Essays on Fertility and Fertility Preferences in India

by

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Dissertation submitted in partial fulfillment of the requirements for the degree of
Doctor of Philosophy in the Department of Sociology
in the Graduate School of Duke University

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ABSTRACT

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Abstract

In this dissertation, I examine at the aggregate and individual levels, why contemporary fertility preferences diverge from actual fertility. I use three waves of cross-sectional survey data from the National Family Health Surveys from India (also known as the Indian Demographic and Health Surveys), fielded in 1992-3, 1998-9 and 2005-6 to investigate the disjuncture between preferences and behavior. The first empirical chapter outlines and operationalizes a new framework to decompose the incongruence between stated preferences and actual fertility into a set of parameters, such as unwanted births, gender preference and postponement of births to later ages, each of which varies in its level and intensity between societies and over time. By delineating the societal constraints that women do not incorporate in their childbearing intentions, this model provides a useful framework to explain variability in fertility in contemporary intermediate- and low-fertility populations. Equally important, the framework provides avenues to enquire into the fundamental structural and cultural correlates producing differences between family size preferences and actual fertility.

Subsequent empirical chapters explore various aspects of fertility preferences in detail. The second chapter probes a key socioeconomic correlate of individual-level fertility preferences, namely educational differences in preferences. In brief, I find that educational differences in family size preferences have considerably converged over time using two-way fixed effects models. However, there is still heterogeneity in the

implementation of preferences (as manifested by the use of contraception). Accordingly, in the third chapter, I analyze the multilevel sources of variation in the use of contraception by young women, given that they express a preference to space or stop childbearing. Using multilevel models, I find that community norms play a strong role in the use of contraception by young women to meet their fertility preferences to space or stop childbearing. I argue that community norms are an influential determinant of young women's ability to regulate their own fertility – serving to enhance or constrain their use of contraception to either space or stop childbearing.

Overall, findings from this dissertation highlight the macro-level factors that explain variation in contemporary fertility, of which fertility preferences emerge as a critical parameter. This dissertation also illuminates the growing convergence of fertility preferences across socioeconomic categories, while focusing attention on local community forces that influence fertility behavior even in the face of women's stated preferences.

to my Mother

whose memory inspires me every minute

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1. INTRODUCTION

This dissertation is motivated by a fundamental question: why are women in contemporary societies unable to meet their childbearing preferences? My main focus is on cultural and structural phenomena that reflect and shape variation in individual and aggregate reproductive preferences and behavior. In the past, variation in fertility behavior across populations was understood in terms of the classic proximate determinants framework (Bongaarts and Potter 1983). However, contemporary societies differ from pre-transitional societies in one primary aspect: individuals can choose to have (a certain number of) children. In the context of increasing prevalence of contraception (and abortion), it becomes necessary to understand childbearing from the vantage point of childbearing preferences. Yet, few studies examine the correlates of preferences or why women are not able to achieve their preferences – at the individual level within families or aggregate level across societies. Thus, this dissertation is part of a larger body of research that seeks to understand family formation against a backdrop of changing preferences and values.

A diverse, multi-ethnic, large, developing country such as India provides a fascinating context to examine this puzzle. Given India's importance as a population heavyweight and the surprising paucity of extant research on its fertility, my dissertation seeks to make a significant contribution to the literature by explaining changes to fertility preferences and actual fertility in the states of India in recent years. Undoubtedly, the

striking contrasts in social and economic conditions between various states over time make India an ideal site for the study of demographic change. To elaborate, total fertility rate in 2005-06 was highest in Bihar at 4 births per woman and lowest in Goa at 1.79 births per woman (IIPS and Macro International 2007). While the TFR declined by more than a birth in Punjab from 2.9 to 1.9 births per woman between 1992 and 2006, it was practically unchanged in Bihar during the same period (IIPS and Macro International 2007). Furthermore, southern states such as Kerala and Tamil Nadu have had experience with below-replacement fertility for more than two decades, whereas the fertility decline is only gradually underway in many northern states. Such spatial and temporal variations in fertility levels and pace of decline provide unique leverage that I capitalize in my dissertation to:

a) empirically determine the relative importance of various factors that affect contemporary intermediate- and low-fertility populations;

b) illuminate the centrality of fertility preferences to contemporary childbearing;

c) enquire into the fundamental structural and cultural correlates producing differences in fertility preferences.

I begin the dissertation with a macro-level examination of the incongruence between fertility preferences (desired family size or DFS) and actual fertility (total fertility rate or TFR) in India by identifying and delineating the factors underlying these differences. Because of the pivotal role of fertility preferences to contemporary childbearing, I subsequently delve into a more nuanced understanding of family size

preferences in India using fixed effects and multilevel analytical models. Specifically, first, I examine family size preferences by level of education to understand if preferences have converged or diverged over time. Next, I study another dimension of fertility preferences: community influences on contraceptive use among young women in India, given that they expressed a desire to delay or stop childbearing.

The first chapter outlines and operationalizes a framework conceptualized by Bongaarts (2001) to decompose the incongruence between stated preferences and actual fertility into a set of parameters, such as unwanted births, gender preference and postponement of births to later ages, each of which varies in its level and intensity between societies and over time. Applying the model to India, I find that fertility preferences explain over half of the variation in actual fertility between states. Other factors that emerge as important are unwanted fertility and son preference, both increasing actual fertility relative to women's childbearing preferences; and postponement of births that depresses fertility relative to preferences. By delineating the societal constraints that women do not incorporate in their childbearing intentions, this model provides a useful framework to explain variability in fertility in contemporary populations. Equally important, the framework provides avenues to enquire into the fundamental structural and cultural correlates producing differences in family size preferences (and the factors that thwart them).

Accordingly, in the second chapter, I examine family size preferences by education over time within states to identify the impact of educational changes on desired

family size using two-way fixed effects models. Results demonstrate that desired family size has considerably converged across all educational categories over time. Such information serves both practical and theoretical interests. It is important to policy makers in their design of targeted and effective programs to ensure that family planning is available to the relevant groups that need them most. Additionally, it builds upon theoretical work that seeks to understand the attitudes that motivate childbearing among different socioeconomic groups, particularly in light of contrasting arguments about the contribution of mass education and the spread of ideational change among lower classes.

In the final chapter, I compare the strength of community norms against community socioeconomic characteristics and family planning program activities in explaining community sources of variation in the use of contraception by young women to space or stop. I argue that community norms are an influential determinant of young women's ability to regulate their own fertility – serving to enhance or constrain their use of contraception to either space or stop childbearing. Using multilevel modeling, I demonstrate that community norms steep young women in a culture that deems family planning appropriate after they have fulfilled or exceeded their family size desires. At the same time, community norms also restrict the use of contraception within marriage to space births appropriately. Therefore, a sizeable proportion of women resort to a permanent method of contraception when it is too late, resulting in excess births at the individual and aggregate level.

I use data from the three waves of the National Family Health Surveys (NFHS; Indian Demographic and Health Surveys) conducted in 1992-3, 1998-9 and 2005-6. All waves of the survey collected detailed demographic data on fertility preferences, birth histories, and contraceptive use. I use the retrospective fertility histories provided by 15-49 year old ever-married women in the three waves (N=89,506 in 1992-3; 89,196 in 1998-9; 92,301 in 2005-6) to construct measures of fertility and fertility preferences used in the analyses. To ensure uniform comparisons across states over time, I merge states that were split between Waves II and III (Uttaranchal with Uttar Pradesh, Jharkhand with Bihar and Chattisgarh with Madhya Pradesh). In addition, I also combined the small states in the North East to ensure uniformity of sample sizes, leaving 20 states in the analyses. A final note refers to the sample from the state of Jammu and Kashmir. In 1992, the survey was conducted only in the Jammu region, whereas it covered the entire state in subsequent waves. Thus, the analyses for Jammu refer to Jammu region in 1992 and to the entire state in 1998 and 2005.

2. THE DETERMINANTS OF LOW FERTILITY IN INDIA[1]

(forthcoming in Demography)

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[2] The first two authors share first authorship and are listed alphabetically. Dharmalingam initiated the project and carried out preliminary empirical work. Rajan carried out all analyses reported in the current paper and wrote the first draft of the paper. All authors contributed to the projects' conceptualization and to the interpretation of results and the writing of multiple drafts of the paper. Rajan is the corresponding author, sowmya.rajan@duke.edu.

2.1 Introduction

How well do existing fertility models explain contemporary fertility trends and differentials? In the past, the proximate determinants framework furthered our understanding of high fertility and the fertility transition. Davis and Blake's (1956) conceptualization of the intermediate variables approach offered an important conceptual tool for capturing the multiple factors and mechanisms that could affect fertility trends and variation. Bongaarts and Potter (Bongaarts and Potter 1983; Bongaarts 1978) formalized and operationalized the proximate determinants framework so it could be routinely applied to widely available data. Thus, the Bongaarts and Potter (hereafter B/P) framework permitted an empirical determination of the relative importance of factors affecting fertility in different populations and over time.

Specifically, B/P showed that most fertility variation (over a broad set of populations) could be accounted for with just four proximate determinants. These proximate determinants were: i) "marriage" (reflecting regular sexual intercourse and exposure to the risk of pregnancy), ii) the frequency and intensity of breastfeeding (the primary determinant of the length of postpartum infecundability), iii) the use and effectiveness of contraception, and iv) the use of abortion. Much research on high or declining fertility in the 1980s and 1990s benefited from this simple but powerful framework. Although the B/P approach was silent on the "fundamental' or "distal" causes of fertility decline, the import and contributions of B-P framework cannot be seriously challenged.

However, once fertility falls to moderate and low levels, the B/P model is much less useful. The reason: in low fertility contexts the fundamentally important proximate determinants are always contraception and abortion.[3] In such contexts, low fertility is the result of persons' desires to have small families and thus the use of contraception and abortion. Moreover, other aspects of the B/P model become irrelevant (such as the biological maximum fertility level and length of breastfeeding).

Is there an alternative model that might prove a useful conceptual and empirical guide in the study of low-fertility populations? Bongaarts (2001) proposed such a model based on two broad components: i) the desired family size characterizing a population and ii) the factors that either enhance or reduce fertility relative to these fertility preferences. As described by Bongaarts (2001: see Figure 4 and discussion) this model could be useful at various stages of the fertility transition. For instance, Bongaarts points out that in early stages of the fertility transition, fertility often exceeds desired family sizes. Once fertility falls to low levels, the opposite is often the case. We argue that this model is most useful once the fertility transition is well underway and birth control is widespread. The Bongaarts (2001) model has proven useful as a conceptual model (for instance, many articles have focused on single components of this model - the effects of tempo, desired family size, or unwanted fertility) and occasionally as an empirical guide

[3] In addition to the conceptual weakness of the B/P model in low fertility settings, we have also found that it does not have high predictive validity in these settings. In analyses not shown (available upon request), we estimate Cc (contraception), Cm (marriage), and Ci (postpartum infecundability) from the classic proximate determinants framework for the states of India in 1992-3, 1998-9, 2005-6. We find that the association between observed and predicted TFRs is much stronger for the Bongaarts (2001) model (compared to the B/P model).

(see Morgan, Guo and Hayford 2009; Morgan and Rackin 2010) for studies of low fertility.

In this paper we operationalize Bongaarts' (2001) model, one that we offer as a general model of the determinants of low fertility. The primary objective of the paper is to demonstrate the model's value in understanding low fertility and its variation. Our illustrative analysis uses the states of India at three time points (1992-3, 1998-9 and 2005-6) as observations. We show that the considerable variation in TFR across states and time are well captured by this model. As an accounting tool, the model decomposes the various parameters that are relevant to contemporary fertility. Substantively, the model captures the powerful influence of fertility desires, unwanted fertility, son preference, and postponed childbearing on variation in the total fertility rate.

2.2 The Low Fertility Model

At the heart of this macro model is an aggregate measure of desired family size. Asking the question at the aggregate level focuses attention on social structure – are there regularities at this level and can we identify the mechanisms that produce them? In looking for explanations that explain aggregate differences, we are not denying micro-level variation or decision making; we view macro-level dynamics as a product of the interaction of micro- and macro-level processes (Johnson-Hanks et al. 2011). However, we assert that major influences on aggregate fertility measures can be conceptualized and operationalized at the aggregate level. Thus, emphasis moves away from individual

decision, what happens in the brain, to the structures in the world that motivate and constrain behavior (Bachrach and Morgan 2013).

Social structures are durable forms of organization, patterns of behavior, or systems of social relations (Greenhalgh 1990; Johnson-Hanks et al. 2011; see also, e.g., McNicoll 1980; Parsons 1949; Radcliffe-Brown 1932; Sahlins 2000). Structures are dual in nature (Giddens 1979; Johnson-Hanks et al. 2011; Sewell, 1992, 2005); social structures emerge from the interplay of observable material structures on the one hand (e.g., objects, speech, observable behaviors, and built environments) and the schematic meanings that material forms instantiate on the other (e.g., values, beliefs, norms, scripts, and ways of categorizing). Thus, low fertility is produced by schemas that legitimate small families as "good" and fertility control as appropriate *as well as* material aspects of the environment that make small families advantageous (see Johnson-Hanks et.al. 2011:Chapter 4). While the aggregate measurement of DFS is operationalized as the mean of individual responses, the concept we seek to measure is the DFS that is "in the world": what family size is judged as most desirable and appropriate in a particular population. Aggregate family size desires are strongly correlated with observed fertility in many contexts (Bongaarts 1992; Morgan 2001). We are interested in factors that can account for observed differences between the mean desired family size and observed fertility. For instance, in India, there is a well-documented stated preference for couples to have a son. Couples without sons are more likely to have an additional child. These regularities reflect the import of the institution of gender and the different roles expected of sons/daughters and boys/girls. In situations where the sex of children cannot be

controlled, this preference leads some persons to revise their fertility desires upward based on their fertility history, and to have more children than previously intended. As noted above, the low fertility model has at its core the incongruence between population level stated preferences and actual observed fertility (Bongaarts 2001; Morgan and Taylor 2006). The framework is described as:

$$TFR = DFS * (F_U * F_R * F_{SP}) * (F_T * F_I * F_C) \quad 1)$$

Aggregate period fertility, the total fertility rate (TFR), equals women's desired family size (DFS) that is increased or decreased by factors and circumstances that are not or cannot be incorporated when women report their childbearing desires. If all women realized their DFS and if tempo distortions were eliminated, (see Bongaarts and Feeney 1998), then period fertility would equal DFS. Notably, the factors that increase fertility relative to desires are: unwanted fertility (F_U), replacement of child deaths (F_R), and gender preference, which in the case of India is a preference for sons (F_{SP}). The effects of these factors in equation 1) would be greater than 1.0 and thus they increase fertility relative to desires (Hagewen and Morgan 2005). The factors that decrease fertility relative to desires are the tempo effect of fertility postponement to later years/ages (F_T), sub- or infecundity (F_I) and competing preferences for children (F_C) (Bongaarts 2001). These factors would be expected to have values of less than 1.0 (in equation 1) and thus they decrease fertility compared to intentions.

2.3 India: The Empirical Case

Unlike the rapid declines elsewhere in Asia, fertility decline in India has been rather gradual in the 1950-90 period (Rele 1987; Bhat 1998; Guilmoto and Rajan 2001; Registrar General India 2002; Visaria 2004). The total fertility rate hovered around 6.0 children per woman during the 1950s and in the early 1960s. Starting in the latter half of the 1960s, the total fertility rate slowly declined, reaching 4.7 children per woman in 1976-81 (Jain and Adlakha 1982; Guilmoto and Rajan 2001). Data from the latest National Family Health Survey conducted in 2005-6 shows that fertility has fallen to 2.7. Averages aggregated at the national level however, mask India's considerable economic, cultural and spatial heterogeneity. Notably, several states have already reached fertility that is at or below the replacement level. Recent data from the NFHS3 (Table 1, column 3) show state fertility levels as high as 4.0 births per woman in Bihar and as low as1.8 in Andhra Pradesh and Goa, indicative of the well-known variation in fertility between north and south India. Thus, India provides substantial variation in relatively low fertility both across states and over time. A second reason to focus on India is the availability of requisite data for operationalizing the low fertility model, as described in the following section.

2.4 Data

We use three waves of data (1992-3, 1998-9 and 2005-6) from the Indian Demographic and Health Surveys (DHS), also referred to as the National Family Health Surveys (NFHS).The NFHS used a multi-stage stratified random sampling to obtain

reliable samples within each state. Since a basic aim of the survey was to obtain reliable estimates at various geographic levels (states, urban/ rural, metropolitan cities), the overall sample sizes were unusually large (IIPS 1995). More precisely, sample sizes range between 1,000 and 10,000 households per state in each wave and samples are representative at the level of place of residence (urban/ rural), state, and for the country as a whole. The response rates for each wave of the survey were high; the average national response rate was over 95% and most states had response rates of over 90% for all three waves. To account for the heterogeneity in the states' population and for oversampling certain groups within states, sampling weights are used to make the samples representative of states and the nation.

All waves of the survey collected detailed demographic data on fertility preferences, birth histories, and contraceptive use. Our measures of fertility and its determinants come from the retrospective fertility histories provided by 15-49 year old ever-married women in the 3 waves (N=89,506 in 1992-3; 89,196 in 1998-9; 92,301 in 2005-6). To ensure uniform comparisons across states over time, we merge states that were split between Waves II and III (Uttaranchal with Uttar Pradesh, Jharkhand with Bihar and Chattisgarh with Madhya Pradesh). In addition, we also combined the small states in the North East to ensure uniformity of sample sizes, leaving us with 20 states (n=20) at each time point for all our analyses. A final note refers to the sample from the state of Jammu and Kashmir. In 1992, the survey was conducted only in the Jammu region, whereas it covered the entire state in subsequent waves. Thus, our analyses for Jammu refer to Jammu region in 1992 and to the entire state in 1998 and 2005.

2.4.1 Conceptualization and Measurement

The key components of the low fertility model must be conceptualized and measured. We describe our conceptualization and operationalization of each:

Total Fertility Rate (TFR)

To measure the *TFR*, we use retrospective birth histories reported by eligible women from waves 1, 2 and 3. We estimated TFRs for the three years preceding each survey using STATA (Schoumaker 2004). Estimates are shown in Table 1. Both the decline across time (nationally, fertility declines from 3.39 to 2.85 to 2.68 across the three survey waves) and the variations by state (the TFR varies by more than 2 births at each time point) are apparent. We attempt to capture this variation with the factors described below.

Desired Family Size (DFS)

Desired family size was measured using the question: "If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?" This question or a slight variation of it has been featured in the World Fertility Surveys and was adopted by the Demographic and Health Surveys. In addition, this survey item was recommended for inclusion in the IUSSP model questionnaire for comparative family studies (Caldwell 1970; Knodel and Prachuabmoh 1973).

What is the question that we think is most consistent with the low fertility model? We propose the following survey item: "If you had no children and could choose the number of children to have in your life, how many would you have given the way things are today?" The last phrase is important and aligns the intent question with a period. Thus it is a hypothetical, synthetic measure that parallels our measure of period fertility, the TFR. We conceptualize the mean DFS as an aggregate representation of the target family size for a particular place/time.

We argue that if we consider only answers to the DFS question for women aged 22-32, we approximate our preferred question wording. Specifically, women at these ages are in the prime childbearing years and thus "going back to the time you had no children" refers to the recent past and very close to "the way things are today". Thus, the DFS question available is a reasonable approximation of our preferred wording. Empirically, this distinction is not important in our data since the correlation between aggregate DFS for those ages 22-32 and those ages 15-49 is 0.96. We use the broader age range in our analyses here so that it matches the TFR age range.

Despite its advantages, this DFS item has two potential sources of bias: non-response or "up to God responses" (hereafter non-response) and rationalization. Non-response was not prevalent in these surveys, and has fallen considerably over time – 9% of the respondents had a non-response in 1992-3, 7% in 1998-9; this declined to a little over 2% in 2005-6 (Table 2). Respondents with a non-response were overwhelmingly concentrated in Bihar, Uttar Pradesh, Madhya Pradesh and Andhra Pradesh across all

waves. For the current study, we exclude those giving "up to God" responses, and restrict our analyses to those respondents who gave a numerical response to the DFS question.

If women are merely rationalizing in response to the DFS question, then a significant proportion of them would report DFS equal to the number of living children. NFHS evidence shows that this is not the case. For instance, in 2005-6, among women with 4 children, 72% reported fewer than 4 as their DFS; and among women with 3 children, over 55% reported fewer than 3 as their DFS. Thus, we infer that Indian women are not reluctant to report a DFS different from their number of surviving children.

Unwanted Fertility (F_U)

The measurement of unwanted fertility has been widely debated. The proportion of women who report having more children than they want is substantial, both in developed and developing countries. Among wealthy countries, the United States has one of the highest proportions of unintended pregnancies, with more than 35 percent of live births unintended at the time of conception (Wildsmith et al. 2010) with approximatley one-third of these births unwanted (as opposed to mistimed). Available data for developing countries indicate that around 20 to 30 percent of all births were unintended in the 1990s (Bongaarts 2001; Kulkarni and Choe 1998) with up to one-half of these births unwanted. However, these estimates are likely to be underestimates because of *ex post* rationalization of children, and the stigma associated with reporting a child as unwanted. Below we discuss two measurement strategies and the biases in each. But regardless of approach it is clear that Indian unwanted fertility varies widely by state.

Thus, we expect that unwanted fertility (F_U) will be one of the most important factors affecting Indian fertility variation both across time and between states.

A first strategy, preferred by DHS, considers a birth as wanted if the number of living children at the time of conception is less than the desired number of children reported by the respondent. Data from the Indian NFHS-3 produces an estimated TFR of 2.7. In contrast, the wanted fertility rate (WFR) is only 1.9 (IIPS and Macro International 2007). The difference between the TFR and the WFR (.8) gives an estimate of the unwanted fertility rate. In other words, in the absence of unwanted fertility, the TFR would drop substantially (by .8) to below-replacement levels (1.9). As mentioned earlier, there is substantial heterogeneity in the level of unwanted fertility between states and over time using the DHS measure (Table 2).

A major drawback of the measurement strategy adopted by DHS is that the stated desired number of children is not appropriate for ascertaining whether specific births in a given period were unwanted (Bongaarts 1990; Casterline and El Zeini 2007). Therefore, in Table 3 we also show estimates of unwanted fertility from the retrospective reports of wantedness; these data allow us to capture the wanted status of specific births that occurred in the three years prior to each survey (the TFR measurement period).[4] More specifically, the question posed to respondents in the NFHS surveys is "At the time you became pregnant with <name of child>, did you want to become pregnant then, did you

[4] Newer techniques use prospective fertility preferences to estimate unwantedness, thereby reducing biases inherent in the conventional techniques (Casterline and El Zeini 2007). Our future analyses will explore these methods of constructing wantedness.

want to wait until later, or did not want more (children) at all?" This question is asked for every birth in some recent reference period (3 or 5 years) before the survey. Accordingly, we construct our second measure of unwanted fertility using retrospective reports from women who did not *want* more children at all. The biggest criticism of retrospective reports is that they are vulnerable to *ex post* rationalizing of wantedness of births, particularly in low income and non-Western settings (Adetunji 1998; Bongaarts 1990). Support for such criticism comes from longitudinal studies that show that among pregnant women who prospectively declare a pregnancy as unwanted, a large proportion subsequently claim that it was wanted (Bankole and Westoff 1998; for India, see Roy et al. 2008). Thus, this measure should be considered a conservative estimate. For the country as a whole, 10-11 percent of births are reported as unwanted, and thus F_U is 1.10 to 1.11 (Tables 2 and 3). The tables show that the DHS measure provides much larger estimates than the ones derived from retrospective reports of wantedness.

Replacement Effect of Child Mortality (F_R)

The idea that mortality decline has a lagged effect on fertility decline has long attracted the attention of demographers. It is explicit in the classic demographic transition theory. However, its empirical validity has been controversial due to measurement issues and the issue of reverse causality between infant mortality and fertility.

To explain, Preston (1978) describes the mechanisms through which infant and child mortality affects fertility. First, the death of an infant results in termination of

breastfeeding. This in turn, ends the period of lactational amenorrhea. Thus in the absence of contraceptive use, a mother experiencing her infant's death more quickly becomes at risk of a new pregnancy. This *physiological replacement* effect of mortality is strong in societies where breastfeeding is prolonged and birth control is rarely used. Next, *volitional replacement* refers to the strategy of having an additional child in response to an infant death in order to achieve the desired number of surviving children. Replacement of dead children as a conscious behavioral response to actual mortality of children is salient in the context of controlled fertility in which couples have family size preferences. The third mechanism, *hoarding,* refers to the practice of having a high number of children in anticipation of future child losses. It is possible that such hoarding is reflected in a woman's report of DFS but this component is difficult to measure with typical survey data. In addition, the best evidence suggests that this third mechanism has weak effects (Lloyd and Ivanov 1988; Palloni and Rafalimanana 1998). We do not attempt to estimate hoarding effects, and instead focus on the first two replacement mechanisms.

Both physiological and volitional replacement can increase fertility by increasing the number of births without changing DFS. However, the physiological replacement effect for each child death is invariably less than one birth, and is usually between 25 to 30 per cent in societies where breastfeeding is prolonged and post-partum abstinence is observed (Lloyd and Ivanov 1988; Montgomery and Cohen 1998; Preston 1978). However, after the mortality transition is underway and reversible methods of contraception gain prominence, the volitional "replacement strategy" is likely to be adopted and becomes the more potent mechanism (Lloyd and Ivanov 1988).

According to the World Bank, infant mortality and child mortality rates have been continuously declining in India since the 1960s, with some of the most pronounced declines occurring in the past decade. Data from the NFHS show that infant mortality rate declined from 79 per 1000 to 57 per 1000 live births; and under-5 mortality declined from 109 per 1000 to 74 per 1000 between 1992-3 and 2005-6. Because of a heavy dependence on female sterilization rather than reversible methods of contraception, and high infant and child mortality rates in many parts of India, the replacement effect on fertility has been shown to be minimal (Bhat 1998). Accordingly, we expect to find only a small effect of (volitional) child replacement on the observed variation in fertility in India.

In our analysis, the *total replacement effect* (F_R) of child mortality on fertility is estimated using the instrumental variable technique proposed by Olsen (1980) and Trussell and Olsen (1983). This technique is attractive due to its simplicity and minimal data requirements. For each woman, we obtain the total children ever born (CEB) and the number dead. We then calculate the proportion dead. Next, we i) regress the number of children dead on the proportion dead; and then ii) regress the predicted values on CEB. This gives us an estimate of the total replacement rate (physiological and volitional but the former is expected to be modest). The effect of the rate of replacement on fertility at the aggregate level is given by the replacement rate multiplied by the infant mortality rate (IMR). Because of the use of children ever born to estimate the replacement rate, we use women aged 35-49 years who have already completed or are close to completing their

fertility. Our estimates for all of India suggest that replacement increases fertility by 5 to 6 per cent (by factors of 1.05 - 1.06, see Tables 2 and 3).

