ABSTRACT

Title of Dissertation: DETERMINANTS OF DIFFERENTIAL REGIONAL FERTILITY RATES IN INDIA: AN EXAMINATION OF FERTILITY INTENTIONS, BEHAVIOR, AND THE UNMET NEED FOR CONTRACEPTION

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This dissertation analyzes social, cultural, and structural factors that lead to women's fertility related decision-making processes, and outcomes, in the Indian context. Although there is a rich literature on fertility in India, my work is the first to use nationally representative panel data from the India Human Development Survey (IHDS) 2005, and 2012, to study the impact of past intentions and actions on subsequent outcomes, and on how intendedness of a birth can affect maternal healthcare utilization.

First, I examine the differences between factors that impact regional differences in fertility preferences, and on the ability to crystallize these preferences. Results show that while a substantial portion of regional differentials in fertility preferences are

explained by socio-economic traits of individuals and their households, a much smaller proportion of differentials in unintended births across regions is explained by these factors. This suggests that unobserved factors, potentially those associated with regional health systems, have a far greater role in explaining underlying differences in unintended births than in explaining fertility preferences.

Second, I evaluate why women who want to limit childbearing in 2005, do not use any contraception (and thus have, an unmet need for contraception); and how this unmet need of contraception translates into subsequent unintended births. Results show that women belonging to poorest households, and residing in neighborhoods with less access to the maternal and child healthcare system, are more likely to have an unmet need for contraception; and women who have an unmet need for contraception in 2005, are more than twice as likely as those without an unmet need to have an unintended birth between 2005 and 2012.

Finally, I examine the consequences of having an unwanted birth on maternal healthcare utilization. Results show that women who have unwanted births are less likely to obtain adequate antenatal, and postnatal care to help support their own health and their babies' health. Results from this study also highlight inequalities in access to maternal healthcare services, based on socio-economic status, caste group, religious group, and area of residence.

Overall, the dissertation helps obtain a better understanding of unwanted fertility, contraception use, and sexual and reproductive health disparities in the Indian context.

DETERMINANTS OF DIFFERENTIAL REGIONAL FERTILITY RATES IN INDIA: AN EXAMINATION OF FERTILITY INTENTIONS, BEHAVIOR, AND THE UNMET NEED FOR CONTRACEPTION

by

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Preface

Chapter 3 has been accepted for publication as an invited book chapter for the collection “Analyzing Contemporary Fertility” edited by Dr. Robert Schoen. Esha Chatterjee is the primary author of this chapter. Esha Chatterjee has done the entire data processing, methods, analyses of the findings, and written the first draft of the chapter. Prof. Sonalde Desai has contributed to redrafting, strengthening, and refining this chapter.

Chapter 5 has been published in the journal Population Studies. Esha Chatterjee is the primary author of this chapter. Esha Chatterjee has done the entire data processing, methods, analyses of the findings, and written the first draft of the paper. Prof. Christie Sennott has contributed to redrafting, strengthening, and refining this paper.

Dedication

To my mother and Sayan.

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Chapter 1: Introduction

Introduction

Fertility intentions are important predictors of future fertility behavior (Bumpass, 1987; Rindfuss, Morgan, & Swicegood, 1988; Thomson, 1997; Westoff & Ryder, 1977; Schoen et al, 1999). While some researchers argue that fertility intentions are transitory perceptions that are only useful in indicating the level of "unintended" fertility (Brown & Eisenberg, 1995; Westoff & Ryder, 1977) or as a method that reflects a couple's decision making processes (Miller & Pasta, 1995; Thomson, 1997; Thomson, McDonald, & Bumpass, 1990), such intentions are important predictors of fertility behavior (Schoen et al. 1999). Fertility intentions occur at a stage when people decide about their reproductive targets and the ways they can attain them. Thereafter these choices are acted upon through proceptive and contraceptive behavior that ultimately cause a decline in reliance on unexpected circumstances (Miller, 1986; Miller and Pasta 1993; Miller and Pasta, 1995).

Literature in demography often uses the terms "intention" "desire" and "preferences" interchangeably (Kodzi, Johnson, and Casterline, 2010, Hayford and Agadjanian, 2012). Due to the time differences between the point where people decide to have kids and the point where couples act on their decision and actual child- birth occurs, fertility decisions are impacted by various life events, and other factors that could cause people to reconsider proceptive or contraceptive choice and behavior (Bongaarts 2001; Morgan 2003). Actual fertility rates are a reflection of fertility intentions and other events that curb, delay or uphold their fulfillment (Schoen et al. 1999; Quesnel-Vallee and

Morgan 2003). The difference between fertility intentions, and outcomes has been classified as unintended fertility (Bongaarts 2001) and has formed a rationale for advocating greater investments in family planning programs. However, measurement of "unintended" fertility in this line of work has relied on concurrent data on preferences and behavior and has been subjected to considerable criticism. Pritchett (1994) has shown that variation in the fertility rates across nations is mainly due to differences in fertility preferences rather than due to family planning initiatives, and availability of contraception. However, other studies disagree with Pritchett (1994) (for e.g. Bongaarts 1994; Günther & Harttgen 2016); for example Günther & Harttgen (2016), find that fertility intentions and behavior are closely related, but in some African countries unwanted births are higher and have not declined compared to other developing countries. Apart from demand for children, there are other factors that have aided decrease in fertility in numerous developing countries. The differentials across time and space in attaining desired levels of fertility can only be partially elucidated by family planning initiatives. Most of these studies are based on demographic and health surveys where cross-sectional data make it difficult to ascertain causality.

Based on a critical review of literature, Morgan (2001) observed that intentions were often inaccurate predictors of actual individual behavior, however later studies discovered that there was conformity between fertility desires and actual behavior particularly at the aggregate level (Bongaarts, 2002; Quesnel-Vallée & Morgan, 2003; Hagewan & Morgan, 2005; Morgan & Rackin, 2010). Ideally, longitudinal data are required to understand the relationship between fertility preferences and behaviors but relatively little research using longitudinal data has been conducted, particularly for

countries with high to moderate fertility. This dissertation will use longitudinal data from the first nationally representative panel survey in the Indian context, to develop a better understanding of the determinants and consequences of unintended fertility. This chapter presents the context of the dissertation, provides rationale for the study, gives a brief description of the research questions studied in the dissertation, and finally gives an overview of the thesis.

