The Decline in Non-Numeric Ideal Family Size: A Cross-Regional Analysis

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Abstract

This paper examines women's non-numeric responses to questions about ideal family size. Such responses have often been interpreted through the lens of classical demographic transition theory, as an indication that reproduction has not yet entered into the"calculus of conscious choice" (Coale 1973:65). Yet non-numeric ideal family size has rarely been investigated in a cross-national framework, and never across time. Thus we know little about the processes underlying changes in these responses. This study uses over 15 years of DHS data from 33 countries representing three world regions. Taking a multi-level modeling approach, we use country- and individual-level indicators to examine the factors associated with non-numeric ideal family size. We then examine how the effect of those predictors changes over time. Results suggest that education and knowledge of contraception have the most salient associations with non-numeric ideal family size; with both being negatively associated with this type of response. While the overall effect of education remains consistently strong over time, we find evidence to suggest the the effect of knowledge of modern contraception decreases over time.

Keywords Fertility transitions, Fertility preferences, Non-numeric responses

Introduction

Non-numeric responses to survey questions on fertility intentions—such as "up to god" or "such things can't be known"—have long captivated researchers studying the cultural and developmental processes underlying fertility change (e.g., Caldwell 1976; Morgan 1982; Olaleye 1993). Within high-fertility contexts, demographers have considered non-numeric fertility intentions as a key piece to the fertility transition puzzle because they seem to represent a "natural fertility" ethos among women (van de Walle 1992). This idea has gained particular traction when conceptualized within the framework of Coale's theory of the fertility transition, which posits that fertility declines when related decisions exist within individuals' "calculus of conscious choice" (Coale 1973:65). Non-numeric responses to questions of ideal family size may thus represent a woman's inability to control, conceptualize, or assign numeric values to her future fertility (Caldwell 1976; Castle 2001; Morgan 1982), and be indicative of a "pre-transition" mindset.

Despite general consensus among demographers that non-numeric responses to ideal family size (IFS) questions are meaningful, our understanding of what such answers actually represent and how they cohere with broader fertility paradigms remains limited. The small body of research that *does* explore the processes underlying non-numeric IFS tells us that such responses are associated with lower levels of education (McCarthy and Oni 1987; Riley et al. 1993) and more recent evidence suggests that uncertainty due to high child mortality and the HIV/AIDS epidemic may drive non-numeric responses to IFS questions in sub-Saharan Africa (Hayford and Agadjanian 2011; LeGrand et al. 2003).

Most empirical examinations of non-numeric IFS have a narrow geographical focus and are limited to point-in-time analyses. But trends in non-numeric IFS are dynamic and follow similar patterns across world regions. Over the past 16 years, the proportion of women who provide non-numeric responses to IFS questions in the Demographic and Health Surveys (DHS) has declined in the majority of the world's developing countries—a trend that has been noted by scholars from various fields (Bongaarts and Casterline 2013; Castle 2001).

Given that fertility transitions necessarily unfold chronologically, non-numeric IFS must also be assessed longitudinally in order to determine how they contribute to wider patterns of fertility change.

This study aims to identify the demographic and sociological trends that have contributed to changes in women's non-numeric IFS and to compare those factors across countries. We use a multilevel modeling strategy and data from 33 countries to answer the following questions:

1. What individual and contextual factors are associated with women providing non-numeric responses to IFS questions?
2. Have those relationships changed over time?

What Survey Respondents Tell Us When They Don't Respond

The tendency for respondents to opt out of answering questions through responses such as"I don't know" or "no opinion" is not limited to surveys about fertility intentions or demographic outcomes. Typically investigated in public opinion or political surveys, methodologists generally agree that such non-responses are not random but instead are related to respondent's characteristics, such as education, income, and gender (Francis and Busch 1975; Laurison 2008; Stinchcombe 1964). In addition to telling us about the respondents themselves, respondents' refusal to answer questions using the scale provided in the survey also provide insight into their social positioning; for example, Bourdieu (1984) posits that "don't know" responses to political questions are more prevalent among those lacking access to power and social capital (see also Bryson 1996).

Within demography, survey questions do not typically ask about people's opinions about political events or their views on social issues, but instead involve more personal issues, such as their first sexual experiences or their expectations and aspirations for their future family life. Demographers are particularly interested in non-responses to questions about fertility preferences. Within this realm, questions are often open-ended and use a numeric or calendar scale, such as how many children a woman would like to have and when she will ideally become pregnant. Refusing to provide a numeric response to such questions is likely not an indication of lack of knowledge about the issue at hand, but instead may indicate a unique cognitive orientation to demographic processes.

Non-numeric Ideal Family Size and the Fertility Transition

Fertility preferences, such as ideal family size, play a large role in demographers efforts to understand the transition from high to low fertility. One of the core tenets of demography is that a population-level decline in fertility can only be achieved once reproduction enters an individuals calculus of conscious choice (Coale 1973). Since non-numeric IFS has been interpreted as womens perceived lack of control over their own fertility (Caldwell 1976; Castle 2001), it follows that fertility transitions should be accompanied by a decline in the prevalence of non-numeric ideal family size.

In his "restatement" of the demographic transition theory, Caldwell (1976) explicitly acknowledges that "up to God" and "dont know" responses to IFS questions are likely more truthful than numeric responses, as fertility decisions in developing countries are often made outside of the nuclear family and are influenced by cultural norms regarding the timing and frequency of reproduction. In fact, there is strong evidence suggesting that treating these responses as missing data and dropping them from analyses will bias results (Jensen 1985; Olaleye 1993).

There is a small body of research that explores the predictors of non-numeric IFS. From this research, we know that providing non-numeric responses to the question of ideal family size is associated with lower levels of education (McCarthy and Oni 1987; Riley et al. 1993). We also have a limited understanding of the role that context plays in non-numeric responses to IFS questions. Generalized uncertainty due to high child mortality and the HIV/AIDS epidemic may drive non-numeric responses to IFS questions in sub-Saharan Africa (Hayford and Agadjanian 2011; LeGrand et al. 2003). To the best of our knowledge, there has been no research investigating non-numeric IFS on large or cross-regional scales. Additionally, while a number of scholars have noted the general decline in non-numeric IFS across countries within the DHS (Bongaarts and Casterline 2013; Castle 2001), no studies have attempted to explain the change in the prevalence of non-numeric IFS or how this general decline may relate to the wider scope of fertility transitions.

Theoretical Framework and Research Hypotheses

Drawing on previous research on non-numeric IFS as well as broader family planning and demographic literature, we center our analysis around four inter-related hypotheses about what prompts women to provide non-numeric responses to questions ideal family size.