Son Preference (F_{SP})

Indicative of India's traditional patriarchal institutions, sons are more valued than daughters for at least two well-documented reasons. First, the economic utility of sons is greater because they provide more financial and emotional support to parents in their old age. Second, a sociocultural logic that rests on traditional religious beliefs, patrilineal family structure and dowry systems accords preferential treatment to sons over daughters. In high-fertility societies with low contraceptive prevalence, a strong son preference does not always result in higher fertility because couples continue to have many children despite the sex composition of their existing children (Arnold et al. 2002; Bongaarts 2013; Clark 2000; Chowdhury and Bairagi 1986). Thus, most couples attain the one or two sons they desire by chance. However, during the period we study in India, we expect to see a substantial effect of son preference because the TFR and DFS are declining, contraceptive use is increasing, and more couples can be expected to reach DFS without a son (or sons). In fact, estimates from the 2001 census show unusually high sex ratios among young children under age seven due to sex-selective abortions and excess female mortality in Punjab and Haryana in the north and Gujarat in the west (Arnold et al. 2002). Fertility is reduced in the face of intense son preference which leads women and couples to selectively allow fetuses that carry sons to term. On the other hand, if women have additional births in the pursuit of sons, then fertility will be increased.

While numerous methods have been proposed to estimate the effect of *son preference* (F_{SP}) on fertility, we choose a method based on estimating the counterfactual, "What would happen to fertility if all sex preferences were to disappear suddenly?" (Arnold 1985: 282). We operationalize the measure by stratifying self-reports of whether or not a respondent wants an additional child by parity and sex composition of existing children. Specifically, the measure is defined as:

$$\Sigma C_i * P_i / \Sigma P_i$$

where C_i is the highest proportion of individuals who do not want any more children at each parity *i,* and P_i is the number of persons at each parity *i*. Our estimates for all of India are in the range of 1.05 to 1.1 (indicating increases in TFR of 5 to 10 per cent, see Tables 2 and 3).

Tempo Effect (F_T)

Postponement of births to later years is an important factor that reduces period fertility in many countries. Increasing education and career aspirations are among the factors that cause women to delay marriage and postpone childbearing. In India, however, marriage remains universal and usually signals the onset of childbearing. Despite variations in age at marriage between states, transition to motherhood occurs at an early age compared to countries in the West and in East Asia. At the same time, there is an unmistakable increase in Indian age at marriage and age at first birth. These differences and changes are consequential, as Hirschman (1985) notes, in populations characterized by early marriage, postponement of marriage affects both individual and

aggregate fertility. But empirical analyses of age at marriage and childbearing in developing countries frequently emphasize the quantum changes rather than tempo.

The *tempo* (F_T) effect of the rising mean age at childbearing is estimated as suggested by Bongaarts and Feeney (1998). This adjustment factor provides an estimate of the TFR that would result if there were no changes in the timing of births. The adjusted TFR, TFR', is obtained by first adjusting the parity specific TFR_i, i= 0 to 4+:

$$TFR'_i = TFR_i / (1-r_i)$$

where TFR_i is the observed total fertility rate in a given period for births of parity i, TFR'_i is the adjusted parity-specific total fertility rate in the absence of postponement, and r_i is the change in mean age at childbearing at order i between the beginning and end of the period. Summing over all birth orders gives the adjusted TFR':

$$TFR' = \sum TFR'_i$$

The effect of tempo on the TFR (F_T) is the ratio of TFR' and the observed TFR (i.e., TFR'/TFR). For all of India, F_T is 0.92-0.93 (postponement reduces TFR by 8 to 9 per cent, see Tables 2 and 3).

Involuntary infertility (F_I)

Here we discuss two components of (F_I), inability to have a child (infecundity) and the inability to find a suitable partner that results in involuntary childlessness or experiencing union disruption before DFS is achieved. These combined factors have historically had small effects on Indian fertility. Although disease-induced sub- or infecundity is slowly on the rise at the population-level, reports of this phenomenon are

not available. The incidence of physiological infecundity is also difficult to measure in contemporary society (see Menken 1985). In large surveys such as the NFHS, a substantial proportion of women are still in the early or middle stages of the reproductive period and infecundity at later ages is a health risk they cannot anticipate. In the context of a society with universal marriage and universal births within marriage, infecundity is less a matter of "running out of time" and more the unforeseen onset of infecundity during the early and middle years of the reproductive span (Bongaarts and Potter 1982: 156).

NFHS data show that less than 2% of currently married 45-49 year old women are childless. This suggests that at the population level, the incidence of infecundity is very low. Infecundity is therefore not likely to have a significant effect on fertility levels and variation. We also make a small adjustment for never-married women in our framework. Thus, we operationalize the effect of infecundity as 0.98 (lowers TFR by 2%), and that of never-married women as 0.97 (lowers TFR by 3%). Thus we estimate an effect of F_I as 0.95 for all states for all time periods examined. Although levels for state-years may well vary, these variations are not likely to be large in the time frame examined here. Thus, this adjustment affects only the TFR level not its variation (across time or place).

Competing Preferences (F_C)

In many settings, competition between childbearing/childrearing and other activities can be intense. McDonald (2000) characterizes this as a situation where gender equity increases in nonfamilial institutions but women's family caretaker roles remain

intense. In such societies, women's desired family sizes may not reflect this competition because women assume that they can eventually resolve it. Thus, the competition leads to fertility postponement but eventually to fertility foregone. In many low fertility settings, where DFS is well above TFR levels, this process is assumed to be operating (Morgan 2003).

In contrast, we expect competing preferences for the states of India to have a negligible effect on total fertility, and so will be set equal to 1.0, indicating no effect (F_C = 1.0). To explain, in many Asian countries experiencing low fertility, delayed marriage is often cited as a key factor reducing fertility, as both men and women pursue higher education and explore career opportunities (Jones 2007). In India, however, marriage continues to be nearly universal, the age at marriage has been rising rather slowly compared to other Asian countries (see NFHS reports), and universal childbearing is still the norm. Thus, at least in the period during and prior to 2005, competing preferences for children are likely to play a small role in India's declining fertility. We evaluate this assumption empirically as part of our analysis and will thus return to this discussion of competing preferences.

2.5 Results

Tables 2 and 3 show nationwide values for the observed TFR, the predicted TFR, and all parameters producing the predicted TFR. Table 2 shows that the r-squared for the three periods are .81, .82 and .94 when unwanted fertility is constructed using the DHS measure; and Table 3 shows that the explained variance in the three periods are .62, .76

and .86 when unwanted fertility is based on retrospective reports. A second observation to note is that the levels of observed and predicted TFR using retrospective reports of unwantedness for India are quite close particularly for the last time period (N=20, 2.68 and 2.58, respectively).

Tables A1 and A2 in the Appendix show the full detail: estimates and parameters for all states for each time period. In Figure 1 we compare the actual and predicted TFR for each time/state (N=60); the scatterplot shows the strong association of the observed and predicted values (using retrospective reports of wantedness). Thus, the model performs well; its predicted TFR values explain 76% of the observed variation in TFR across time period and Indian states (Table 2). The predictions appear accurate over most of the range of the observed TFR, but predictions are less accurate for TFRs over 3.5. Figure 2 shows this scatterplot again but disaggregating by time period for Table 3. A strong association is apparent in each period, but the model improves over time. This is largely a function of later periods having few values over 3.5.

Below we show the additions to explained variance as we add parameters to the model:

Parameters included	Explained variance (retrospective reports of wantedness)	Explained variance (DHS measure of wantedness)
TFR		
DFS	0.50	0.50
DFS*F_U	0.55	0.68
DFS*F_U*F_{SP}	0.64	0.74
DFS*F_U*F_{SP} *F_R	0.67	0.76
DFS*F_U*F_{SP} *F_R *F_T	0.76	0.81
DFS*F_U*F_{SP} *F_R *F_T *F_I	0.76	0.81

All additions improve the model predictions, except the last one that is a constant. In the following section, we describe the estimates for individual parameters used in the model in greater detail.

Desired family size (DFS) is the central parameter in the low fertility model. Table 4 shows the estimates of mean values of DFS as well as values of nonresponse by state and survey year. As expected, there is considerable heterogeneity in DFS across the states. Consistent with the notion of a society in transition, mean state values of DFS are declining over time, hovering close to replacement level in several states. States in the early or middle stages of the transition have mean values of DFS that are slightly below observed TFR (Madhya Pradesh, Bihar, Uttar Pradesh, Rajasthan) whereas DFS in states in the later stages of the transition are higher than TFR (Goa, Kerala, Punjab).

Further (not shown here), over 50 per cent of the respondents in each survey year indicated a desire for two children, whereas between a fifth and a quarter of respondents desired three children. In Table 4, we show that at the national level, DFS was close to 2.9 in 1992-3, coming down to 2.4 by 2005, indicating strong antinatalist pressures and a strong social imperative for two children. This finding is consistent with evidence from other countries that shows that as the TFR declines, DFS remains near or above two children (Bongaarts 2001; Bachrach 2001; Morgan 2003). In addition to southern states, urban areas also have already reached replacement-level fertility. Other studies suggest a possible transition to very low fertility among small subgroups in India, where a preference for one-child families may be emerging (Basu and Desai 2010). In fact the NFHS shows that the percentage of women with one living child who want no more

children increased exponentially from 17 per cent to 47 percent between 1992-3 and 2005-6. These women are more likely to be urban (than rural) and have at least a secondary school education, but the trend is emerging among women with little education.

After family size preferences, unwanted fertility and son preference add the most predictive power to the model. Table 5 shows estimates of unwanted fertility (F_U) using the DHS conceptualization and the retrospective reports of wantedness.[5] These effects are highly variable across states. The DHS measure indicates that in 2005-6, F_U ranged from (a factor increase in TFR of) 1.07 in Kerala to 1.46 in Uttar Pradesh. Overall, F_U has a substantial effect on fertility. Mean values of F_U for the pooled sample are 1.22 in 1992-3, increasing to 1.29 in 2005-6, with an average of 1.24 for all years. Both measures indicate that F_U has declined for states further advanced in the fertility transition (Delhi, Maharashtra, Tamil Nadu), whereas it has increased for states that are in the middle stages of the transition (Uttar Pradesh and Bihar).

The effects of son preference are given in Table 7. These are highly variable, from 1.02 in Tamil Nadu in 2005-6 to 1.18 in Bihar in 1992-3. There is also a clear decline in the size of effects across the period of study (Kerala being the most obvious exception). The effect of son preference (F_{SP}) on TFR declined from 1.10 in 1992-3 to 1.05 in 2005-6. This pervasive decline could result from two processes. First, it could reflect a genuine decline in the preference for sons. A second possibility is the widespread use of sex-

[5] The correlation between the two measures is modest in the survey years, and therefore we show final results from both in the paper.

selection technologies in these states (despite the legal ban on their use). Availability and use of sex-selection procedures reduces the likelihood of higher-order births, but adversely affects the sex ratio at birth in these states.

Estimates of replacement (F_R) are given in Table 8. We find an overall modest replacement effect of child mortality (F_R) on TFR (see Table 8, row 1). But there is substantial variation. Estimates vary from 1.01 in Kerala (2005-6) to 1.07 in Madhya Pradesh (1998-9). Estimates are lowest among the southern states but show little sign of declining across time. In a high-mortality society, replacement of children who have died has a much stronger effect on fertility than in low-mortality ones. Although infant mortality declined from 79 to 57 deaths per 1,000 live births between 1992-3 and 2005-6, the replacement rate of child deaths actually rose from 0.67 births per woman in 1992-3 to 0.85 births in 2005-6. Two points are worth noting. First, this finding could indicate a transition from a hoarding strategy to a replacement strategy, encouraged by lower infant mortality and made possible by an increase in the use of contraceptives. Second, although the replacement rate has increased, its effect on TFR remains stable because of a corresponding drop in infant and child mortality during the same period. In the future, the replacement effect on fertility is likely to decline, particularly in states that are experiencing pronounced declines in infant and child mortality (Andhra Pradesh, Tamil Nadu, Delhi, Himachal Pradesh).

We find a strong tempo (postponement) effect on period fertility in India. Figure 3 shows a steady increase in mean age at childbearing at the national level for all parities. The rate of increase of the age at childbirth is highest among first and second births, but it

is only slightly lower for higher order births. Specifically, between 1975 and 2004, the ages at first and second births increased by approximately 3 years: from 18.6 to 21.6 years for first birth, and from 20.9 to 24 years for second birth.

Table 9 shows the effects of increasing ages at childbearing (F_T) on TFR: 0.92 to 0.93 in each year examined. That is, TFR is reduced by about 8%. As illustrated by Bongaarts and Feeney (1998), an increase in the mean age at childbearing has an impact on TFR by postponing births that would have occurred in the current year to subsequent years. The strongest tempo effects (greatest fertility postponement) are seen in all southern states and in Goa and Himachal Pradesh. However, given the relatively low mean age at childbearing at all birth orders, there is scope for continued decline, and we could expect F_T to have continued, and perhaps stronger, effects in the future.

As noted earlier, we have set a potentially important parameter, competing preferences, equal to 1.0 (i.e., no effect on fertility level and variation). Before arriving at this decision, we conducted a variety of analyses to measure competing preferences and estimate its effect on fertility. Conceptualizing and estimating a valid measure of competing alternatives to childbearing for women in India is not a straightforward task. We proceeded by identifying and analyzing key socioeconomic correlates of the residuals from the low fertility model. If competition emerges as an important phenomenon, then this should present itself as a negative correlation between the model residual and socioeconomic characteristics, such as education and employment.

As in other countries, we expected employment and education to exert some influence as potential conflicting interests to childbearing in India. For instance, women

employed in non-agricultural settings do not have the option of bringing a child to work. Thus, in the absence of other childcare options, women in these settings might be constrained in their choice between employment and childbearing. In agricultural settings, however, women are able to bring and care for their child while they work in the fields, and therefore, farm employment is a weaker deterrent to childbearing. We also expected women with secondary or high school education to face a conflict between childbearing and educational aspirations. Finally, we expected women living in urban areas to experience a greater degree of competing alternatives to childbearing. Following from the above, we examined correlations among subgroups of women who might be expected to face more conflicting priorities than other women. For instance, women in the ages 20-40 years who live in urban areas, had a secondary or high school education, are currently employed, and work outside of home in non-agricultural activities might face a high degree of competition that works against their ability to achieve their fertility preferences. In the Appendix, we show the results from these analyses as well as details on how we constructed these variables. In brief, we find that these variables are only weakly correlated with the model residual. Thus, these analyses substantiate our initial claim that competing alternatives have not yet begun to influence fertility in India.

2.6 Future Prospects

Most states in India are characterized by the resilience of early universal marriage, a cultural and social imperative for at least one son, and overall low levels of female employment. Despite this relatively rigid patriarchal structure, both actual and

desired fertility levels have been declining quite pervasively. Specifically, total fertility rates are falling in India, and as Bongaarts (2001, see Figure 4 and discussion) claimed is generally the case, there is a reversal in the discrepancy of desired family size (DFS) relative to the total fertility rate (TFR). At earlier stages of the transition (when fertility is at levels of 4-7) the TFR exceeds DFS; when fertility falls to levels below three and especially to levels near 2 births per woman, DFS frequently exceeds the TFR. Consistent with these expectations, the number of states in which the DFS is greater than TFR has increased from 5 to 9 between 1992-3 and 2005-6. In the same period, the number of states where TFR was higher than DFS decreased from 15 to10. Furthermore, the absolute difference between TFR and DFS has been falling over time, both in states that are early in the fertility transition and those that are in the later stages of the transition. Greater availability of effective birth control (especially female sterilization) has reduced unwanted fertility over time and has contributed significantly to narrowing the gap between TFR and DFS.

To be sure, the future of India's fertility decline, particularly to replacement levels, will depend heavily upon the magnitude of decline in the large northern states. But, India has long been characterized by state differences in fertility levels that have been linked to institutional differences (e.g., Dyson and Moore 1983). In the south, the fertility transition started at least a decade earlier than in the north, but it would be a mistake to project convergence in state-level fertility to replacement levels in a decade or two. We believe that India's TFR will decline further in the coming decades but that variation across states will remain substantial. A likely scenario is that DFS will level off

at around two children per woman across states: no state had a DFS greater than 2.75 or lower than 2 in 2005-6. However the ability to achieve this fertility level may vary. For instance in the north, higher unwanted fertility as a result of the region's high level of unmet need for contraception, and lingering son preference could push fertility well above replacement even given a DFS at replacement level. In the south, the TFR may consistently fall short of DFS because (lower) unwanted fertility and (potentially weak) son preference are more than offset by an emerging "competition" between childbearing and further education and employment. The model we propose provides a framework for thinking about the key factors that determine levels and allows for empirical comparisons of interesting alternatives.

2.7 Conclusion

We analyzed fertility patterns and trends in India through an application of Bongaarts' (2001) model whose cornerstone is a measure of desired family size. We argue that the model provides a general framework for understanding the important factors affecting fertility at moderate and low levels. In fact, our results show that the key factors we operationalize, when considered together, account for at least three-fourths of the observed TFR variation across states and time in India. The model also produces mean estimates of appropriate magnitude. We view these results as very promising, i.e., they demonstrate the usefulness of this approach. The remaining (unexplained) variation, by definition, is due to excluded factors and/or measurement error. Our ongoing work examines these additional sources of variation. How can we better operationalize and

measure factors in this model? Which omitted factors are most important? And how can they be measured?

The ultimate test of this model's value is its usefulness in providing a better understanding of fertility change in India and elsewhere. The traditional Bongaarts and Potter (1983) proximate determinants model has proven valuable for understanding variation in pre-transition fertility and in the early stages of fertility decline. We offer the Bongaarts (2001) model as a useful conceptual model that codifies important influences on the TFR at mid and later stages of the transition to low fertility. This "low fertility" model posits that contemporary TFR levels are driven by a combination of factors, of which DFS plays a central role. However, other key parameters in the low fertility model vary across time and space. Second, this low fertility model allows for approximate answers to a host of useful counterfactuals (e.g., Morgan et.al. 2009). For instance, what would the TFR be if unwanted fertility declined? How much higher would the TFR be if age at childbearing was not rising? Does the effect of fertility postponement on the TFR offset the effect of unwanted fertility?

Finally, this is an aggregate level decomposition model. Thus it does not address many important questions. But it can help us identify and prioritize questions. For instance, why is desired family size and unwanted fertility declining? What is producing a rising age at childbearing and how long will this trend continue? This model provides a framework for "prioritizing' the most important questions based on their impact on the TFR or by estimating the likely effect on the TFR of a plausible policy change.

Table 1. Total Fertility Rate by survey year and state

Region	State	1992-3	1998-9	2005-6
India		3.39	2.85	2.68
North				
	Delhi	3.02	2.4	2.13
	Haryana	3.99	2.88	2.69
	Himachal Pradesh	2.97	2.14	1.94
	Jammu	3.13	2.71	2.38
	Punjab	2.92	2.21	1.99
	Rajasthan	3.63	3.78	3.21
Central				
	Madhya Pradesh	3.90	3.31	3.12
	Uttar Pradesh	4.82	3.99	3.82
East				
	Bihar	4.00	3.49	4.00
	Orissa	2.92	2.46	2.37
	West Bengal	2.92	2.29	2.27
	Assam	3.53	2.31	2.42
	Northeast	3.09	2.97	2.96
West				
	Goa	1.90	1.77	1.79
	Gujarat	2.99	2.72	2.42
	Maharashtra	2.86	2.52	2.11
South				
	Andhra Pradesh	2.59	2.25	1.79
	Karnataka	2.85	2.13	2.07
	Kerala	2.00	1.96	1.93
	Tamil Nadu	2.48	2.19	1.80
	Range	1.90-4.82	1.77-3.99	1.79-4.00

Table 2. Estimates of Proximate Determinants for India by Survey Year: Unwanted Fertility Estimates from DHS Reports

S.No	Key estimates	Symbol	1992-3	1998-9	2005-6	All Years
1)	Observed TFR	TFR	3.39	2.85	2.68	2.97
2)	Estimated TFR	TFR_E	3.57	3.44	3.03	3.32
3)	Desired family size	DFS	2.90	2.7	2.41	2.67
4a)	Unwanted fertility (DHS reports)	F_U	1.22	1.25	1.29	1.24
5)	Sex preference	F_{SP}	1.10	1.09	1.05	1.08
6)	Replacement effect	F_R	1.05	1.06	1.05	1.05
7)	*Factors that increase TFR*	$F_U * F_{SP} * F_R$	*1.41*	*1.41*	*1.37*	*1.4*
8)	Tempo	F_T	0.92	0.93	0.93	0.93
9)	Infecundity	F_I	0.95	0.95	0.95	0.95
10)	*Factors that decrease TFR*	$F_I * F_T$	*0.87*	*0.88*	*0.88*	*0.88*
11)	Net Adjustment (7 x10)		1.23	1.24	1.2	1.23
12)	Explained Variance (all states)		0.81	0.82	0.94	0.81

Note: Rows 1-11 in Tables 2 and 3 represent estimates for all of India that have either been published in the DHS reports or calculated using individual weights for states. The parameters calculated using arithmetic means are much lower than those using weighted means, particularly when computing TFR, UTFR, etc. Row 12 shows explained variance across all states observed in each year (n=20).

Table 3. Estimates of Proximate Determinants for India by Survey Year: Unwanted Fertility Estimates from Retrospective Reports

S.No	Key estimates	Symbol	1992-3	1998-9	2005-6	All Years
1)	Observed TFR	TFR	3.39	2.85	2.68	2.97
2)	Estimated TFR	TFR_E	3.25	3.06	2.58	2.96
3)	Desired family size	DFS	2.9	2.7	2.41	2.67
4b)	Unwanted fertility (retrospective reports)	F_U	1.11	1.11	1.1	1.11
5)	Sex preference	F_{SP}	1.1	1.09	1.05	1.08
6)	Replacement effect	F_R	1.05	1.06	1.05	1.05
7)	*Factors that increase TFR*	$F_U * F_{SP} * F_R$	*1.28*	*1.28*	*1.21*	*1.26*
8)	Tempo	F_T	0.92	0.93	0.93	0.93
9)	Infecundity	F_I	0.95	0.95	0.95	0.95
10)	*Factors that decrease TFR*	$F_I * F_T$	*0.87*	*0.88*	*0.88*	*0.88*
11)	Net Adjustment (7 x10)		1.11	1.12	1.06	1.11
12)	Explained Variance (all states)		0.62	0.76	0.86	0.76

Table 4. Desired Family Size and Up to God Responses by survey year and state

		DFS			Up to God/ Missing (%)		
Region	State	1992-3	1998-9	2005-6	1992-3	1998-9	2005-6
India		2.9	2.7	2.41	9.05	6.94	2.34
North							
	Delhi	2.5	2.4	2.21	0.68	0.56	0.52
	Haryana	2.6	2.5	2.26	0.81	0.66	8.88
	Himachal Pradesh	2.4	2.2	1.94	0.24	0.20	0.10
	Jammu	2.8	2.7	2.40	0.12	0.19	0.43
	Punjab	2.6	2.3	2.01	0.47	0.83	6.40
	Rajasthan	3.0	2.8	2.72	5.11	1.95	1.64
Central							
	Madhya Pradesh	3.1	2.9	2.55	12.61	4.55	4.40
	Uttar Pradesh	3.4	3.1	2.57	27.06	25.93	16.57
East							
	Bihar	3.4	3.3	2.65	12.53	9.71	3.90
	Orissa	3.0	2.7	2.34	5.90	0.11	3.28
	West Bengal	2.6	2.4	2.02	7.10	5.34	6.87
	Assam	3.2	2.9	2.29	2.07	0.61	7.69
	Northeast	3.97	3.6	3.19	0.78	0.51	2.64
West							
	Goa	2.7	2.3	2.11	0.04	0.04	0.22
	Gujarat	2.6	2.5	2.22	1.48	2.40	15.75
	Maharashtra	2.5	2.3	2.09	3.66	6.02	3.28
South							
	Andhra Pradesh	2.7	2.4	2.22	7.08	27.14	7.68
	Karnataka	2.5	2.2	2.13	7.25	3.48	5.35
	Kerala	2.6	2.5	2.40	3.89	5.65	4.21
	Tamil Nadu	2.1	2.0	2.10	1.13	3.13	0.19

Table 5. Unwanted fertility derived from DHS measure of wantedness by survey year and state

Region	State	1992-3	1998-9	2005-6
India		1.22	1.25	1.29
North				
	Delhi	1.27	1.28	1.25
	Haryana	1.30	1.27	1.22
	Himachal Pradesh	1.31	1.30	1.23
	Jammu	1.29	1.36	1.33
	Punjab	1.26	1.30	1.25
	Rajasthan	1.23	1.30	1.31
Central				
	Madhya Pradesh	1.18	1.27	1.33
	Uttar Pradesh	1.21	1.29	1.46
East				
	Bihar	1.21	1.26	1.43
	Orissa	1.21	1.23	1.24
	West Bengal	1.25	1.22	1.25
	Assam	1.29	1.24	1.26
	Northeast	1.11	1.14	1.17
West				
	Goa	1.16	1.17	1.16
	Gujarat	1.22	1.24	1.26
	Maharashtra	1.26	1.26	1.19
South				
	Andhra Pradesh	1.19	1.16	1.16
	Karnataka	1.24	1.27	1.23
	Kerala	1.09	1.08	1.07
	Tamil Nadu	1.29	1.22	1.22

Table 6. Unwanted fertility derived from retrospective reports of wantedness by survey year and state

Region	State	1992-3	1998-9	2005-6
India		1.11	1.11	1.10
North				
	Delhi	1.17	1.14	1.07
	Haryana	1.11	1.06	1.05
	Himachal Pradesh	1.14	1.11	1.04
	Jammu	1.14	1.19	1.11
	Punjab	1.08	1.09	1.07
	Rajasthan	1.09	1.10	1.09
Central				
	Madhya Pradesh	1.09	1.13	1.07
	Uttar Pradesh	1.14	1.17	1.21
East				
	Bihar	1.12	1.14	1.14
	Orissa	1.12	1.06	1.09
	West Bengal	1.20	1.10	1.10
	Assam	1.12	1.12	1.09
	Northeast	1.12	1.09	1.12
West				
	Goa	1.04	1.07	1.02
	Gujarat	1.03	1.03	1.11
	Maharashtra	1.08	1.07	1.04
South				
	Andhra Pradesh	1.08	1.07	1.11
	Karnataka	1.10	1.08	1.09
	Kerala	1.03	1.02	1.04
	Tamil Nadu	1.11	1.06	1.06

Table 7. Estimates of son preference by survey year and state

Region	State	1992-3	1998-9	2005-6
India		1.10	1.09	1.05
North				
	Delhi	1.07	1.04	1.03
	Haryana	1.13	1.12	1.08
	Himachal Pradesh	1.12	1.07	1.05
	Jammu	1.08	1.08	1.06
	Punjab	1.12	1.07	1.04
	Rajasthan	1.12	1.13	1.09
Central				
	Madhya Pradesh	1.14	1.13	1.07
	Uttar Pradesh	1.13	1.14	1.08
East				
	Bihar	1.18	1.14	1.10
	Orissa	1.11	1.09	1.07
	West Bengal	1.07	1.07	1.04
	Assam	1.09	1.07	1.05
	Northeast	1.06	1.07	1.05
West				
	Goa	1.08	1.10	1.06
	Gujarat	1.15	1.12	1.08
	Maharashtra	1.09	1.10	1.05
South				
	Andhra Pradesh	1.06	1.06	1.03
	Karnataka	1.08	1.05	1.02
	Kerala	1.04	1.01	1.04
	Tamil Nadu	1.05	1.04	1.02

Note: Estimates for son preference are obtained by stratifying the sex composition at every parity for respondents with 0, 1, 2, 3 and 4 and more children who report wanting no more children. The key assumption is that if the sex of the child did not matter, then respondents with one son would be just as satisfied with their family as those with one daughter and would therefore have the same rate of not wanting more children.