Context

India is the second most populous country in the world and is likely to surpass China by 2027 to become the most populous country in the World (United Nations Population Division 2019). India's contribution to the yearly world population growth is higher than that of any other country (approximately 19 million out of 89 million). Despite its growing population, India has seen a marked decline in fertility over the past few decades: the total fertility rate (TFR) dropped from 5.9 children per woman in 1960 (World Bank 2017) to 2.2 in 2016 (International Institute for Population Sciences (IIPS) and ICF 2017). Between 2005-07 and 2015-17, TFR at the national level has reduced by 21.4%. According to the results of the India National Family Health Survey (IIPS and ICF 2017), the total wanted fertility rate in India is 1.8 children per women. Nearly 50 per cent of married women in India use modern contraceptives, and 13 per cent have an unmet need for contraception. Sterilization is the most popular method of contraception among women in India, and is used by around 36 per cent of married women aged 15–49 (IIPS and ICF 2017).

However, despite an overall decline in fertility at the national level there are differences in TFR across regions of residence. For example, TFR in rural regions in

2017 was 2.4, while it was 1.7 in urban areas. Amongst the bigger states and Union Territories (UTs) TFR in 2017 varied from 1.5 in Delhi, to 3.2 in Bihar (Registrar General of India, 2017). A group of northern states with a high population, low educational attainment, lower status of women, less adequate administration, and a larger prevalence of traditional norms and beliefs has been termed as "Empowered Action Group (EAG)" states. Various Government health and family planning programs focus on these states. The states include Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttarakhand, and Uttar Pradesh. EAG states accounted for 46 percent of India's population in 2011 and 53% of the growth in population. On the contrary the Southern states comprised of 21% of India's total population in 2011, but contributed to just 15% of the national population growth from 2001 onwards. Moreover like in other developing countries, population growth in India is largely based in the poorest areas with high populations (PRB report on Census 2011). Fertility rates are lower than the replacement level of 2.1 in 12 states, and union territories. Amongst the districts, 28% of all Indian districts (174 out of 621) have a fertility level below 2.1. It is anticipated that 12 districts all over India could achieve the lowest low fertility rates by 2020 (Guilmoto and Rajan, 2013). On the other hand, there are 72 districts that have fertility rates above 4. These districts are spread across the Northern and Northeastern region. Regional differences in fertility could occur due to differences in fertility intentions, and also on the ability to implement these intentions across regions. In turn these differences in fertility intention, and subsequent ability to implement intentions may be determined by several socio-economic, demographic factors specific to women and households in the region; by cultural norms, and also by the quality of family planning

services available in the region of residence.

Rationale

Even though fertility rates have declined in India, the country still has high rates of unintended pregnancy, and poor maternal health. Using data from United Nations (UN) and the National Family and Health Survey, Singh et al. (2018) find that about nearly 50 per cent of the estimated 48.1 million pregnancies in India in 2015 were unwanted or mistimed. The role of unmet need in shaping subsequent unintended fertility are best observed through panel studies (Jain and Winfrey 2017). There are few panel studies across contexts that have examined this relationship (Westoff and Bankole 1998; Jain 1999; Casterline, El-Zanaty, and El-Zeini 2003; Roy et al. 2008; Kodzi, Casterline, and Aglobitse 2010; Jain et al. 2014). With some exceptions, longitudinal studies that examine the fertility intentions and subsequent behavior are limited in the Indian context (Roy et al. 2008, Koenig et al. 2006, Vlassoff, 1990, 2012; Speizer et al., 2013; MacQuarrie et al., 2011). Further, these past studies in the Indian context have used data from a smaller sub-sample (for e.g. a single state).

Pregnancy intentions have emerged as an important determinant of maternal and child health in the literature (Brown and Eisenberg 1995; Gipson et al. 2008; Singh et al. 2010; Tsui et al. 2010; Sedgh et al. 2014). Unintended births may negatively influence women and their families by imposing financial, social, emotional, and physical costs (for example see review by Gipson et al 2008; Smith-Greenaway and Sennott 2016). However, there is limited research examining the impact of fertility intentions on women's healthcare utilization during and after pregnancy (Joyce and Grossman 1990;

Gipson et al. 2008; Tsui et al. 2010; Kost and Lindberg 2015). In the Indian context only three studies have evaluated the impact of intendedness of a birth on maternal healthcare utilization (A. Singh et al. 2012, Singh et al. 2013, L. Singh et al. 2012). These studies have mostly used retrospective measures of fertility intentions (exception Singh et al. 2013) that could be susceptible to recall bias due to ex- post rationalization (Lightbourne 1985; Bongaarts 1990, 2011; Westoff 1991; Bhushan and Hill 1996); also they are limited to rural regions in four States (Singh et al. 2013), or use cross sectional data (A. Singh et al. 2012). Moreover, no study in the Indian context has examined the impact of birth wantedness on timely postnatal care use.

The first nationally representative panel data from the India Human Development Survey (IHDS), 2005, and 2012 provides aunique opportunity to examine reasons behind variations in different measures of fertility preferences, subsequent unmet need for contraception, and fertility behavior across regions in the Indian context. The data also allows for examining the impact of a prospective measure of fertility intention, on subsequent maternal healthcare utilization.

Research Questions

This dissertation looks at three sets of inter-related problems in addressing fertility differentials in the Indian context.