Hypothesis 1: Mortality-related uncertainty is positively associated with non-numeric ideal family size.

There is a growing body of literature, particularly focused on sub-Saharan Africa, that documents how uncertainty shapes actions and decision-making (Johnson-Hanks 2004, 2006; Trinitapoli and Yeatman 2011). One source of uncertainty in developing countries is mortality. Frequent encounters with mortality may lead women to be uncertain whether they will live to parent their children as well as whether their children will survive to adulthood, making the task of choosing an "ideal" number of children considerably more complex. In fact, localized, cross-sectional studies have demonstrated a positive association between child mortality and the likelihood of providing a non-numeric response to IFS questions (Hayford and Agadjanian 2011; LeGrand et al. 2003; Sandberg 2005). Drawing from these bodies of research, we expect to find a strong positive relationship between both personal experiences of child death and contextual differences in rates of child and adult mortality and the likelihood of providing a non-numeric response to the question of ideal family size.

Hypothesis 2: Higher levels of education and literacy among women are positively associated with the likelihood of providing a non-numeric response when asked about ideal family size.
Since the 1994 International Conference on Population and Development in Cairo, the empowerment of women—particularly through education—has featured prominently in research on fertility decline and efforts to promote family planning (Ashford 1995; Cleland et al. 2006; Knodel and Jones 1996). While the mechanisms through which education decreases fertility have been contended (Martin 1995), womens education is likely associated with decreases in non-numeric responses to IFS through improvements in numeracy (van de Walle 1992). In fact, studies using data sources other than the DHS have shown strong positive associations between education and providing numeric responses to IFS questions (Hayford and Agadjanian 2011; McCarthy and Oni 1987; Riley et al. 1993). We expect that individual measures of educational attainment and literacy, as well as contextual measures of women's school attendance will be positively associated with non-numeric responses to ideal family size.

Hypothesis 3: Knowledge of modern contraception and lower contextual-level fertility rates are negatively associated with the likelihood of providing a non-numeric response when asked about ideal family size.
Extending Coale's (1973) line of reasoning, it follows that knowledge of family planning brings fertility within the "calculus of conscious choice" by allowing women to imagine controlling their fertility. Empirical evidence indeed suggests that the *use* of modern contraception is negatively correlated with ideal family size and positively correlated with the desire to stop childbearing (Bhargava 2007).

The idea that people may not know they want to limit their family size until they see other people doing so is also relevant and has been championed by diffusion theorists who believe that fertility decline is a process of change begetting change. Research on Taiwan's rapid fertility transition shows clear support for diffusion within local townships (Montgomery and

Casterline 1993). Likewise, knowledge of family planning methods are positively associated with exposure to family planning outreach efforts, suggesting that interpersonal networks support emerging preferences to limit childbearing (Debpuur et al. 2003).

Hypothesis 4: Wealth is negatively associated with the likelihood of having non-numeric ideal family size.

Economic theories of fertility decline hold that as wealth increases, children become more expensive, leading people to desire smaller families (Macunovich 1996; Lee 2003). The idea that economic modernization changes the way that people plan for and think about childbearing goes all the way back to Notestein (1953), who describes how the "urban industrial society" brings about "the development of a rational and secular worldview" and the emergence of "a new ideal of the small family" (Notestein 1953: 16). In his 1976 reformulation of Notestein's demographic transition theory, Caldwell describes two separate regimes of fertility, both of which can be considered economically rational: one where there it is economically rational to have an unlimited number of children and the other where it is economically rational to restrict one's fertility; he describes how societies transition to the latter regime through economic modernization leading to changes in social norms and family structure (Caldwell 1976).

Empirical analyses of fertility decline support these early theories that economic development and wealth increases are associated with the desire to limit one's fertility. Economic development and wage increases were found to explain 45 to 65 percent of the rapid fertility decline in Bangladesh in the 1980s; contraceptive programs, on the other hand, appear to have little effect (Gertler and Molyneaux 1994). Likewise, the decrease in Iran's marital fertility between the 1950s and 1970s closely followed a demand-specific model, with fertility behavior being determined largely by costs of children (Raftery et al. 1995). Household wealth and community-level socio-economic status have also been found to be negatively associated with the likelihood of providing a non-numeric response in both Mozambique and

Nigeria (Hayford and Agadjanian 2011; McCarthy and Oni 1987).

Data and Methods

Data

This study uses data from the Demography and Health Surveys (DHS) from 33 developing countries representing three world regions: South and Southeast Asia, Latin America, and sub-Saharan Africa. The DHS are standardized and nationally representative household-based surveys that are primarily used to gather information on sexual and reproductive health, child health, and fertility.

DHS surveys have been repeatedly administered in many countries, allowing for comparisons over time. To examine change across time, two surveys are included for each country. The most recently available survey is used for each country as is either the Phase III or Phase IV survey for that country.[1] The data span 16 years from 1993 through 2011, with data for individual countries spanning between three and sixteen years. Table 1 contains the countries included in our analysis, the year of data collection, and the sample size for each survey.[2]

—TABLE 1 ABOUT HERE—

The DHS collect data at the individual and household levels. Thus, in order to tap into country-level information not measured consistently within the DHS, we also supplement data from the World Development Indicator Database (World Bank 2012).

A country was chosen to be included in the study if it had at least two standard DHS surveys administered during or after the Phase III period (roughly around 1993), when interviewers began probing for numeric responses to the question of ideal family size. These selection criteria were implemented in order to allow us to examine change between surveys

[1]The Phase III and Phase IV surveys were administered between 1993 and 2001.

[2]In instances where data collection took place over multiple years, we report the year that the majority of respondents were interviewed.

and to minimize methodological and measurement variance on our outcome measure. Additionally, we restrict our analyses to women who have complete information available on all key measures used in our analyses. Overall, 1.3 percent of respondents had missing data on at least one variable of interest, and the percent missing ranged from 0.01 for Bangladesh in year 1994 to 10.4 for Chad in year 2004. Our final analytic sample includes 768,636 women.

Dependent variable

Our outcome measure is a binary indicator of whether a woman has provided a non-numeric response to the question of ideal family size (1=non-numeric, 0=numeric). The DHS measures a woman's ideal family size through the following question: *"If you could chose exactly the number of children to have in your whole life, how many would that be?"*.[3] The wording and placement of this question has remained consistent throughout the observation period. Interviewers are instructed to probe for numeric responses, but also have the option of writing in "other" responses. The probing on this question allows us to treat non-numeric IFS as valid responses to the question, rather than missing data or errors.

