responses are more common when uncertainty about the future is greater. We expand on previous research linking child mortality and non-numeric fertility preferences by testing the predictive power of economic conditions, marital instability, and adult mortality. Results show that uncertainty related to adult and child mortality and to economic conditions predicts non-numeric responses, while marital stability is less strongly related.

Keywords

fertility; fertility intentions; non-numeric preferences; sub-Saharan Africa

Statements of desired family size have been used to predict fertility, to assess demand for contraception, and to explain fertility trends and differentials (e.g., Bhargava 2007; Lutalo et al. 2000; Pritchett 1994). However, in high-fertility contexts, especially in sub-Saharan Africa, many women do not report quantitative goals for completed family size, instead giving non-numeric responses such as "up to God" or "don't know" (Casterline and El-Zeini 2007; Feyisetan and Casterline 2000; Pritchett 1994). In the most recent round of Demographic and Health Surveys, 10% of women or more reported non-numeric preferences in 9 of 26 countries in sub-Saharan Africa.[1] Since the first round of DHS surveys in the late 1980s, the proportion of nonnumeric responses has declined in some countries and remained stable or even increased in others; time trends in uncertainty are non-monotonic in many DHS countries. The question of how to interpret these responses is important in predicting fertility and measuring policy-relevant characteristics such as unmet need for contraception.

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[1]According to tables produced using the DHS StatCompiler, http://www.statcompiler.com/.

Non-numeric preferences are also theoretically important in explaining the transition from high to low fertility. Coale's (1973) seminal formulation of the preconditions for fertility transition postulates that birth rates will decline only when reproduction enters "the calculus of conscious choice"—that is, when childbearing becomes a subject about which women can form and articulate desires and preferences. More specifically, Coale's precondition has been interpreted to require the formation of precise numeric goals for completed fertility (van de Walle 1992). Women who do not express numeric preferences when asked how many children they want are considered to be less advanced along the path to low fertility.

Non-numeric responses have sometimes been interpreted more broadly as evidence of a general fatalism with regards to individual control over demographic outcomes or of a lack of cognitive capacity for quantitative reasoning (e.g., Lloyd and Ivanov 1988; McCarthy and Oni 1987; van de Walle 1992). Ever since Caldwell's (1976) "restatement" of transition theory, however, demographers have argued that non-numeric fertility preferences can be rational responses to uncertain conditions. Under this framework, fertility transition occurs not when individuals undergo a shift in outlook or cognitive capacity, but when social conditions change to allow for individual control. This school of thought is best developed, both theoretically and empirically, in analyses of the relationship between infant and child mortality and fertility behavior (LeGrand, Koppenhaver, Mondain, and Randall 2003; LeGrand and Sandberg 2006; Lloyd and Ivanov 1988; Montgomery 1998, 2000; Sandberg 2005). The relationship between fertility preferences and other forms of social and demographic uncertainty have been little theorized (but see LeGrand et al. 2003: 389–394; Trinitapoli and Yeatman 2011) and even less analyzed.

This analysis expands previous research on fertility preferences by examining the relationship between non-numeric family size preferences and multiple aspects of social and demographic uncertainty. Data for the analysis come from southern Mozambique, a sub-Saharan African setting experiencing rapid economic transformation, high levels of labor migration, and high rates of HIV infection—and a setting where many women give non-numeric responses to survey questions about desired family size. Consistent with previous research, we find that non-numeric preferences are more common where child mortality rates are high. In addition, we find that other elements of social uncertainty, including HIV mortality, household economic conditions, and husband's migration status, predict non-numeric responses.

Fertility preferences in high-fertility contexts

Early surveys in high-fertility contexts prompted concern about the utility of asking questions about intentions and preferences. In countries that had not yet undergone the transition to controlled fertility, demographers hypothesized that childbearing was not normally the subject of individual decision-making, especially for women. In such settings, it was unclear whether women would be able to formulate preferences or to consider childbearing goals under hypothetical conditions. Some researchers worried that respondents would simply answer "don't know" or "as many as God sends" to questions about desired family size, reducing the utility of the data generated by these questions. Concerns about

courtesy bias in responses and rationalization of children already born also contributed to distrust of survey questions about desired or ideal family size (Bongaarts 1990, 1992).

A series of studies reacting to these concerns examined and largely confirmed the overall validity of reported family size preferences (e.g., Knodel and Prachuabmoh 1973; McClelland 1983; Shah and Palmore 1979). More contemporary research continues to use desired family size as a predictor of both individual and aggregate-level reproductive behavior. At the national level, desired family size explained more than 90% of cross-national variation in fertility in DHS countries in the 1980s and early 1990s (Pritchett 1994). At the individual level, reported intention to stop childbearing is positively correlated, and desired family size negatively correlated, with the use of modern contraceptives (e.g., Bhargava 2007; Guilkey and Jayne 1997; Lutalo et al. 2000).