The first set of analyses (chapter 3) provides a broad overview of regional fertility in India across major state groups (using data from IHDS 1 and 2), and describes state level differences in fertility intentions, and behavior. Thereafter, it examines how much of the differences in state-wise fertility intentions and behavior are explained by select

individual/ household characteristics. Analyses presented in this chapter begin with descriptives and then adds hierarchical models to evaluate determinatnts of inter-state differences in fertility preferences and behavior. Results show that while socioeconomic characteristics of individuals account for substantial proportion of regional differences in fertility preferences, they only account for a small proportion of regional differences in unintended births.This suggests that unobserved factors, potentially those associated with regional health systems, have a far greater role in explaining underlying differences in unintended births than in explaining fertility preferences.

Given the results in chapter 3, in chapter 4 I look at what stops women from using contraception when they want to stop childbearing, and how regional health systems impact the unmet need for contraception and unintended fertility. Analyses in this chapter is limited to women who want to stop childbearing (seen to be strongly associated with future fertility behavior in literature, for e.g. review by Cleland et al. 2020), and examines which groups of women are more likely to not use any means of contraception even when they (along with their husbands) do not want any more children; and also focuses on how the local difference in health systems impact unmet need for contraception. Finally, this chapter examines how this unmet need for contraception translates into unintended births (after taking into account individual/household and district level characteristics of women). Results from this chapter show that poorer women, who do not have a living son, who reside in households where women have no exposure to mass media; and in districts where a lower proportion of women avail antenatal checkup up, are more likely to have an unmet need for contraception. Further, women who have an unmet need for contraception in 2005, are about 2.5 times as likely as those with no unmet need for

contraception, to have an unintended birth between 2005 and 2012, after taking into account all other individual/household, and district level characteristics.

Chapter 5 examines the associations between birth intendedness and subsequent maternal healthcare utilization. Given the high incidence of unintended fertility in India, and limited research on the consequences of fertility intentions on maternal healthcare utilization in the context of low-and middle income countries, the third set of analyses (chapter 5) addresses the consequences of having an unwanted birth, and compares maternal antenatal care, timely postnatal care utilization, and delivery setting for wanted, and unwanted births. Results from this chapter show that, net of maternal and household characteristics, women with unwanted births were less likely to obtain any antenatal care and had fewer antenatal tests performed. Unwantedness was also associated with a lower likelihood of delivering in an institutional setting and of obtaining timely postnatal care.

Overview

In summary the dissertation focuses on the determinants of fertility intentions, behavior, and unmet need for contraception; thereafter it examines the impact of having an unwanted birth on maternal healthcare utilization. Chapter 2 provides details of the data set used in the study. Chapter 3 describes statewise differences in ideal family size in 2005, and percentage exceeding ideal family size in 2005 by 2012 (analyses limited to those who had child fewer than or equal to ideal family size in 2005). This chapter shows how much of the state-level differences in fertility intention and behavior is explained by individual and household level characteristics. Chapter 4 examines the determinants of unmet need for contraception in India in 2005 (with a focus on both individual level and

district level factors), and on how it translates into subsequent unintended births between 2005 and 2012. Chapter 5 examines the impact of fertility intentions (in 2005) on subsequent maternal healthcare utilization during and after pregnancy (in 2012). The final chapter reinstates the main findings from chapters 3,4 and 5, and highlights the contributions of the research. It also elaborates on the limitations of the studies, and discusses directions for future research.

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Chapter 2: Data

Overview

In this chapter, the dataset used to conduct analyses in the subsequent chapters is described. Thereafter, the difference between interviewed and non-interviewed women in the sample, with respect to some socio-demographic characteristics is briefly discussed. Finally, the broad sample used in the study is highlighted.

Dataset

The present study uses data from two rounds of the India Human Development Survey (IHDS) (2005 and 2012). The 2005 survey (IHDS-I) includes data collected in face-to- face interviews with individuals in 41,554 households across 33 (now 34) states and union territories, covering 1,503 villages and 971 urban regions in India (Desai et al. 2010). IHDS is the first nationally representative panel dataset in the Indian context. Follow-up interviews were conducted in 2012 (IHDS-II) with 83 per cent of the IHDS-I households and split households (separated from the root household) that resided in the same community. Attrition was lower among households that were larger, in rural areas, and that owned land (Thorat et al. 2017). Questions in the household module (e.g., on income, consumption, and social capital) were answered by heads of household— often men—whereas questions in the health (e.g., on fertility history, fertility preference, ideal number of children, health beliefs, gender relations, marital history) and education module were answered by ever-married (currently married, divorced or separated women and widows) aged 15-49 per household, often the spouse of the household head. These ever-married women aged 15-49 who were interviewed are referred to as “interviewed

eligible women", whereas those ever-married women aged 15-49 who were not interviewed are referred to as "non-interviewed eligible women". In 2005, one eligible woman was interviewed per household, and in 2012 upto two eligible women were interviewed per household.

Comparing Interviewed and Non-Interviewed Eligible Women in IHDS 2005

Since IHDS did not interview all women in the household, this section gives a quick examination of whether there are any particular differences between interviewed, and non-interviewed eligible women (in 2005) with respect to characteristics such as age, education levels, number of eligible women in the household, household income quintile, area of residence, caste, and religion. Further, the differences between interviewed and non-interviewed eligible women in households where there were two, or more eligible women are observed with respect to the same characteristics. There were women in 2012 who exceeded the age range and were re-interviewed; however, they are not considered in descriptive tables presented in this chapter.

Table 1 lists the percentage of interviewed and non-interviewed eligible women (overall) in each of the categories of the variables discussed above for the year 2005. The total number of interviewed eligible women in 2005 included in the table is 33336, and the number of non-interviewed eligible women is 8884. .

<Table 1 about here>

In households with two or more eligible women where the number of interviewed women and the number of non-interviewed women is greater than zero, the number of

interviewed eligible women is 5,547 and the number of non-interviewed eligible women is 6,857 in 2005. Characteristics of these women are enlisted in Table 1 (columns 3 & 4).

Results from Table 1 show that, there is not much difference in the characteristics of interviewed and non-interviewed eligible women (both overall, and for households which have two or more eligible women and at least one interviewed and non-interviewed woman).