Individual-level independent variables

We use individual-level predictor variables to test each of our four hypotheses. To explore whether mortality-related uncertainty is associated with non-numeric IFS, we include a variable indicating whether a woman has experienced the death of a child. To evaluate the role that education plays in predicting non-numeric IFS, we use two measures: whether or not a woman can read (1= literate, 0=illiterate)[4] and a categorical variable specifying the

[3] To avoid answers that may be biased by a woman's current number of children, the question is prefaced with, *"If you could go back to the time when you did not have any children..."* for women who already have children.

[4] Due to changes in the literacy question over time, we are unable to drill down to a more nuanced measure of literacy. In this measure, we consider women who "read easily", "read with difficulty", are "able to read a whole sentence" and are "able to read part of a sentence" as literate. Robustness checks of our literate measure confirm that literacy increases over time in the vast majority of the countries in our sample. It should also be noted that the DHS assumes that women who completed secondary school are literate, and they are not asked the literacy question. Thus, we make the same assumption in our analysis.

highest educational level she completed—primary school or higher, some primary school, or no school at all (reference group).

To assess our hypothesis that exposure to family planning plays a role, we include a measure of whether a woman knows any modern method of contraception (1=yes, 0=no). In considering whether economic conditions are associated with non-numeric IFS, we use a categorical variable that represents household socioeconomic status (SES), as measured by the DHS wealth index quintiles (with the middle quintile as the reference group). While evidence suggests that wealth indices are good proxies for SES (Bollen et al. 2002), the DHS wealth index is constructed on a per-country basis and therefore is a measure of *relative* wealth within a country. We also include a measure for the woman's residence in an urban versus rural area (1=urban, 0=rural).

All models also control for the following individual-level sociodemographic variables that are known to be associated with ideal family size and/or completed fertility: age, marital status, number of living children, and whether the respondent is Muslim. Aside from dummy variables, all variables are standardized (mean=0) to allow a direct comparison of effect size.

Country-level independent variables

To examine whether contextual-level characteristics may play a role in predicting non-numeric IFS independent of a woman's individual attributes, we also include several macro-demographic and socioeconomic indicators obtained from the World Development Indicator Databank (World Bank 2012), which give national-level estimates for each survey included in our models. These include the under-five child mortality rate, the maternal mortality rate, HIV prevalence (percent of population ages 15-49), the total fertility rate (TFR), the percent of the population living in a rural area, and GDP per capita. The latter represents GDP converted into international dollars using purchasing power parity rates. In addition, we include a country-level education measure representing the proportion of women in the country that have ever attended school (any level). This variable was aggregated from the data collected by the DHS. All country-level variables reflect the year the DHS data were collected for each survey. A summary of all predictor variables, organized according to their corresponding hypothesis, can be found in Table 2.

—TABLE 2 ABOUT HERE—

Analytic Approach

To test our hypotheses, we use a series of multilevel logistic regression models. We a take multilevel modeling approach because it allows us to investigate both individual- and country-level effects on non-numeric responses while accounting for the non-independence of observations (Raudenbush and Bryk 2001)—that is, women in our data being nested within countries.

Our analysis begins by determining the significant predictors of non-numeric IFS. To do so, we estimate separate models predicting non-numeric IFS for each of our hypotheses, along with a combined model with all covariates included.

We assess change in non-numeric ideal family size over time by including a dummy variable for the second survey in all models. Recognizing that the time interval between the first and second survey for each country varies, we estimate all models by defining the dummy variable for the second survey as a random slope (as represented by the term, $\gamma_{11} Z_j^* X_{ij}$, in Equation 1). This allows the effect of the time interval to vary from country to country. The resulting coefficient for this variables should, therefore, be interpreted as the average slope across all countries. While there is a chance that this approach will make the estimates overly conservative, we feel it better captures the structure of our data. In fact, results from likelihood ratio tests confirm that the random slope model fits our data better than a random intercept model.

We use the following model for each of our four hypotheses:

$$log\left[\frac{p_{ij}}{1-p_{ij}}\right] = \gamma_{00} + \gamma_{01} Z_j + \gamma_{10} X_{ij} + \gamma_{11} Z_j^* X_{ij} + \delta_{0j} + \delta_{1j} X_{ij} + \epsilon_{ij} \quad (1)$$

Where i units are nested in j contexts and $log\left[\frac{p_{ij}}{1-p_{ij}}\right]$ is the probability of individual i, in country j providing a non-numeric response to the IFS question. Z_j is a vector of covariates whose effects vary at the country level and X_{ij} is the vector of covariates whose effects vary at the individual level. The term, $Z_j^* X_{ij}$, represents the random slope, with Z_j^* specifically representing the effect of the second survey, rather than all country-level variables. The error terms for individual and contextual measures are represented by the δ and ϵ terms, respectively.

Once we have identified significant predictors of non-numeric IFS, we test for changes in the *effect* of those predictors over time by including interaction terms between the second survey variable and given predictors.[5] Statistically significant interactions suggest that the effect of a given predictor changes over time. This procedure is common in analyzing repeated survey data (Haynie 1998; Omariba and Boyle 2007) and is formally known as a changing parameter model (Firebaugh 1997).

Results

We present the descriptive information on our sample for each survey period in Table 2. Estimates are weighted to adjust for regional variation in sampling within countries (individual-level variables only) and for differences in population size across countries (all variables).[6]

Average non-numeric IFS decreases from 10 percent in the first survey year to 6 percent in the final survey year. On average, child mortality becomes a rarer event across the survey years: both the proportion of respondents who report experiencing a child death as well as the national-level child mortality rates decrease by more than 20 percent, on average. We

[5]Despite the challenges of interpreting interaction terms in nonlinear models (Ai and Norton 2003), the multilevel nature of our data preclude the calculation of marginal effects of interaction terms (as in Karaca-Mandic, Norton, and Dowd 2011). Therefore, we interpret all interaction terms using odds ratios, which allow one to assess the multiplicative effects of the interaction on the baseline odds for each group (Buis 2010).

[6]Population estimates or adults aged 15-45 were obtained from the United Nations Population Division (United Nations, Department of Economic and Social Affairs 2010).

also see a striking increase in literacy and educational attainment across the survey years, with the proportion of the sample who never attended school decreasing by 26 percent and the proportion who completed primary school increasing by 23 percent.

The countries included in this study experience modest fertility decline, on average, between the two periods of observation. Women in the second survey year have 0.2 fewer children and the proportion of women that know of at least one modern method of contraception increases by about three percent in later surveys. These changes are also evident in the decline in average TFR from 5.1 to 4.6.