The utility of numeric measures of intended family size suggests the possible importance of understanding how to interpret non-numeric measures as well. Methodologically-focused research has proposed varied answers to this question. In some cases, non-numeric responses are treated as measurement error and efforts are made to estimate the "true" underlying quantitative preferences of women who give these responses.[2] In empirical tests of this approach in Guatemala and North India, non-numeric responses do not appear to represent a desire for very large families but are more consistent with the hypothesis that non-numeric responses are randomly distributed across all fertility preferences (Jensen 1985). Other approaches accept non-numeric responses at face value, without attempting to attribute a quantitative desire to women who give these responses, and examine the sociodemographic characteristics associated with non-numeric preferences. Thus, research in Nigeria has found that women with no education and women with few children were more likely to report non-numeric preferences than more educated women and women further along in their childbearing careers (McCarthy and Oni 1987). Education has also been found to be associated with numeric responses in Costa Rica (Riley, Hermalin, and Rosero-Bixby 1993).

In general, these methodologically-focused studies assume that numeric preferences represent a more advanced stage along the path of demographic transition (see also van de Walle 1992 for a theoretical discussion of this assumption). A more theoretically-driven series of studies examines this assumption and hypothesizes about the conditions under which numeric preferences emerge, particularly conditions related to child mortality (Agadjanian 2005; Castle 2001; LeGrand et al. 2003; Lloyd and Ivanov 1988). Where child mortality rates are high, it is difficult to predict how many children will survive; even parents with clear preferences for numbers of surviving children will have difficulty planning births to meet their goals. According to this approach, non-numeric responses are a logical response to this type of uncertainty (Lloyd and Ivanov 1988; Montgomery 1998, 2000). Empirical research in Nepal has shown that child mortality rates in women's social networks predict non-numeric responses (Sandberg 2005). Links between child mortality and non-numeric response in other contexts have not been empirically established.

[2]This approach has also been applied to uncertain or "don't know" responses to the question of *whether* women want to continue childbearing (Becker and Sutradhar 2006). Here, we concentrate on responses to questions about *number* of children.

The key insight from theories connecting child mortality levels and non-numeric response is that desired family size is hard to quantify when child deaths are likely, but not certain and not predictable. That is, uncertainty about child outcomes leads to uncertainty about desired family size. LeGrand and colleagues (2003: 389–394) outline other possible sources of uncertainty about returns to childbearing. In high-mortality contexts, parents may worry about their own survival as well as children's mortality. These concerns produce uncertainty around plans for childbearing to the extent that parents have difficulty predicting the likelihood of surviving to benefit from children in old age; they are likely to be particularly salient in settings with high HIV prevalence, since HIV mortality is high among adults of reproductive age. Economic conditions also introduce unpredictability into parents' plans for family formation through shifting calculations about investment in children. Goals for childbearing incorporate child "quality" – that is, children's education and ultimately their ability to contribute economic support to parents and siblings as well as themselves – as well as "quantity." Calculations about quantity-quality tradeoffs take into account costs of investment, such as school fees and opportunity costs of enrollment, and returns to investment, such as wages and agricultural productivity. If these costs and benefits are unstable, parents may have difficulty forming numeric preferences. The key argument here is that it is variation in possible responses that produces uncertainty: non-numeric preferences should be most common in situations where parents perceive negative outcomes as possible but unpredictable and not inevitable.

In this paper, we test the hypothesis that child mortality increases the likelihood of non-numeric response in a high-fertility sub-Saharan African setting. We also extend this line of reasoning to test associations between non-numeric response and other types of uncertainty. The possibility of adverse events in varying spheres, notably economic instability and concerns about parental health, has been proposed as a predictor of non-numeric preferences but not empirically tested (Agadjanian 2005; Johnson-Hanks 2005, 2006, 2007; LeGrand et al. 2003; LeGrand and Sandberg 2006). This paper moves toward more formal hypothesis generation and testing of these proposed relationships.

Setting

This analysis focuses on these questions through a study of fertility preferences in Mozambique, a country in southeast Africa with approximately 22 million inhabitants. Data come from a representative survey of married women of reproductive age (18–40) conducted in June-July 2006 in four rural districts (total area approximately 5900 square miles, population approximately 625,000) of Gaza province in southern Mozambique. (The survey is described in more detail in the data section below.) After gaining independence from Portugal in 1975, Mozambique experienced a decade and a half of brutal civil war. The war ended in 1992, ushering in a period of rapid economic growth and structural adjustment. Despite this macroeconomic growth, Mozambique remains one of the world's poorest and least economically developed nations, with an average per capita annual income of $320, life expectancy of 42 years, and female literacy rate of 32% (World Bank 2011).