One of the differences between interviewed, and non-interviewed women was that overall, the dominant age group for non-interviewed women was 21-25, while for interviewed women it was 26-30 (in 2005). For women in families with two or more eligible women (and at least one interviewed, and non-interviewed woman), the dominant age group of both interviewed, and non-interviewed women was 21-25. Amongst not-interviewed eligible women (both overall, and in households with two, or more eligible women) higher percentage of women belong to the youngest age group (15-20) compared to interviewed women.

Secondly, while looking at household income quintiles for eligible women while of both the interviewed, and non-interviewed women, the largest percentage of women belonged to richest households, a larger percentage of non-interviewed women belong to the top quintile compared to interviewed women. A larger percentage of interviewed women belong to the lowest, the second, and the third quintile. These differences become appreciably smaller while looking at interviewed and non-interviewed women in households with two or more eligible women (and at least one interviewed and non-interviewed woman).

Most (both interviewed and non-interviewed) eligible women were Hindus, belonging to Other Backward Castes (OBCs), and resided in less developed regions. They were more likely to be from families, which fall in the top quintile of income, and most of them are illiterate.

Comparing Interviewed Eligible women in 2005 to those who were Re-interviewed in 2012

Table 2 shows the percentage of interviewed eligible women (overall) (column 1), and percentage of reinterviewed women (column 2) in each of the categories of the variables age group, education levels, household income quintile, area of residence, caste, and religion. Sub-sample of 25,479 women interviewed across both rounds (2005 and 2012) are included in analyses in the subsequent chapters.

<Table 2 about here>

Table 2 shows that the re-interviewed sample is very similar to the overall sample of interviewed eligible women interviewed in 2005, in terms of the socio-economic characteristics discussed above. Majority of the women who were re-interviewed were illiterate, belonged to households in the highest income quintile, resided in less developed villages, belonged to Other Backward Classes (OBC), and were Hindu.

Present Study

Analyses conducted in the subsequent chapters are conducted using subsets of data collected for 25,479 ever married eligible women aged 15-49 in 2005, who were interviewed in both 2005 and 2012.

Since, we use sub-samples of eligible women for analyses used in the subsequent

chapters, descriptive results presented in chapter 3, and all analyses conducted in chapters 4 and 5 are weighted using the integer value of weights used for eligible women aged 15-49. Observations in the sample are weighted using eligible women weights to reflect the Indian population.These weights help correct for factors such as: different sampling ratios by state and differences in the number of eligible women in the household. If eligible women weights are not included, then there would be an under-sampling of women living in households with multiple eligible women.

A snapshot of the sample set, and the key independent and dependent variables used in chapters 3-5 are briefly outlined in Table 3.

<Table 3 about here>

Table 1. Interviewed and non-interviewed eligible women in 2005

	Non-Interviewed eligible women (overall) (in %)	Interviewed Eligible women (overall) (in %)	Non- Interviewed eligible women in households with two or more eligible women, where the no of interviewed women and no of non-interviewed women>0 (in %)	Interviewed eligible women in households with two or more eligible women where the no of interviewed women and no of non-interviewed women>0 (in %)
	(1)	(2)	(3)	(4)
Age Categories				
15-20	17.23	5.69	18.84	15.14
21-25	22.97	16.05	23.38	27.15
26-30	17.73	20.39	15.97	18.21
31-35	9.98	19.53	8.75	10.51
36-40	10.09	19.29	9.35	9.95
41-45	12.78	12.99	13.56	10.96
46-49	9.22	6.04	10.15	8.08
Education				
Illiterate	47.08	44.07	47.41	42.69
Pre-Primary education	6.47	7.66	6.42	6.49
Primary and post primary	27.49	28.43	28.16	30.47
Secondary and post secondary	9.42	9.89	9.32	10.47
Higher secondary and some college	4.81	4.93	4.78	5.44
College graduate	4.73	5.03	3.91	4.43
Number of Eligible Women in the Household				
1	18.34	83.36	-	-
2	53.57	13.34	64.62	80.17
3	21.42	2.77	26.79	16.66
4 or more	6.67	0.53	8.59	3.17
Household Income Quintiles				
Negative or income<1000	1.51	1.54	1.43	1.32

Lowest Quintile	8.9	15.25	8.98	15.47
2nd Quintile	11.47	17.95	10.02	11.23
3rd Quintile	16.77	19.46	16.03	17.14
4th Quintile	24.4	21.47	25.13	25.53
Top Quintile	36.94	24.33	40.34	36.83
Area of Residence				
Metro City	4.69	8.11	3.89	4.25
Other Urban	22.52	27.88	22.02	22.43
More Developed Village	34.74	31.62	35.37	35.17
Less Developed Village	38.05	32.39	38.72	38.15
Caste				
Brahmin	5.52	5.57	5.35	5.35
Forward Castes (except Brahmins)	25.7	26.7	26.38	26.27
Other Backward Classes (OBC)	41.72	39.5	41.74	41.23
SC	18.84	20.41	18.94	19.51
ST	8.23	7.81	7.58	7.64
Religion				
Hindu	81.91	80.75	82.25	82.35
Muslim	12.12	11.92	12.16	11.99
Christian	1.4	2.81	1.06	1.17
Sikh	2.99	2.43	3.06	2.94
Buddhist	0.38	0.67	0.41	0.45
Jain	0.32	0.33	0.26	0.25
Tribal	0.81	1.03	0.7	0.78
Others	0.07	0.07	0.08	0.07

Table 2 Comparison of interviewed eligible women in 2005 (overall) and re-interviewed eligible women