Table 8. Replacement effect of child mortality on fertility by survey year and state

Region	State	1992-3	1998-9	2005-6
India		1.05	1.06	1.05
North				
	Delhi	1.05	1.05	1.04
	Haryana	1.06	1.04	1.03
	Himachal Pradesh	1.03	1.02	1.03
	Jammu	1.03	1.04	1.03
	Punjab	1.04	1.06	1.03
	Rajasthan	1.05	1.05	1.05
Central				
	Madhya Pradesh	1.05	1.07	1.05
	Uttar Pradesh	1.06	1.06	1.06
East				
	Bihar	1.04	1.05	1.04
	Orissa	1.06	1.06	1.04
	West Bengal	1.06	1.05	1.05
	Assam	1.05	1.05	1.05
	Northeast	1.02	1.05	1.03
West				
	Goa	1.03	1.03	1.01
	Gujarat	1.04	1.05	1.03
	Maharashtra	1.03	1.04	1.03
South				
	Andhra Pradesh	1.03	1.05	1.03
	Karnataka	1.04	1.04	1.03
	Kerala	1.02	1.01	1.01
	Tamil Nadu	1.04	1.04	1.02

Table 9. Tempo Adjustments to TFR by survey year and state

Region	State	1992-3	1998-9	2005-6
India		0.92	0.93	0.93
North				
	Delhi	0.92	0.91	0.91
	Haryana	0.94	0.93	0.92
	Himachal Pradesh	0.89	0.89	0.87
	Jammu	0.87	0.87	0.86
	Punjab	0.97	0.98	0.98
	Rajasthan	0.95	0.98	1.00
Central				
	Madhya Pradesh	0.91	0.91	0.91
	Uttar Pradesh	0.95	0.97	0.98
East				
	Bihar	0.96	0.99	1.03
	Orissa	0.90	0.90	0.90
	West Bengal	0.90	0.90	0.90
	Assam	0.89	0.89	0.89
	Northeast	0.88	0.87	0.86
West				
	Goa	0.85	0.85	0.85
	Gujarat	0.95	0.96	0.97
	Maharashtra	0.89	0.88	0.86
South				
	Andhra Pradesh	0.89	0.88	0.86
	Karnataka	0.93	0.92	0.89
	Kerala	0.87	0.87	0.87
	Tamil Nadu	0.89	0.89	0.88

Note: From the three surveys, we estimate the year and order-specific mean age at childbearing (MAC_{iy}) for orders i=1, 2, 3, and 4 and above for each year y, between 1976 and 2004. Because of substantial sampling variability and year-to-year fluctuations, we smooth the observed MAC_{iy} by fitting a second-order polynomial equation. From the smoothed estimates, we obtain the adjustment factor r_{iy} that is used to calculate the tempo-adjusted TFR'_{iy}. The tempo effect on TFR is estimated as: TFR'_{iy}/TFR. Finally, we get the three-year moving average of the tempo effect for the three years preceding each survey year so that the time window used for the tempo effects matches that for the other parameters.

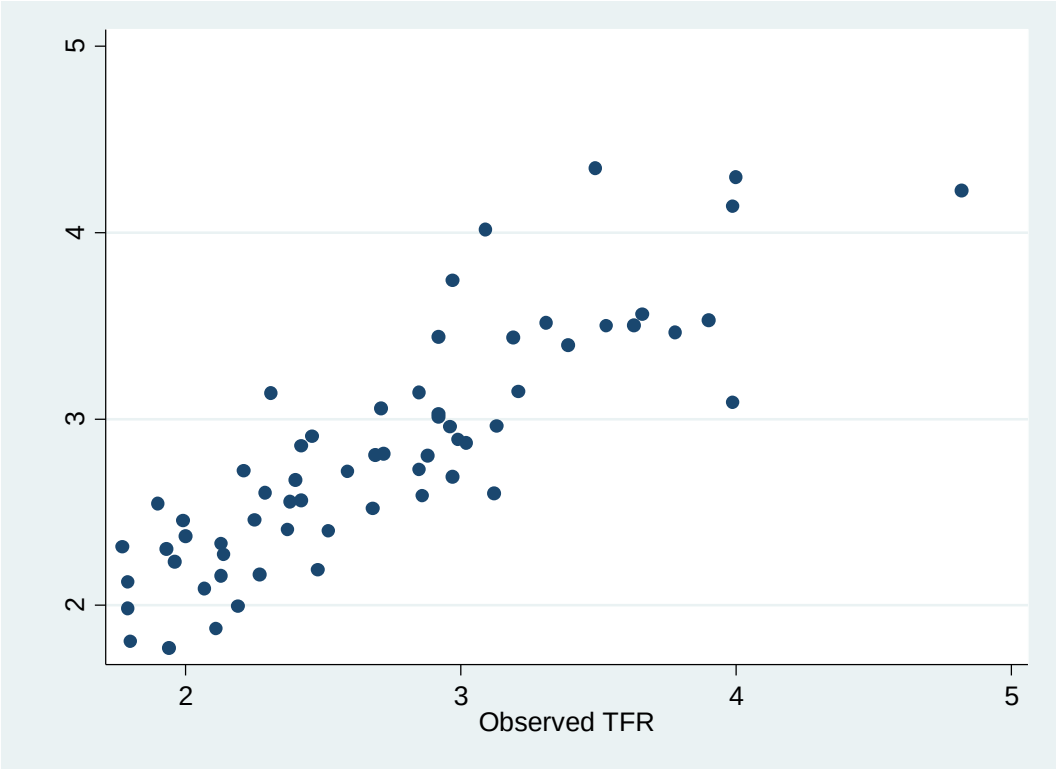

Figure 1. Observed and Estimated TFR – All Years (NFHS 1-3)

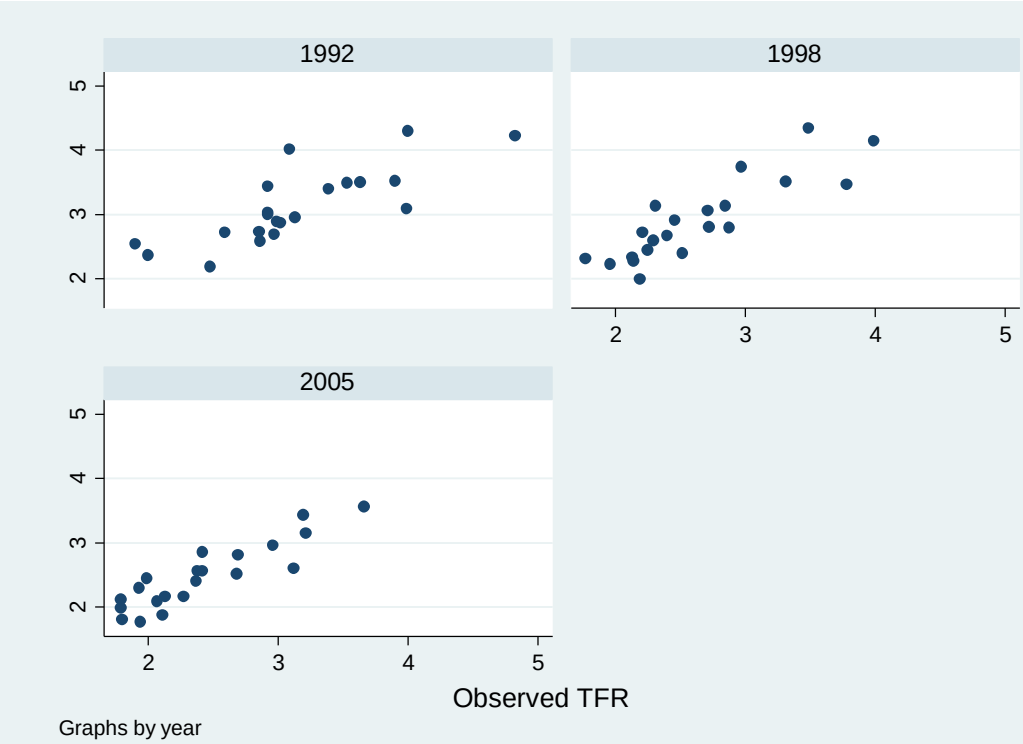

Figure 2. Observed and Estimated TFR by survey year

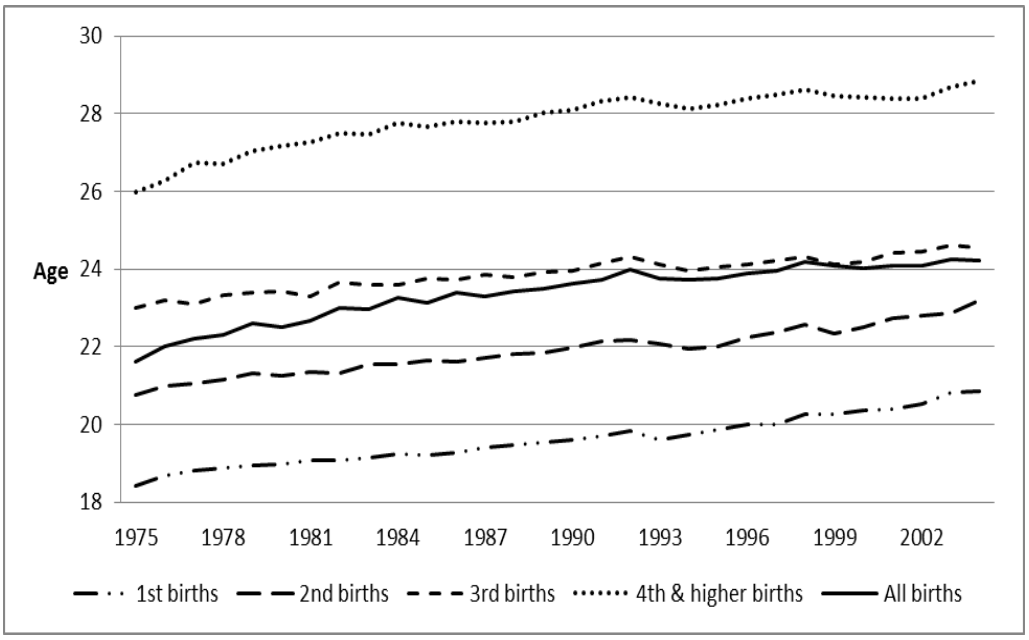

Figure 3. Mean age at childbearing at first, second, third, fourth and higher-order births, India, 1975-2004

Source: Authors' calculations from NFHS 1, 2 and 3

3. EDUCATIONAL DIFFERENTIALS IN FERTILITY PREFERENCES IN INDIA

3.1 Introduction

Fertility preferences are central to understanding contemporary childbearing behavior. It is not difficult to understand why – in any society with moderate contraceptive prevalence, individuals choose to have children (Thomson and Brandreth 1995). Almost all contemporary theories of fertility incorporate this crucial notion – fertility preferences are a primary determinant of actual fertility. For instance, two of Coale's (1973) preconditions for the fertility transition to intermediate and low levels are in the realm of fertility preferences: (1) fertility must be within the calculus of conscious choice for parents and (2) parents must want smaller families. Thus, the motivation (latent or explicit) to limit family size must exist for actual fertility to decline.

Yet few topics in demography are as controversial as the measurement and validity of fertility preferences. Specifically, whether or not fertility preferences can be used to predict subsequent childbearing behavior has been intensely debated. Critics argue that young women (to whom questions on fertility preferences are often posed) face considerable uncertainty about the future and are not able to accurately predict their childbearing career (Zabin 1999). However, theories that seek to describe fertility preferences draw on the theory of planned behavior (Ajzen and Fishbein 1980; Fishbein and Ajzen 1975) to posit that childbearing behavior is complex and evolves over an

extended period of time. Accordingly, fertility preferences have more explanatory power when considered in conjunction with *attitudes towards competing behaviors* (italics in original) to childbearing (Barber 2001). Indeed, a substantial body of evidence confirms that fertility preferences are a strong predictor of subsequent fertility (Barber 2001; Foreit and Suh 1980; Nair and Chow 1980; Rindfuss et al. 1988; Schoen et al. 1999; Tan and Tey 1994; Westoff and Ryder 1977), even among teen women (Barber 2001), and in both developed and developing countries. Currently, the consensus from the cumulative body of empirical research suggests that measures of fertility preferences and desired family size and from survey data are generally valid; and have been used in several studies to better understand fertility behavior.

Perhaps not as well-studied as the measurement and validity of fertility preferences are the socioeconomic differentials in fertility preferences. For instance, although differences in fertility outcomes by education are among the most widely studied socioeconomic differentials in the demographic literature, the relationship between education and fertility preferences among societies at different stages of the transition has not received adequate attention. Yet, contingent on the level of economic development, social structure and cultural norms, it is reasonable to expect that fertility preferences and therefore, fertility outcomes vary by level of education (Heiland et al. 2005; Sennott and Yeatman 2012). Such information serves both practical and theoretical interests: it is important to policy makers in their design of targeted and effective programs, and to academics to better understand the attitudes and preferences that motivate childbearing among different socioeconomic groups.

Fertility preferences are particularly salient in India where massive market reforms have been transforming social and economic life since the early 1990s. Preferences for large families are declining, but the uptake of contraception is not rapid enough to forestall unwanted pregnancies. On the one hand, there is a pronounced improvement in mass education (Bhat 2002), altering the educational composition of women in the country which could have a sizeable effect on fertility preferences (Dreze and Murthi 2000; Dreze and Murthi 2001). On the other, there appears to be a strong trend towards the homogenization of fertility preferences across socioeconomic strata (McNay et al. 2003). Further, the states of India are markedly heterogeneous with respect to stage of fertility transition, economic development, and social structure. As in other societies that are in the intermediate or final stages of the transition, it is difficult to predict how educational differences actually drive fertility preferences. All of these factors make India an interesting case study for an examination of the influence of education on fertility preferences.

In this paper, I provide an empirical description of changes in education and desired family size using three waves of the National Family Health Surveys between 1992 and 2006. Cross-sectional regression models provide further illumination of these trends after adjusting for individual and household socioeconomic characteristics as well as state fixed effects. Finally, interactive time fixed effects models identify the impact of educational changes over time on desired family size. These empirical analyses show considerable convergence of desired family size across all educational categories over

time. I discuss these results in the light of contrasting arguments about the contribution of mass education and the spread of ideational change among lower classes.

3.2 Empirical Research on Fertility Preferences

Just as the longstanding enquiry into the relationships between education and various development indicators (Brady et al 2007; Nussbaum 2004; Pritchett and Summers 1996; Shandra et al 2004; Ware 1984; Williamson 2001), the empirical literature abounds with studies that test the link between education and fertility (see Jejeebhoy 1995 for a review; also Bongaarts 2003; Diamond et al 1999). The general consensus that emerges from these studies is that there is an inverse relationship between education and fertility: as the level of education increases (at the individual and aggregate level), fertility declines. Underlying this broad pattern is the heterogeneity that is observed among societies at different stages of the transition (Martin 1995). In the early and middle stages of the fertility transition, particularly in the countries in Africa, there is ample evidence for the well-established inverse link between education and fertility (Diamond et al. 1999; Jejeebhoy 1995). However, as societies reach the end of the transition, there is less consensus on the nature of the relationship (Bongaarts 2003). While the belief that educational differentials in fertility will persist even at the end of the transition is generally accepted, others point to a convergence of fertility levels among different education categories once less-developed countries reach replacement fertility (Jeffery and Basu 1996; Lutz and Goujon 2001; Cleland 2002).

Conspicuously absent from this literature is a systematic understanding of the relationship between education and fertility preferences. Although fertility preferences are among the strongest predictors of subsequent fertility, the relation between education and fertility is not necessarily the same as the relation between education and fertility preferences. For instance, studies from the US and other Western countries suggest that well educated women intend to have more children than less educated women (Heiland et al 2005), but then end up having fewer (Morgan and Rackin 2010); or frequently revise their intentions downward (Liefbroer 2009; Iacovou and Tavares 2011).

Given its long tradition of research into fertility preferences, the US features most prominently in this literature. Using a sample of white married American women in the 1970s, Udry (1983) shows that "going back to school" (a proxy for education) has a positive effect on intended family size at parity 1 (Udry 1983). Other early studies of preferences in the US also indicate that education is positively associated with childbearing desires (Miller 1992; Schoen et al. 1997). Similarly, empirical evidence from Europe notes a positive association between education and fertility desires (Heiland et al 2005).

On the other hand, considerable heterogeneity exists in the nature of the relationship between education and fertility preferences in developing countries (Martin 1995). Overall, there is a weaker negative association between education and fertility preferences (compared to education and actual fertility). Although less educated women have higher fertility than well educated women, their family size preferences are

generally not that far apart. This suggests that norms for family sizes may have become more homogenous across educational categories. However, the gap between the preferences of less educated and well educated women still persist in several countries (Brackett et al. 1978; Lightbourne 1984) where family size preferences (desired family size) almost invariably declines as women's education increases. Others also report that reproductive preferences vary little by socioeconomic status, and contend that there is greater divergence in the implementation of preferences (Martin and Juarez 1995). As might be expected, the gap in preferences is widest in sub-Saharan Africa and smallest in Latin America (Martin 1995; Cleland 2002).

Mechanisms through which education influences fertility preferences also vary between developed and developing societies. Early studies in economics point out that the opportunity costs of having additional children increase, particularly for educated women (Becker 1991; Pritchett 1994; Rosenzweig and Schultz 1985). According to this school of thought, as women's general conditions improve – including an improvement in their education, and therefore the economic opportunities available to them, they place a higher value on their time. This leads to a decline in their demand for children, while increasing their demand for effective contraception. At the same time, women and couples realize the importance of modern education in the new economy, and the costs associated with securing such education for their children. Accordingly, as is well known from the quality-quantity tradeoff, couples choose fewer children with the aim of providing better education and human capital development for them.

In this view, women (and men) make rational fertility choices in the context of the social, economic and cultural conditions they face and are a strong determinant of their actual fertility (Becker 1991). Thus improving women's objective conditions such as increasing their education, employment opportunities and income would be the optimal way to bring about declines in fertility preferences that ultimately lead to reduced fertility.

Social demographic theories on fertility preferences, on the other hand are largely grounded in the influential second demographic transition (SDT) theory (Lesthaeghe and Meekers 1986; Lesthaeghe and Surkyn 1988; Van de Kaa 1987). The primary argument put forth in the second demographic transition is that family formation is contingent not only upon economic factors, but also upon ideational and attitudinal changes. Drawing on ideas proposed by Inglehart (1977), they emphasized the shift in the value orientation sweeping through Western Europe in the late 1970s and 1980s. Differently described as value pluralism, progressiveness, and "the advent of the postmodern era", the attitudinal changes broadly included a heightened emphasis on greater freedom of choice for individuals and gender equity (Inglehart 1971).

The second demographic transition also underscores the role of education in disseminating value change across different strata in society. Following Bourdieu (1985), SDT scholars note that particularly in Western Europe, shifts in attitudes, are initiated by the educational elite (Lesthaeghe and Surkyn 1988). Distinguishing clearly from the economic conceptualization of education as human capital development, SDT associates

education with cultural endowment, wherein different educational groups possess different forms of "cultural capital" (Lesthaeghe and Surkyn 1988). Thus, values and aspirations with regard to family formation are formed even before critical junctures in life such as marriage, careers and childbearing.

The SDT also makes explicit that education and cohort effects are complementary: older generations receive less schooling, and thus they are shaped by value orientations that they acquired during their socialization phase. Younger generations, on the other hand, acquire more education, and their attitudes are formed against the backdrop of improved educational systems and/ or peer groups that are also exposed to the new organization. For Europe, evidence reveals that newer cohorts become more progressive, and that cohort profiles of various attitudes are typically parallel and flat, suggesting the existence of strong cohort effects. However, studies that measure cohort and education effects or those that are able to disentangle the age, period and cohort effects in other societies are rare because of the intense requirements for repeated attitudinal data (Hayford 2009; Yang and Land 2013).

The main critique of the SDT is that far from being a second transition, it can only be deemed a continuation of the first demographic transition, where TFRs continue to fall to low levels (Cliquet 1991; Coleman 2004). Critics also note that the absence of markers to signal the onset and end-point of the SDT across societies is another weakness of the SDT. A lingering concern with the SDT relates to its universality – particularly in Asia where fertility preferences have changed dramatically, but without the associated rise in

individualism over familism and Confucianism (Coleman 2004). Nonetheless, recent evidence emerging from Asian countries suggests that at least some of the decline of fertility to low levels in these societies could be attributed to the influence of attitudinal change. Particularly in the context of an increasingly globalized era, the role of attitudinal factors cannot be downplayed, even in an anomalous case such as China (Cai 2010).

3.3 Fertility Preferences in India

As in other places, empirical research in India on childbearing is dominated by research on fertility, but not on preferences. The few studies that touch upon fertility preferences note that like other developing countries, desired family size declines with even a few years of education (Jejeebhoy 1995; Basu 2002).

Basu (2002) argues that rising aspirations of women for themselves and their children are key to understanding the trend in declining family size preferences in India. Among the various mechanisms linking education and fertility preferences in India, she cites as most important the mediating influence of the exposure to media messages about the possibilities of material consumption. The media also showcases modern lifestyles and individualism, which provide women options that are more appealing than large families.

Other pathways that mediate the relationship between education and fertility preferences include women's autonomy within the society as well as the household. Dreze and Murthi (2001) explain that educated women enjoy greater autonomy in setting

their reproductive goals in response to modern social norms. Additionally, educated women are more likely to be married to educated husbands who are more likely to share similar reproductive preferences; and are also better able to communicate their goals with their spouse (Mason and Taj 1987; Jejeebhoy 1995; Sathar and Casterline 1998; Basu 1999).

Spill-over effects of other women's education in the community have also emerged as a prominent influence on a woman's fertility desires (Kishor 1994; Cleland and Kaufmann 1998; Bhat 2002; McNay et al. 2003). Several studies demonstrate that educational differentials in fertility preferences are converging, leading to homogenization of preferences. Using aggregate data, Bhat (2002) shows that of the overall fertility decline between 1980 to 1990, more than half can be attributed to its decrease among less educated women. He goes on to suggest that fertility has declined mainly because of changing values about family size among illiterate women and their desire to educate their children. However, like Basu, Bhat (2002) also emphasizes the pivotal influence of the media as well as increased access and availability of contraception on changing family size preferences even among the lower classes and the less educated. A study conducted in Tamil Nadu suggests that socioeconomic differentials in fertility preferences have greatly converged, even more than actual fertility (Nagaraj 1999). In the same state, Kishor (1994) finds that material aspirations of lower classes have risen greatly, leading to declining family size preferences and the use of effective contraception in an attempt to achieve their aspirations. Indeed, Cleland and Kaufman (1993) point out that educational differentials in preferences are largely

homogenized after controlling for age and number of living children; but that educated women are better able to implement their preferences than less educated women, resulting in larger educational differentials in actual fertility.

Hypotheses – Divergence or Convergence?

Following Basu (2002), it seems reasonable to expect that the negative relationship between education and fertility preferences would become stronger over time. Well educated women are better able to filter media representations and translate them into content appropriate to their life circumstances. Educated women are also believed to have the tools and confidence to form informed opinions about reproductive health, even in the face of opposition (Jejeebhoy 1995). They are more likely to be selected by educated husbands who might share similar childbearing preferences. Such advantages enjoyed by educated women in India may not be easily available to less-educated women. This argument motivates the first hypothesis (Hypothesis 1): *educational differences in fertility preferences increase over time in India.*

Conversely, the widespread reach of the mass media and diffusion of ideas, values and attitudes on the family and childbearing may have weakened the link between socioeconomic circumstances including education, and fertility preferences. According to this viewpoint, although women in different education categories hold different preferences initially, uneducated women seek to emulate their educated counterparts, particularly in terms of aspirations for themselves and their families. In the context of a modernizing society, they begin to adopt the social norms of the educated in the hopes of

securing a better future for their children. Accordingly, this argument lends support to the second hypothesis (Hypothesis 2): *educational differentials in fertility preferences homogenize and the preferences of less-educated women converge to that of well-educated women.*

3.4 Data and Definition of Variables

I use data from the National Family Health Surveys in 1992-3, 1998-9 and 2005-6 conducted by the Ministry of Health and Family Welfare (MoHFW), with technical assistance from ICF Macro (IIPS and Macro International 2007). These surveys were initiated by the MoHFW to provide important data to monitor programs as well as to identify emerging population health and family welfare issues. Data from the NFHS provide valuable information on fertility preferences and education. The survey has a clustered sampling design. Within each state, in rural areas, primary sampling units (PSUs) or villages were selected with probability proportional to population size (PPS). Next, households were randomly selected within each PSU. In urban areas, the survey followed a three stage sampling design. First, wards were selected within each state based on PPS. Next, within each ward, one census enumeration block or primary sampling unit (PSU) was selected. Finally, households were randomly selected from PSUs.

The surveys in 1992-3 and 1998-9 interviewed all ever-married women ages 15-49 who stayed in the household the previous night. In 2005-6, never-married women ages 15-49 and men ages 15-59 years were also included in the survey. For the analyses used

in this paper, I use ever-married women from the three surveys. This leaves 89,506 women in 1992-3, 89,196 women in 1998-9 and 92,301 women in 2005-6 in 20 states as primary units of analyses. For all analyses, I incorporate sampling weights to make sure that estimates are appropriately adjusted for sampling design.

3.4.1 Dependent Variable: Desired Family Size

The dependent variable in this analysis is Desired Family Size (*DFS*). As described in the earlier chapter, DFS was recorded for each woman in response to the question, "If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?"

Figure 4 shows the trends in desired family size for ever-married fecund women ages 15-49 for India between 1992-3 and 2005-6. Although the popularity of two and three children remains roughly the same in the three survey years, it is important to note the striking increase in the acceptance of the norm of two children per family.[1] In 1992-3, 42 per cent of women indicated a preference for two children. This increased to 58 per cent in 2005-6. Also remarkable is the doubling in the percentage of women who desire only one child, from 3.3 per cent in 1992-3 to almost 8 per cent in 2005-6. These figures are even more striking for individual states. For instance, in Bihar, the preference for two

[1] Unless otherwise noted in the text, all these descriptive figures and tables indicate that these differences are significant at the 0.001 level.

children more than doubled from 21 to 46 per cent. Furthermore, at least 10 per cent of the sample in several states reported a desire for one child at the time of the third survey in 2005-6. In Punjab, less than 2 per cent of women indicated a preference for one child in 1992-3, which increased to more than 11 per cent by 2005-6. This figure is close to 15 per cent in Himachal Pradesh and 20 per cent in West Bengal in 2005-6. Overall, while the modal number of children preferred is still strong at 2 children per woman, there has been a manifold increase in the preference for just one child across many states in India, including in Assam, Bihar, Goa, Himachal Pradesh, Karnataka, Madhya Pradesh and West Bengal.

Disaggregating by education category, Figures 5, 6 and 7 show that for India as a whole, desired family size is converging to two children per woman across education levels. Specifically, the gap between education categories in the proportion of women who desire two children has been declining in the period between 1992-3 and 2005-6 period. At the same time, there is an unmistakable increase in the proportion of women who want only one child across education levels. Among women with no education, 1.5 per cent reported desiring one child in 1992-3; this number doubled in 2005-6. Similarly, 2.6 per cent of women with primary school education reported a desired family size of one child in 1992-3; this increased to 5.3 per cent in 2005-6. Last, although tiny, the proportion of women who desire no children has been increasing, with the greatest increase noted among women with no education.