The time periods between the two surveys in each country are also characterized by increasing development: GDP per capita increases over time, and more women live in urban areas in the later survey years, though this change is not statistically significant at the country level.[7]

—TABLE 3 ABOUT HERE—

Predictors of non-numeric IFS

Table 4 presents odds ratios from our first set of multilevel logistic models. All models were estimated to include the aforementioned individual-level control variables, but for the sake of space, their odds ratios are not presented. Estimated odds ratios for these variables can be found in Table A.1 in the Appendix. Model 1 in Table 4 indicates that, accounting for basic controls, time (last survey) is negatively associated with the likelihood of providing a non-numeric response to the question of ideal family size. Specifically, women across all countries have, on average, 46 percent lower odds of providing a non-numeric response in the second survey relative to women interview in the first survey. Variance on this estimated slope is quite substantial, with a standard deviation of 0.9 across all countries. However, the vast majority of countries have a negative slope for second survey, with odds ratios between 0.960 and .002 for 95 percent of countries in the sample. This provides support for the overall

[7] Table 2 does not include descriptive measures of the wealth index, as wealth quintiles calculated by the DHS—by definition—represent one-fifth of the population at both time periods.

decline in non-numeric IFS.

—TABLE 4—

Model 2 is estimated to test our first hypothesis—that mortality-related uncertainty is positively associated non-numeric IFS. Here we find that having had a child die is a significant predictor of non-numeric IFS. Women who have experienced the death of a child have almost one and a half times greater odds of providing a non-numeric response to the question of IFS. This finding is in line with what other researchers have found in localized settings (Hayford and Agadjanian 2011). However, we find no evidence suggesting that the contextual effects of country-level child and maternal mortality rates influence individual-level non-numeric IFS, although the effect of the child mortality rates operate in the expected direction and is border-line significant ($p < 0.1$).

We also see from Model 2 that a country's HIV prevalence rate is significantly associated with non-numeric IFS. However, contrary to our hypothesis, this relationship is *negative*, with women living in higher-prevalence areas being less likely to provide non-numeric IFS responses. We interpret this relationship as perhaps being an indicator of greater exposure to HIV prevention programming—much of which overlaps with family planning rhetoric. More broadly, higher HIV prevalence at a national level might suggest a context in which sex is more frequently discussed as something requiring caution and planning (Cleland and Watkins 2006; Robinson 2011). Supplementary analyses focusing only on sub-Saharan Africa suggest that this result is primarily driven by that region (models not shown, but available on request).

We find support for our second hypothesis about the effect of education. Model 3 indicates that being literate reduces the odds that a woman will provide a non-numeric response for IFS by 35 percent. Likewise, relative to women who have never attended school, those who have attended primary school and those who have completed primary education are less likely to provide a non-numeric response to this question, with the effect being stronger for the latter group.

Model 4 presents the results testing our third hypothesis about the role of family planning knowledge.[8] As expected, women who have knowledge of modern family planning methods are significantly less likely to give a non-numeric responses than women who do not. This model also indicates that the contextual effect of fertility rates is significantly associated with a woman's likelihood of having a non-numeric IFS. Specifically, a one-unit increase in TFR increases a woman's odds of providing a non-numeric response by 71 percent. Note that the effect of national-level TFR is stronger than that of a woman's age and current number of children (see Table A.1 in Appendix A).

We test our final hypothesis in Model 5, which includes our wealth-related variables. While the contextual effects of GDP per capita and percent of population living in a rural area are not predictors of non-numeric IFS, Model 5 does indicate that individual-level measures of wealth are significantly associated with non-numeric IFS. Living in an urban area reduces the odds of a woman providing a non-numeric response to the question of desired family size by 21 percent. Additionally, we see that a woman's household wealth is significantly associated with her odds of providing a non-numeric response to the question of ideal family size. Compared to women who reside in households in the third quartile of wealth, women in the lowest quartile have 40 percent greater odds of having non-numeric IFS. Conversely, women in the highest quartile of household wealth have 27 percent lower odds of providing a non-numeric response compared to those in the middle-quartile of wealth. Taken together, this suggest that the effect of being relatively poor is larger than being relatively wealthy.

To identify the most important predictors of non-numeric IFS, we estimate a model that includes all controls and all hypothesis-specific variables. From Model 6 we see that experiencing a child death, education and knowledge of modern methods of contraception remain statistically significant predictors of non-numeric IFS. However, support for our wealth

[8] Based on the results of Model 2 and our interpretation of the effect of HIV being be related to the role of family planning, we estimated supplementary models that include HIV prevalence in this model. The addition of HIV as a covariate did not alter the results of Model 4 as it is presented here.

hypothesis is reduced. While living in an urban area remains negatively associated with non-numeric IFS, when it comes to household wealth, only the relatively poorest women show greater odds of having non-numeric IFS. Finally, Model 6 indicates that the contextual effects of TFR and HIV are not robust to a host of other factors.[9]

Comparing model fit, among the hypotheses-specific models, we see that the education model fits the data best. Taken together with the strong and robust negative association between education and non-numeric IFS, this suggests that there is greatest support for the education hypothesis. However, in terms of change over time, it should be noted that none of the models in Table 4 entirely explain away the effect of time as a predictor of non-numeric desired family size. That is, the average slope of last survey remains statistically significant (albeit less so) throughout all estimated models.

The results in Table 4 also show that there is substantial and significant variation between countries in the likelihood of a woman providing a non-numeric response to the question of desired family size (as is evident in the variance parameter of 0.78). This is unsurprising given that the sample represents 33 countries from three different regions of the world.

Changing effects of predictors across time

We turn to our second research question by specifying interactions between the significant predictors of non-numeric IFS and the second survey to evaluate whether the effects of these predictors have changed over time. We approached this by estimating individual models for each interaction. For the sake of space, Table 5 presents only the interactions that were statistically significant when estimated one at a time in the hypotheses-specific model (individual models available on request).[10]

The models in Table 5 indicate that the effect of a child's death becomes stronger over time—that is, this variable is a stronger predictor of non-numeric IFS in later surveys than

[9] In supplementary analyses focused on only the sub-Saharan African countries in our sample, the contextual effects of HIV persist in models that include all covariates.

[10] All models in Table 5 were estimated controlling for individual-level socio-demographic characteristics. The odds ratios for these variables can be found in Table A.2 in Appendix A.

it is in earlier surveys. Considering that, on average, fewer women experience the death of a child in later surveys, one explanation for this may be that the event of a chid death is more of a shock to mothers in terms of how they think about their future childbearing in contexts of relatively lower child mortality.