	Interviewed Eligible women in 2005 (overall) (in %)	**Re-interviewed Eligible women**
	(1)	(2)
Age Categories		
15-20	5.69	5.3
21-25	16.05	15.28
26-30	20.39	20.13
31-35	19.53	20.25
36-40	19.29	19.87
41-45	12.99	13.08
46-49	6.04	6.09
Education		
Illiterate	44.07	46.82
Pre-Primary education	7.66	7.83
Primary and post primary	28.43	28.02
Secondary and post secondary	9.89	8.99
Higher secondary and some college	4.93	4.37
College graduate	5.03	3.97
Household Income Quintiles		
Negative or income<1000	1.54	1.65
Lowest Quintile	15.25	16.32
2nd Quintile	17.95	19.19
3rd Quintile	19.46	19.8
4th Quintile	21.47	21.02
Top Quintile	24.33	22.03
Area of Residence		
Metro City	8.11	6.02
Other Urban	27.88	24.87
More Developed Village	31.62	33.94
Less Developed Village	32.39	35.17
Caste		
Brahmin	5.57	5.09
Forward Castes (Except Brahmins)	25.7	25.68
OBC	39.5	40.1
SC	20.41	21.27
ST	7.81	7.86

Religion		
Hindu	80.75	81.56
Muslim	11.92	11.47
Christian	2.81	2.42
Sikh	2.43	2.54
Buddhist	0.67	0.73
Jain	0.33	0.27
Tribal	1.03	0.95
Others	0.07	0.05

Table 3 Overview: Sample and Key Dependent & Independent Variables

Chapter Name	Sample	Key Dependent Variable(s)	Key Independent Variable(s)
Chapter 3 Regional fertility differentials in India	Sample is restricted to 19,132 ever married women aged 18-40 in 2005 who were interviewed in both rounds, and had non-missing data for each of the independent, and control variables. Sample size for the regression analysis in case of ideal family size as reported in 2005 is limited to 8,348 women, and the sample for having atleast one unintended birth between 2005 and 2012 is further limited to 5,903 women.	a) **Ideal Family size in 2005**, 'If you could go back to the time you did not have any children and could choose the number of children to have in your life, how many would that be?' This is a continuous variable that ranges from 0-12 in our data. b) **Undesired births between 2005 and 2012**: We use the ideal family size variable in 2005; and limit our sample to those women who had living children fewer than, or equal to ideal family size in 2005. As the next step, we go on to see whether these women exceeded their ideal family size as reported in 2005 by 2012. If the total number of living children in 2012, is greater than the ideal family size in 2005, then the binary variable measuring unplanned births takes a value of 1; and the variable takes a value of 0 if the total number of living children as reported in 2012 is less than or equal to ideal family size in 2005.	a) **Ideational factors**: i) Number of social networks in the formal sector (0-3, dummy variables for each category). ii) Exposure to mass media (0-3, dummy variable for each category). b) **Household Bargaining power**: No of decisions in which the woman has the most say (0-4, dummy variables). c) **A woman's connection with the maternal and child health system** (thus our sample is limited to only those who had a birth between Jan 2000 and interview date in 2005). i) Any ANC, ii) Timely PNC (0-2), dummy variables
Chapter 4 Determinants of unmet need for contraception and its impact on subsequent unintended births in the Indian context	Sample limited to 13,170 currently married, non-pregnant, fertile, women aged 18-40 in 2005, with at least one child, who along-with their husbands did not want any more children, and who were interviewed in both rounds.	a) **Unmet need for contraception in 2005**: We refer to women who do not want any more children but who do not use any method as having an unmet need for contraception (for e.g. refer to Sedgh et al. 2016). We construct a binary variable that takes a value of 1 if the woman has an unmet need for contraception in 2005, and takes a value of zero otherwise. b) **Unintended Birth between 2005 and 2012**: If a woman had one or more births between 2005 and 2012, after expressing their desire not to have an additional child in 2005, then the dependent variable takes a value of one; otherwise the variable takes a value of zero.	a) **Socio-economic and cultural factors:** Woman's Education, Household Asset Quintile, Son alive (corresponding to opportunity cost, economic cost, and psychological cost). b) **Exposure to mass media** **c) Availability of knowledge about/access to contraception**: Information regarding family planning is given to women during antenatal care, and the greater the proportion of women obtaining antenatal care in the district, the more likely is it for women residing in that district to have information on and access to contraceptive methods. In order to construct this variable, we aggregate up data on whether a woman got antenatal checkup during her last pregnancy from IHDS 2005 to the district level. Data on antenatal check-up was collected for ever-married women aged 15-49 in 2005, for all those who had at least one

			birth between Jan 2000 to the interview date in 2005. Proportion of women who obtained antenatal care in the district was calculated by dividing the total number of women in the district who had a birth between January 2000 and the interview date in 2005, and obtained at least one antenatal checkup; by the total number of women in the district who had a birth between January 2000, and the interview date in 2005. Both sampling design and differences between urban and rural areas in service delivery requires that we get estimates separately for rural and urban parts of a district.
Chapter 5 Fertility intentions and maternal health behaviour during and after pregnancy	This includes 3,442 non-pregnant, currently married women aged 18–40 in 2005 who had non-missing data on all independent variables, who were interviewed across both rounds, and had atleast one child between 2005 and 2012. The sample sizes for each model range from 3,153 to 3,345 due to missing data on the dependent variables.	a) **Any antenatal check-up (ANC):** This variable takes a value of '0' if the woman obtained no antenatal care, and '1' if she obtained at least one antenatal check-up during her pregnancy. b) **Adequate antenatal check-ups:** This variable takes a value of '1' if the woman had four or more antenatal check-ups during pregnancy and '0'otherwise. c) **Antenatal check-up index:** This is an additive index counting the number of different tests that the woman received during her pregnancy. The index values range from '0' to '8', with '0' indicating that no tests were performed and '8' indicating that all of the tests were performed at least once during the pregnancy. d) **Postnatalcare index:** The postnatal care (PNC) index takes a value of '0' if the woman or her child had no postnatal check-up, '1' if the woman or her child had a postnatal check-up more than 24 h after the birth but within two months, and '2' if the women or her child had a postnatal check-up within 24 hours of the birth. e) **Delivery in an institutional setting**: This variable takes a value of '1' if the delivery took place in a government hospital/ clinic, private nursing home, or some other institutional setting with health personnel, and it takes the value '0' if the delivery took place at home.	The key independent variable measures **women's prospective fertility intention**s. We assess whether a woman's most recent birth was **wanted vs. unwanted** by comparing the number of additional desired children in 2005 with the number of children born between 2005 and 2012. If the number of additional desired children in 2005 was lower than the number of children born between 2005 and 2012 (including those who died in the interim), then the most recent birth was labelled as unwanted. If the number of additional desired children in 2005 was greater than or equal to the number of children born between 2005 and 2012, the most recent birth was labelled as wanted (also see Yeatman and Sennott 2015). This variable takes a value of '1' if the last birth was unwanted and '0' if the last birth was wanted.