As might be expected, the gap in family size preferences between education categories is much less in states that are farther along in the transition, such as Andhra Pradesh and Himachal Pradesh and is negligible in Tamil Nadu. Kerala seems to be a notable exception to this trend where there are still substantial gaps between educational categories. On the other hand, the relationship between education and desired family size is stronger in states that are in the earlier stages of the transition such as Bihar and Madhya Pradesh. In these states, there is at least a 35 percentage point difference between illiterate women and those with a secondary school education in their preference for a two-child family. Additionally, more than half of illiterate women in these states express a preference for three or more children even in 2005-6.

Table 10 shows descriptive analyses of women at parities 1, 2 and 3 who report that they want another child by education in the three survey years. Overall, we can see that the proportion of women who want another child at every parity and education category has been declining over time. Conversely, strikingly high proportions of women report not wanting another child at every parity and education level, but particularly in parity 1. The proportion of women who are undecided has also shrunk over time, and at any given time period, is the lowest for women who have three or more children. The dramatic decline in the undecided category across every parity and education category suggests that the level of fatalism and uncertainty about survival of children in India as a whole has declined considerably.

Illiterate women with one living child experienced the greatest increase among those who report not wanting another child between 1992-3 and 2005-6. With this increase, the fertility preferences of these women have to a great extent, converged to the levels of secondary-school educated women by 2005-6. Increasingly, illiterate women with two living children also report not wanting another child, indicating their convergence to the universal social norm of two children per family. Over four-fifths of illiterate women with two living children indicate that they do not want any more children, compared to over 90 per cent of secondary-school educated women. In general, preference for larger families is on the decline as women in parity two and higher report not wanting more children.

3.4.2 Education

Education is measured as a series of categorical variables indicating whether the respondent was *illiterate*, completed *primary* school and completed *secondary* school. Figure 8 shows trends in education levels in the India samples between 1992-3 and 2005-6. During this period, the proportion of secondary-school educated women increased by over 60% from 27 per cent to 44 per cent. All of these gains have occurred due to the 30 % decline in the share of illiterate women from 56 per cent in 1992-3 to 41 per cent in 2005-6. Surprisingly, the share of women who have completed primary school has remained roughly the same in all three survey periods, declining from 17 per cent to 15

per cent. Statewise, some of the largest increases in the percent of women who are secondary school educated have occurred in Andhra Pradesh (over 150 per cent), Rajasthan (100 per cent), Uttar Pradesh and West Bengal (over 80 per cent). Kerala stands out for having the lowest share of illiterate women and the highest share of secondary school educated women in all three periods, but notably in 2005-6: 5 per cent and 82 per cent respectively. In general, close to half of the samples from southern and western states have completed secondary school education. In the north, except for Punjab and Himachal Pradesh in which large proportions of women have completed secondary school, about a third of the women from the other states have a secondary school education.

3.4.3 Control Variables

The analyses include a variety of individual- and household-level variables that earlier studies have found to be associated with family size preferences. Fertility preferences vary with age. Accordingly, I include controls for *age* and *age-squared* in the analyses. Although the surveys sampled ever-married women, close to 95 per cent of them are currently married. I code marital status as a binary variable indicating whether the respondent is currently *married*. Number of living children is usually correlated with desired family size. Therefore I include a control for current family size (*CFS*). I control for the influence of media by including variables that indicate whether the respondent watches TV at least once a week (*weekly TV*) and whether the respondent listens to the

radio at least once a week (*weekly radio*). I code respondents' employment as three binary variables: employed in professional, sales and service sectors (*service*), employed in the agricultural sector or as skilled or unskilled manual labor (*agricultural*) and *unemployed*, which is the reference category.

Among household characteristics, I control for the religion practiced by the head of the household by including three binary indicators: *Muslim*, and *Other religion* with *Hindu* being the reference category. Household wealth is measured in quintiles in the NFHS; accordingly, there are five indicator variables indicating the quintile that the respondent's household belongs to (*lowest, fourth, middle, second* and *highest;* the *middle* quintile is the reference).

Husband's fertility preferences are not consistently available for all three surveys. Therefore, I control for husband's socioeconomic characteristics since these are normally associated with their fertility preferences as well. Husband's education is coded as a series of four categorical variables: completed *primary* school, completed *secondary* school, completed *high* school with *illiterate* being the reference. Likewise, husband's occupation is coded as: employed in professional, sales and service sectors (*service*), employed in the agricultural sector or as skilled or unskilled manual labor (*agricultural*), and *unemployed*, which is the reference category. Finally, I include a control to indicate if the respondent resided in an *urban* area.

3.4.4 Analytic Strategy

I employ three sets of regression models to estimate the relationship between education and family size preferences, and examine the change over time in this relationship. In the first instance, I study the associations for each survey period using cross-sectional models. These models are used at the outset to describe the patterns of association between education and DFS, controlling for relevant respondent and household characteristics. As I mentioned earlier, I use sampling weights in all analyses to factor in the differential rates of being sampled; as well as correct standard errors to reduce the bias inherent in clustering of women within states by using the Huber-White corrections.

Given the non-negative count nature of the dependent variable, I employ Poisson regression to predict the desired family size for person *i* in state *k* for each year. Accordingly the logarithm of DFS is linked to a linear function of predictor variables such that:

$$\log(DFS)_{ik} = \beta_0 + \beta_1 (Educ_{ik}) + \beta_2(State_k) + \beta_x X_{ik} + e_{ik} \qquad (1)$$

where $Educ_{ik}$ is the set of indicators for education category, and β_2 represents state fixed effects and X_{ik} is the vector of individual- and household-level variables. Then, the intercept term β_0 indicates the logged DFS when all other variables take on the value

of zero. The set of coefficients for $Educ_{ik'}$ β_1 represents the conditional mean difference in logged DFS for each educational category compared to illiterate women within each state.

Although cross-sectional models help us understand the nature of the relationship between education and fertility preferences at each time point, it is much less useful when trying to understand how it has changed over time. Specifically, they cannot help us discern temporal changes, which are particularly important in the case of both fertility preferences and education. Cross-sectional analyses face another important limitation in the form of endogeneity or omitted variable bias. That is, the association between education and fertility preferences as evidenced in a cross-sectional model could be influenced by the different characteristics of each survey period that are common to all respondents.

In order to overcome some of the limitations of cross-sectional analyses, in the second set of analyses, I estimate the relationship for the pooled samples at all three time points for India, by accounting for period fixed effects. Thus, unobservable period factors that affect both dependent and independent variables are reduced to within-period and within-state differences. Specifically, it has the following form:

$$\log(DFS)_{ikt} = \beta_0 + \beta_1 (Educ_{ikt}) + \beta_2(State_k) + \beta_3(Time_t) + \beta_x X_{ikt} + e_{ikt}$$

(2)

where fixed effects for time period and state are represented by $Time_t$ and $State_k$ respectively. In this model, the effect of education is assumed to be the same between time periods.

Finally, in the third set of analyses, I examine how the effect of education on DFS has changed over time, by relaxing the period assumption (of same effects between time periods). Specifically, I add an interaction between period and educational attainment to allow the period difference in logged DFS to vary by education category. This model is represented by:

$$\log(DFS)_{ikt} = \beta_0 + \beta_1 (Educ_{ikt}) + \beta_2 (State_k) + \beta_3 (Time_t) + \beta_4 (Educ_{ikt} * Time_t) + \beta_x X_{ikt} + e_{ikt} \quad (3)$$

In this model, education effects on DFS vary across periods within each state. Thus β_4 represents the change in logged DFS as education increases from one level to the next across periods.

3.5 Results

Table 11 shows the results of the cross-sectional Poisson models of logged DFS on education (and individual- and household-level controls) for 1992-3, 1998-9 and

2005-6. For the sake of economy, Table 11 displays only the main effects of education on DFS. All models however, include all the individual- and household-level controls discussed earlier. The full results are shown in the Appendix. The coefficients for education can be interpreted as the increase in logged DFS for an increase in education from one level to the next by a factor of $\exp(\beta_1)$. Therefore, for $\beta_x > 0$, larger values indicate a larger rate of change; on the other hand, for $\beta_x < 0$, smaller values indicate a larger rate of change.

Overall, there is a statistically strong, significant and negative association between the level of education and DFS: DFS declines with each level of education. In 1992-3, a woman who has completed primary school has a DFS that is lower than an illiterate woman's by a factor of exp(-0.064) or 0.94 that declines marginally to 0.95 in 2005-6. A woman with a secondary school education however, has a DFS lower than an illiterate woman by a factor of 0.89 in 1992-3 that declines to 0.91 in 2005-6. Thus, preliminary cross-sectional models show that although there is a negative relationship between education and DFS, it seems to be stronger within periods than between periods, with the effect of education gradually declining over time. This pattern of association is also evident from Figure 9 which compares the observed DFS for each education category in the three periods with the marginal values of DFS after incorporating the controls at their means.

The cross-sectional models also show that DFS is significantly higher for married, older women who have a large number of living children and who are employed in

service, sales or professional occupations (see Appendix). It is also significantly higher for Muslim women compared to Hindu women, whereas DFS for women from other religions (mainly Christians, Jains and Sikhs) is not significantly different from that of Hindu women. It declines with the level of household wealth, and husband's education, although both of these effects seem to weaken over time. Weekly exposure to media through television is consistently associated with lower DFS across all time points. Finally, DFS is significantly lower among women living in urban areas.

The next set of models capture time fixed effects and the interaction between education and time period. Table 12 shows these results, again displaying only main education and time effects and their interaction effects. The full set of results is shown in the Appendix. Model 1 shows the results of the regression of education on DFS, controlling for period fixed effects. Model 2 includes interaction terms for education categories and period fixed effects.

The coefficients on education in Model 1 can be interpreted as the average effect of education within each period. Thus, this model assumes that education effects are the same between periods. Model 1 shows that a woman who has completed primary school education reports a DFS that is lower than that of an illiterate woman by a factor of 0.94, net of period and state fixed effects and other controls. Similarly, a secondary school educated woman has a DFS that is lower than that of an illiterate woman by a factor of 0.90.

With the incorporation of interaction effects between education and period in Model 2, the constraint on education, namely that its effect is the same in all periods is relaxed. Accordingly, the net effect of education has to be interpreted simultaneously with the interaction effects (education effect = $\exp(\beta_1 (Educ_{ikt}) + \beta_3(Time_t) + \beta_4(Educ_{ikt} * Time_t))$. Accordingly, we find that the educational differentials in DFS decline gradually over time. In 1992-3, the DFS of a woman with primary school education is lower than an illiterate woman's DFS by a factor of 0.92; and that of a woman with secondary school education is lower than an illiterate woman's DFS by a factor of 0.86. By 2005-6, an illiterate woman's DFS has become considerably lower than that of an illiterate woman in 1992-3: reducing by a factor of 0.83. A woman with primary education in 2005-6 has a DFS that is lower than an illiterate woman's DFS in 1992-3 by a factor of 0.79; and a woman with secondary school education in 2005-6 has a DFS that is lower than an illiterate woman's DFS in 1992-3 by a factor of 0.78. Between primary and secondary school educated women in 2005-6, there is practically no difference in their DFS, whereas there is only a marginal difference (of 4%) between their DFS and that of illiterate women in 2005-6.

A few observations are worth noting. First, DFS is lower in 2005-6 compared to earlier periods for just a few years of education, as evidenced by the negligible difference in DFS between women with primary- and secondary-school education. A second observation relates to the narrowing of educational differentials between 1992-3 and 2005-6 even between illiterate women and better-educated women (0.83 and 0.78 for

illiterate and secondary school educated women respectively). Finally, in contrast to results from the cross-sectional models, Figure 10 shows that once time fixed effects (and all other controls) are accounted for, differences within periods become muted. In this figure, we see that factor changes in DFS are greater between periods, with large declines in DFS in 1998-9 and 2005-6. Particularly in 2005-6, the differences between education categories in fertility preferences are subtle, indicating considerable homogenization of norms about DFS.

3.6 Summary and Discussion

Fertility preferences have had a long and contentious history relating to its measurement and validity. Nonetheless, it has emerged as a strong predictor of subsequent fertility behavior. Given its centrality in understanding contemporary fertility, empirical studies of socioeconomic differentials in preferences are relatively scarce. While educational differentials in preferences are quite well understood in high-fertility societies, their progression is much less clear in societies with intermediate and low levels of fertility.

India is an opportune site to study educational differentials in family size preferences. On the one hand, the fertility transition is well underway in many states, which might lead us to expect convergence of fertility preferences across different education levels. In societies experiencing low fertility, fertility preferences are typically homogenous, converging to two children per woman. On the other hand, fertility levels

are still high in several states providing a case for extended divergence of fertility preferences by level of education. Such a pattern has been observed in African countries where both fertility preferences and actual fertility levels are high.

In this chapter, I provide detailed description of the relationship between women's family size desires and education, and how it has changed during the period 1992 to 2006. Evidence from the NFHS show that educational differentials in DFS are substantial in 1992-3. But by 2005-6, DFS across all education categories have declined greatly. Moreover, after relevant controls and interaction effects are introduced to capture period and education effects, only subtle differences by level of education remain in the DFS.

It is interesting to note that the effect of education has weakened considerably by 2005-6 within states. No doubt more women are getting educated for longer in 2005-6; but there is still considerable scope for expansion, given that 40 per cent of women have not completed even primary education. However, as Bhat (2002) demonstrated for fertility levels in India, the decrease of fertility within each educational group was by itself more important than the decline associated with the increase in educational level. In the case of family size desires, the dominant social norm of two children widely prevalent in other societies is increasingly pervading all strata of society in India. Indeed, the analyses in this chapter show a small, but steadily increasing support for one-child families, even among illiterate women. Descriptive analyses shown in this chapter confirm this trend: illiterate women who desire two children increased in the study period

from 30 per cent to almost 50 per cent; and 45 per cent of illiterate women with one living child in 2005-6 do not want another child, compared to only 12 per cent in 1992-3.

Given the secular declines in fertility preferences in India, a few observations are worth noting. Some of the earlier hypotheses about mechanisms through which education affected family size desires stressed its macrosocial and structural contributions to the demographic transition. At the microsocial level, education is believed to provide the initial impetus towards a transition in theories of innovation and diffusion. Undoubtedly, like fertility transitions noted elsewhere, the improvement in mass education was a key driver of the initial (gradual) decline in fertility desires, and subsequently of fertility in India. However, in recent decades, as noted by McNay et al (2003), fertility desires and behavior are changing faster than conventional socioeconomic characteristics. It appears that differentials in fertility and fertility preferences are the results of lags in the adoption of a new form of behavior/ preferences as it spreads from the upper educated classes to lower classes.

This study has several limitations which imposed constraints on the kind of analyses I was able to conduct. Notably, important aspects of the schooling experience, such as its quality and content were not available. To be sure, more fruitful analyses could have been conducted if a few cohorts of women were followed over time so that their education and fertility preferences could be measured over time. Regrettably, longitudinal data of this kind are not currently available in India. Given the variability in preferences documented in various studies, future research needs to be directed towards

capturing prospective and retrospective intentions; and attitudes towards family formation and other competing activities. In recent years, an important relationship has been observed between husband's fertility preferences and wives' preferences and actual fertility outcomes. The NFHS does not however, provide consistent reports of husbands' preferences for all three survey years; and also has a considerable amount of missing data on these measures. Therefore, the analysis relies on imperfect controls such as husband's education and occupation.

Of course, these analyses do not present the entire story. Notably, they do not take into account family planning effort or structural changes in the country during the study period. Family planning efforts were revitalized following the liberalization in 1991. At the very least, intensive program efforts in many states are seen as a catalyst in the transformation of demand from larger to smaller families (Degraff 1991; Koenig et al. 1992; Cleland et al. 1994; Caldwell et al. 2002;). These effects could be incorporated in multilevel analyses that can identify the extent of variation in fertility desires and behavior that stems from the level of program effort. My next chapter will explore some of these aspects.

The data and analyses used in this paper could also be used to further examine other dynamics of fertility preferences in India. In particular, strong son preference in the country as a whole, but more intensive in the north, has been known to affect the fertility desires of both educated and uneducated men and women (Basu 1999). Future research should incorporate a more dynamic analysis that includes the role of education and son

preference on fertility preferences. With the information on the sex composition of children within families, subsequent analyses might include an examination of education and family size desires and preference for additional children at different parities. It is likely that current sex composition strongly affects reported family size desires as well as preference for more children.

Table 10. Want another child, by Parity and Education, 1992-2006

	Parity=1			Parity=2			Parity=3		
Education	Yes	No	Undecided	Yes	No	Undecided	Yes	No	Undecided
1992-3									
Illiterate	73.55	12.63	13.82	41.14	47.82	11.03	19.32	72.44	8.24
Primary	69.53	17.40	13.08	24.67	66.92	8.41	9.14	85.64	5.22
Secondary	69.73	23.53	6.75	15.03	80.41	4.55	5.58	91.2	3.22
Total	71.6	17.15	11.25	29	62.73	8.26	14.05	79.50	6.45
1998-9									
Illiterate	69.88	17.41	12.7	32.38	57.94	9.69	13.67	78.88	7.45
Primary	63.94	24.56	11.51	19.19	73.56	7.25	6.89	87.42	5.69
Secondary	60.87	32.33	6.80	11.06	84.94	4.00	4.69	90.97	4.34
Total	64.94	25.21	9.85	20.7	72.55	6.75	9.86	83.9	6.25
2005-6									
Illiterate	53.17	44.67	2.17	16.19	82.68	1.13	6.9	92.38	0.72
Primary	46.7	50.27	3.03	8.92	90.52	0.56	3.77	96.02	0.21
Secondary	48.85	47.94	3.21	6.49	92.65	0.86	2.66	97.08	0.26
Total	49.63	47.43	2.94	9.53	89.57	0.89	4.85	94.69	0.46

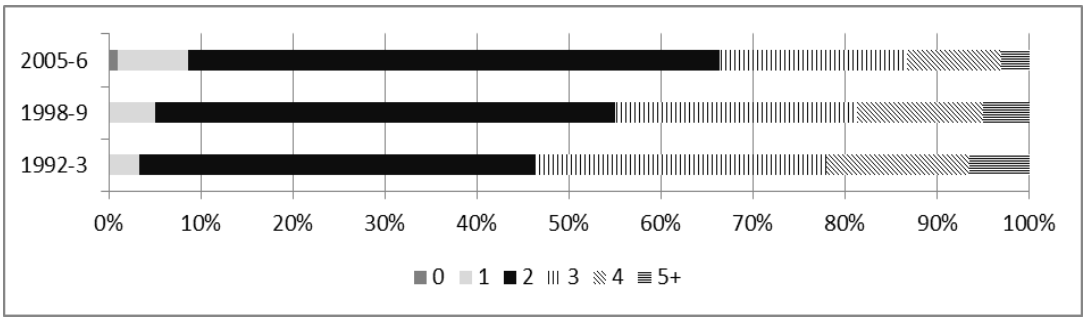

Figure 4. Trends in Desired Family Size, 1992-2006, India

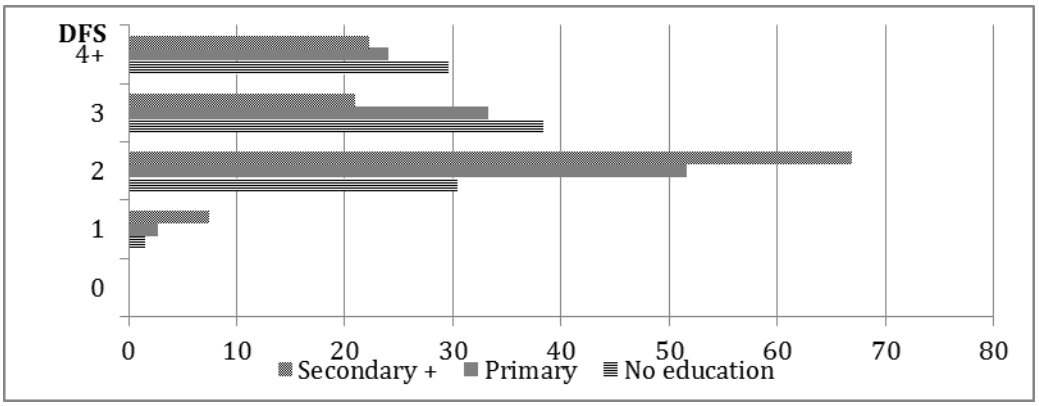

Figure 5. Trends in Desired Family Size by Education, 1992-3, India

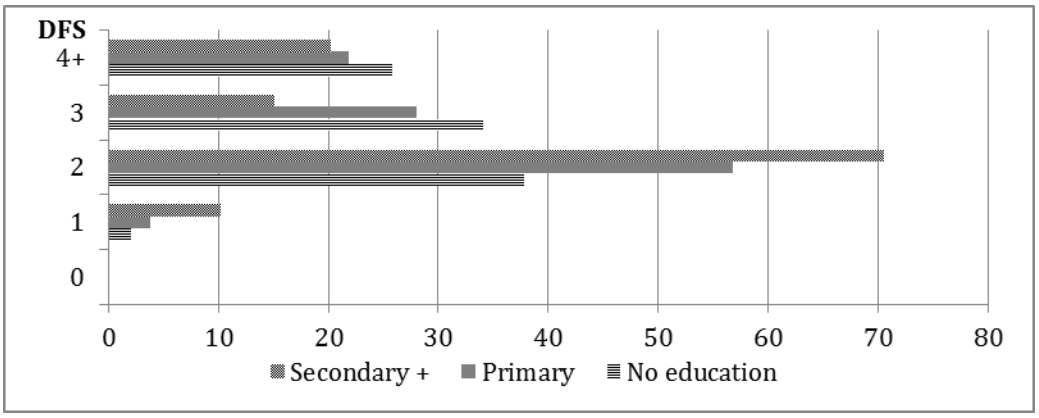

Figure 6. Trends in Desired Family Size by Education, 1998-9, India

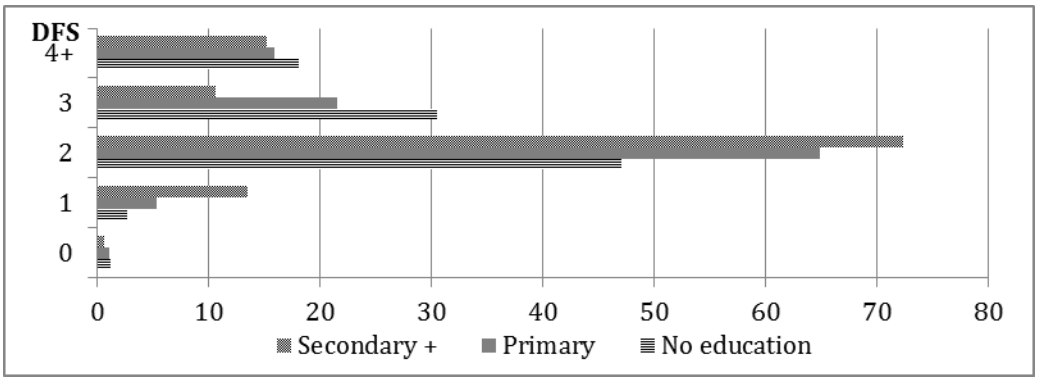

Figure 7. Trends in Desired Family Size by Education, 2005-6, India

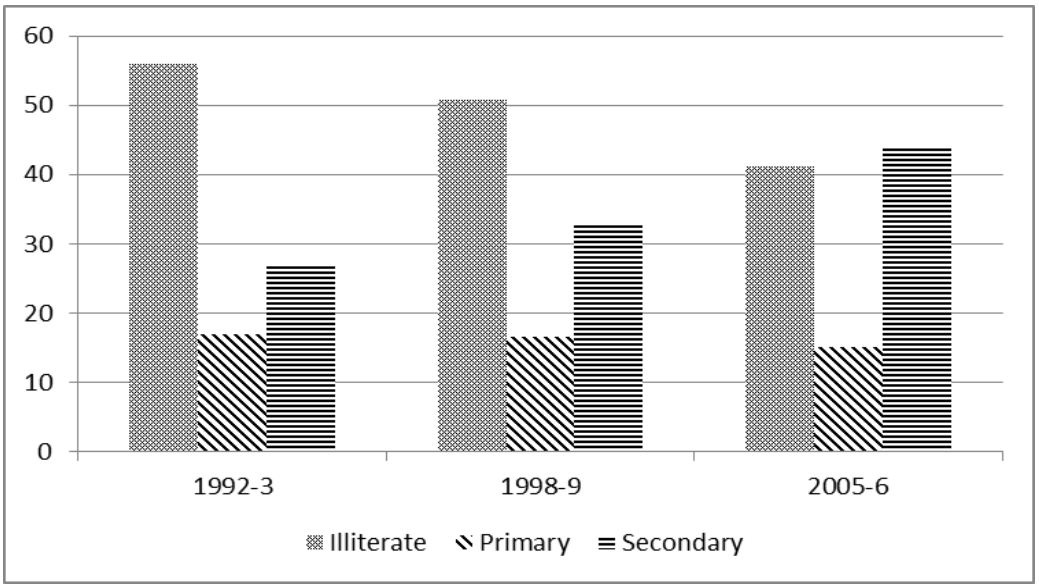

Figure 8. Trends in Level of Education, India 1992-2006

Table 11. Poisson Cross-Section Regression Results of Education on DFS

	1992-3	1998-9	2005-6
Education (Ref: Illiterate)			
Primary	-0.064***	-0.057***	-0.055***
	(-8.8)	(-7.8)	(-7.7)
Secondary	-0.118***	-0.099***	-0.089***
	(-14.8)	(-17.3)	(-16.1)
N	89,506	89,196	92,301

Note: z-scores in parenthesis
*p<0.05, **p<0.01, ***p<0.001

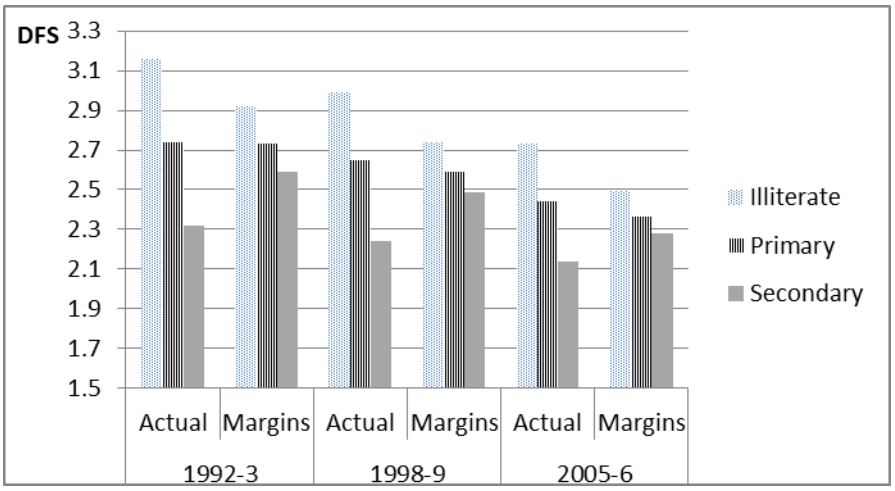

Figure 9. Actual and Predicted Values of DFS, by Education and Period

Table 12. Poisson Pooled Fixed Effects Regression Results of Education on DFS

	Model 1	Model 2
Education (Ref: Illiterate)		
Primary	-0.060***	-0.080***
	(-14.8)	(-11.6)
Secondary	-0.099***	-0.144***
	(-30.3)	(-26.1)
Period (Ref: 1992-3)		
1998-9	-0.061***	-0.071***
	(-19.8)	(-18.2)
2005-6	-0.162***	-0.189***
	(-47.8)	(-41.3)
Education * Period		
Primary * 1998-9		0.017*
		(2.2)
Secondary * 1998-9		0.044**
		(5.1)
Primary * 2005-6		0.038***
		(3.3)
Secondary * 2005-6		0.084***
		(8.9)
N	271,003	271,003

Note: z-scores in parenthesis
*p<0.05, **p<0.01, ***p<0.001

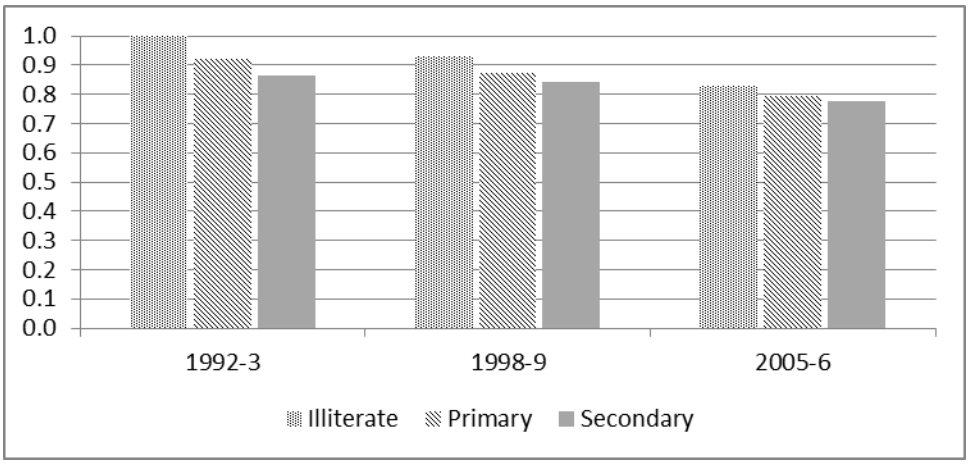

Figure 10. Factor Changes in DFS from Interaction Model

4. COMMUNITY NORMS AND THE USE OF CONTRACEPTION TO SPACE OR STOP AMONG YOUNG WOMEN IN INDIA

4.1 Introduction

One in three births were unwanted in India in 2005 (IIPS and Macro International 2007). If unwanted fertility were eliminated, the country would have achieved replacement fertility as early as 1998 (IIPS and ORC Macro 2000). That women should be able to meet their reproductive preferences is a significant social welfare goal in and of itself. It assumes added weight since helping women meet their reproductive preferences would place the country on the track towards replacement fertility.