The interaction effect of incomplete primary education is statistically significant, indicating that the effect of incomplete primary education changed from the first survey period to the second survey period. The odds ratio of 0.94 for this interaction term, together with the negative association between some primary and non-numeric IFS, tells us that the effect of having some primary education as a predictor of non-numeric IFS becomes stronger across the time intervals. While significant, the magnitude of this interaction effect is relatively small and we find no evidence to indicate that the effects of being literate or completing primary school changes over time. Taken together, this suggests that the negative effects of education on non-numeric ideal family size, as a whole, have not dramatically changed over time within our sample.

We also find a significant change in the effect of knowing a modern method of contraception across the two survey periods. While knowledge of contraception continues to be negatively associated with non-numeric IFS, this effect is weaker in later surveys. This is unsurprising given that the proportion of women who know a modern method of contraception is nearly universal in the second survey period (93 percent), making this attribute less discerning when it comes to predicting non-numeric IFS.

Likewise, we also see that the negative effect of living in an urban area weakens over time, although the magnitude of this change is relatively small. As with knowledge of contraception, as more people move to urban areas, living in one is less of a distinguishing factor. Perhaps unsurprisingly, the effect of relative poverty, as measured by the wealth quintiles, remains stable in this model.

Finally, we estimate a full model with all significant interaction (Model 5 in Table 5).[11]

[11] For the sake of model stability, interactions with incomplete primary education and the lowest wealth quintile are excluded from Model 5 in Table 5.

Here we see that these cross-time relationship remain robust in when accounting for all other covariates. As we would expect, this is also the relatively best-fitting model.

—TABLE 5 ABOUT HERE—

Discussion

This article examines a key element of canonical theories of fertility change: the idea that high fertility is partially attributable to women's perceived lack of control over their own fertility, or to their not conceiving of family size as the target of intentions or aspirations (Caldlwell 1976; Castle 2001; Morgan 1982). Based on previous research on non-numeric IFS and literature on fertility transitions more broadly, we test four hypotheses about what predicts non-numeric responses to the question of ideal family size. To understand these processes longitudinally, we also examine if and how the effects of these predictors change across time. Our analysis reveals several important insights into what respondents tell us when they do not give a number for questions of ideal family size.

In testing our four hypotheses, we find that experiencing a child death is positively associated with the odds of having non-numeric IFS. This finding replicates previous findings from Mozambique (Hayford and Agadjanian 2011). Additionally, we find that this relationship is stronger in later surveys, despite the average decline in women experiencing such events and a reduction in child mortality rates across all countries in our analysis. Literacy and primary school attendance reduce the odds that a woman will provide a non-numeric response for IFS. Likewise, women who know a modern method of contraception are less likely to have non-numeric IFS than those who do not. There is also limited evidence to support the hypotheses that relative wealth is negatively associate with non-numeric IFS, although these relationships are less robust in models that include all covariates and they exhibit less change in later surveys.

While we find varying levels of support for all of our hypotheses, education and family planning seem to be the most robust predictors of non-numeric IFS. The two models testing the effects of education and family planning fit the data better than those testing the uncertainty and wealth hypotheses. This might suggest that non-numeric IFS is tied less to access to resources and situational uncertainty and more to knowledge (both general and fertility-specific).

How the effects of education and knowledge of contraception change (and do not change) across survey periods also provides insight into the longitudinal processes that underly non-numeric IFS. Overall, the negative effect of education—particularly as measured by literacy and completing primary school—on non-numeric IFS remains perpetually strong from the first to second survey period. If anything, the negative effect of incomplete primary education on non-numeric IFS becomes *stronger* in later survey years. While the magnitude of this shift is relatively small, this suggests that exposure to some education continues to help women to think about their families in a numerical sense.

Knowledge, as it applies to family planning, reveals a different pattern across time. Unlike the effect of exposure to primary education, our analyses suggest that the positive association between this knowledge and non-numeric IFS weakens over time. This is in line with what we would expect from a diffusion theories of fertility decline. That is, knowledge of modern contraception is consistently high (above 90 percent of women) across both survey years, indicating that this type of knowledge is well diffused throughout the population of women. In turn, such knowledge becomes less of a distinguishing factor over time.

Our analysis presents results that are empirically robust and theoretically coherent. Yet there are four primary limitations are worthy of note. First is that our contextual variables are measured at the country level. Given the geographic diversity within countries included in our analysis, this aggregation likely does not accurately capture the contexts of many women. While defining contexts with smaller geographical areas would have been preferable, certain measures—such as HIV prevalence and GDP per capita—are unattainable for sub-country units.

Second, in testing for changes in the effect of predictor variables on non-numeric IFS between surveys, we use a crude measure for time that varies by country. This is a result of data availability, but we attempt to adjust for it by allowing the effect of time to vary across countries in our models. However, our ability to measure general trends over time is still limited by the fact that the surveys represent time intervals of varying lengths and starting points.

Third, although we have quite a few countries that span different developmental epochs, there are likely other types of experiences in non-numeric IFS that are not represented in our sample. A similar study using more developed countries or focused on other world regions may yield different results. In particular, examining trends in non-numeric responses to ideal family size in regions that have experienced rapid fertility decline in recent decades, such as East Asia and the Middle East, would help to illuminate the extent to which non-numeric responses can be understood as indicative of a "pre-transition mindset." A related concern is that, because of the small number of countries in Latin America and Asia that fit our sampling criteria, we were unable to parse out regional trends for these areas.

Finally, for conceptual reasons, we present our hypotheses individually. However, we recognize that they are highly inter-related. For instance, women's knowledge of family planning methods do not exist within a vacuum, but are intertwined with her education and even the wealth of a country. How these interdependencies act to influence non-numeric IFS is something not explored in this study, but would be a productive avenue for future research.[12]

To the extent that non-numeric IFS is related to women's inability to control their fertility, there are two potential policy implications of this research. The first is that investments in education may matter most in helping women feel in control of their reproductive lives. We found no evidence to suggest that there are changes in the effect of literacy or completing primary education on the way women imagine their fertility. In fact, we found an increase

[12] A correlation matrix for all variables can be found in Appendix A.

in the negative effect of incomplete primary education on non-numeric IFS across the survey periods. This suggests that efforts to ensure women have access to primary schooling may help to increase their perceived ability to plan for and influence their reproductive lives.

Second, our analysis suggests that even though great strides have been made reducing child mortality, having had a child die is significantly strong predictor of non-numeric IFS that has strengthened over time. This indicates that continuing to make strides against child mortality in developing countries may reduce the uncertainly that surrounds planning a family.

Future research on education and child health interventions is needed to explore whether our interpretation of the results as they apply to policy implications is accurate. Nevertheless our results demonstrate the utility of examining non-numeric IFS in a longitudinal framework. By understanding what predicts non-numeric IFS and how the relationship between those predictors change over time, our analysis acknowledges the dynamic nature of the global trend in declining non-numeric IFS.