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Chapter 3: Regional Fertility Differences in India*

Abstract

While theoretical literature distinguishes between factors that affect individual preferences regarding fertility and their ability to achieve these preferences, empirical literature often tends to conflate the two by focusing on completed family size. This chapter uses unique longitudinal data for India to distinguish between factors that affect fertility preferences, and those that affect ability to implement these preferences. India, with its tremendous regional heterogeneity in socioeconomic conditions as well as service delivery systems, offers a unique laboratory for this analysis. The results show that while socioeconomic characteristics of individuals account for substantial proportion of regional differences in fertility preferences, they only account for a small proportion of regional differences in unintended births. This suggests that unobserved factors, potentially those associated with regional health systems, have a far greater role in explaining underlying differences in unintended births than in explaining fertility preferences.

Introduction

Theoretical literature on fertility tends to differentiate between three sets of processes. First, individuals take into account their own social, and economic circumstances to develop a mental map of how many children (if any) they would like to have. Second, they negotiate with significant others in their lives and begin to develop a life plan for

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crystalizing their preferences, and finally they negotiate on the use of family planning services to find ways of implementing these preferences (Easterlin 1978, 1983; Easterlin and Crimmins 1985; Bulatao and Lee 1983, Hirschman 1994, Bongaarts 1978; Schoen et al. 1999).

Empirical literature has failed to keep up with this theoretical sophistication, resulting in strident debates in the field regarding the importance of family planning service delivery (see debates surrounding Pritchett 1994), or the role of innovation and diffusion vis-à-vis development, in shaping fertility outcomes (Cleland and Wilson, 1987). Part of the problem arises from the fact that much of the literature is based on cross-sectional data from large survey programs such as the World Fertility Survey, or Demographic and Health Surveys where we observe the ultimate culmination of all of these processes into achieved fertility, but do not have a step-by-step glimpse into how these factors play out in women's reproductive lives.

In this chapter we try to fill this niche by using unique longitudinal data for India to distinguish between factors that shape reproductive preferences from those that enable women to carry out their preferences. India provides an ideal laboratory to study the interplay between individual choices, and health services due to its geographic, economic, and cultural diversity overlaid with differences in state capacity and effectiveness.

Indian constitution divides up various functions of governance between the central, and the state governments; and health is under the portfolio of the state governments. While central government provides funding for many health, and family welfare programs including delivering contraception, and maternal and child health,

ultimate administrative responsibilities lie with the states. State capacity varies substantially across states with some states carrying out their responsibilities with relative efficiency while others are unable to efficiently deliver services (Dreze and Sen, 2013).

Regional variation in fertility in India is well recognized; while fertility in many states is well below replacement level, in several large states it is still above replacement level, resulting in tremendous heterogeneity. In this chapter, we examine regional heterogeneity in fertility preferences, as well as women's ability to carry out these preferences to identify the extent to which this heterogeneity may be a function of individual characteristics such as education, and intra-household processes vis-à-vis that of a deeper systemic nature. An understanding of regional differences in fertility in India has tremendous policy significance. India's ability achieve demographic transition rests on the ability of large states in North Central India such as Bihar, Uttar Pradesh and Madhya Pradesh to achieve fertility decline. Moreover, Indian government is in a process of changing the formulae for revenue sharing between the center and the states with increased weightage being given to population share of individual states. This has led to complaints from the Southern states with claims that they are being punished for achieving demographic targets while the laggards are benefiting from their numerical superiority. A better understanding of the extent to which different parts of fertility are associated with state performance vis-à-vis differences in the characteristics of the people who reside in these states may have important policy implications.

Using longitudinal data for the 19,132 women interviewed in both 2005 and 2012, we show that:

1. Regional differences in desired fertility as well as probability of having unplanned births are vast. In the so-called lagging states, desired fertility is 2.74 and probability of exceeding fertility preferences expressed in 2005 interviews in the subsequent seven years† is 0.25; in contrast, for the states more advanced in demographic transition, desired fertility is 2.21 and probability of exceeding fertility preferences is 0.12.
2. A substantial proportion of the regional difference in desired fertility can be attributed to individual characteristics such as education and economic status. However, the likelihood of having an unplanned birth is only weakly associated with individual characteristics, leaving a far greater role for regional influences.

This chapter is organized into the following sections: we begin with a discussion of fertility preferences, and ability to implement these preferences; the next two sections describe the sociocultural and demographic diversity of India; thereafter we describe the sample used in the analyses. The next section describes our conceptual framework for examining regional differences in fertility preferences, and behaviors, and is followed by a section that focuses on statistical techniques, and construction of dependent variables. The subsequent sections describe the key independent variables used in this analysis, and presents descriptive and multivariate results respectively. The chapter ends with a discussion of the results and concluding remarks.

Fertility Preferences Vs. Ability to Implement Preferences

In this chapter we focus on two dimensions of fertility – fertility preferences, and ability to implement these preferences. Both quantitative and qualitative studies find that

† Sample size for this is 13,128 women who had children less than or equal to ideal family size in 2005.

fertility preferences are important in determining contraception usage, and fertility behavior (England et al.,2016; Hayford and Agadjanian, 2012; Moreau et al., 2013; Schoen et al., 1999; Yoo, Guzzo, and Hayford, 2014; Edin and Kefalas, 2011), however, this relationship is mediated by various factors. The translation of fertility preferences into behavior depends on context specific experiences faced by women (Dommaraju and Agadjanian,2009; Agadjanian 2005; Johnson-Hanks, 2007).