Underlying efforts to reduce unwanted fertility through better fertility regulation is the unstated assumption that its reduction through better use of contraceptives is preferable to induced abortions (Casterline and Sinding 2000). However, recent data from the National Family Health Surveys 3 (NFHS 3) shows that among women who do not want any more children, about a third are currently not using any form of contraception, and among women who want to space or delay childbearing, more than 60 percent are not using contraception. Thus there is a clear discrepancy between stated preferences and actual behavior. This discrepancy has occupied the interest of demographers for several decades and is referred to as the unmet need for family planning and reproductive health

services (Bogue 1974; Westoff 1978; Bongaarts and Bruce 1995; Westoff and Bankole 1995; Westoff 1998; Jain 1999).

Over the last three decades, unmet need for family planning has come to occupy a central role for organizing family planning program effort in developing countries. Since the 1960s, policymakers and demographers have been interested in identifying the extent of demand for fertility regulation in order to devise appropriate strategies to increase the uptake of contraception. Unmet need has evolved from its original conceptualization based on the Knowledge, Attitudes and Practice (KAP)-gap surveys of the 1960s to Westoff's subsequent formulation of unmet need in the late 1970s from the World Fertility Surveys (WFS) and its continuing refinements using the Demographic and Health Surveys (DHS) (Westoff 1978; Westoff and Pebley 1981; Nortman 1982; Nortman and Lewis 1984; Westoff and Ochoa 1991; Westoff and Bankole 1995; Westoff 2006; Bradley et al. 2012).

The existence of an unsatisfied demand for contraception first came to light in the KAP surveys of the 1960. The KAP surveys collected data on the knowledge, attitudes and practices regarding family planning in several high-fertility populations at the time. The data demonstrated that unmet need for contraception could be fulfilled through the provision of better family planning programs and services, and justified funding towards population programs in these countries. The bulk of the definitional refinements to unmet need occurred after the late 1970s. Over the next two decades, the concept received tremendous attention due to its central role in validating family planning programs

around the world. The definition was broadened to include unmet need for spacing in addition to limiting (Westoff and Pebley 1981; Nortman 1982); refined in how pregnant and amenorrheic women were assessed (Westoff and Ochoa 1991); and modified to correctly identify and exclude infecund women (Westoff and Ochoa 1991; Westoff and Bankole 1995).

The increased focus on the measurement of unmet need was accompanied by a surge in empirical research to understand the determinants of unmet need. Particularly, in the 1990s, the Demographic and Health Surveys incorporated several questions on respondents' fertility preferences and contraceptive use patterns. This allowed researchers and policymakers to better understand the barriers that men and women face in meeting their reproductive aspirations. There is broad consensus that the determinants of unmet need can be grouped under two leading categories – access to family planning services and barriers to contraceptive use that are not related to access (Casterline and Sinding 2000). Although there is some disagreement, in general, research suggests that inadequate access to services is *not* the main reason for the existence of unmet need. Among non-access barriers, the most prominent are social opposition and lack of information about contraception, including knowledge on source, how to use and perceived or real side effects of contraception (Bongaarts and Bruce 1995). This line of research indicates that unmet need is as much a function of women's primary social relations (family, neighbors, community) as it is of their own reproductive attitudes and behaviors (Casterline and Sinding 2000). Yet, studies that systematically account for the individual, social and cultural factors associated with unmet need are lacking in the empirical literature.

Community social and cultural factors have long been recognized as particularly strong influences on contraceptive use. However, quantitative studies that examine unmet need focus on individual and household (including husband) characteristics (Bankole and Ezeh 1999; Becker 1999; Casterline et al. 1997), whereas localized qualitative studies tend to miss the overarching sociocultural context by providing idiosyncratic explanations (for instance, see Dharmalingam and Morgan 2004). Salient to any study of unmet need in South Asia, for instance is the programmatic thrust on female sterilization. Across communities in Bangladesh, India, Nepal and Pakistan, contraceptive use is synonymous with female sterilization (Saavala 1999; Stash 1999; Casterline et al. 2001). Local explanations that examine the reasons for unmet need for family planning must pay attention to this defining context that is common to these societies. Thus, in order to meaningfully understand the presence of unmet need in these societies, one must turn toward a multilevel approach that can provide persuasive social accounts.

The aim of this paper is to extend research on unmet need by incorporating community influences on contraceptive use among young women given that they express a desire to space or limit future births in India. In particular, I compare the strength of community norms against community socioeconomic characteristics and family planning program activities in explaining community sources of variation in unmet need for spacing and stopping. I draw on data from two waves of the National Family Health Surveys (India DHS) in 1992-93 and 2005-06. By using a multilevel analytical framework, I am able to incorporate community effects on the use of contraception given

that a woman wants to space or stop childbearing, while adjusting for individual, household and state characteristics.

Results indicate that community norms exert a strong influence on young women's use of contraceptives to stop childbearing in both years. In 1992-3, the family planning program effort within communities partially mediates the strong relation between community norms and the stopping behavior of young women.[1] In 2005-6, however, community norms have powerful independent effects on their stopping behavior. This suggests that in 1992-3, the family planning program may have been instrumental in shaping community norms and beliefs about sterilization. But by 2005-6, these norms seem to be internalized by the community to have strong effects over that of the family planning program.

On the other hand, community norms have little influence on the spacing behavior of young women in 1992-3, and all community variation stems from community socioeconomic characteristics. In 2005-6, community socioeconomic characteristics still account for a portion of the spacing behavior of young women; but community norms also exert a moderate influence on the use of contraceptives by young women to space.

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[1] In its seventh five year plan published in 1985, the Indian government acknowledged its poor performance in the realization of family planning goals (Indian Planning Commission 1985; Visaria et al 1999). It renewed its impetus to enhance reproductive health services for women during the seventh plan period 1985-90. Although the data in NFHS does not allow an examination of the mechanisms for the strong effect of program effort in 1992, the family planning program that was revitalized in the few years preceding the survey could partly explain some of the strength in this association in the 1992-3 survey years.

I focus on young women because although unmet need has been declining in India, it is disproportionately high among currently married young women in the ages 15 to 29 years (IIPS and Macro International 2007). In 2005-6, over 22 per cent of young women had an unmet need for family planning (for both spacing and limiting) compared to only 6 percent of women older than 30 years. Young women represent almost one fifth of the entire Indian population, and 40 percent of currently married women in the country. More than 75 percent of women ages 15 to 29 years have been married by age 20, invariably through marriages arranged by their families, leaving them exposed to a long fertile period, and greater possibility of high and unwanted fertility. Not surprisingly, they contribute to more than half of the country's total fertility.

4.2 India's Family Planning Program

India's family planning program was one of the first state-sponsored population programs in the world. Since its initiation, the program has emphasized permanent methods of contraception. This is because of a culture and tradition that deems family planning appropriate only for older women who have fulfilled (or exceeded) their childbearing desires (Rajaretnam and Deshpande 1994; Jejeebhoy 1998; Santhya 2003). Although the program ostensibly adopted a cafeteria approach, whereby a variety of reversible and permanent methods were offered free or at subsidized rates, in reality, it is skewed towards female sterilization. Undoubtedly, female sterilization is an efficient contraceptive, because of both its high use-effectiveness as well as its cost-effectiveness. Nonetheless, studies show that given the low age at marriage, delayed childbearing and

adequate spacing between children can bring about a decline in the fertility of individual couples (for India, see Matthews et al. 2009; Rajaretnam 1990; see Bongaarts and Greenhalgh 1985 for China).[2]

From time to time, the program renews its commitment to promote the reproductive health of women and couples by emphasizing reversible methods, as was the case before and after the Cairo Conference in 1994 (Visaria et al. 1999). However, it is well known that targets and performance evaluations at every level of the health system are set for the number of female sterilizations performed (Mishra et al. 1999). Thus, field workers have little incentive to promote or educate users about reversible contraception in the official basket of contraceptives made available to women and couples – pills, IUDs and condoms. Evidence from the NFHS and small-scale studies support these claims: health workers rarely visit and counsel young newly married women, and when prospective users of contraceptives request information from health workers, only a minority of them are informed of reversible methods (Rajaretnam and Deshpande 1994). Even when they are provided information about reversible methods, most of them are related to negative health and other side effects associated with those (Santhya 2003). As might be expected, female sterilization is the most common method used in India.

The family planning program is now deeply embedded in society, and contraceptive use is synonymous with female sterilization (Matthews et al. 2009).

[2] Bongaarts and Greenhalgh (1985) demonstrate for China that a "strict stop-at-two" rule would have resulted in cohort TFRs well under 2.0. This rule, combined with a policy of higher minimum age at first birth (say 25 years) and longer spacing interval between 2 children (say of about 3 years) would have brought about corresponding declines in period TFRs as well.

Sterilization is often the only contraceptive used by women after a series of wanted, mistimed and unwanted pregnancies. In 2005-6, more than three-fourths of all sterilized women did not use any contraception prior to getting sterilized (IIPS and Macro International 2007). The use of sterilization has also been increasing gradually over time. In 1992-3, 27 percent of currently married women ages 15-49 years were sterilized; this increased to 34 percent in 1998-9 and further to 37 percent in 2005-6. Additionally, more women are getting sterilized at younger ages. The median age at sterilization was 26.6 years in 1992-3, which decreased to 25.5 years in 2005-6. Arguably, the overwhelming use of sterilization has aided in the reduction of overall fertility in the country, notably at higher parities (Saavala 1999).

However, the dependence on sterilization is not adequate to help women meet their reproductive preferences or for the country to achieve replacement fertility (Rajaretnam and Deshpande 1994). For instance, although contraceptive prevalence rate has been rising in the last few decades, estimates from the sample registration system shows that marital fertility was stagnant between 1995 and 2007: declining slightly from 4.7 to 4.4 births per woman. Thus, even as late as 2007, married women in India could be expected to have about 4 children on average, given current fertility conditions. Mean number of children ever born among women ages 40-49 years was 4.16 in 1992-3, which declined to only 4.0 in 2005-6. Among female sterilization acceptors, mean number of living children was 3.5 in 1992-3, which declined marginally to 3.1 in 2005-6. Estimates show that with very little increase in the age at childbearing, alongwith a gradual lowering of the age at sterilization and short birth intervals, India is in fact poised to

experience an increase in the rate of growth of its population (Matthews et al 2009). Thus, for program officials to steer the country back on the way to replacement fertility, it is important to focus attention on factors other than "population control", such as delayed childbearing and longer spacing intervals (both of which relate to aspects of the contemporary fertility model outlined in Chapter 2).

4.3 Community/ Neighborhood Norms and Beliefs

Traditionally, social scientists studied fertility behavior as a function of socioeconomic indicators such as education and income (Davis 1963; Dyson and Murphy 1985; Notestein 1945). Over the last quarter century, researchers have come to recognize that forces operating beyond the control of a woman's circumstances nonetheless have powerful effects on her behavior (Coale and Watkins 1986; Bongaarts and Watkins 1996; Montgomery and Casterline 1996). An emerging line of research in fertility examines the role of ideational forces in shaping women's decision-making and behavior by influencing their existing beliefs and value systems (Johnson-Hanks et al. 2011; Thornton et al. 2012). At the heart of cultural models is the notion that people's values and beliefs orient them to a particular mode of living and behaving (Swidler 1986). Several scholars conceptualize these cultural models as schemas, scripts or mental maps (Sewell 1992; Johnson-Hanks et al. 2011). The dominant theme underlying this research is that schemas and ideas provide people with an understanding of what is good for them, guidelines for a particular course of action and methods and strategies to achieve goals (Geertz 1973).

And yet, values and norms are not set in isolation. They are defined and prescribed within communities and groups that women belong to, and turn to for information, social support and interaction (Donner 2008). To the extent that women derive a sense of identity from belonging in a group, and align their values in line with the norms of their group, neighborhoods in which they reside are particularly important for their childbearing behavior.

Evidence from other countries reveal that community interactions and norms about family planning have strong effects on the fertility behavior of women in those communities. Particularly in African and South Asian countries, these topics feature frequently in informal interactions within villages and neighborhoods. For instance, in Nigeria, over 35 percent of women who were not using contraception reported that they were not using because they or someone they knew had experienced a problem with a method or were worried about potential negative side effects (Fakeye and Babaniyi 1989). In South Nyanza, Kenya, women frequently discuss family planning with friends, relatives and neighbors (Rutenberg and Watkins 1997). This study also revealed that although women get "official" information about contraceptive methods from family planning clinics, they ultimately make contraceptive decisions based on stories that circulate in informal networks in their community. Closer home, in Nepal, information shared freely among men and women in the community influenced individuals' perceptions and decisions about contraception (Stash 1999). While sterilization enjoyed positive evaluations among most women in the community, negative perceptions about reversible methods were in wide circulation. Interestingly, the study found remarkable

similarity in the spatial organization of contraceptive methods even in the small communities studied. Similarly, a study conducted in two districts in South India revealed that women who discontinue a particular reversible method actively discourage its use among other women in the community (Rajaretnam and Deshpande 1994).

Neighborhoods and communities are particularly salient in India. Neighborhoods provide women with a wider sense of belonging, and are frequently the site where women form their non-kin networks, given the limitations on their physical mobility and the close proximity of household compounds. Women's actions are deeply aligned with the "behavioral codes and ideas about feminity and proper conduct" prescribed within the neighborhood (Donner 2008: 8). Their interactions with community members as well as observations of community and non-community role models are an instrumental way for women to form aspirations for themselves and their families (Appadurai 2004), and to evaluate the appropriateness of the use of a particular contraceptive method.

Underlying the predominance of female sterilization as the method of choice for young women in India is their exposure to and interpretation of worldviews around them. Evidently, "the demand for children" has decreased at varying levels across India. Young women are exposed to this idea everywhere: in the media, in the community and within the household as well. In general, they are tuned to this orienting "schema" of small family size. This argument motivates the first hypothesis (Hypothesis 1): *ideal family size within the community will be inversely related to use of contraceptives to space or stop.*

However, young women are constrained by community and familial norms from delaying first births, and the options and resources ("materials") available to them to space are limited. Among the basket of contraceptives promoted by the family planning program, condoms are not deemed licit within marriage (in India, see Patel 1994; for comparison, see Watkins and Danzi 1995), women harbor negative perceptions about IUDs that are relayed to other members of their community (Saavala 1999), and the pill is too cumbersome and is also associated with side effects (Basu 2005; Stash 1999). Sterilization, on the other hand, is a cost-effective and widely accessible procedure that women can avail of often without any spousal intervention, and in most cases, with the support of spouses and in-laws (Saavala 1999). As local studies show, young women are exposed to the experiences of other, often older women in their communities who have themselves been sterilized (Saavala 1999). Older women in India gain appreciably in status and their opinions are valued and discussed, as young women aspire to their status eventually. The argument outlined above supports the following hypothesis (Hypothesis 2): *sterilization experiences of older women in the community shapes the use of contraceptives by young women to space or stop childbearing.*

4.4 Data and Definition of Variables

I use data from the National Family Health Surveys in 1992-3 and 2005-6 conducted by the Ministry of Health and Family Welfare (MoHFW), with technical assistance from ICF Macro (IIPS 1995; IIPS and Macro International 2007). I do not use data from the second wave of the survey in 1998-9 since some of the variables I use in

the analyses in this paper were not fielded in 1998-9. These surveys were initiated by the MoHFW to provide important data to monitor programs as well as to identify emerging population health and family welfare issues. The survey has a clustered sampling design. Within each state, in rural areas, primary sampling units (PSUs) or villages were selected with probability proportional to population size (PPS). Next, households were randomly selected within each PSU. In urban areas, the survey followed a three stage sampling design. First, wards were selected within each state based on PPS. Next, within each ward, one census enumeration block or primary sampling unit (PSU) was selected. Finally, households were randomly selected from PSUs. Thus, PSUs represent either a village in rural areas or a census block in urban areas and typically about 30 households were selected from each PSU for the survey.

The original survey in 1992-3 interviewed all ever-married women ages 15-49 who stayed in the household the previous night. In 2005-6, never-married women ages 15-49 and men ages 15-59 years were also included in the survey. In this study, I construct individual-level variables for young women at risk of an unintended pregnancy defined as currently married, not pregnant 15-29 year old women. This leaves 35,240 young women in 3,167 PSUs in 1992-3 and 31,490 young women in 3,747 PSUs in 2005-6 for the individual-level analyses.

Given the multilevel framework in which I seek to explain the influence of the micro-ecological community on women's contraceptive behavior, the community should be small enough to correspond to the immediate neighborhood in which women live. The

primary sampling units in both rural and urban areas roughly represent the local environment of women. Accordingly, the analyses used in this study treat PSUs as local communities in which women's preferences and actions are deeply embedded.

For community-level predictors, I aggregated responses from all ever-married women ages 15-49 within communities. These consisted of 89,404 ever-married women ages 15-49 years from 3,167 PSUs in 1992-3, and 92,301 ever-married women ages 15-49 years in 3,747 PSUs in 2005-6. I also constructed strategically chosen age groups for community-level variables to see if they had greater relevance and explanatory power over the contraceptive use of younger women. However, these community variables constructed from differential age groups yielded results consistent with those I obtained by using averages constructed from all ever-married women. Therefore, I use the mean community measures derived from individual responses of all ever-married women ages 15-49 years for the analyses. The only exception is for the level of sterilization among older women within the community, in which case, I aggregate individual responses of women ages 30-49 years. Descriptive statistics of the sample of women and communities are shown in Tables 13 and 14 respectively. All descriptive measures are weighted using the sampling weights provided in the NFHS.

State-level data are taken from various sources. Net state domestic product per capita for both survey years are drawn from reports published by the Central Statistical Office. State literacy rates are taken from data from the National Sample Surveys Office and published by the Ministry of Statistics and Programme Implementation (MoSPI).

4.4.1 Dependent Variable: Contraceptive Use

The analytical issue at stake is to understand the preference-behavior disjuncture: among women who report wanting to space or limit future childbirth, some of them use contraception and some do not. This problem can be accounted for by a regression model of contraceptive use of women (who report wishing to space or stop) on the hypothesized determinants of use (Casterline et al 1997).

Accordingly, in this study, I model the use of contraceptives by young women for spacing and limiting purposes in two different time periods to understand the patterns of change in contraceptive use and its determinants. Two outcome variables are used in the analysis: a dichotomous variable with a value of one if the respondent is currently using *any contraception* among those who report that they want to delay childbearing for at least 2 years; and a dichotomous variable with a value of one if the respondent is currently using *any contraception* among those who report that they want no more children. The analytic sample is restricted to young women at risk of an unintended pregnancy, defined as currently married, not pregnant 15-29 year old women. Women not using a modern or traditional method are classified as not currently using contraceptives. Modern methods included in the survey are: female and male sterilization, oral pills, IUDs, condoms, injectables and emergency contraception. Traditional methods covered in the survey include rhythm, withdrawal and other folk methods. I include traditional methods in the analyses because they have been shown to be effective if properly used

(Johnson-Hanks 2002). Additionally, well-educated women in India seem to show a preference for using less invasive forms of contraception that does not interfere with their bodies' normal functioning (Basu 2005). Therefore, traditional methods are found to be prevalent as a form of "ultramodern" contraception among this elite subgroup of women who are averse to medicalization of what is inherently a natural process (Basu 2005).

In addition to analyses on 15-29 year old currently married women who were not pregnant, I conducted analyses for other subgroups of women: currently married and not pregnant women ages 20-29 and women ages 15-24. The results on these different subgroups of women were consistent with those obtained for 15-29 currently married not pregnant women. Table 3 shows how contraceptive use varies among young women by their key socioeconomic characteristics.

There are several reasons for operationalizing contraceptive behavior as current use versus noncurrent (ever-use or former use) use. Current contraceptive use is a well-studied (Entwisle et al. 1989; Mason and Smith 2000) and significant measure. Contraceptive prevalence rate (CPR) which is based on contraceptive use in a particular period is a widely used indicator of development, health and women's empowerment. The NFHS allows three possible measures of contraceptive use: never use, former use, and current use. Models run using *ever use* (versus *never use*) of contraceptives produced essentially similar results, though the effects were of a slightly greater magnitude. However, current contraceptive use is more relevant to the current study because of its close temporal proximity to potential explanatory variables measured at the time of the

interview. The category consisting of former users is very diverse including discontinuers, sporadic users and those who used in the past for spacing purposes (Entwisle et al. 1989). The NFHS provides limited information on timing of starting and discontinuing use of a particular method, and reasons for doing so. Thus, while studying them is beyond the scope of this paper, it is also not possible to study them with the information available in the NFHS. Thus, following convention and for practical reasons, I choose current contraceptive use as a measure of contraceptive behavior.

4.4.2 Community-level Independent Variables

The structural effects of community characteristics and as well as community norms are best captured by variables measured at the community level. However, characteristics of the local environment in which women live are not collected in the India NFHS and are not available from other sources either. Therefore, I construct each community measure as the aggregated average of individual responses within PSUs (described in Table 14). Past research shows that individual responses aggregated at the cluster level can be used as valid and efficient proxies for community characteristics (Lesthaeghe and Meekers 1986; Entwisle et al. 1989; McNay et al. 2003; Moursund and Kravdal 2003; Hayford 2005). Several of these studies estimate such averages using the DHS data from India. As an example, McNay et al (2003) use district averages to explain the contraceptive use of uneducated women in India using the 1992-3 NFHS. Kravdal (2003) uses the 1998-9 NFHS to study the effect of community-level education on fertility behavior, by constructing community averages derived from individual data.

They also test and validate their analysis of community averages serving as proxies for various community characteristics. My analyses also show that multicollinearity among the variables is not a concern. Additionally, the NFHS are highly regarded for the quality of its data, particularly on fertility preferences and behavior. Thus, given the lack of appropriate data to capture community effects, I am motivated to make good use of this rich set of PSU information to understand their effects on a young woman's contraceptive use. I assess community effects by constructing twelve community measures under four categories: community norms, socioeconomic characteristics, media exposure and family planning program effort. I elaborate these measures below.

4.4.2.1 Community Norms

I use two variables to serve as proxies for patterns of cultural norms and social interactions in the community: percentage of older women who are sterilized (*percent sterilized 30-49 years)* and *mean ideal family size* in the community. Sterilization of older women in the community is indicative of the prevailing culture towards contraception in the community. Communities in which a high proportion of older women are sterilized might expect the same behavior from younger women living in them as well, since this is what their "older sisters" had done in the past. This behavior consists mainly of low use of reversible contraception to space or delay births, and using contraception only when they are ready to stop childbearing. Of course this could also be a cohort effect with very different norms for the younger generation. However, given the low status of younger women, and their general lack of awareness of reversible contraception, all they might be

hearing from older women in the neighborhood is that female sterilization is the most appropriate, accessible and effective contraception available to them. They might also be exposed to negative perceptions about reversible forms of contraception that are in the official basket of contraceptives of the family planning program[3]. To the extent that younger women are expected to follow similar paths as older women living near them by the community and health workers in general, and are exposed to positive information about sterilization, they are more likely to adhere to the behavior expected of them in the community.

I use *mean ideal family size* within the community as another proxy for the cultural norms in the community. There might be several reasons why communities with high mean ideal family size might be different from those where it is low. However, ideal family size is a value orientation by individuals and societies that describes the appropriate number of children to have. They are indicative of the prevailing attitudes within the community regarding children and women's fertility. Where the local preferences favor larger family size, we would expect that young women residing in them face constraints in their use of contraception to regulate their fertility.

I use different subgroups of women to estimate community norms. To calculate the percentage of older women in the community who are sterilized, I incorporated the responses of all women ages 30-49 who were interviewed in the community. I included

[3] The state officially sponsors pills, IUDs and condoms in addition to female sterilization in its basket of contraceptives through its Public Health Centers, community health workers and various other state channels. Nonetheless, awareness and use of reversible contraception remains low (see Santhya 2003).

visitors to the group of permanent residents in the community since they are part of the social network of a given young woman and may bring new information and ideas from outside the community (Hayford 2005). Further, using the responses of 30-49 year old women enables me to identify how older women in a community influence the attitudes and behavior of younger women in the same community, without the problem of endogeneity.

I estimate the mean ideal family size based on the responses of all 15-49 year old ever married women. As in the previous chapter, mean ideal family size is an aggregate representation of family size preferences for a particular place and time. Thus, I argue that the average of these responses in the community captures the appropriate number of children to have for women in their childbearing ages, given the current cultural and social constraints they face in the local community in which they live.

4.4.2.2 Community Socioeconomic characteristics

Percent secondary schooling refers to the percentage of ever-married women ages 15-49 years in the community that has completed secondary schooling. To estimate mean community wealth, I use the wealth index derived for each household. The NFHS measures household wealth as a composite index of the economic status of a household based on its ownership of key assets. This measure has been developed and tested in a number of developing countries and represents the level of wealth that is consistent with expenditure and income measures (Rutstein and Johnson 2004). First, a list of household assets and housing characteristics is compiled to construct factor scores for each

household asset. Next, a wealth index is estimated for each household, from which wealth quintiles are constructed. *Percent rich* indicates the percentage of women in the community who belong to households that are in the higher wealth quintiles (third, fourth and fifth). *Percent professionally employed* refers to the percentage of women in the community who are professionally employed. *Percent Muslims* indicates the percentage of women in the community who are Muslim. Finally, I add variables to control for *PSU size* and to indicate whether a PSU was in a rural or *urban* area.