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Tables

Table 1 List of Sampled Countries, Years of Survey, Sample Size, and Length of Observed Interval

Country	First Survey Year	n	Last Survey Year	n	Time Span
Sub-Saharan Africa					
Burkina Faso	1999	6,342	2003	12,296	4
Benin	1996	5,312	2006	17,057	10
Cote D'ivoire	1994	7,920	1998	3,009	4
Cameroon	1998	5,448	2004	10,522	6
Ethiopia	2000	15,210	2005	13,853	5
Ghana	1993	4,541	2008	4,883	15
Guinea	1999	6,642	2005	7,904	6
Kenya	1993	7,502	2009	8,353	16
Madagascar	1997	6,921	2009	17,264	12
Mali	1996	9,481	2006	14,369	10
Malawi	2000	13,144	2010	22,937	10
Mozambique	1997	8,646	2003	12,141	6
Nigeria	2003	7,428	2008	32,693	5
Niger	1998	7,302	2006	8,874	8
Namibia	2000	6,586	2007	9,663	7
Rwanda	2005	11,239	2010	13,617	5
Chad	1997	7,283	2004	5,451	7
Tanzania	1996	8,061	2004	10,283	8
Uganda	1995	6,967	2006	8,095	11
Zambia	1996	7,950	2007	6,984	11
Zimbabwe	1994	6,101	2005	8,833	11
Asia					
Bangladesh	1994	9,639	2007	10,961	13
Indonesia	1997	28,707	2007	32,410	10
Cambodia	2000	15,260	2010	18,718	10
Nepal	1995	8,424	2011	12,668	16
Philippines	1993	14,917	2008	13,512	15
Vietnam	1997	5,651	2002	5,658	5
Latin America					
Bolivia	1994	8,059	2008	16,730	14
Dominican Republic	1996	8,383	2007	26,846	11
Guatemala	1995	12,312	1999	5,992	4
Haiti	1994	5,351	2006	10,710	12
Nicaragua	1998	13,604	2001	12,931	3
Peru	1996	28,504	2000	27,582	4

Table 2 Independent Variables Grouped by Hypotheses (excludes controls)

	Country-level indicators	Individual-level indicators
Hypothesis 1: mortality-related uncertainty	child mortality rate: maternal mortality rate; AIDS Prevalence	Experienced a child death
Hypothesis 2: education	Proportion ever attend school	Educational attainment; literacy
Hypothesis 3: knowledge of family planning	Total Fertility Rate	Knowledge of modern contraception methods
Hypothesis 4: wealth	GDP per capita; proportion of population living in a rural area	Household wealth index; urban residency

Table 3 Descriptive Statistics of Key Individual- and Country-Level Variables

	First Survey		Last Survey		
	Mean/Percent	SD	Mean/Percent	SD	T-Statistic
Non-Numeric Response to Ideal Family Size	10.4%	0.31	6.3%	0.24	8.8***
Control Variables					
Age	29.9	9.3	30.6	9.6	-4.5***
Number of living children	2.5	2.2	2.3	2.1	9.6***
Currently Pregnant	8.1%	0.3	7.1%	0.3	6.7***
Muslim	44.5%	0.5	43.7%	0.5	0.4
Married	77.7%	0.4	75.2%	0.4	3.8***
Individual-level Independent Variables					
Experienced Child Death	25.9%	0.4	20.1%	0.4	14.1***
Literate	52.4%	0.5	62.1%	0.5	-10.9***
Educational Attainment					
No Schooling	31.1%	0.5	23.0%	0.4	10.0***
Attended Some Primary School	21.7%	0.4	19.0%	0.4	7.1***
Completed Primary School	47.2%	0.5	57.9%	0.5	-11.9***
Knows Modern Method of Contraception	90.6%	0.3	93.4%	0.2	-8.2***
Urban Residence	29.0%	0.5	34.5%	0.5	-4.5***
Country-Level Independent Variables					
Child Mortality Rate	128.0	54.1	97.8	51.3	2.3*
Maternal Mortality Rate	554.1	263.7	418.1	244.1	2.2*
% in School	63.1%	0.3	69.7%	0.3	-1.1
Total Fertility Rate	5.2	1.3	4.6	1.5	1.7*
HIV Prevalence	4.3	5.6	3.8	4.8	0.4
GDP Per Capita	589.9	593.4	988.2	988.7	-2.0*
% of Population Living in Rural Area	68.1%	15.4	63.9%	16.6	1.1

Table 4 Odds Ratios from Multilevel Logistic Regression of Non-Numeric Ideal Family Size

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Second Survey	0.542***	0.689*	0.620**	0.704*	0.591**	0.708*
	(0.082)	(0.113)	(0.092)	(0.111)	(0.099)	(0.121)
Child Death		1.441***				1.262***
		(0.016)				(0.014)
Literate			0.650***			0.702***
			(0.011)			(0.012)
Education Level (ref. = no education)						
Incomplete Primary			0.750***			0.854***
			(0.011)			(0.012)
Complete Primary			0.454***			0.575***
			(0.009)			(0.012)
Knowledge of Modern Contraception				0.406***		0.540***
				(0.005)		(0.007)
Socio-economic Status (ref. = middle quintile)						
Lowest Quintile					1.401***	1.136***
					(0.020)	(0.017)
Second Quintile					1.130***	1.031*
					(0.017)	(0.016)
Fourth Quintile					0.870***	0.974
					(0.014)	(0.016)
Highest Quintile					0.727***	0.987
					(0.013)	(0.018)
Urban Residence					0.789***	0.879***
					(0.011)	(0.012)
Level-2 Variables						
Child Mortality Rate		1.703				1.153
		(0.486)				(0.444)
Maternal Mortality Rate		0.900				1.020
		(0.238)				(0.269)
HIV Prevalence		0.944*				0.761
		(0.025)				(0.109)
% Ever attended school			0.818			1.170
			(0.119)			(0.252)
TFR				1.623**		1.359
				(0.251)		(0.260)
% Rural					1.032	0.898
					(0.240)	(0.200)
GDP per capita					0.813	1.086
					(0.191)	(0.245)
Random Effects Parameters[a]						
Intercept	0.055***	0.052**	0.092***	0.095***	0.056***	0.031***
	(0.009)	(0.010)	(0.015)	(0.015)	(0.010)	(0.027)

SD of Intercepts	0.929***	0.814***	0.886***	0.828***	0.945***	0.784***
	(0.116)	(0.103)	(0.112)	(0.105)	(0.119)	(0.103)
SD of Second Survey	0.859***	0.809***	0.815***	0.823***	0.840***	0.813***
	(0.109)	(0.103)	(0.104)	(0.104)	(0.107)	(0.108)
Model Fit Statistics						
AIC	336,503	335,436	328,862	331,524	332,580	325,549
BIC	336,618	335,598	329,024	331,662	332,777	325,861
Observations	768,636	768,636	768,636	768,636	768,636	768,636
Number of groups	33	33	33	33	33	33

Standard Errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

[a]Estimated parameters, not odds ratios.