The capacity of women to translate their fertility preferences into actual fertility is often constrained by a variety of factors – both within and outside the household. In particular, factors that affect crystallization of her preferences include ability to convince other household members, as well as knowledge about, and ability to obtain and effectively use contraception. Despite the various cross-sectional studies on fertility and family planning focusing on proximate determinants of contraceptive use such as socio-economic factors, and supply of family planning, longitudinal studies that examine the fertility preferences, and subsequent behavior are limited in number (Islam & Bairagi, 2003; Roy et al. 2008, Koenig et al. 2006; Kodzi et al. 2010; Vlassoff, 2012, Speizer et al. 2013, Kastor & Chatterjee 2018).

Using longitudinal data, we first examine the correlates of women's fertility preferences measured by their response to questions regarding ideal family size. Then, we restrict our sample to women who are at, or below their ideal family size, and observe them seven years later to see how many exceed their preferred ideal, and factors that are associated with this phenomenon. We focus on these two processes to better understand regional diversity in fertility across Indian states.

Socio-Economic Diversity in India

Indian states are characterized by tremendous socioeconomic diversity. Table 1 shows some of the key characteristics of Indian states (aggregated from IHDS 2005 data). Because the IHDS samples are not designed to give precise estimates of any indicator for individual states and union territories, and north-eastern states are relatively small (Desai et al. 2009), we combine the 34 states and union territories into 22 groups where smaller states or Union Territories are combined with adjacent states. We present data on five indicators, average per capita income (in 2005 Rs.), percent of doctor assisted deliveries, percent households with access to flush toilets, percent households with access to electricity, and average number of consumer durables owned by a household.‡

The primarily urban union territory of Delhi has the highest per capita income (Rs 15,000), followed by the Northeastern States (Rs 13,350), Kerala (Rs 9,987) and Himachal Pradesh (Rs 9,942). The poorest regions in the sample in 2005, that have the lowest per capita income are Orissa (Rs 3,450), followed by Bihar (Rs 3,530), Madhya Pradesh (Rs 4,125), and Uttar Pradesh (Rs 4,300). Household assets show the long-term economic standing of households. Together, assets and amenities such as electricity depict the overall quality of life. Column 5 in table 1 aggregates data from IHDS 2005 to the State level and we can see that Bihar, Chhattisgarh, Orissa, Jharkhand and Madhya Pradesh are the poorest States, and Delhi, Punjab, Haryana, and Kerala are the richest. From measures of per capita income/average number of assets owned, all of the poorest

‡ The IHDS asked questions on the goods households owned and quality of the household (on 30 items that include: a) ownership of goods such as television, refrigerator, chair/table etc.; and b) quality of housing (such as pucca wall, roof, electricity etc.).

States are “Empowered Action Group (EAG)” States (greater explanation in the next section).

In terms of access to electricity, about 72% households in the IHDS 2005 sample had electricity in 2005 (column 4, Table 3). States where the lowest percentage households had access to any electricity were: Bihar (35%), Orissa (43%), Uttar Pradesh (45%, and West Bengal (53%). Only 23% households all over India (in the sample) had access to flush toilets. There was a wide state-wise variation in percentage households with access to flush toilets; while in Kerala and Delhi, it was more than 60%; in some of the poor States (Bihar, Orissa and, Chhattisgarh), it is below 10%. Finally, column (2), shows the percentage women in each state group who had a doctor assisted delivery (for their last birth). Physician assisted delivery is an indicator of the larger maternal care system in the state. In the IHDS 2005 sample, 42% women had a doctor assisted delivery, however there was a large state level variation in doctor assisted deliveries. While, it was the highest in the Southern States of Kerala (98%), Andhra Pradesh (82%) , and Tamil Nadu (79%); it was the lowest in Uttar Pradesh (15%), Madhya Pradesh (16%), Uttarakhand (20%), and Chhattisgarh (21%). This is reflective of the poor maternal health care system in the EAG States compared to the non-EAG States.

<Table 1 about here>

There is tremendous diversity between states in education. Column 6 and 7 of Table 1 shows proportion of men and women who were literate in 2005, with considerably higher level of literacy in Southern, and Western states of Kerala, Karnataka, Gujarat and Maharashtra, compared to states in Central India such as Uttar Pradesh, Bihar, and Madhya Pradesh.

Demographic Diversity in India

Socioeconomic diversity of India is also reflected in its demography. India is expected to surpass China by 2027, to become the most populous country in the World (United Nations Population Division, 2019). India's contribution to the yearly world population growth is higher than that of any other country (approximately 19 million out of 89 million). As in other developing countries, population growth in India is largely based in the poorest areas with high populations (PRB report on Census 2011).

The Indian sub-continent is marked by substantial regional diversity in culture, social systems and reproductive behavior (Dyson and Moore, 1983). While India has seen a marked decline in fertility over the decades, from a TFR of 6 children per women in the 1950s to 2.2 in 2017 (Population Bulletin 2015; RGI 2017), as Figure 1 documents, there is considerable variation in fertility rates across different state groups.

<Figure 1 about here>

While a group of Northern States with high population, a larger prevalence of traditional norms and beliefs, lesser educational attainment, and less effective administration termed as “Empowered Action Group (EAG)” States (Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttarakhand, and Uttar Pradesh), accounted for 46 percent of India’s population in 2011 and 53% of the growth in population, the Southern States comprised of 21% of India's total population in 2011 but contributed to just 15% of the national population growth from 2001 onwards.

Fertility rates are lower than the replacement level of 2.1 in 12 States, and union territories. Amongst the districts, 28% of all Indian districts (174 out of 621) have a fertility level below 2.1. It is anticipated that 12 districts all over India could achieve the

lowest low fertility rates by 2020 (Guilmoto and Rajan, 2013). On the other hand, there are 72 districts that have fertility rates above 4. These districts are spread across the Northern and Northeastern region. The fall in fertility in these regions in the last decade has been lower than the national average.