4.4.2.3 Media exposure in the community

Mean media exposure indicates the mean level of exposure to the media in the community. In 1992-3, the survey included questions on weekly exposure to the television and the radio; in 2005-6, weekly exposure to newspapers was added. These responses were summed and averaged to get the mean level of exposure to the media in the community.

4.4.2.4 Family planning program effort in the community

Evidence from several countries reveal that the intensity and placement of family planning program activities within communities exert a strong influence on the choice of contraceptive methods among women (Frankenberg et al 2003). The presence of family planning services within communities has also been linked to overall increased use of those services by women in those communities (Frankenberg et al 2009).

However, the NFHS does not focus on the level of effort by the family planning program within communities and among individuals, and so does not have strong measures of program effort. Further, the measures of family program effort differed between the survey years. Therefore, I incorporate different sets of variables in 1992-3 and 2005-6 to account for the level of family planning program activities and placement of family planning clinics within communities. Thus, the effects of family planning program activities within communities are likely to be conservative and must be interpreted with caution.

In 1992-3, the survey asked respondents who used a particular type of contraception if they were visited by a community health worker subsequent to their adoption of the method. I construct a second measure of the family planning program within communities based on respondents who had a birth in the last five years preceding the survey. As part of their antenatal care, health workers often also counsel women about family planning and the options for contraception available to them subsequent to birth. I only include responses for the last birth since they are indicative of the most recent program effort in communities. For both measures, I sum and then average the individual responses on visits by health workers to get the mean level of visits by health workers in the community for women who are using contraception and for women who had a birth in the last five years.

In 2005-6, I include two controls: a variable to indicate whether a community health worker visited all eligible respondents in the ages 15-49 years at least once in the

last three months, and a variable to indicate whether the respondent lived in a household that was covered by the local public health center. Both these variables serve to reflect the exposure of a particular woman to activities and counseling offered by staff of the family planning program in her community.

4.4.3 Individual-level control variables

I include several indicators of individual and household sociodemographic characteristics to control for fixed effects at the individual level (described in Table 13). Additionally, in 2005-6, I include measures of women's autonomy that are often closely associated with contraceptive use and fertility (Jejeebhoy 1995). Because contraceptive use is greatly influenced by respondent's age, I include respondent's *age* and *age-squared* at interview. I also include *age at first marriage* as a control because it is usually associated with the decision to use contraceptives. Contraceptive use increases with *parity*, and so, I control for number of living children. Because families prefer to have *at least one son*, I include an indicator variable to capture the effect of son preference on contraceptive use of young women. Fertility differences between religions are well-known; in order to control for these differences, I include variables to indicate respondents' religion (*Muslim*, and *Other religion*, with *Hindu* being the reference). Respondents' education is measured as a series of categorical variables: *primary*, *secondary* and *high school* with *no education* being the reference category. Respondents' employment is coded in three broad categories: employed in a professional or service job

(*professional employment*), employed in agricultural or manual labor (*agricultural labor*), and not employed (*unemployed*), with the last being the reference category.

Although weaker, husbands' education has been shown to influence wives' contraceptive use in some societies, independent of the effects of wives' education (Jejeebhoy 1995). Accordingly, I add a variable to indicate the completion status of *husband's secondary school* education. In models not shown in the paper, I also test the effects of husband's education as a series of categorical variables (no education, primary, secondary and higher secondary). Since the main results remain unchanged, I choose the single indicator of husband's secondary school education in the interest of parsimony. Household wealth is scored on the basis of the living standard of a household. Individuals are then split into wealth quintiles based on the household score: *lowest*, *second*, *fourth* and *highest* quintiles with the *middle* wealth quintile as the reference.

Additionally, I include variables to capture respondents' level of exposure to media. Specifically, in 1992-3, in two separate questions, respondents reported if they listened to the radio or watched television at least once a week. Respondents who both listened to the radio and watched television at least once a week were coded as having a high level of exposure to media (*high media*). Respondents who were exposed to either media weekly were coded as having a moderate level of exposure to media (*moderate media*), whereas those who were not exposed to either media at least once a week were those with a low level of media exposure (*lowmedia*). In 2005-6, an additional question was asked on whether the respondent reads the newspaper at least once a week. Therefore

in 2005-6, women with high media exposure were exposed to all three forms of media at least once a week. Those with moderate media exposure were exposed to two forms of media at least once a week; whereas those with low media exposure were exposed to less than two forms of media weekly.

Finally, I construct three measures of women's autonomy based on answers to 14 survey questions in 2005. The three measures of women's autonomy are: (1) *physical autonomy,* (2) reported *independence* in taking care of oneself, and (3) extent of *joint decision making* with spouse. Details on the question wordings for these measures of women's autonomy are given in the Appendix. *Physical autonomy* is constructed from a set of three survey questions that enquire about whether a respondent is "allowed to" go on her own to the market, health facility and places outside the village or community in which she lives. The sum of these three measures is the estimate of physical autonomy used in the analysis (range: 0-3; Cronbach's alpha: 0.85). The second measure, respondent's *independence* in taking care of oneself is constructed from a series of five questions on whether a respondent finds it a big problem to get medical help for herself. The questions enquire about major perceived or real obstacles in getting medical help for the respondent and whether she finds these obstacles to be significant. The responses to these questions are summed to get the estimate of independence (range: 0-5; Cronbach's alpha: 0.74). The final measure is constructed from a set of five questions on who makes the final decisions for key household matters (range: 0-5; Cronbach's alpha: 0.82). These questions represent a respondent's self-reported participation in household decisions. Responses are summed to get the composite index of *joint decision making* with husband.

Had they been available, more nuanced measures of autonomy to tap underlying dimensions would have been preferable, especially on reproductive health matters and physical autonomy.

4.5 Analytic Strategy

This analysis focuses on current contraceptive use among currently married and not pregnant 15-29 year old women[4], given that they want to delay or stop childbearing, as a function of individual, community and state factors. Multilevel models are particularly suited to analyze the impact of variables at different levels of a hierarchical structure on a specific outcome variable (Raudenbush and Bryk 1986; Guo and Zhao 2000; Goldstein 2003). They also correct for the biases in parameter estimates that result from the clustering of data within PSUs and states, thereby providing accurate standard errors and coefficients. Standard regression techniques that do not correct for this clustering provide biased results, particularly when the effects of higher-level variables are strong. Finally, and of significance to this study is the ability of multilevel models to partition variance in the outcome variable at each higher level, so that we are able to gauge which level contributes to the most variation in the outcome. The relevance of multilevel models to partition variance at different levels substantively and technically, in

[4] In analyses not shown, I controlled for the selection effects of wanting no more children. That is, women who want no more children are more likely to be selected into contraceptive use. I accounted for this endogeneity using Heckman selection models. The differences were very marginal.

this case, individual, neighborhood and state, has been elaborated in several studies elsewhere (Blakely and Subramanian 2006; Guo and Zhao 2000).

The multilevel model for dichotomous outcomes is quite similar to that used for standard logistic regression. All multilevel estimation models were computed on HLM7 via penalized quasi-likelihood approximation that uses an iterative process of analysis until estimates converge. Using contraception to space or to terminate childbearing represent two distinct decision processes, and so, I estimate different models for whether or not a respondent uses contraception, given that she reports wanting to delay or stop childbearing.

The outcome variable used in the study y_{ijk}, whether or not respondent *i* in community *j* in state *k* is currently using any contraception (given that she desires to delay or terminate childbearing) follows a Bernoulli distribution. The probability that a woman is currently using contraception is defined as p_{ijk}, which is modeled using a logit-link function. The three-level model takes the form:

$$\log [p_{ijk} / (1- p_{ijk})] = \beta_{0jk} + \beta_1 X_{ijk} \quad \text{(level 1 model)} \quad (1)$$

$$\beta_{0jk} = \beta_{0k} + \beta_2 X_{jk} + u_{0jk} \quad \text{(level 2 model)} \quad (2)$$

$$\beta_{0k} = \beta_0 + \beta_3 X_k + v_{0k} \quad \text{(level 3 model)} \quad (3)$$

where Equation 1 refers to the level 1 model in which $\log [p_{ijk} / (1- p_{ijk})]$ is the logit of the probability that a woman *i* living in community *j* in state *k* is using any contraception; β_{0jk} is the intercept; X_{ijk} is the vector of individual-level variables; and β_1 are the estimated parameter effects of the individual variables.

Equation 2 refers to the level 2 model that takes into account community characteristics in which the intercept of community *j* in state *k* (level 1 intercept) is given by β_{0jk}, which is a function of a fixed population intercept for all communities β_{0k}, the vector of community characteristics of community *j* in state *k*, X_{jk}, for which the parameter estimates are given by β_2, and a random component u_{0jk} accounting for the residual variation at the community level. Equation 3 is the level 3 model that incorporates random state variation, in which the intercept of state *k* (level 2 intercept) is given by β_{0k}, which has a fixed intercept for all states β_0, a vector of state characteristics X_k, their parameter estimates β_3 , and a random residual term for each state v_{0k}. The models assume that the random effects across different levels (u_{0jk} *and* v_{0k}) are uncorrelated (Guo and Zhao 2000).

Multilevel models allow the decomposition of variation in the dependent variable into within-community variation (individual fixed effects), between-community variation (level 2) and between-state variation (level 3). This is done by computing the intra class correlation (ICC). When the intra class correlation is high, it implies that the between-community variation is stronger than the within-community variation. For binary dependent variables, Guo and Zhao (2000) suggest the use of $\pi^2/3$ as the level 1 variance based on the variance of the standard logistic distribution. Then, the intraclass correlations at the various levels can be estimated as ρ:

$$\rho_2 = var(u_{0jk}) / (\pi^2/3 + var(u_{0jk}) + var(v_{0k})) \quad \text{(between-community variation)} \quad (4)$$

$$\rho_3 = var(v_{0k}) / (\pi^2/3 + var(u_{0jk}) + var(v_{0k})) \quad \text{(between-state variation)} \quad (5)$$

The interpretation of intraclass correlation is straightforward. For instance, when all the variation in the dependent variable is contributed by between-community variation, every woman living in a given community will have the same probability of using contraception. That is, the heterogeneity (random effects) between communities contributes significantly to the variation in the dependent variable. On the other hand, when all the variation is within communities, a woman from a given community will have the same probability of using contraception as another woman from any other community. In this case, the heterogeneity between individuals within communities (fixed effects) contributes to the variation in the dependent variable.

To examine how the association between community and state characteristics and the contraceptive use of young women unfolds in the presence of individual-level variables, I compared models that progressively incorporate additional covariates. Both sets of models for spacing and stopping behavior are robust to the order in which variables are progressively added. However, because community factors differently influence the spacing and stopping behavior of young women, I showcase this particular sequence of progressive models for spacing and stopping to demonstrate these differences.

To elaborate, the results indicate that among community and state variables, community socioeconomic characteristics contribute the most variance in the spacing behavior of young women in both years. Accordingly, in Table 17, I sequentially add community factors to Model 1, which is a multilevel logistic regression model that

incorporates individual and household characteristics and the random error terms for states and communities. This allows me to examine the original variance contributed by the two levels before adjusting for any higher-level covariates. In Model 2, I include community socioeconomic characteristics (education, wealth, and religion), community controls (community size and urban/ rural) and state literacy and state GNP per capita. I add level of media exposure in Model 3, and the level of family planning program effort in Model 4. Model 5 is the full model that includes community norms (mean ideal family size and level of sterilization). The last model shows the effect of community norms after controlling for individual, community and state factors. Further, this sequencing allows me to gauge how much of the variance in spacing behavior is explained by various community measures.

For stopping, results indicate that among community and state variables, community norms contribute the most variance in young women's use of contraception to stop childbearing. To demonstrate the strength of community norms for stopping behavior, I use a different sequence of models. Model 1 in Table 18 is the same as in Table 17 – it is a multilevel logistic regression model that incorporates individual and household characteristics and the random error terms for states and communities. Model 2 adds community controls (community size and urban/ rural) and incorporates the effects of community norms. I add community socioeconomic characteristics in Model 3, level of exposure to media in Model 4 and level of family planning program effort in Model 5, which is the complete model for stopping.

4.6 Results

4.6.1 Descriptive Patterns

Age patterns of contraceptive use among young women reveal striking trends. The proportion of young women using contraception has increased significantly for every age group in this period. Among 15-49 year old currently married, not pregnant women, 47 percent were using any contraception in 1992-3 (see Figure 11). This increased sizably in 2005-6, by almost a third to 62 percent. Even as overall contraceptive use has increased over time for all women, in both periods, 15-24 year old women have the lowest contraceptive use among all women, whereas women ages 25-29 years also have contraceptive use rates that are lower than the national mean. Contraceptive use increases in both periods with age, peaking among women in their mid to late thirties. This is suggestive of the pattern of women and couples not using contraception to space and delay in the early childbearing years, but only to stop as they reach or exceed their target family size.

In 2005-6, the number of currently married 15-19 year old women who are not pregnant has declined dramatically, and there is a slight increase in the number of currently married 25-29 year old women who are not pregnant. While this could be sampling differences between the two surveys, they are also suggestive of increasing ages at marriage for young women in recent years. While the number of young women who wish to space their next birth has fallen considerably in 2005-6, the proportion of them that are using any contraception to space has more than doubled in the same period. At the same time, the number of young women who wish to stop childbearing has also

increased in 2005-6, with a modest increase in the proportion of them using contraception to terminate childbearing.

Contraceptive use among young women varies widely by their socioeconomic characteristics and use dynamics have changed considerably between 1992-3 and 2005-6 (see Table 15). A sharp education gradient in contraceptive use can be seen in 1992-3, which has become flatter in 2005-6. Further, the number of women in the lower education categories has declined considerably, with a complementary increase in the number of women in higher education categories, particularly those who have completed secondary school. Across all education categories, more young women are using contraception in 2005-6. In both time periods, contraceptive use is highest among women employed in professional or service occupations. There is no difference in both periods between the use rates of women who are not employed or who are employed in agricultural or manual labor. Wealth has a positive linear association with the contraceptive use of young women: women in the higher wealth quintiles have greater use rates in both periods. Hindu and Muslim women have lower use rates compared to women from other religions (composed mainly of Christian, Jain, Sikh women). Women who are exposed to television, radio and newspaper at least once a week and women residing in urban areas have use rates higher than average. Although the socioeconomic characteristics exhibit strong associations with contraceptive use, they are probably not causal. Rather, they are likely correlated with other characteristics, such as social class of the household, and the availability and accessibility of family planning clinics and counselors to the respondents.

In the next set of descriptive analyses, I examine the patterns of association between community variables and young women's contraceptive use in 2005-6 (Table 16). I split communities into three tiers based on contraceptive prevalence among the young women living in them. In the table, I only show communities in the top and bottom tiers of contraceptive prevalence. As expected, contraceptive use is high in communities that have a high proportion of women with a secondary school education; where more than half of the women come from households in the higher wealth quintiles; and where a high proportion of women are exposed to mass media. It is marginally lower in communities that have a high proportion of women that are from Muslim households.

4.6.2 Analytical Results

Tables 17 and 18 show the odds ratios and their z scores for community and state variables of the logit regressions of contraceptive use among young women who want to space and stop respectively. All models in both tables adjust for individual and household characteristics already described in the earlier sections. The tables display the results of community effects, while the odds ratios for individual characteristics are shown in the Appendix. I first provide a brief summary of the results in the tables below, before proceeding to elaborate them in the following sections.

Upon the inclusion of community socioeconomic characteristics in 1992-3, the variance in contraceptive use for spacing contributed by community factors is no longer significant. This suggests that once community socioeconomic factors are controlled in

the model, there is no more variation between communities to be explained. In 2005-6, the findings suggest that both community socioeconomic characteristics and community norms play an important role on the use of contraception for spacing. Nonetheless, the unexplained community variance is still significant, suggesting the importance of other unobserved community factors. In both years, the findings indicate that community norms exert a strong influence on the stopping behavior of young women, even after accounting for individual, community and state characteristics.

4.6.2.1 Factors that Influence the Odds of Spacing

Model 1 in Table 17 indicates that communities and states contribute a sizeable portion of the variance in young women's spacing behavior. With no other state or community controls, in 1992-3, states and communities contributed a third of the variance in the use of contraceptives to space, above and beyond the effect of individual characteristics. The variation between communities does not have a significant effect in Model 2 when community socioeconomic characteristics are added. Based on the significance of coefficients and the contribution to total variance, community socioeconomic characteristics exert a significant and powerful influence on the spacing behavior of young women in 1992-3. More specifically, living in wealthy areas with a large proportion of secondary-school educated women has a positive, although relatively small effect on the use of contraceptives to space or delay childbearing. Nonetheless, there is substantial variability in these measures between communities that when they are controlled, there is no more community variation to be explained. State variation reduces

by almost two-thirds in Model 2 when state literacy and logged GNP per capita are controlled. It then increases marginally in subsequent models with state variables being constant, and community measures of media exposure, program effort and norms are added. This suggests that these additional community measures contribute to heterogeneity at the state level as well.

In 2005-6, Model 1 shows that the extent of variation between states has declined, whereas variation between communities remains constant. Together, they explain a quarter of the variation in the use of contraceptives to space. Community variation reduces by 45 percent, but is still significant when community socioeconomic characteristics are added in Model 2. Again, living in wealthy communities with a high proportion of secondary-school educated has a small, positive influence on the use of contraceptives to space.

The next two models that add the level of media exposure and family planning program effort in the community have little impact on the variance in the dependent variable after adjusting for the effect of community socioeconomic characteristics. The level of exposure to media in the community has a strong influence on the odds of spacing in both years. In Model 5, net of all other controls, the odds of a young woman spacing her next birth increases by a factor of 1.46 and 1.33 in 1992-3 and 2005-6 respectively in communities with high media exposure. On the other hand, the odds of spacing reduces by a factor of 1.20 and 1.32 in 1992-3 and 2005-6 respectively in communities with low media exposure. The community effects of media exposure are

significant even after adjusting for media exposure at the individual level. Thus ideas and attitudes gained from the media are diffusing within communities in both periods. But because media exposure does not have an effect on the variance in spacing, it is likely related to the socioeconomic characteristics of the community. The mean level of visits by family planning workers in the community has a small positive effect on the odds of spacing in 1992-3 but not in 2005-6. This variable is not only a proxy for the presence of a health center in or near the village, but is also indicative of the level of exposure to information on family planning within the community through (regular) visits by health workers.

Model 5 shows that of the two measures of community norms, the mean ideal family size expressed by members of the community has a stronger effect on the odds of spacing in both years. An increase in the average ideal number of children in the community decreases the odds of using contraception to space by a factor of 1.35 and 1.90 in 1992-3 and -62005 respectively. However, community norms have no effect on the variance in 1992-3 after adjusting for socioeconomic characteristics. This indicates that community socioeconomic characteristics rather than norms drive the spacing behavior in 1992-3. On the other hand, in 2005-6, norms alone reduce the variance in spacing by over 15 percent and 9 percent at the community and state levels respectively, even after accounting for individual, community and state characteristics.

4.6.2.2 Factors that Influence the Odds of Stopping

Table 18 displays the odds ratios and z scores for contraceptive use among young women who want to stop. Model 1 that controls for individual and household characteristics shows that communities and states contribute about a fifth of the total variance in the odds of stopping. In both years, community variance is higher than state variance. In Model 2, upon the inclusion of community norms and state variables, both community and state variation declines substantially – by about 20 percent in 1992-3 and 27 percent in 2005-6. In analyses not shown, I find that this effect is robust to the order in which variables are added, but displaying them in the current order in Table 6 allows me to demonstrate the strength of community norms for stopping. Adding state variables also reduces the state variance by 56 percent, even though state literacy and state GNP per capita do not have a significant association with the odds of stopping.

In 1992-3, Model 2 shows that both mean ideal family size and the level of sterilization of older women have strong and significant effects on the odds of stopping. An increase in mean ideal family size by one child decreases the odds of stopping by a factor of 1.9. The odds of stopping increase by a factor of 1.28 in communities with high prevalence of sterilization among older women, whereas it reduces by a factor of 1.16 in communities with low prevalence of sterilization. Including community socioeconomic characteristics in Model 3 has only a marginal effect on community variance. Further, the effect of mean ideal family size declines to 1.5, but the effect of sterilization of older women remains unchanged. Adding the level of media exposure in Model 4 once again has no impact on the variance in stopping, suggesting that media exposure is likely

correlated with other socioeconomic characteristics of the community. Living in communities with high media exposure increases the odds of stopping, but there is no association between communities with low media exposure and stopping. Additionally, the measures of community norms still have the same effects as in Model 3.

Model 5 adds the level of family planning program effort within the community. Two findings are notable in this model. First, in 1992-3, community and state variance reduce substantially – by 20 percent and 30 percent respectively. Additional analyses not shown demonstrate that this finding is also robust to the order in which the variables are added. Clearly, family planning program effort contributes considerably to the variance in young women's stopping behavior in 1992-3. Second, the inclusion of program effort in 1992-3 renders the level of sterilization among older women in the community non-significant. This indicates that program effort mediated the effect of sterilization in communities in 1992-3. Communities that had a high level of sterilization were probably the ones which were most visited by health workers, who likely provided the information and motivation for women to get sterilized. Given the program's emphasis on married women who have already completed childbearing, this finding indicates that these are probably the women counseled by health workers to undergo sterilization in 1992-3.

Model 5 for 2005-6 shows that the level of visits by health workers in communities had a strong positive effect on the use of contraception to terminate childbearing, over and above the effects of all other covariates. However, the contribution of program effort to the variation in contraceptive use for stopping is negligible. The

results also show that both measures of community norms are significant in 2005-6: high values of mean ideal family size are associated with low stopping behavior, whereas high prevalence of sterilization among older women increases the odds of stopping by younger women. Similarly, low prevalence of sterilization among older women reduces young women's odds of stopping. This result suggests that by 2005-6, with a more widespread reach of program effort across communities, there is not a lot of variation between communities in this factor. On the other hand, young women seem to be more influenced by the sterilization experiences of older women in the community.

4.7 Summary and Discussion

To summarize, community norms are powerful in shaping the stopping and spacing behavior of young women in India in both 1992-3 and 2005-6. The analyses reported in this paper find support for both hypotheses: ideal family size norms in the community influence young women's spacing and stopping behavior; and young women's stopping behavior is influenced by the sterilization experiences of older women within the community. Importantly, the influence of community norms seems to have strengthened over time for both spacing and stopping. This is a significant finding because it means that normative expectations about contraception choice and type are increasing, rather than decreasing over time, as young women's contraceptive use seems to be constrained or enhanced by the social group to which they belong, independent of their own characteristics. In this case, their immediate local environment provides

information and guidelines to young women, who have very little status in the average Indian community, and rely on generalized norms within the community on matters relating to childbearing and contraception.

For young women who desire to stop, the mean ideal family size in the community has a substantial influence even after adjusting for all other community socioeconomic characteristics and family planning effort. However, and strikingly visible is the large effect of the prevalence of sterilization of older women within their community in 2005-6: in 1992-3, the effect of this measure was largely a function of the invigorated program effort within communities. Together, these measures capture a considerable portion of the variation in the stopping behavior of young women.

On the other hand, these two measures of community norms do not seem adequate to capture the variation in young women's decision to space childbearing. Yet even in the case of spacing, the importance of community norms has been gradually rising. Particularly, as the mean ideal family size in the community increases, young women in the community are much less likely to use contraceptives to space, and this effect has become stronger over time. Further, the contribution of community norms to spacing behavior of young women has also started to exhibit effects independent of the socioeconomic characteristics of the community.

How do we interpret the influence of the specific measures of community norms chosen in this study? Mean ideal family size was shown to have powerful effects net of all other community characteristics on spacing as well as stopping behavior of young women. Ideal family size within a community reflects the implicit social norms with

respect to how many children are considered appropriate for a family. Such a prescription might well be fluid, and as has been recognized by several studies, might indicate a latent demand for family planning services (Koenig et al 1992). Insofar as the mean ideal family size within a community increases, the results of this study demonstrates that the use of contraception to either space or stop declines, reflecting the responsiveness of individual behavior to social pressures within the community.

The second community variable representing community norms, the influence of the sterilization experience among older women is indicative of behavior in the networks that young women find themselves in. As older women are encouraged by family planning personnel to adopt sterilization, they harbor fear and negative perceptions of reversible methods and begin to perceive contraception only as a means to stop childbearing rather than to space (Rajaretnam and Deshpande 1994). It follows that older women acting as counselors to young women might perpetuate their negative perceptions of reversible methods. Young women find reassurance in the permanence of sterilization, especially as it can be done even without negotiating with their husbands' or in-laws. In fact, evidence suggests husbands support wives' decision to sterilize (Saavala 1999).

The variation in the contraceptive use of young women across communities demonstrates the power of social interactions and social norms in shaping individual decisions. However, this analysis only showcases initial exploratory work on the role of community norms in enhancing or constraining contraceptive use among young women in India. Further analyses are needed to fully understand the nature of these interactions and the extent of its influence. Particularly salient is the role of timing: the NFHS data

only capture current use and ever-use, but not past use or reasons for choosing a particular method or for discontinuing a method in the past. Further, communities with a low prevalence of sterilization among older women are essentially different from those with a moderate or high prevalence of sterilization. They could be more likely to have a higher proportion of users of temporary methods, even among older women; more likely to be underserved by program workers; or less likely to encourage the use of any contraception among all its women. Understanding the characteristics of communities with low prevalence of sterilization and the reasons thereof could be the focus of future research.