Mozambique has high rates of out migration, particularly labor migration by men to South Africa. This migration system dates to colonial times, when formal contracts brought

Mozambican laborers to work in South African mines. The civil war increased both voluntary and forced migration, and high migration levels have persisted after the conflict (de Vletter 2000). Gaza province, where the data for this study were collected, borders South Africa; due to this proximity, as well as to the fragility of agricultural production in this drought- and flood-prone region, the province has among the highest rates of international labor out migration in Mozambique. The province has also experienced large internal out migration, especially to Mozambique's capital, Maputo (Knauder 2000). However, while labor migration flows have probably increased in recent times, economic returns to migration have become lower and less certain, as job opportunities in overcrowded Mozambican cities have dwindled and formal employment in South African mines has been increasingly replaced by informal work (de Vletter 2007). Migration-induced separation between husbands and wives, exacerbated by declining returns to migration, has contributed to the destabilization of marriage and family systems in Mozambique (Agadjanian, Menjívar, and Cau, forthcoming). The move toward less formal employment among migrants has also increased the range and unpredictability of outcomes for migrants, leading to a situation in which some migrant husbands are able to substantially improve economic conditions in their households while others are not able or do not choose to provide regular remittances.

HIV-related morbidity and mortality contribute to uncertainty regarding survival and economic support from family members. Mozambique has one of the highest HIV prevalence rates in the world, and infection rates in Gaza province are the highest of all of Mozambique's provinces. Estimates based on antenatal surveillance data showed adult prevalence in Gaza rising from 19% in 2001 to 27% in 2007, and population-based data from the 2009 National AIDS survey showed adult prevalence of 25% in the province (Ministry of Health 2010).

There is some evidence that fertility transition has begun in Gaza province. According to the 2003 Demographic and Health Survey (DHS), the latest DHS for which data are available at this writing, virtually all women surveyed in Gaza reported knowing at least one modern method of contraception. At the time of the DHS, about 15% of women of reproductive age were using some form of modern contraception, primarily hormonal methods, and more than three quarters of non-users reported planning future use. Still, the median desired family size was 4.3 children, and contraception was largely used for spacing at low parities. Birth rates also remain high, with an estimated TFR in Gaza of 5.4 children per woman (Instituto Nacional de Estatistica and Ministerio da Saude 2005). Some previous research suggests that Mozambique was experiencing an early-transition stall during the first few years of the twenty-first century (Shapiro and Gebreselassie 2008).

Hypotheses

Demographic theory draws strong ties between birth rates and levels of infant and child mortality: birth rates will fall only when parents can feel confident that the children they have will survive to adulthood. More generally, uncertainty about child survival makes it difficult to make plans for future childbearing. Previous research has found that higher local child mortality levels are associated with higher proportions of women reporting non-

numeric preferences for completed family size (Sandberg 2005). We test this proposition in a sub-Saharan African setting. **Hypothesis 1:** Women living in communities with higher child mortality will be more likely to have non-numeric fertility preferences.

The connection between adult mortality and fertility preferences is less well theorized. Worries about individual mortality may limit fertility if people fear leaving orphaned children behind or, alternatively, may increase birth rates if people are eager to leave a lineage behind them. A growing literature on the impact of the HIV epidemic on fertility finds some support for both of these possibilities (e.g., Aka-Dago-Akribi et al. 1999; Baylies 2000; Cooper et al. 2007; Rutenberg, Biddlecom, and Kaona 2000; Yeatman 2009). We propose that higher perceived risk of HIV mortality will lead to more uncertainty about future health and reproductive capability. Again, perceptions of mortality are likely based on observation of one's own community and social networks, rather than on formal measures. **Hypothesis 2:** Women who perceive higher community levels of adult HIV mortality will have higher proportions of non-numeric fertility preferences.

Moving beyond mortality, we hypothesize about associations between non-numeric preferences and other aspects of uncertainty about child and adult outcomes. As with most demographic surveys, we have no direct measures of individual women's perceptions of uncertainty or their level of control over future events. Instead, we consider two dimensions of uncertainty that can be measured using standard sociodemographic variables. First, we measure the resources women can call upon to deal with possible changes. Women with more resources (both economic and human capital, i.e. education) will be (and will perceive themselves to be) better able to react to subsequent changes in social and economic conditions. **Hypothesis 3:** Women living in more economically secure households will be less likely to give non-numeric responses about their childbearing plans.

Second, we assess the stability of marital relationships. The vast majority of childbearing in rural Mozambique takes place within marriage. Children are traditionally understood to belong to a marriage and often remain with the father or his extended family in cases of separation. Thus, decisions about future childbearing are tied to assessments of marital outcomes. In recent decades, however, rural marriage has undergone considerable changes. While formal marriage through civil registry or religious ceremony has remained rare, the bridewealth marriage, once the mainstay of the patrilineal marital system, has eroded. In areas of massive labor outmigration marriages have become particularly unstable, as men's migration and prolonged absence weaken the marital bond and often lead to marital dissolution. The unpredictability of financial returns to migration (as described above) means that migrant husbands are less likely to provide stable remittances as compensation for the instability introduced by physical separation. We predict that uncertainty regarding the future of a marriage will increase difficulty in setting numeric goals for future childbearing. **Hypothesis 4:** Women who perceive their relationship with their husband as insecure will be more likely to give nonnumeric responses about how many children they want to have.