Table 5 Odds Ratios from Multilevel Logistic Regression of Non-Numeric Ideal Family Size, Including Interaction Terms

	Model 1	Model 2	Model 3	Model 4	Model 5
Second Survey	0.666*	0.628**	0.618**	0.575**	0.601**
	(0.108)	(0.094)	(0.097)	(0.097)	(0.104)
Child Death	1.366***				1.197***
	(0.020)				(0.018)
Literate		0.650***			0.703***
		(0.011)			(0.012)
Education Level (ref. = no education)					
Incomplete Primary		0.771***			0.881***
		(0.014)			(0.016)
Complete Primary		0.449***			0.573***
		(0.011)			(0.012)
Knowledge of Modern Contraception			0.377***		0.502***
			(0.006)		(0.009)
Socio-economic Status (ref. = middle quintile)					
Lowest Quintile				1.398***	1.137***
				(0.025)	(0.017)
Second Quintile				1.130***	1.032*
				(0.017)	(0.016)
Fourth Quintile				0.869***	0.974
				(0.014)	(0.016)
Highest Quintile				0.729***	0.989
				(0.013)	(0.018)
Urban Residence				0.751***	0.854***
				(0.014)	(0.015)
Level-2 Variables					
Child Mortality Rate	1.706				1.197
	(0.486)				(0.445)
Maternal Mortality Rate	0.904				1.020
	(0.239)				(0.269)
HIV Prevalence	0.763*				0.763
	(0.092)				(0.109)
TFR			1.615**		1.309
			(0.251)		(0.257)
% Ever attended school		0.817			1.568
		(0.119)			(0.445)
% Rural				1.023	0.900
				(0.238)	(0.120)
GDP per capita				0.808	1.092
				(0.190)	(0.247)
Interactions					
Child Death X Survey	1.117***				1.115***

	(0.022)				(0.023)
Incomplete Primary X Survey		0.939*			0.931**
		(0.025)			(0.022)
Complete Primary X Survey		1.022			—
		(0.028)			—
Modern Contraception X Survey			1.166***		1.165***
			(0.030)		(0.029)
Lowest Quintile X Survey				1.005	—
				(0.023)	—
Urban X Survey				1.101***	1.060**
				(0.025)	(0.0237)
Random Effects Parameters[a]					
Intercept	0.043***	0.092***	0.101***	0.057***	0.132***
	(0.007)	(0.015)	(0.016)	(0.010)	(0.021)
SD of Intercepts	0.814***	0.886***	0.826***	0.946***	0.782***
	(0.103)	(0.112)	(0.105)	(0.119)	(0.102)
SD of Second Survey	0.807***	0.814***	0.832***	0.841****	0.820***
	(0.103)	(0.104)	(0.105)	(0.107)	(0.109)
Model Fit Statistics					
AIC	335,408	328,856	331,487	332,565	325,470
BIC	335,581	329,041	331,637	332,785	325,828
Observations	768,636	768,636	768,636	768,636	768,636
Number of groups	33	33	33	33	33

Standard Errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05
[a]Estimated parameters, not odds ratios.

Appendices

A Supplementary Tables

Table A.1 Odds Ratios from Multilevel Logistic Regression of Non-Numeric Ideal Family Size (including odds ratios for control variables)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Age	1.143***	1.080***	1.103***	1.149***	1.188***	1.089***
	(0.008)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
Parity	1.281***	1.261***	1.190***	1.292***	1.209***	1.190***
	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)
Pregnant	1.152***	1.129***	1.10***	1.158***	1.108***	1.092***
	(0.019)	(0.019)	(0.018)	(0.019)	(0.019)	(0.018)
Muslim	1.810***	1.778***	1.534***	1.655***	1.805***	1.509***
	(0.025)	(0.024)	(0.021)	(0.023)	(0.025)	(0.021)
Married	0.814***	0.791***	0.742***	0.825***	0.765***	0.740***
	(0.010)	(0.010)	(0.009)	(0.010)	(0.010)	(0.009)
Second Survey	0.542***	0.689*	0.620**	0.704*	0.591**	0.708*
	(0.082)	(0.113)	(0.092)	(0.111)	(0.099)	(0.121)
Child Death		1.441***				1.262***
		(0.016)				(0.014)
Literate			0.650***			0.702***
			(0.011)			(0.012)
Education Level (ref. = no education)						
Incomplete Primary			0.750***			0.854***
			(0.011)			(0.012)
Complete Primary			0.454***			0.575***
			(0.009)			(0.012)
Knowledge of Modern Contraception				0.406***		0.540***
				(0.005)		(0.007)
Socio-economic Status (ref. = middle quintile)						
Lowest Quintile					1.401***	1.136***
					(0.020)	(0.017)
Second Quintile					1.130***	1.031*
					(0.017)	(0.016)
Fourth Quintile					0.870***	0.974
					(0.014)	(0.016)
Highest Quintile					0.727***	0.987
					(0.013)	(0.018)
Urban Residence					0.789***	0.879***
					(0.011)	(0.012)
Level-2 Variables						
Child Mortality Rate		1.703				1.153

		(0.486)				(0.444)
Maternal Mortality Rate		0.900				1.020
		(0.238)				(0.269)
HIV Prevalence		0.944*				0.761
		(0.025)				(0.109)
% Ever attended school			0.818			1.170
			(0.119)			(0.252)
TFR				1.623**		1.359
				(0.251)		(0.260)
% Rural					1.032	0.898
					(0.240)	(0.200)
GDP per capita					0.813	1.086
					(0.191)	(0.245)
Random Effects Parameters[a]						
Intercept	0.055***	0.052**	0.092***	0.095***	0.056***	0.031***
	(0.009)	(0.010)	(0.015)	(0.015)	(0.010)	(0.027)
SD of Intercepts	0.929***	0.814***	0.886***	0.828***	0.945***	0.784***
	(0.116)	(0.103)	(0.112)	(0.105)	(0.119)	(0.103)
SD of Second Survey	0.859***	0.809***	0.815***	0.823***	0.840***	0.813***
	(0.109)	(0.103)	(0.104)	(0.104)	(0.107)	(0.108)
Model Fit Statistics						
AIC	336,503	335,436	328,862	331,524	332,580	325,549
BIC	336,618	335,598	329,024	331,662	332,777	325,861
Observations	768,636	768,636	768,636	768,636	768,636	768,636
Number of groups	33	33	33	33	33	33

Standard Errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05
[a]Estimated parameters, not odds ratios.