Table 13. Descriptive Statistics of Individual-level Variables (15-29 currently married and not pregnant women)

Variable	1992	2005
Number of (young) women	35,240	31,490
	Mean	Mean
Current contraceptive use	0.27	0.46
Contraceptive type		
Modern reversible	0.08	0.14
Female sterilization	0.13	0.24
Traditional	0.05	0.09
Education		
None	0.57	0.41
Primary	0.17	0.16
Secondary	0.23	0.38
High school	0.03	0.05
Age		
15-19	0.32	0.15
20-24	0.35	0.39
25-29	0.33	0.46
Living children		
0	0.28	0.17
1	0.27	0.27
2	0.23	0.31
3+	0.22	0.25
Religion		
Hindu	0.8	0.82
Muslim	0.12	0.14
Other	0.08	0.04
Employment		
Not employed	0.73	0.63
Professional/ service	0.02	0.05
Agricultural/ manual	0.25	0.32
Household wealth quintile		
Poorest	0.18	0.2
Second	0.2	0.21
Middle	0.21	0.21
Fourth	0.22	0.2
Richest	0.19	0.17
Husband's education		

	Secondary or greater	0.44	0.61
Exposure to media			
	Low	0.45	0.32
	Medium	0.28	0.36
	High	0.27	0.32
Women's autonomy			
	Decision-making with husband	na	1.42
	Self confidence	na	2.77
	Physical mobility	na	1.2

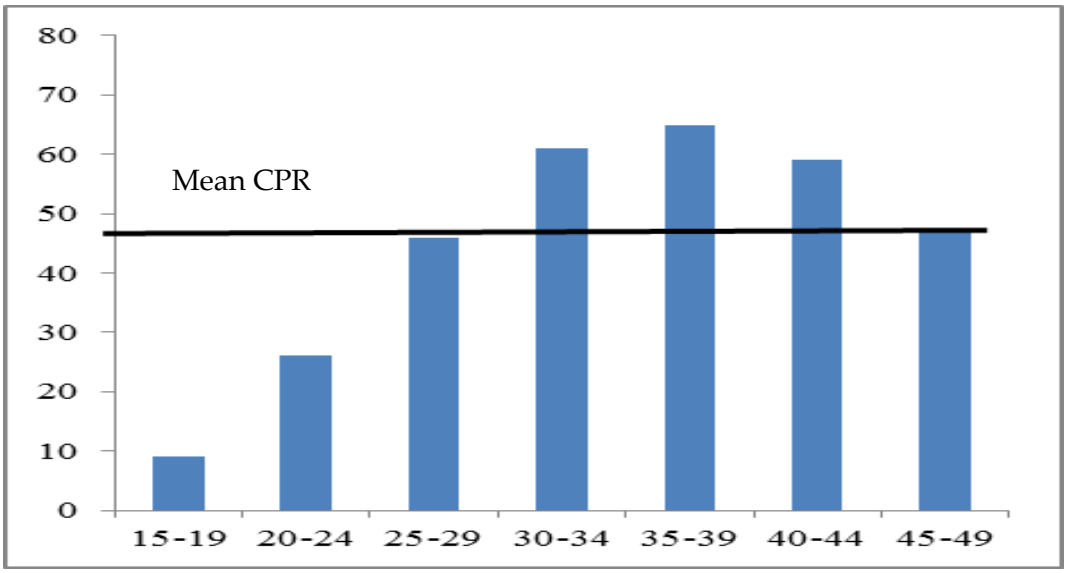
Note: Sample weights used in these calculations

Table 14. Descriptive statistics of community variables

Variable	1992	2005
Number of communities	2,987	3,437
Mean Community size (households)	20.34	17.24
Percent Contraceptive use	44.73	56.18
Percent women with secondary school education	29.01	45.72
Percent women professionally employed	4.68	8.98
Percent women from households above poverty line	49.46	48.13
Mean level of exposure to mass media	0.86	1.34
Percent Muslim	10.63	12.85
Percent urban	40.18	43.09

Note: Sample weights used in these calculations

Panel A: 1992



Panel B: 2005

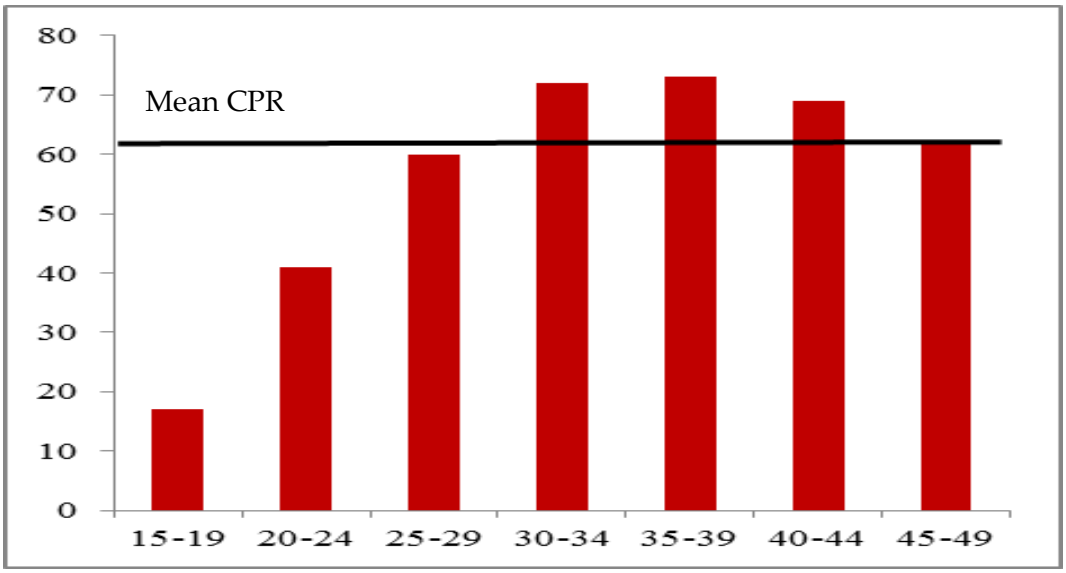


Figure 11. Contraceptive Prevalence Rate (%), Currently Married Not Pregnant Women

Table 15. Contraceptive Use among Young Women by Key Socioeconomic Characteristics

	1992		2005	
	Percent	Total women	Percent	Total women
All women	44	77060	62	82039
Young women	27	35385	46	31974
Young women who want to delay	14	11642	33	7272
Young women who want to stop	68	12617	73	15664
Age				
15-19	9	6144	16	3782
20-24	25	13905	40	12048
25-29	47	15336	61	16144
Education				
No education	23	19326	39	10662
Primary	38	5890	48	4989
Secondary	42	8701	52	13879
Higher	53	1367	58	2443
Employment status				
Unemployed	27	25352	46	21163
Professional/ Service employment	49	1034	62	2050
Manual/ Farm employment	26	8854	45	8761
Household Wealth (quintiles)				
Lowest	15	5843	35	4702
Second	19	6443	41	5447
Middle	24	7136	46	6584
Fourth	31	8256	53	7674
Highest	47	7562	60	7567
Religion				
Hindu	27	28050	47	23990
Muslim	25	3969	43	4505
Other	30	3221	51	3479
Husband's education				
Secondary	32	16200	49	20864
Exposure to media				
TV at least once a week	41	12243	55	19078
Radio at least once a week	34	16487	49	8983

Newspaper at least once a week			55	7066
Place of residence				
Rural	23	25504	43	19150
Urban	39	9736	56	12824

Note: Sample weights used in these calculations

Table 16. Mean Contraceptive Use among Young Women, by Level of Various Community Characteristics, (2005-6)

Community Characteristic	High	Low
Proportion of women with secondary school education	0.59	0.45
Proportion of women from higher wealth quintiles	0.55	0.4
Proportion of women employed in professional or service sectors	0.56	0.45
Proportion of women from Muslim households	0.46	0.49
Proportion of women with high media exposure	0.60	0.47

Table 17. Odds Ratios and Z-scores from Multilevel Logit Regression of Young Women's Contraceptive Use for Spacing on Individual, Community and State Characteristics

	Model 1		Model 2		Model 3		Model 4		Model 5	
	1992	2005	1992	2005	1992	2005	1992	2005	1992	2005
State variables										
Literacy %			1.04*	1.04	1.04*	1.04	1.04*	1.04	1.04*	1.05*
			(2.4)	(1.9)	(2.5)	(1.9)	(2.6)	(1.9)	(2.7)	(2.5)
Log GNP per capita			.94	.44	.90	.42	.83	.43	.75	.32*
			(-.1)	(-1.8)	(-.2)	(-1.8)	(-.3)	(-1.8)	(-.5)	(-2.3)
Community variables										
Community size			.99	1.00	.99	1.00	.99	1.00	.99	1.00
			(-1.5)	(1.4)	(-1.4)	(1.3)	(-1.5)	(1.4)	(-1.1)	(1.4)
Urban			1.03	1.22*	.94	1.17	1.01	1.08	1.02	1.09
			(.4)	(2.4)	(-.6)	(1.9)	(.5)	(1.0)	(.6)	(.7)
Socioeconomic characteristics										
Percent women with secondary school education			1.02*	1.02*	1.02*	1.01*	1.02*	1.01*	1.02*	1.01*
			(12.9)	(9.0)	(9.5)	(6.3)	(9.3)	(6.1)	(7.4)	(4.5)
Percent women from households in top wealth quintiles			1.005*	1.01*	1.004*	1.01*	1.00	1.01*	1.00	1.01*
			(2.9)	(5.2)	(2.3)	(4.1)	(1.8)	(4.0)	(1.6)	(3.7)
Percent Muslim			1.00	1.00	1.00	1.00	1.003*	1.00	1.004*	1.003*
			(1.4)	(.1)	(1.6)	(.3)	(2.3)	(.7)	(2.9)	(2.9)
Media exposure										
High					1.44*	1.29*	1.47*	1.28*	1.46*	1.33*
					(3.4)	(2.4)	(3.4)	(2.4)	(3.6)	(2.6)
Low					.80*	.71*	0.80*	.72*	.83*	.76*
					(-2.3)	(-3.8)	(-2.3)	(-3.7)	(-2.0)	(-3.1)
Family planning program effort										

Level of visits by health workers for family planning							1.02*	.99	1.02*	.99
							(4.5)	(-1.0)	(4.5)	(-.7)
Level of visits by health workers for antenatal care							.99		.99	
							(-.8)		(-.8)	
Presence of public health center in community								.88		.87
								(-1.7)		(-1.8)
Community norms										
Mean ideal family size									.74*	.53*
									(-3.0)	(-7.8)
High prevalence of sterilization among women ages 30-49									.98	.98
									(0.2)	(-.2)
Low prevalence of sterilization among women ages 30-49									1.14	.87
									(1.6)	(-1.7)
Intercept	.26*	.65*	.21*	.58*	.21*	.58*	.21*	.58*	.21*	.54*
	(-6.4)	(-2.7)	(-11.1)	(-3.7)	(-10.7)	(-3.5)	(-10.2)	(-3.4)	(-10.5)	(-4.2)
Community variance	.66*	.63*	.38	.35*	.37	.33*	.36	.33*	.34	.28*
State variance	.87*	.48*	.37*	.42*	.40*	.44*	.44*	.44*	.43*	.40*
Intra cluster correlation-community	.14	.14	-	.09	-	.08	-	.08	-	.07
Intra cluster correlation-state	.18	.11	.10	.10	.11	.11	.12	.11	.12	.10
Number of individuals	11571	7110	11571	7110	11571	7110	11571	7110	11571	7110
Number of communities	2823	2833	2823	2833	2823	2833	2823	2833	2823	2833
Number of states	20	20	20	20	20	20	20	20	20	20

Table 18. Odds Ratios and Z-scores from Multilevel Logit Regression of Young Women's Contraceptive Use for Stopping on Individual, Community and State Characteristics

	Model 1		Model 2		Model 3		Model 4		Model 5	
	1992	2005	1992	2005	1992	2005	1992	2005	1992	2005
State variables										
Literacy %			1.02	1.00	1.01	.99	1.02	.99	1.02*	.99
			(1.8)	(.0)	(1.4)	(-.6)	(1.5)	(-.3)	(2.7)	(-.3)
Log GNP per capita			1.01	1.28	1.07	1.28	1.04	1.23	.88	1.19
			(.1)	(.9)	(.2)	(1.0)	(.1)	(.9)	(-.4)	(.6)
Community variables										
Community size			1.00	1.00	1.00	1.01*	1.00	1.01*	1.00	1.01*
			(.6)	(1.9)	(.3)	(2.4)	(.5)	(2.3)	(.8)	(2.2)
Urban			1.00	1.31*	.92	1.08	.90	1.08	1.06	1.11
			(.1)	(5.5)	(-1.1)	(1.4)	(-1.4)	(1.22)	(.8)	(1.6)
Socioeconomic characteristics										
Percent women with secondary school education					1.004*	1.003*	1.003*	1.001	1.01*	1.002
					(3.0)	(2.2)	(2.0)	(1.3)	(2.8)	(1.2)
Percent women from households in top wealth quintiles					1.00	1.004*	1.00	1.003*	1.00	1.003*
					(1.2)	(2.9)	(1.6)	(2.6)	(.7)	(2.7)
Percent Muslim					.99*	.99	.99*	.99*	.99*	.99
					(-4.3)	(-1.8)	(-4.6)	(-1.6)	(-3.5)	(-1.4)
Media exposure										
High							1.21*	1.22*	1.31*	1.23*
							(2.2)	(2.2)	(3.1)	(2.3)
Low							.98	.93	.99	.93
							(-.3)	(-1.1)	(-.1)	(-1.1)
Family planning program effort										

Level of visits by health workers for family planning									1.04*	1.03
									(11.0)	(.5)
Level of visits by health workers for antenatal care									1.00	
									(.4)	
Presence of public health center in community										1.00
										(.9)
Community norms										
Mean ideal family size			.52*	.55*	.66*	.64*	.66*	.66*	.69*	.65*
			(-11.0)	(-10.8)	(-5.5)	(-6.8)	(-5.6)	(-6.5)	(-5.0)	(-6.5)
High prevalence of sterilization among women ages 30-49			1.28*	1.52*	1.27*	1.55*	1.27*	1.53*	1.09	1.54*
			(4.3)	(7.3)	(4.2)	(7.4)	(4.1)	(7.3)	(1.4)	(7.4)
Low prevalence of sterilization among women ages 30-49			.86*	.81*	.88*	.83*	.88*	.83*	.94	.82*
			(-2.4)	(-3.5)	(-2.0)	(-2.9)	(-2.0)	(-3.0)	(-.9)	(-3.2)
Intercept	2.17*	2.86*	2.21*	2.81*	2.21*	2.97*	2.23*	2.85*	2.25*	2.85*
	(5.4)	(7.8)	(8.4)	(11.3)	(7.8)	(11.7)	(8.0)	(11.2)	(9.7)	(11.4)
Community variance	.41*	.44*	.33*	.32*	.31*	.32*	.31*	.32*	.25*	.31*
State variance	.39*	.35*	.17*	.15*	.19*	.16*	.19*	.16*	.13*	.15*
Intra cluster correlation-community	.10	.11	.08	.08	.08	.08	.08	.08	.07	.08
Intra cluster correlation-state	.09	.08	.04	.04	.05	.04	.05	.04	.03	.04
Number of individuals	12512	15190	12512	15190	12512	15190	12512	15190	12512	15190
Number of communities	2909	3384	2909	3384	2909	3384	2909	3384	2909	3384
Number of states	20	20	20	20	20	20	20	20	20	20

5. CONCLUSION

5.1 Introduction

Fertility preferences are crucial to understanding contemporary fertility. Over the course of several decades, detailed theoretical and empirical studies have emerged to provide a nuanced understanding of fertility behavior, often under the assumption that preferences can be achieved without great difficulty. Underlying this assumption is the central notion that individuals in contemporary societies can choose both the timing and number of children that they want due to the increasing prevalence of modern contraception. However, preferences and actual behavior in the context of childbearing are not always aligned with each other. Despite being a primary predictor of childbearing, intentions deviate substantially from actual behavior. Family size preferences often exceed actual fertility in developed low-fertility societies, as individuals seek to have more children than they actually have. In contrast, in developing societies, individuals end up having more children than their stated family size preferences. Another dimension relates to the use of contraception: contraceptive use is not always aligned with stated fertility preferences to space and stop childbearing.

My dissertation builds on research that seeks to unravel the puzzling mismatch between preferences and behavior, both at the aggregate and individual levels. I use standard demographic techniques as well as statistical analyses to repeat cross-sectional data from India to illuminate this mismatch by: (1) operationalizing the parameters of a

framework that explains this discrepancy at the aggregate level; (2) providing an understanding of how family size preferences have changed over time with education; and (3) underscoring the importance of local community norms in constraining or supporting the use of contraception among women who want to space or stop childbearing. Findings from my dissertation have implications for understanding the nature of the discrepancy between family size preferences and actual behavior, family planning preferences and actual contraceptive use, and the nature of socioeconomic differentials in family size preferences in a transitional society such as India.

5.2 Summary and Findings

In Chapter Two, I first showed that the new framework can account for a substantial portion of the macro-level discrepancy between actual fertility and fertility preferences between the states of India over the period 1992 to 2006. The most important contribution of this chapter is the ability of the model to analyze childbearing from the perspective of fertility preferences. Specifically, this model identifies factors that can be attributed to the preference-behavior disjuncture with respect to family size. Thus, the model provides a reasonable heuristic device for the examination of patterns of aggregate differences in societies at different stages of the fertility transition. But findings from an application of this model to the states of India at three time points show particularly strong support for the most recent time period, when the transition is well underway in most states. Second, the model confirms that desired family size is the fundamental

parameter explaining over half of the observed variation in TFR across period and states. Next to DFS, unwanted fertility and son preference capture the most variation in TFR.

In the third chapter, I investigated whether family size preferences tend to converge or diverge in societies in transition. Despite the literature being replete with studies of fertility behavior in general, few studies examine fertility preferences or how they change over time particularly with respect to changing socioeconomic characteristics. Findings indicate that unlike African countries, or even compared to the past, family size preferences have considerably homogenized over time across educational categories within states in India. Within each survey period, however, there are strong effects of education that seem to weaken over time. Period and interactive fixed effects models demonstrate the muted effects of education: models show that the educational differentials have become negligible even for women with just a few years of education. This chapter provides preliminary support for the notion that fertility desires and behavior are changing faster than conventional socioeconomic characteristics. Although improvements in mass education triggered the initial response in terms of reduced childbearing preferences, in recent times, a revision of fertility attitudes may be taking place among less-educated women in response to changing social and economic circumstances.

In the fourth chapter, I analyzed another facet of the intent-behavior disjuncture in childbearing by incorporating the multiple ways in which the local community can shape the reproductive behavior of young women despite their stated preferences. Specifically,

I compare the strength of community norms against community socioeconomic characteristics and intensity of family planning program activities in explaining the use of contraception to space or stop. Results indicate that community norms exert a strong influence on young women's use of contraceptives to stop childbearing in both years. Moreover, rather than attenuating, the strength of community norms has actually increased between 1992-3 and 2005-6. In 1992-3, the family planning program effort within communities partially mediates the strong relation between community norms and the stopping behavior of young women. In 2005-6, however, community norms have powerful independent effects on their stopping behavior. On the other hand, community norms have little influence on the spacing behavior of young women in 1992-3, and all community variation stems from community socioeconomic characteristics. In 2005-6, community socioeconomic characteristics still account for a portion of the spacing behavior of young women; but community norms also exert a moderate influence on the use of contraceptives by young women to space.

5.3 Future Research

My dissertation sets the stage for a promising research agenda that I hope to pursue after I graduate. First, I believe that the new framework to examine contemporary fertility has substantial potential. Particularly for scholars seeking to understand comparative social histories, the framework offers a parsimonious way to describe the complex array of factors that drive social change. At the same time, the model also lends itself to a more nuanced understanding of the unique cultural and structural factors

affecting different groups within each society. I plan to apply the new framework to examine contemporary fertility to other societies, particularly in East Asia, where fertility is very low, but with substantial diversity in its levels and nature of constraints. To do so, I will work on alternative ways to operationalize and measure the key parameters of the framework.

Second, I would like to move beyond a cross-sectional understanding and analysis of fertility preferences and explore the evolution of fertility preferences over the life course. Specifically, studies of fertility preferences from developing countries assume their immutability and stability during the reproductive careers of women. However, as has been shown in developed societies, reproductive goals are similar to a moving target – evolving and changing in response to the unfolding of various life circumstances over the course of a reproductive career spanning around 30 years. Studies from the United States and Europe demonstrate that reproductive decision-making is dynamic and that women frequently revise their fertility preferences as individual and contextual factors around them change. I believe that obtaining and analyzing longitudinal data on fertility preferences with a life course perspective would be a fruitful avenue for my future research.

Another line of research that I would like to pursue relates to the discrepancy between the use of contraception among women who report wanting to space or stop. This discrepancy has been chalked up to unmet need for family planning. However, an emerging line of research suggests that in a rapidly changing social and reproductive

environment, fertility preferences are often contradictory, and contraceptive use (actual behavior) therefore tends to be experimental and not always aligned with preferences. It is quite possible that women who by definition have an unmet need, also have ambivalent preferences that manifest themselves in the form of non-use or ineffective use of contraception to achieve stated desires. Again, I believe that this notion, while underexplored in developing countries is worthy of more detailed examination to understand its true significance and relevance in studies of childbearing behavior.

Finally, this dissertation research could be expanded by studying the intensification of son preference in India, a leading factor in explaining individual and aggregate level fertility preferences. As my dissertation shows, the proportion of women who desire or currently have one child, and report not wanting any more children after parity 1 is small, but steadily increasing even cutting across education categories. What is striking is that over two-thirds of women with one child have only sons. Thus, the interaction between the strong preference for sons in a traditionally patriarchal society and the desire for modern, smaller families is manifesting itself in the gradual intensification of one-son families in India. This emergent phenomenon has received little attention. Yet changes to the Indian family, especially in terms of its overall masculinization, are likely to have significant implications for women's education and employment opportunities.

Appendix A: Additional tables for Chapter 2

A1. Estimates of Proximate Determinants and Predicted TFR, Observed TFR and their Difference (Unwanted fertility constructed from DHS measure of wantedness)

Panel A: 1992-3

State	DFS	FU	FSP	FR	FT	FI	Observed TFR	Estimated TFR	Difference
India	2.9	1.22	1.1	1.05	0.92	0.95	3.39	3.57	-0.18
North									
Delhi	2.5	1.27	1.07	1.05	0.92	0.95	3.02	3.12	-0.1
Haryana	2.4	1.3	1.12	1.03	0.89	0.95	2.97	3.61	-0.64
Himachal Pradesh	2.6	1.31	1.13	1.06	0.94	0.95	3.99	3.06	0.93
Jammu	2.8	1.29	1.08	1.03	0.87	0.95	3.13	3.32	-0.19
Punjab	2.6	1.26	1.12	1.04	0.97	0.95	2.92	3.51	-0.59
Rajasthan	3	1.23	1.12	1.05	0.95	0.95	3.63	3.91	-0.28
Central									
Madhya Pradesh	3.1	1.18	1.14	1.05	0.91	0.95	3.9	3.74	0.16
Uttar Pradesh	3.4	1.21	1.13	1.06	0.95	0.95	4.82	4.44	0.38
East									
Bihar	3.4	1.21	1.18	1.04	0.96	0.95	4	4.6	-0.6
Orissa	3	1.21	1.11	1.06	0.9	0.95	2.92	3.65	-0.73
West Bengal	2.6	1.25	1.07	1.06	0.9	0.95	2.92	3.15	-0.23
Assam	3.2	1.29	1.09	1.05	0.89	0.95	3.53	3.99	-0.46
North East	3.97	1.11	1.06	1.02	0.88	0.95	3.09	3.98	-0.89
West									
Goa	2.7	1.16	1.08	1.03	0.85	0.95	1.9	2.81	-0.91
Gujarat	2.6	1.22	1.15	1.04	0.95	0.95	2.99	3.42	-0.43
Maharashtra	2.5	1.26	1.09	1.03	0.89	0.95	2.86	2.99	-0.13
South									
Andhra Pradesh	2.7	1.19	1.06	1.03	0.89	0.95	2.59	2.96	-0.37
Karnataka	2.5	1.24	1.08	1.04	0.93	0.95	2.85	3.07	-0.22
Kerala	2.6	1.09	1.04	1.02	0.87	0.95	2	2.48	-0.48
Tamil Nadu	2.1	1.29	1.05	1.04	0.89	0.95	2.48	2.5	-0.02

Panel B: 1998-9

State	DFS	FU	FSP	FR	FT	FI	Observed TFR	Estimated TFR	Difference
India	2.7	1.25	1.09	1.06	0.93	0.95	2.85	3.44	-0.59
North									
Delhi	2.4	1.28	1.04	1.05	0.91	0.95	2.4	2.9	-0.5
Haryana	2.5	1.27	1.12	1.04	0.93	0.95	2.88	3.27	-0.39
Himachal Pradesh	2.2	1.3	1.07	1.02	0.89	0.95	2.14	2.64	-0.5
Jammu	2.7	1.36	1.08	1.04	0.87	0.95	2.71	3.41	-0.7
Punjab	2.3	1.3	1.07	1.06	0.98	0.95	2.21	3.16	-0.95
Rajasthan	2.8	1.3	1.13	1.05	0.98	0.95	3.78	4.02	-0.24
Central									
Madhya Pradesh	2.9	1.27	1.13	1.07	0.91	0.95	3.31	3.85	-0.54
Uttar Pradesh	3.1	1.29	1.14	1.06	0.97	0.95	3.99	4.45	-0.46
East									
Bihar	3.3	1.26	1.14	1.05	0.99	0.95	3.49	4.68	-1.19
Orissa	2.7	1.23	1.09	1.06	0.9	0.95	2.46	3.28	-0.82
West Bengal	2.4	1.22	1.07	1.05	0.9	0.95	2.29	2.81	-0.52
Assam	2.9	1.24	1.07	1.05	0.89	0.95	2.31	3.41	-1.1
North East	3.6	1.14	1.07	1.05	0.87	0.95	2.97	3.81	-0.84
West									
Goa	2.3	1.17	1.1	1.03	0.85	0.95	1.77	3.32	-1.55
Gujarat	2.5	1.24	1.12	1.05	0.96	0.95	2.72	2.46	0.26
Maharashtra	2.3	1.26	1.1	1.04	0.88	0.95	2.52	2.77	-0.25
South									
Andhra Pradesh	2.4	1.16	1.06	1.05	0.88	0.95	2.25	2.59	-0.34
Karnataka	2.2	1.27	1.05	1.04	0.92	0.95	2.13	2.67	-0.54
Kerala	2.5	1.08	1.01	1.01	0.87	0.95	1.96	2.27	-0.31
Tamil Nadu	2	1.22	1.04	1.04	0.89	0.95	2.19	2.23	-0.04

Panel C: 2005-6

State	DFS	FU	FSP	FR	FT	FI	Observed TFR	Estimated TFR	Difference
India	2.41	1.29	1.05	1.05	0.93	0.95	2.68	3.02	-0.34
North									
Delhi	2.21	1.25	1.03	1.04	0.91	0.95	2.13	2.56	-0.43
Haryana	2.26	1.22	1.08	1.03	0.92	0.95	2.69	2.68	0.01
Himachal Pradesh	1.94	1.23	1.05	1.03	0.87	0.95	1.94	2.13	-0.19
Jammu	2.4	1.33	1.06	1.03	0.86	0.95	2.38	2.85	-0.47
Punjab	2.01	1.25	1.04	1.03	0.98	0.95	1.99	2.5	-0.51
Rajasthan	2.72	1.31	1.09	1.05	1	0.95	3.21	3.87	-0.66
Central									
Madhya Pradesh	2.55	1.33	1.07	1.05	0.91	0.95	3.12	3.29	-0.17
Uttar Pradesh	2.57	1.46	1.08	1.06	0.98	0.95	3.82	4	-0.18
East									
Bihar	2.65	1.43	1.1	1.04	1.03	0.95	4	4.24	-0.24
Orissa	2.34	1.24	1.07	1.04	0.9	0.95	2.37	2.76	-0.39
West Bengal	2.02	1.25	1.04	1.05	0.9	0.95	2.27	2.36	-0.09
Assam	2.29	1.26	1.05	1.05	0.89	0.95	2.42	2.69	-0.27
North East	3.19	1.17	1.05	1.03	0.86	0.95	2.96	3.3	-0.34
West									
Goa	2.11	1.16	1.06	1.01	0.85	0.95	1.79	2.11	-0.32
Gujarat	2.22	1.26	1.08	1.03	0.97	0.95	2.42	2.87	-0.45
Maharashtra	2.09	1.19	1.05	1.03	0.86	0.95	2.11	2.2	-0.09
South									
Andhra Pradesh	2.22	1.16	1.03	1.03	0.86	0.95	1.79	2.23	-0.44
Karnataka	2.13	1.23	1.02	1.03	0.89	0.95	2.07	2.33	-0.26
Kerala	2.4	1.07	1.04	1.01	0.87	0.95	1.93	2.23	-0.3
Tamil Nadu	2.1	1.22	1.02	1.02	0.88	0.95	1.8	2.23	-0.43

A2. Estimates of Proximate Determinants and Predicted TFR, Observed TFR and their Difference (Unwanted fertility constructed from retrospective reports of wantedness)