Data and methods

Data

The sample for the individual survey was drawn from the population of married women aged 18–40 residing in 56 villages of four contiguous districts in southern Mozambique. We limited the sample to women age 40 and under in order to capture women of reproductive age (i.e., to exclude (most) menopausal women). About 18% of women in the sample were married before age 18, and about 85% of women had at least one child at the time of the interview. Thus, our analysis is best interpreted as describing childbearing intentions among women who have started their reproductive careers. To the extent that uncertainty increases with age or parity, our analysis will underestimate non-numeric response in the population of women of reproductive age.

In each district, 14 villages were selected with probability proportional to size. In each selected village (or randomly selected section thereof if a village was large), all households with at least one married woman were canvassed and divided into two groups—those with at least one woman married to a migrant and those with no such women. These two groups were used as separate sampling frames: from each of them 15 households were randomly selected. In each selected household a woman was interviewed (in households classified as migrant, a woman married to a migrant was interviewed). The resulting sample consisted of 1680 women (420 per district, 30 per village), more or less evenly split between women married to migrants and women married to non-migrants. Weights were constructed to account for the differential selection probabilities of women married to migrants and non-migrants; all descriptive and multivariate analyses presented here apply survey weights.

The survey collected detailed demographic and socioeconomic information, including pregnancy histories, reproductive intentions, husband's migration history, and household material status, as well as information on HIV/AIDS awareness and prevention, women's social networks, and their gender attitudes. In parallel with the individual women's survey, a community survey was carried out in each of the villages included in the sample. The community survey focused on village economic and social life, proximity of health services, out-migration, and HIV/AIDS issues.

Dependent variable

The dependent variable is constructed based on a series of questions about future childbearing desires. All women were asked whether they would like to have more children at any point in the future. Women who responded in the affirmative to this question were then asked how many children they would like to have. Specifically, women were asked: "How many children, in addition to those you have, would you like to have?' The primary dependent variable in this analysis is a dichotomous variable defined only for women who want more children. Women who give a numeric response to the question about how many children are assigned a value of zero for the dependent variable, while women who give any non-numeric response are assigned a value of one. Following previous research on non-numeric response, we combine all possible non-numeric responses ("don't know", "up to

God", etc.) in one response category (Jensen 1985; McCarthy and Oni 1987; Riley, Hermalin, and Rosero-Bixby 1993; Sandberg 2005).

By defining the dependent variable only for women who want more children, we assume a sequential model of fertility intention formation where women first decide *whether* or not they want more children and then consider *how many* children they want. This sequential model accurately reflects the structure of the survey questions about fertility intentions. It is also consistent with empirical understandings of actual fertility decision-making (Morgan 2001; Namboodiri 1972, 1983). In exploratory analysis, we estimated selection models analyzing the two steps in the decision-making sequence (wanting more children and forming numeric intentions) simultaneously. Results showed low correlation between the two models, indicating that selection based on wanting more children does not bias the estimated coefficients for nonnumeric response. We therefore report results from a model predicting non-numeric response independently from the decision to have more children. Results from the selection models are available on request.

Our primary focus in this research is on the process of forming numeric preferences, rather than decisions on whether or not to have another child. However, we also present and briefly discuss models examining the determinants of wanting more children and of desired family size for women with numeric preferences. Comparisons between the factors shaping nonnumeric response and those affecting the desire for more children shed light on the mechanisms through which independent variables are associated with the formation of non-numeric responses.

Independent variables

The key independent variables in this analysis operationalize three components of uncertainty described in the analytic approaches section above: access to resources, marital stability, and child and adult mortality. Access to resources is measured primarily at the household level. We include three measures of household wealth: whether the household has electricity (either from the grid or from solar panels, batteries, or generator), whether the household owns cattle, and an index of household material possessions. The index is scored from one to four and reflects household ownership of key items (radio, bicycle, and motorcycle or car).[3] Women's education level (no education, 1–4 years of education, 5 or more years of education) could be interpreted as an indicator of access to economic and social resources. However, education is also associated with increased numeracy, increased exposure to western family ideals, and increased connections with non-family institutions. Thus, we do not treat education as measure of uncertainty about the future for the purposes of testing hypothesis 1.

[3]In exploratory analyses, we tested models using a wealth index score generated from principal components analysis (PCA) of household characteristics (possession of durable goods, housing materials, water source, ownership of domestic animals, etc.) (See Filmer and Pritchett (2001), Rutstein and Johnson (2004) for descriptions of this method of index construction.) Results from these models were qualitatively similar to the results presented here – in particular, coefficient values were nearly identical. However, because the PCA-based index combines information from multiple measures of household wealth, it requires more variables and has more missing values. Thus, sample sizes were smaller in the models using the PCA-based measure and standard errors were larger. We prefer the models with larger sample sizes and more precisely estimated coefficients. Results from models using the PCA-based index score are available on request.