Table A.2 Odds Ratios from Multilevel Logistic Regression of Non-Numeric Ideal Family Size with Interaction Terms (including odds ratios for control variables)

	Model 1	Model 2	Model 3	Model 4	Model 5
Age	1.080***	1.104***	1.15***	1.188***	1.090***
	(0.0007)	(0.007)	(0.008)	(0.007)	(0.008)
Parity	1.260***	1.190***	1.292***	1.210***	1.191***
	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)
Pregnant	1.129***	1.099***	1.158***	1.108***	1.092***
	(0.019)	(0.018)	(0.0194)	(0.019)	(0.018)
Muslim	1.777***	1.534***	1.663***	1.806***	1.515***
	(0.024)	(0.021)	(0.023)	(0.025)	(0.021)
Married	0.792***	0.742***	0.826***	0.765***	0.742***
	(0.010)	(0.009)	(0.010)	(0.009)	(0.009)
Second Survey	0.666*	0.628**	0.618**	0.575**	0.601**
	(0.108)	(0.094)	(0.097)	(0.097)	(0.104)
Child Death	1.366***				1.197***
	(0.020)				(0.018)
Literate		0.650***			0.703***
		(0.011)			(0.012)
Education Level (ref. = no education)					
Incomplete Primary		0.771***			0.881***
		(0.014)			(0.016)
Complete Primary		0.449***			0.573***
		(0.011)			(0.012)
Knowledge of Modern Contraception			0.377***		0.502***
			(0.006)		(0.009)
Socio-economic Status (ref. = middle quintile)					
Lowest Quintile				1.398***	1.137***
				(0.025)	(0.017)
Second Quintile				1.130***	1.032*
				(0.017)	(0.016)
Fourth Quintile				0.869***	0.974
				(0.014)	(0.016)
Highest Quintile				0.729***	0.989
				(0.013)	(0.018)
Urban Residence				0.751***	0.854***
				(0.014)	(0.015)
Level-2 Variables					
Child Mortality Rate	1.706				1.197
	(0.486)				(0.445)
Maternal Mortality Rate	0.904				1.020
	(0.239)				(0.269)
HIV Prevalence	0.763*				0.763
	(0.092)				(0.109)
TFR			1.615**		1.309

			(0.251)		(0.257)
% Ever attended school		0.817			1.568
		(0.119)			(0.445)
% Rural				1.023	0.900
				(0.238)	(0.120)
GDP per capita				0.808	1.092
				(0.190)	(0.247)
Interactions					
Child Death X Survey	1.117***				1.115***
	(0.022)				(0.023)
Incomplete Primary X Survey		0.939*			0.931**
		(0.025)			(0.022)
Complete Primary X Survey		1.022			—
		(0.028)			—
Modern Contraception X Survey			1.166***		1.165***
			(0.030)		(0.029)
Lowest Quintile X Survey				1.005	—
				(0.023)	—
Urban X Survey				1.101***	1.060**
				(0.025)	(0.0237)
Random Effects Parameters[a]					
Intercept	0.043***	0.092***	0.101***	0.057***	0.132***
	(0.007)	(0.015)	(0.016)	(0.010)	(0.021)
SD of Intercepts	0.814***	0.886***	0.826***	0.946***	0.782***
	(0.103)	(0.112)	(0.105)	(0.119)	(0.102)
SD of Second Survey	0.807***	0.814***	0.832***	0.841****	0.820***
	(0.103)	(0.104)	(0.105)	(0.107)	(0.109)
Model Fit Statistics					
AIC	335,408	328,856	331,487	332,565	325,470
BIC	335,581	329,041	331,637	332,785	325,828
Observations	768,636	768,636	768,636	768,636	768,636
Number of groups	33	33	33	33	33

Standard Errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

[a]Estimated parameters, not odds ratios.

Table A.3 Correlation matrix for all variables

	Non-Numeric IFS	Age	Parity	Pregnant	Muslim	Married	Second Survey	Child Death	Child Mortality Rate	Maternal Mortality Rate
Non-Numeric IFS	1.00									
Age	0.07	1.00								
Parity	0.10	0.69	1.00							
Pregnant	0.01	-0.08	-0.03	1.00						
Muslim	0.15	0.04	0.06	0.04	1.00					
Married	0.06	0.30	0.39	0.17	0.21	1.00				
Second Survey	-0.06	0.01	-0.03	-0.02	0.00	-0.05	1.00			
Child Death	0.09	0.37	0.38	0.03	0.11	0.21	-0.05	1.00		
Child Mortality	0.09	-0.08	0.06	0.08	0.31	0.09	-0.23	0.21	1.00	
Maternal Mortality	0.09	-0.06	0.05	0.08	0.35	0.10	-0.24	0.19	0.90	1.00
Literate	-0.14	-0.14	-0.26	-0.07	-0.22	-0.21	0.09	-0.28	-0.41	-0.35

	Incomplete Primary	Complete Primary	% In School	Mod. Contraception	TFR	HIV Prevalence	Lowest Quintile	2nd Quintile	4th Quintile	Highest Quintile	% Rural	GDP per capita
Incomplete Primary	1.00											
Completed Primary	-0.53	1.00										
% In School	0.13	0.38	1.00									
Mod. Contraception	0.05	0.22	0.23	1.00								
TFR	0.02	-0.34	-0.66	-0.23	1.00							
HIV Prevalence	0.11	-0.05	0.09	0.02	0.36	1.00						
Lowest Quintile	0.08	-0.23	0.03	-0.14	-0.04	-0.02	1.00					
2nd Quintile	0.05	-0.12	0.01	-0.05	-0.01	-0.02	-0.24	1.00				
4th Quintile	-0.02	0.08	0.01	0.06	0.00	0.02	-0.24	-0.24	1.0			
Highest Quintile	-0.11	0.27	-0.06	0.12	0.06	0.02	-0.27	-0.26	-0.27	1.00		
% Rural	0.08	-0.33	-0.52	-0.06	0.53	0.32	-0.03	-0.02	-0.01	0.08	1.00	
GDP per capita	-0.04	0.29	0.51	0.10	-0.56	-0.16	0.03	0.02	0.01	-0.07	-0.74	1.00
Urban	-0.12	0.33	0.11	0.15	-0.12	-0.07	-0.32	-0.22	0.11	0.48	-0.26	0.19