Panel A: 1992-3

State	DFS	FU	FSP	FR	FT	FI	Observed TFR	Estimated TFR	Difference
India	2.9	1.11	1.1	1.05	0.92	0.95	3.39	3.25	0.14
North									
Delhi	2.5	1.17	1.07	1.05	0.92	0.95	3.02	2.87	0.15
Haryana	2.4	1.11	1.12	1.03	0.89	0.95	2.97	2.6	0.37
Himachal Pradesh	2.6	1.14	1.13	1.06	0.94	0.95	3.99	3.17	0.82
Jammu	2.8	1.14	1.08	1.03	0.87	0.95	3.13	2.93	0.2
Punjab	2.6	1.08	1.12	1.04	0.97	0.95	2.92	3.01	-0.09
Rajasthan	3	1.09	1.12	1.05	0.95	0.95	3.63	3.47	0.16
Central									
Madhya Pradesh	3.1	1.09	1.14	1.05	0.91	0.95	3.9	3.5	0.4
Uttar Pradesh	3.4	1.14	1.13	1.06	0.95	0.95	4.82	4.19	0.63
East									
Bihar	3.4	1.12	1.18	1.04	0.96	0.95	4	4.26	-0.26
Orissa	3	1.12	1.11	1.06	0.9	0.95	2.92	3.38	-0.46
West Bengal	2.6	1.2	1.07	1.06	0.9	0.95	2.92	3.03	-0.11
Assam	3.2	1.12	1.09	1.05	0.89	0.95	3.53	3.47	0.06
North East	3.97	1.12	1.06	1.02	0.88	0.95	3.09	4.02	-0.93
West									
Goa	2.7	1.04	1.08	1.03	0.85	0.95	1.9	2.52	-0.62
Gujarat	2.6	1.03	1.15	1.04	0.95	0.95	2.99	2.89	0.1
Maharashtra	2.5	1.08	1.09	1.03	0.89	0.95	2.86	2.56	0.3
South									
Andhra Pradesh	2.7	1.08	1.06	1.03	0.89	0.95	2.59	2.69	-0.1
Karnataka	2.5	1.1	1.08	1.04	0.93	0.95	2.85	2.73	0.12
Kerala	2.6	1.03	1.04	1.02	0.87	0.95	2	2.35	-0.35
Tamil Nadu	2.1	1.11	1.05	1.04	0.89	0.95	2.48	2.15	0.33

Panel B: 1998-9

State	DFS	FU	FSP	FR	FT	FI	Observed TFR	Estimated TFR	Difference
India	2.7	1.11	1.09	1.06	0.93	0.95	2.85	3.06	-0.21
North									
Delhi	2.4	1.14	1.04	1.05	0.91	0.95	2.4	2.58	-0.18
Haryana	2.5	1.06	1.12	1.04	0.93	0.95	2.88	2.73	0.15
Himachal Pradesh	2.2	1.11	1.07	1.02	0.89	0.95	2.14	2.25	-0.1
Jammu	2.7	1.19	1.08	1.04	0.87	0.95	2.71	2.98	-0.27
Punjab	2.3	1.09	1.07	1.06	0.98	0.95	2.21	2.65	-0.44
Rajasthan	2.8	1.1	1.13	1.05	0.98	0.95	3.78	3.4	0.38
Central									
Madhya Pradesh	2.9	1.13	1.13	1.07	0.91	0.95	3.31	3.43	-0.12
Uttar Pradesh	3.1	1.17	1.14	1.06	0.97	0.95	3.99	4.04	-0.05
East									
Bihar	3.3	1.14	1.14	1.05	0.99	0.95	3.49	4.24	-0.75
Orissa	2.7	1.06	1.09	1.06	0.9	0.95	2.46	2.83	-0.37
West Bengal	2.4	1.1	1.07	1.05	0.9	0.95	2.29	2.54	-0.25
Assam	2.9	1.12	1.07	1.05	0.89	0.95	2.31	3.09	-0.78
North East	3.6	1.09	1.07	1.05	0.87	0.95	2.97	3.64	-0.67
West									
Goa	2.3	1.07	1.1	1.03	0.85	0.95	1.77	2.25	-0.48
Gujarat	2.5	1.03	1.12	1.05	0.96	0.95	2.72	2.76	-0.04
Maharashtra	2.3	1.07	1.1	1.04	0.88	0.95	2.52	2.35	0.17
South									
Andhra Pradesh	2.4	1.07	1.06	1.05	0.88	0.95	2.25	2.39	-0.14
Karnataka	2.2	1.08	1.05	1.04	0.92	0.95	2.13	2.27	-0.14
Kerala	2.5	1.02	1.01	1.01	0.87	0.95	1.96	2.15	-0.19
Tamil Nadu	2	1.06	1.04	1.04	0.89	0.95	2.19	1.94	0.25

Panel C: 2005-6

State	DFS	FU	FSP	FR	FT	FI	Observed TFR	Estimated TFR	Difference
India	2.41	1.1	1.05	1.05	0.93	0.95	2.68	2.58	0.1
North									
Delhi	2.21	1.07	1.03	1.04	0.91	0.95	2.13	2.19	-0.06
Haryana	2.26	1.05	1.08	1.03	0.92	0.95	2.69	2.31	0.38
Himachal Pradesh	1.94	1.04	1.05	1.03	0.87	0.95	1.94	1.8	0.14
Jammu	2.4	1.11	1.06	1.03	0.86	0.95	2.38	2.38	0
Punjab	2.01	1.07	1.04	1.03	0.98	0.95	1.99	2.14	-0.15
Rajasthan	2.72	1.09	1.09	1.05	1	0.95	3.21	3.22	-0.01
Central									
Madhya Pradesh	2.55	1.07	1.07	1.05	0.91	0.95	3.12	2.65	0.47
Uttar Pradesh	2.57	1.21	1.08	1.06	0.98	0.95	3.82	3.31	0.51
East									
Bihar	2.65	1.14	1.1	1.04	1.03	0.95	4	3.38	0.62
Orissa	2.34	1.09	1.07	1.04	0.9	0.95	2.37	2.43	-0.06
West Bengal	2.02	1.1	1.04	1.05	0.9	0.95	2.27	2.07	0.2
Assam	2.29	1.09	1.05	1.05	0.89	0.95	2.42	2.33	0.09
North East	3.19	1.12	1.05	1.03	0.86	0.95	2.96	3.16	-0.2
West									
Goa	2.11	1.02	1.06	1.01	0.85	0.95	1.79	1.86	-0.07
Gujarat	2.22	1.11	1.08	1.03	0.97	0.95	2.42	2.53	-0.11
Maharashtra	2.09	1.04	1.05	1.03	0.86	0.95	2.11	1.92	0.19
South									
Andhra Pradesh	2.22	1.11	1.03	1.03	0.86	0.95	1.79	2.14	-0.35
Karnataka	2.13	1.09	1.02	1.03	0.89	0.95	2.07	2.06	0.01
Kerala	2.4	1.04	1.04	1.01	0.87	0.95	1.93	2.17	-0.24
Tamil Nadu	2.1	1.06	1.02	1.02	0.88	0.95	1.8	1.94	-0.14

A3. Correlations of key variables with TFR and Model Residual

Variable	TFR	Residual	Variable details
Urban	-0.3	-0.15	Respondent lives in Urban area
Employed	-0.09	-0.23	Respondent currently employed
Secondary+ schooling	-0.72	0.04	Respondent highest education level: Secondary/ High School
Husband Secondary+ schooling	-0.41	-0.09	Husband highest education level: Secondary/ High School
Respondent & Spouse Sec+ schooling	-0.68	0.02	Respondent & Husband highest education level: Secondary/High school
Works in non-agric. Labor	-0.4	0.26	Respondent works in non-farm/ fishing activity
Works outside home	0.22	-0.13	Respondent works outside home
Urban, Sec+ schooling, Employed	-0.53	-0.03	Respondent lives in Urban area, had secondary/ high school education & is currently employed
Urban, Sec+ schooling	-0.44	-0.09	Respondent lives in Urban area, had secondary/ high school education
Urban, Employed	-0.48	-0.12	Respondent lives in Urban area, & is currently employed
Sec+ schooling, Employed	-0.6	-0.07	Respondent had secondary/ high school education & is currently employed

Appendix B: Additional tables for Chapter 3

B1. Poisson Cross-Section Regression Results of Education on DFS

	1992-3	1998-9	2005-6
Education (Ref: Illiterate)			
Primary	-0.064*	-0.057*	-0.055***
	(-8.8)	(-6.8)	(-5.8)
Secondary	-0.118*	-0.099*	-0.089***
	(-14.8)	(-13.2)	(-10.6)
Age	-0.029*	-0.023*	-0.020*
	(-10.4)	(-11.7)	(-6.9)
Age-squared	0.000*	0.000*	0.000*
	(-9.5)	(-11.6)	(-6.9)
Currently married	0.031*	0.015	0.026*
	(-2.7)	(-1.5)	(-2.7)
Watches TV at least once	-0.047*	-0.051*	-0.038*
a week	(-7.0)	(-8.4)	(-6.4)
Listens to radio at least once	-0.015*	-0.008	0.002
a week	(-2.9)	(-1.6)	(-0.4)
Employment (ref: not employed)			
Professional/ service sector	-0.022*	-0.014	-0.014
	(-2.0)	(-1.3)	(-1.7)
Agricultural/ manual labor	-0.003	0.014*	0.008
	(-0.6)	-2.6	-1.4
Current family size	0.076*	0.069*	0.078*
	(-45.5)	(-45.3)	(-47.9)
Religion (ref: Hindu)			
Muslim	0.122*	0.124*	0.125*
	(-16.2)	(-17.7)	(-17.4)
Other religion	0.115*	0.138*	0.142*
	(-13.4)	(-16.1)	(-17.8)
Wealth quintile (ref: Lowest)			
Second	-0.023*	-0.033*	-0.040*
	(-3.0)	(-4.5)	(-4.7)
Middle	-0.047*	-0.061*	-0.057*
	(-6.0)	(-8.1)	(-6.5)
Fourth	-0.053*	-0.077*	-0.054*
	(-6.1)	(-8.7)	(-5.5)
Highest	-0.081*	-0.101*	-0.070*

	(-7.0)	(-9.0)	(-6.0)
Husband's education (ref: illiterate)			
Primary	-0.029*	-0.014*	-0.012
	(-4.7)	(-2.2)	(-1.6)
Secondary	-0.051*	-0.026*	-0.028*
	(-7.6)	(-4.2)	(-4.2)
High school	-0.089*	-0.054*	-0.062*
	(-8.1)	(-6.2)	(-6.1)
Husband's occupation (ref: not employed)			
Professional/ service sector	0.005	0.003	0.016
	(-0.4)	-0.2	(-1.0)
Agricultural/ manual labor	0.01	-0.001	0.017
	(-0.7)	(0.1)	(-1.0)
Urban	-0.021*	-0.016*	-0.021*
	(-3.3)	(-2.7)	(-3.6)
N	89,506	89,196	92,301

z-scores in parenthesis
*p<0.001

B2. Poisson Fixed Effects Regression Results of Education on DFS (with Interactions)

	Model 1	Model 2
Education (Ref: Illiterate)		
Primary	-0.060*	-0.080*
	(-13.1)	(-11.9)
Secondary	-0.099*	-0.144*
	(-22.2)	(-22.7)
Period (Ref: 1992-3)		
1998-9	-0.061*	-0.071*
	(-19.2)	(-18.5)
2005-6	-0.162*	-0.189*
	(-43.0)	(-40.1)
Education * Period		
Primary * 1998-9		0.017*
		(-3.2)
Secondary * 1998-9		0.044*
		(-5.5)
Primary * 2005-6		0.038*
		(-6.2)
Secondary * 2005-6		0.084*
		(-12.2)
Age	-0.022*	-0.024*
	(-9.8)	(-18.7)
Age-squared	0.000*	0.000*
	(-10.3)	(-18.3)
Currently married	0.030*	0.023*
	(-3.7)	(-3.9)
Watches TV at least once	-0.038*	-0.045*
a week	(-8.0)	(-12.8)
Listens to radio at least once	-0.015*	-0.010*
a week	(-3.1)	(-3.3)
Employment (ref: not employed)		
Professional/ service sector	-0.029*	-0.016*
	(-4.6)	(-2.9)
Agricultural/ manual labor	-0.007	0.001
	(-1.2)	(-0.4)
Current family size	0.067*	0.074*

	(-15.5)	(-79.7)
Religion (ref: Hindu)		
Muslim	0.127*	0.123*
	(-8.9)	(-29.5)
Other religion	0.035	0.132*
	(-1.0)	(-27.3)
Wealth quintile (ref: Lowest)		
Second	-0.028*	-0.032*
	(-4.4)	(-7.3)
Middle	-0.056*	-0.058*
	(-11.3)	(-12.7)
Fourth	-0.065*	-0.066*
	(-6.5)	(-12.8)
Highest	-0.088*	-0.089*
	(-6.4)	(-13.7)
Husband's education (ref: illiterate)		
Primary	-0.019*	-0.020*
	(-5.2)	(-5.1)
Secondary	-0.035*	-0.034*
	(-8.4)	(-9.0)
High school	-0.068*	-0.065*
	(-15.9)	(-11.6)
Husband's occupation (ref: not employed)		
Professional/ service sector	0.014	0.005
	(-1.6)	(-0.7)
Agricultural/ manual labor	0.017*	0.007
	(-2.0)	(-0.8)
Urban	-0.025*	-0.021*
	(-3.0)	(-6.1)
N	271,003	271,003

z-scores in parenthesis
*p<0.001

Appendix C: Additional tables for Chapter 4

C1. Questions used to construct women's autonomy measures

A. **Physical Autonomy**
Are you usually allowed to go to the following places alone, only with someone else, or not at all?

a. to the market?
b. to the health facility?
c. to places outside this village/community?

B. Independence in taking care of oneself
Many different factors can prevent a woman from getting medical advice or treatment for themselves. When you are sick and want to get medical advice or treatment, is each of the following a big problem, a small problem, or no problem?

a. getting permission to go?
b. getting money for treatment?
c. having to take transport?
d. finding someone to go with you?
e. concern that there may not be a female provider?

C. Joint decision-making
1. Who usually makes the following decisions: mainly you, mainly your husband, you and your husband jointly, or someone else?

a. decisions about health care for yourself?
b. decisions about making major household purchases?
c. decisions about making purchases for daily household needs?
d. decisions about visits to your family or relatives?

2. Would you say that using contraception is mainly your decision, mainly your husband's decision, or did you both decide together?

C2. Odds Ratios and Z-scores from Multilevel Logit Regression of Young Women's Contraceptive Use for Spacing on Individual, Community and State Characteristics (only individual characteristics shown in Table)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	1992	2005	1992	2005	1992	2005	1992	2005	1992	2005
Age	1.24*	1.29*	1.29*	1.30*	1.29*	1.35*	1.30*	1.35*	1.37*	1.42*
	(2.9)	(2.1)	(2.5)	(2.5)	(2.3)	(2.2)	(2.2)	(2.2)	(2.2)	(2.5)
Age-squared	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
	(-1.7)	(-1.4)		(-1.7)	(-1.7)	(-1.5)	(-1.7)	(-1.5)	(-1.7)	(-1.7)
Number of living children	0.95	0.88*	0.94	0.86*	0.95	0.88*	0.95	0.87*	0.95	0.85*
	(-1.2)	(-2.2)	(-1.1)	(-2.3)	(-1.0)	(-2.1)	(-.9)	(-2.1)	(-.9)	(-2.4)
Age at first marriage	0.97*	0.92*	0.95*	0.91*	0.96*	0.92*	0.96*	0.91*	0.95*	0.90
	(-2.4)	(-4.2)	(-2.7)	(-4.8)	(-2.6)	(-4.4)	(-2.5)	(-4.4)	(-2.4)	(-4.8)
Education (ref: No education)										
Primary	1.34*	1.18	1.51*	1.24	1.44*	1.23	1.49*	1.22	1.52*	1.24
	(3.5)	(1.5)	(3.9)	(1.7)	(3.8)	(1.6)	(3.9)	(1.6)	(3.9)	(1.7)
Secondary	1.77*	1.48*	2.05*	1.63*	1.87*	1.55*	1.93*	1.55*	2.06*	1.64*
	(6.3)	(3.7)	(6.5)	(4.1)	(6.3)	(3.8)	(6.3)	(3.8)	(6.3)	(4.1)
Higher	2.38*	2.30*	2.74*	2.65*	2.39*	2.47*	2.52*	2.46*	2.74*	2.68*
	(4.9)	(4.9)	(5.3)	(5.3)	(5.0)	(5.1)	(5.1)	(5.0)	(5.2)	(5.3)
Religion (ref: Hindu)										
Muslim	0.83	0.96	0.78	0.94	0.81	0.95	0.81	0.95	0.79	0.94
	(-1.5)	(-.3)	(-1.7)	(-.4)	(-1.6)	(-.3)	(-1.5)	(-.3)	(-1.5)	(-.4)
Other religion	0.62*	0.90	0.57*	0.88	0.59*	0.89	0.59*	0.89	0.57*	0.87
	(-3.6)	(-.5)	(-3.9)	(-.7)	(-3.8)	(-.6)	(-3.9)	(-.6)	(-3.8)	(-.7)
Husband's education: Completed secondary school	1.16*	1.07	1.21*	1.09	1.18*	1.07	1.18*	1.07	1.21*	1.09
	(2.2)	(.7)	(2.2)	(.9)	(2.2)	(.7)	(2.1)	(.7)	(2.1)	(.8)
Employment (ref: not employed)										
Professional/ service sector	1.13	1.21	1.15	1.26	1.14	1.23	1.13	1.23	1.14	1.27
	(1.8)	(1.2)	(.8)	(1.4)	(.8)	(1.3)	(.7)	(1.3)	(.7)	(1.4)
Agricultural/ manual labor	0.93	1.12	0.91	1.14	0.91	1.13	0.91	1.13	0.91	1.14
	(-.9)	(1.1)	(-.9)	(1.1)	(-.9)	(1.1)	(-.9)	(1.1)	(-.9)	(1.1)
Wealth quintile (ref: Middle)										
Lowest	0.88	0.78	0.78	0.69*	0.81	0.72*	0.81	0.72*	0.77	0.69*
	(-1.2)	(-1.8)	(-1.7)	(-2.2)	(-1.6)	(-2.0)	(-1.5)	(-2.0)	(-1.5)	(-2.2)
Second	0.97	0.89	0.94	0.86	0.96	0.88	0.96	0.87	0.93	0.86
	(-.2)	(-.9)	(-.5)	(-1.1)	(-.3)	(-1.0)	(-.3)	(-1.1)	(.3)	(-1.1)

Fourth	1.27*	1.27*	1.36*	1.31*	1.32*	1.27*	1.32*	1.27*	1.37*	1.31*
	(2.6)	(2.1)	(2.7)	(2.2)	(2.7)	(2.0)	(2.6)	(2.0)	(2.6)	(2.2)
Highest	1.76*	1.60*	1.83*	1.66*	1.74*	1.60*	1.74*	1.60	1.84*	1.67*
	(4.4)	(3.4)	(4.1)	(3.4)	(4.1)	(3.3)	(4.0)	(3.2)	(4.0)	(3.4)
Media exposure (ref: moderate)										
High	1.26*	0.99	1.29*	0.99	1.24*	0.99	1.26*	0.99	1.29*	0.99
	(2.2)	(-.6)	(2.2)	(-.1)	(2.1)	(-.1)	(2.1)	(-.1)	(2.2)	(-.1)
Low	0.79*	.91	0.73*	0.88	0.75*	0.90	0.74*	0.89	0.72*	0.88
	(-3.4)	(-1.03)	(-3.6)	(-1.3)	(-3.6)	(-1.0)	(-3.5)	(-1.1)	(-3.5)	(-1.3)
Has at least one son	1.17*	1.11	1.21*	1.14	1.19*	1.13	1.19*	1.13	1.21*	1.14
	(2.7)	(1.6)	(2.7)	(1.8)	(2.7)	(.7)	(2.6)	(1.6)	(2.6)	(1.8)
Women's autonomy										
Physical autonomy		1.01		1.02		1.01		1.01		1.02
		(.4)		(.4)		(.4)		(.4)		(.4)
Independence in taking care of oneself		1.02		1.03		1.02		1.02		1.03
		(1.0)		(1.0)		(.9)		(.9)		(1.0)
Joint decision-making with husband		0.96		0.95		0.95		0.95		0.95
		(-1.2)		(-1.3)		(-1.1)		(-1.2)		(-1.3)

C3. Odds Ratios and Z-scores from Multilevel Logit Regression of Young Women's Contraceptive Use for Stopping on Individual, Community and State Characteristics (only individual characteristics shown in Table)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	1992	2005	1992	2005	1992	2005	1992	2005	1992	2005
Age	1.68*	1.93*	1.68*	2.16*	1.68*	2.13*	1.68*	2.14*	1.63*	2.03*
	(4.0)	(5.6)	(4.0)	(6.1)	(4.0)	(6.1)	(4.0)	(6.1)	(3.9)	(5.9)
Age-squared	0.99*	0.99*	0.99*	0.99	0.99*	0.99*	0.99*	0.99*	0.99*	0.99*
	(-2.7)	(-4.2)	(-2.7)		(-2.7)	(-4.6)	(-2.7)	(-4.6)	(-2.6)	(-4.4)
Number of living children	0.83*	0.90*	0.83*	0.89*	0.83*	0.89*	0.83*	0.89*	0.84*	0.89*
	(-6.4)	(-3.5)	(-6.4)	(-3.9)	(-6.4)	(3.9)	(-6.4)	(-3.9)	(-6.4)	(-3.8)
Age at first marriage	0.89*	0.89*	0.89*	0.88*	0.89*	0.88*	0.89*	0.88*	0.89*	0.89*
	(-9.3)	(-11.2)	(-9.4)	(-11.7)	(-9.5)	(-11.7)	(-9.5)	(-11.7)	(-9.5)	(-11.8)
Education (ref: No education)										
Primary	1.22*	1.09	1.22*	1.10	1.22*	1.10	1.22*	1.10	1.22*	1.09
	(2.8)	(1.3)	(2.8)	(1.3)	(2.8)	(1.3)	(2.8)	(1.3)	(2.8)	(1.3)
Secondary	1.16	1.11	1.16*	1.13	1.16	1.13	1.16	1.13	1.16	1.12
	(1.8)	(1.7)	(1.8)	(1.7)	(1.8)	(1.7)	(1.8)	(1.7)	(1.8)	(1.7)
Higher	1.65*	1.05	1.68*	1.05	1.71*	1.05	1.71*	1.05	1.67*	1.04
	(2.9)	(.4)	(2.9)	(0.4)	(2.9)	(.3)	(2.9)	(.3)	(2.9)	(.3)
Religion (ref: Hindu)										
Muslim	0.63*	0.80*	0.64*	0.77*	0.64*	0.78*	0.64*	0.78*	0.65*	0.79*
	(-4.1)	(-2.3)	(-4.0)	(-2.5)	(4.0)	(-2.5)	(-4.0)	(-2.5)	(-4.0)	(-2.5)
Other religion	0.88	0.99	0.88*	0.99	0.88	0.99	0.88	1.00	0.88	0.99
	(-1.1)	(-.1)	(-1.1)	(-.0)	(-1.1)	(-.0)	(-1.1)	(-.0)	(-1.1)	(.0)
Husband's education: Completed secondary school	1.08	1.14*	1.08	1.16*	1.08	1.16*	1.08	1.16*	1.08	1.15*
	(1.3)	(2.4)	(1.3)	(2.5)	(1.3)	(2.5)	(1.2)	(2.5)	(1.3)	(2.5)
Employment (ref: not employed)										
Professional/ service sector	1.32*	1.26*	1.34*	1.32*	1.34*	1.32*	1.34*	1.32*	1.31*	1.31*
	(2.7)	(2.6)	(2.1)	(2.7)	(2.1)	(2.7)	(2.1)	(2.7)	(2.1)	(2.7)
Agricultural/ manual labor	1.24*	1.31*	1.25*	1.35*	1.24*	1.35*	1.24*	1.35*	1.24*	1.34*
	(2.0)	(4.5)	(3.2)	(4.7)	(3.2)	(4.7)	(3.2)	(4.7)	(3.2)	4.7)
Wealth quintile (ref: Middle)										
Lowest	0.77*	0.86	0.77*	0.85	0.77*	0.85	0.77*	0.85	0.78*	0.86
	(-2.8)	(-1.6)	(-2.8)	(-1.7)	(-2.7)	(-1.7)	(2.7)	(-1.7)	(-2.7)	(-1.7)
Second	0.92	0.95	0.92	0.95	0.92	0.95	0.92	0.95	0.93	0.95

	(-.9)	(-.6)	(-.9)	(-.7)	(-.9)	(-.7)	(-.9)	(-0.7)	(-0.9)	(-.7)
Fourth	1.06	1.17*	1.06	1.19*	1.06	1.19*	1.06	1.19*	1.06	1.19*
	(.7)	(2.3)	(.7)	(2.4)	(.7)	(2.4)	(.7)	(2.4)	(0.8)	(2.4)
Highest	1.06	1.23*	1.06	1.27*	1.06	1.27*	1.06	1.27*	1.06	1.26*
	(.5)	(2.3)	(.5)	(2.5)	(.5)	(2.5)	(.5)	(2.5)	(0.5)	(2.5)
Media exposure (ref: moderate)										
High	1.06	0.88	1.06	0.87	1.06	0.86	1.06	0.86	1.07	0.87
	(.6)	(-1.6)	(.6)	(-1.6)	(.6)	(-1.6)	(.6)	(-1.6)	(.7)	(-1.6)
Low	0.80*	0.74*	0.80*	0.72*	0.80*	0.72*	0.80*	0.72*	0.81*	0.73*
	(-3.6)	(-5.1)	(-3.6)	(-5.4)	(-3.6)	(-5.4)	(-3.6)	(-5.4)	(-3.5)	(-5.4)
Has at least one son	1.54*	1.50*	1.57*	1.60*	1.57*	1.61*	1.57*	1.61*	1.54*	1.57*
	(4.6)	(5.9)	(4.7)	(6.1)	(4.7)	(6.2)	(4.7)	(6.1)	(4.7)	(6.2)
Women's autonomy										
Physical autonomy		1.03		1.04		1.04		1.04		1.03
		(1.6)		(1.7)		(1.7)		(1.7)		(1.7)
Independence in taking care of oneself		1.01		1.01		1.01		1.01		1.01
		(.7)		(.7)		(.7)		(.7)		(0.8)
Joint decision-making with husband		0.94*		0.94*		0.94*		0.94*		0.94*
		(-2.6)		(-2.7)		(-2.8)		(-2.7)		(-2.8)

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Biography

Sowmya Rajan was born in Madras in southern India. She received a Bachelor of Commerce (B.Com) from the University of Madras in 1998. Subsequently, she went on to obtain a Master's in Business Administration from the Symbiosis Center for Management in Pune in 2001. After working for a few years in the corporate sector, she moved to the United States to study at the Terry Sanford School of Public Policy in Duke University, where she received a Master of Public Policy in 2008. Her co-authored publication with A. Dharmalingam (with whom she shares first authorship) and S. Philip Morgan is forthcoming in *Demography*: "The Determinants of Low Fertility in India." She was selected as a James B. Duke Fellow for the period 2006-13 and as a Terry Sanford Scholar in 2006-08, both of which are university-wide competitive fellowships awarded to incoming students. She has also been an invited member of the Society of Duke Fellows during the period 2006-14. In addition, she was a Policy Communication Fellow at the Population Reference Bureau (Washington D.C.) in 2012-13.