Men's migration can be a crucial determinant of their wives' access to resources. But male migration can also have a strong impact on the marital relationship, and this impact likely depends on the economic outcome of migration. Successful migration, i.e., migration that results in a steady flow of remittances, may reduce the strain induced by spousal separation, while unsuccessful migration may further amplify this strain. To capture this variability in migrant experience, we use a measure that combines whether the woman's husband was currently a migrant with a subjective assessment of whether this migration has improved household economic conditions. This migration measure represents both access to resources and marital stability; by separating successful migrants from those whose migration did not improve household economic conditions, we are able to focus on the migration experiences that are likely to be most disruptive. As a second measure of perceived marital stability, we also include a variable for whether the respondent thinks (either knows or suspects) that her husband is having sex with another woman.

Perceived level of child mortality is operationalized as a continuous variable representing the proportion of women in the community who report at least one child death.[4] This information is taken from the birth history section of the survey, which collects a complete fertility history and information about whether each child is still living. For each woman in the community, a dichotomous variable was constructed indicating whether the woman had ever experienced the death of a child. These variables were averaged for the 30 women in each sample community in order to create a community-level measure of child mortality.

Perceptions of AIDS mortality are used to index variation in adult mortality. At the individual level, we measure respondents' sense of local health conditions through the number of people they know who have died of AIDS. This measure is a continuous variable. Village-level health conditions are represented by the number of people in the village who died of AIDS in the year prior to the survey. Community-level data were collected in each village from a key informant, such as a village administrator, health worker, or religious leader. The number of AIDS deaths is based on the perception and knowledge of this informant and is impressionistic rather than a precise measure of mortality. We therefore divided villages into high AIDS mortality (five or more deaths) and low AIDS mortality (fewer than five deaths) based on the median level of AIDS deaths reported.

In addition to these measures of uncertainty, we include control variables commonly used in studies of fertility in sub-Saharan Africa: age, education, whether a woman is in a polygamous marriage, parity, religious affiliation, and local access to modern contraception. Education in the survey is measured as completed years of schooling; the mean in the sample was 3.5 years, and no woman reported more than 11 years of schooling. For the purposes of analysis, we divide education into three categories: no formal education, some primary school (1–4 years of schooling), and complete primary school (5 or more years of schooling). Measures of religion distinguish between members of Catholic and mainline Protestant churches; members of Zionist churches; women who reported other religious affiliations; and women who reported no formal affiliation. We have no a priori hypotheses

[4]Women's own experiences of the death of a child are not included in the model because child deaths are closely correlated with parity.

about the relationship between these control variables and the likelihood of giving non-numeric responses.

In addition, all models control for interviewer effects by including interviewer-specific dummy variables. There were a total of 12 interviewers working for the project. All interviewers were female, had at least a high school degree, and lived in the capital city. Thus, interviewers were similar on key sociodemographic characteristics. However, they likely varied in terms of rapport with respondents, degree of probing when given non-numeric responses, and general ability and motivation. To account for variation in these unmeasured characteristics, we added a dummy variable for each interviewer to the model. In the interest of conserving space, coefficients for these dummy variables are not displayed in results tables. Although the proportion of non-numeric responses did vary significantly across interviewers, controlling for interviewer did not affect other associations. All estimated coefficients are robust to controls for interviewer effects.

Methods

We use logistic regression to model the likelihood of giving a non-numeric response to a question about future childbearing plans. Models are estimated using SAS PROC SURVEYLOGISTIC to account for the two-stage sampling procedure and complex sample design. All models apply survey weights.

Results

We first briefly describe the general context of fertility preferences in this sample of women from southern Mozambique. Table 1 shows the proportion of women who want more children, the proportion of those women who provide non-numeric responses for the number of children wanted, and the average number of children wanted among women giving numeric responses, along with variation in these figures according to key independent variables. The distribution of independent variables is also shown in Table 1. Most women in the sample—married women age 18–40—want to have more children. About 20% of the women who want more children give non-numeric responses when asked how many more they want; of those who give numeric responses, the average number of additional children desired is 3.0.

As might be expected, the proportion of women who want more children declines with both age and parity. Women with five or more years of education are more likely to want additional children than women with less education; this relationship is somewhat surprising, and may stem from cohort differences in educational attainment or from educational differences in fertility timing. Fewer women in polygamous marriages (59%) than women in monogamous marriages (72%) want to continue childbearing. Other sociodemographic characteristics are not strongly associated with the desire to continue childbearing. Notably, having an easily accessible family planning clinic is not associated with the desire to stop childbearing—72% of respondents who live in a village with a family planning clinic want more children, compared to 68% of respondents in a village without. Household economic status does not predict childbearing desires either, with the exception of husband's migration status: Women married to migrants, regardless of the economic

outcome of migration, are more likely to intend to keep having children (78% and 74%) than women married to non-migrants (64%).

Among women who report that they want more children, both sociodemographic characteristics and economic and demographic uncertainty appear to be associated with non-numeric responses. Older women and less educated women are more likely to give non-numeric responses. These associations are consistent with earlier research arguing that non-numeric responses are an indicator of pre-transition attitudes toward childbearing. In addition, women who attend Catholic or mainline Protestant churches have much lower rates of non-numeric response (13%) than women who attend Zionist churches (23%) or who report having no religious affiliation (29%). Women with other religious affiliations (mainly other types of Pentecostals) also have relatively low rates of non-numeric response (17%). To the extent that Catholic and mainline Protestant churches may be more attuned to Western values and tastes, this relationship may also support the idea that non-numeric responses stem from a pre-transition outlook on fertility. However, the presence of a family planning clinic in the village does not seem to encourage quantitative thinking about fertility; 22% of women living in villages with clinics nearby provide non-numeric responses, compared to 17% of women living in villages without clinics.

For the most part, the associations between economic and mortality conditions are consistent with the hypothesis that non-numeric responses are more common when conditions are more uncertain. Women living in households with electricity are about half as likely to give a non-numeric response as women living in households without electricity (11% vs. 21%), and women whose economic conditions have been improved by their husband's migration are less likely to give non-numeric responses than either wives of non-migrants or wives of unsuccessful migrants. Both community levels of child mortality and community levels of adult AIDS mortality are positively associated with non-numeric responses about future childbearing. The relationship between individual perception of AIDS mortality and non-numeric response appears to be curvilinear. Both women who know no one who has died of AIDS and women who know 4 or more people are more likely to give non-numeric responses than women who know a few people (23% vs. 15% vs. 22%). In addition, women who know or suspect that their husbands have extramarital partners, a likely indicator of perceived marital instability, are less likely to give non-numeric responses than women who believe their husbands are faithful.

Overall, these bivariate relationships provide some support for an association between perceptions of uncertainty and the formation of numeric preferences for future childbearing. In order to understand the joint relationships between these variables, we proceed to multivariate analysis. Results are shown in Table 2.

The first column in Table 2 shows the determinants of reporting non-numeric fertility preferences among women who want more children. These results confirm some associations between economic and demographic conditions and non-numeric fertility preferences shown in the bivariate results. The second and third columns in Table 2 show predictors of wanting more children and of the number of children desired by women with numeric preferences. Considering these results in conjunction with the determinants of non-

numeric fertility intentions provides a more complete picture of the effects of uncertainty on plans for childbearing. We discuss results from these secondary analyses where relevant to the primary hypotheses regarding uncertainty and non-numeric intentions.

Child mortality is positively associated with non-numeric fertility preferences, as hypothesized. The proportion of women in the community who have experienced the death of a child is strongly and positively associated with giving a non-numeric response (b=2.84) (hypothesis 1). Individual perceptions of AIDS mortality are also positively correlated with uncertain fertility preferences (hypothesis 2), although the magnitude of this association is small, indicating a 5% increase in the odds of non-numeric response for each additional known AIDS death (b=0.05; OR=1.05).[5] Community levels of AIDS mortality are not significantly associated with uncertain preferences. This relationship is not statistically different from 0 even when individual perceptions are not included in the model (results not shown); the bivariate relationship between community AIDS mortality and non-numeric preferences shown in Table 1 appears to be an artifact of other community characteristics.

Hypothesis 3, linking economic resources and non-numeric preferences, is supported. Women living in households with electricity are much less likely to give non-numeric responses (b=−0.79). In addition, women whose husbands are unsuccessful migrants have about 60% higher odds of reporting non-numeric preferences (OR=exp(0.47)=1.6) than wives of successful migrants or wives of non-migrants. Education is also a strong predictor of numeric responses, with more educated women (those who have completed primary school) less likely to report nonnumeric preferences. Theoretically, these results would also be consistent with the argument that non-numeric preferences are simply the equivalent of very high desires for children. To the extent that education and household resources are indicative of greater progress toward fertility transition, they would be associated with lower desired family size and fewer non-numeric responses. In this population, however, education is not significantly associated with wanting more children (columns 2 and 3), and women living in households with more resources (as measured by electricity, although not by household possessions) are *more* likely to want to continue childbearing (column 2). That is, education and economic resources are not associated with progress toward fertility transition. Furthermore, after accounting for other sociodemographic characteristics, parity is not significantly associated with non-numeric fertility preferences, but does predict the desire to continue childbearing and the number of additional children desired (columns 2 and 3). On the whole, these results suggest that non-numeric plans for further childbearing are not simply an expression of high desired fertility.

Results show less support for hypothesis 4, relating marital instability and uncertain fertility preferences. The association between unsuccessful migration and non-numeric response can be interpreted as supporting hypothesis 4. However, the relationship between husband's infidelity and non-numeric preferences is statistically significant (p<.01) in the opposite direction as predicted: women who know or suspect infidelity are *less* likely to give non-

[5]Because bivariate statistics suggested a non-linear relationship between individual perceptions of AIDS mortality and the likelihood of non-linear responses, various curvilinear specifications were tested in exploratory analysis. A linear relationship was found to fit the data best.

numeric responses. It may be that this measure is a poor indicator of perceived marital stability. Alternatively, marital stability may have different effects on fertility plans than other forms of uncertainty; column 2 shows that women who suspect infidelity are less likely to want more children (b=−0.26), i.e., they are more likely to want to stop childbearing. Further research is necessary to determine which of these conclusions is appropriate.

Conclusions

This analysis tested four hypotheses based on the argument that non-numeric preferences for family size are shaped by women's uncertainty about their future. Consistent with previous research in other settings, rates of non-numeric response are higher in communities with higher levels of child mortality (hypothesis 1). We extend this research to show that adult mortality levels, as measured by individual perceptions of adult HIV/AIDS morbidity, also predict nonnumeric family size preferences, though only weakly (hypothesis 2). Results indicate some support for the hypothesis that economic stability, measured by the availability of resources, reduces the odds of reporting non-numeric preferences (hypothesis 3). However, there is little evidence for the impact of marital stability on certainty in fertility preferences (hypothesis 4).

This approach poses measurement challenges, both in using what is essentially a lack of preferences as a dependent variable and in assessing individual perceptions of uncertainty. Notably, the weakest results of this analysis are those testing the hypothesis regarding marital uncertainty, the construct that uses the least direct measures. Further research is needed to determine how best to operationalize social uncertainty at the individual level. Still, this analysis demonstrates that theoretically meaningful predictors of non-numeric preferences can be identified using existing survey data, providing a first step toward opening the "black box" (LeGrand and Sandberg 2006: 91) of expectations about the future and their influence on fertility plans.

The implicit alternative to the hypotheses tested here is that non-numeric fertility preferences are, indeed, an expression of a fatalistic approach to childbearing and an indication of slow progress toward fertility transition. Some results could be construed as supportive of this alternative hypothesis—for example, more educated women and women who belong to Catholic or mainline Protestant churches are less likely to give non-numeric responses. However, parity is not significantly associated with non-numeric preferences. In addition, factors such as having an unsuccessful migrant husband or knowing people who have died from AIDS, which are not associated with demographic transition according to standard frameworks, do predict nonnumeric responses in directions consistent with theory.

Overall, then, these results lend additional support to theories linking social uncertainty and non-numeric fertility preferences. This conceptualization of non-numeric fertility preferences does not contradict earlier assumptions that uncertain preferences result when fertility is outside of individual control. However, under this framework uncertain preferences represent a rational response to structural conditions, rather than a lack of cognitive capacity to formulate preferences. A logical question for further research is

whether this approach to interpreting non-numeric preferences leads to better understanding of the connection between preferences and subsequent fertility *behavior*. A follow-up survey was recently completed, and future analyses will examine the subsequent fertility behavior of women who reported non-numeric fertility preferences in this survey.

These results also illustrate the utility of extending the scope of fertility research to consider uncertainty around preferences as well as preferences themselves. This approach has proven fruitful in the United States (e.g., Morgan 1981, 1982) and has potential applications across multiple substantive areas in high-fertility contexts. For instance, this approach might help in conceptualizing emerging research on the impact of the HIV epidemic on fertility preferences. The mixed results generated by existing empirical studies may be better understood by considering how the epidemic shapes individual control and predictability of future reproduction than by asking whether HIV prevalence increases or decreases desire for children. More generally, studying the determinants of non-numeric preferences provides a way of moving beyond outcomes to think about the process of formation of fertility preferences and their transformation into reproductive behavior.

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Table 1

Fertility intentions according to selected sociodemographic variables

	N (whole sample)	N (want more)	Proportion wanting more children	Of those wanting more children: Proportion giving non-numeric response	Of those wanting more children: Average # desired among those giving number
All women	1620	1118	0.70	0.20	3.0
Sociodemographic variables					
Age 20 and under	264	237	0.90	0.16	3.4
Age 21–25	452	379	0.84	0.18	3.1
Age 26–30	454	307	0.69	0.19	2.8
Age 31 and over	450	195	0.43	0.29	2.4
No education	428	291	0.69	0.27	2.9
1–4 years of education	733	487	0.67	0.21	3.0
5 or more years of education	457	339	0.74	0.12	2.9
Monogamous marriage	1276	913	0.72	0.20	3.0
Polygamous marriage	344	205	0.59	0.20	2.7
Parity					
No living children	236	214	0.90	0.19	4.1
1–3 living children	1028	794	0.78	0.19	2.8
4+ living children	356	110	0.32	0.24	1.7
No family planning services in village	841	567	0.68	0.17	3.0
Family planning services available in village	779	551	0.72	0.22	2.9
Religious affiliation					
No religion	222	155	0.72	0.29	3.0
Catholic/mainline Protestant	450	294	0.65	0.13	2.8
Zionist	536	381	0.71	0.23	3.0
Other religion	412	288	0.71	0.17	3.1
Household conditions					
Material possessions index = 1	546	364	0.68	0.21	2.8
Material possessions index = 2	526	356	0.68	0.18	3.1
Material possessions index = 3	409	298	0.74	0.20	3.1

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	N (whole sample)	N (want more)	Proportion wanting more children	Of those wanting more children: Proportion giving non-numeric response	Of those wanting more children: Average # desired among those giving number
Material possessions index = 4	139	100	0.73	0.21	3.0
No electricity in household	1386	937	0.68	0.21	3.0
Electricity in household	234	181	0.78	0.11	3.0
Does not own cattle	1110	751	0.68	0.19	3.0
Owns cattle	510	367	0.73	0.21	3.0
Husband's characteristics					
Husband is not a migrant	946	607	0.64	0.20	3.0
Husband is a migrant and:					
Life is better since husband migrated	339	262	0.78	0.15	2.8
Life is worse since husband migrated	335	249	0.74	0.23	3.2
Does not suspect husband had sex with other women	1101	771	0.71	0.22	3.0
Knows/suspects husband had sex with other women	519	347	0.68	0.14	2.9
Mortality conditions					
Level of child mortality in village					
<25% of mothers experienced child death	556	383	0.68	0.14	3.0
25%–35% of mothers	600	402	0.67	0.21	2.9
>35% of mothers	464	333	0.74	0.24	3.0
Number of people known who died of AIDS					
0	842	570	0.69	0.23	2.9
1–3	479	348	0.73	0.13	3.1
4 or more	299	200	0.66	0.22	3.0
Low AIDS mortality village	827	575	0.70	0.17	3.0
High AIDS mortality village	793	543	0.69	0.23	2.9

All proportions weighted. See text for further description of data and variables.

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Table 2

Effects of social uncertainty on intentions for future childbearing

	Non-numeric response			Want more children			Number of additional children desired		
	Coefficient	**S.E.**		**Coefficient**	**S.E.**		**Coefficient**	**S.E.**	
Intercept	−1.69	0.61	**	2.75	0.52	***	4.07	0.45	***
Interviewer effects: not shown in table									
Sociodemographic variables									
Age 20 and under (omitted)									
Age 21–25	0.01	0.25		−0.12	0.27		0.10	0.16	
Age 26–30	−0.01	0.28		−0.40	0.27		0.19	0.18	
Age 31 and over	0.58	0.33	+	−0.90	0.30	**	0.07	0.22	
No education (omitted)									
1–4 years of education	−0.20	0.22		0.01	0.18		0.08	0.16	
5 or more years of education	−0.73	0.27	**	−0.08	0.21		−0.23	0.17	
Polygamous marriage	−0.26	0.25		−0.46	0.16	**	−0.39	0.14	**
Number of living children	0.03	0.08		−0.64	0.06	***	−0.58	0.05	***
Family planning services available in village	0.29	0.19		0.05	0.14		−0.19	0.12	
No religion (omitted)									
Catholic/mainline Protestant	−0.71	0.30	*	−0.33	0.23		−0.12	0.20	
Zionist	−0.17	0.25		−0.04	0.22		−0.03	0.19	
Other religion	−0.53	0.28	+	−0.33	0.24		−0.01	0.20	
Household conditions									
Material possessions index	0.01	0.11		0.02	0.08		0.04	0.07	
Electricity in household	−0.79	0.31	*	0.56	0.21	**	0.11	0.17	
Owns cattle	0.25	0.22		0.18	0.17		0.00	0.13	
Husband is not a migrant	0.06	0.23		−0.54	0.20	**	0.12	0.13	
Life is better since husband migrated (omitted)									
Life is worse since husband migrated	0.47	0.26	+	−0.54	0.24	*	0.13	0.17	
Suspects husband having sex with other woman	−0.71	0.22	**	−0.26	0.15	+	−0.12	0.14	
Mortality conditions									
% of mothers in village reporting a child death	2.84	1.01	**	1.67	0.83	*	0.55	0.72	

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	Non-numeric response			Want more children		Number of additional children desired	
	Coefficient	**S.E.**		**Coefficient**	**S.E.**	**Coefficient**	**S.E.**
Number of people known who died of AIDS	0.05	0.03	+	0.01	0.03	0.01	0.02
High AIDS mortality village	0.25	0.23		−0.02	0.17	0.06	0.13
−2 log likelihood	1001			1500		--	
N	1118			1620		891	

Column 1: women who reported wanting more children with non-missing values for independent variables. Logistic regression. Column 2: women with non-missing data on all independent variables. Logistic regression. Column 3: women who reported numeric preferences for more children with non-missing values for independent variables. Linear regression. R^2=.20. All models also include controls for interviewer effects (coefficients not shown). See text for details on data and measures. All models apply weights and incorporate survey design effects.

+ p<.1;

* p<.05;

** p<.01;

*** p<.001, two-tailed tests.

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