Sample

In the present study our sample is restricted to 20,464 ever married women aged 18-40 in 2005 who were interviewed in both rounds of the India Human Development Survey (IHDS). We further restrict our focus to women aged 40 and below to ensure that early menopause, or infecundity does not bias our results. In addition sample size is limited (for descriptive results in Appendix Table 1, Tables 3,4), to non-missing data for each of the dependent, independent, and control variables. Specifically for the key dependent variables, descriptive analyses for a) ideal family size in 2005 is non-missing for 19,132 women; whereas the variable measuring b) unintended births between 2005 and 2012 is limited to 13,128 women (for whom the number of living children in 2005 was less than or equal to ideal family size in 2005). Finally, regression analyses presented in tables 5 and 6 is limited only to women who had at least one birth between January 2000, and their interview date in 2005; this is because data on maternal healthcare utilization is available only for these women. Thus, the sample size for the regression analysis in case of ideal family size as reported in 2005 is limited to 8,348 women. In addition, since the sample size for the binary outcome variable measuring at least one unintended birth between 2005 and 2012 is further limited to only those who had children

less than or equal to ideal family size in 2005, the sample size for the second regression analyses is limited to 5,903 women.§

Conceptual Framework for Explaining India's Demographic Diversity

India's demographic diversity, combined with longitudinal data, allows us to understand the role of socioeconomic development vis-à-vis state policy, and infrastructure in shaping fertility differentials between Indian states. Two separate processes may account for demographic diversity between states. As Table 1 indicates, north-central states are home to some of the poorest, and the least educated populations in India. They are also characterized by poorly functioning public health systems. Hence, we first examine the extent to which individual characteristics such as education, wealth, and intra-household relationships explain inter-state differences in fertility preferences. Thereafter, we examine the extent to which these same characteristics explain women's ability to implement their preferences, and avoid unwanted birth. We hypothesize that individual factors will play a greater role in explaining inter-state variation in fertility preferences, than in explaining unplanned and possibly unwanted births. The latter may be a function of state level public health systems, and family planning service delivery.

Research on fertility argues that both demand for children, and ability to avoid unwanted fertility (Bongaarts,1994) form key components of total completed fertility; with socio-economic and ideational factors playing an important role in shaping demand for children, and contraceptive knowledge and availability shaping unwanted fertility.

§ In analyses not reported here, we removed the restriction of including only women with a birth in the five years preceding the 2005 interview to expand the sample size. Our conclusions did not change. Hence, for parsimony only the final regression results are presented on the restricted sample.

Unfortunately, empirical research often finds it difficult to distinguish neatly between the two. Demand for children, typically measured by questions regarding ideal family size, is affected by ex post rationalization (Lightbourne 1985; Bongaarts 1990, 2011; Westoff 1991; Bhushan and Hill 1996), i.e. ideal family size is adjusted in a way that it is closer to actual family size (even when desired family size is actually lower than actual family size). Consequently, measures of unwanted fertility are typically derived at the population level rather than at individual levels, making it difficult to examine factors driving individual women to have more children than they may consider ideal.

Using longitudinal data we are able to partially address this shortcoming, and try to distinguish between factors that may affect ideal family size, from those that affect unwanted fertility in subsequent years. In the present study, we focus on one indicator each for fertility preferences and subsequent behavior.

Ideal Family Size in 2005:

International (Bulatao, 1981; Bulatao & Lee, 1983; Bankole, 1995) as well as India specific literature (Bongaarts, 2001; Dharmalingam et al., 2014) argues that demand for children plays an important role in shaping fertility. Ideal family size is often used as an indicator of demand for children in research focusing on India (for example Roy et al. 2008; Chatterjee and Kastor 2018). We measure ideal family size using the following questions, administered to eligible women respondents at Wave 1 of the IHDS survey:

'If you could go back to the time you did not have any children and could choose the number of children to have in your life, how many would that be?'

This is a continuous variable that ranges from 0-12 in our data.

Undesired births between 2005 and 2012:

Unwanted fertility is far more difficult to measure due to ex-post rationalization and its aggregate measures have led to considerable debate (Pritchett, 1994; Bongaarts, 1994). Instead of relying on aggregate measures, we exploit longitudinal data to measure unplanned fertility. In order to construct the measure, we use the ideal family size variable in 2005; and limit our sample to those women who had living children fewer than, or equal to ideal family size in 2005. As the next step, we go on to see whether these women exceeded their ideal family size as reported in 2005 by 2012. If the total number of living children in 2012, is greater than the ideal family size in 2005, then the binary variable measuring unplanned births takes a value of 1; and the variable takes a value of 0 if the total number of living children as reported in 2012 is less than or equal to ideal family size in 2005.

Statistical Model:

Results presented in the chapter are based on the hierarchical linear models which view individuals as being nested in within a state. Multilevel (random effects) models can be conveniently expressed as a system of equations at separate levels (Bryk and Raudenbush 1992; Goldstein 1995).

First, for the dependent variable measuring ideal family size in 2005, we consider a simple, two level random intercept model,

$$\mathcal{Y}_{ij} = \beta + \mathfrak{u}_j^{(2)} + \epsilon_{ij}^{(1)} \text{---------- (1)}$$

for the measurements i (level 1 observations)= 1, 2, …..$\boldsymbol{n_j}$; and level 2 (state groups) j=1, 2,….,M. $\mathcal{Y}_{ij}$ is the outcome variable: ideal family size in 2005 for the ith person in

the jth state, β an unknown fixed intercept, $u_j^{(2)}$ is a random intercept, and $\epsilon_{ij}^{(1)}$is a level 1 error term. The assumption is that the errors are distributed normally with mean 0, and variance σ_1^2 ; random intercepts are assumed to be normally distributed with mean 0 and variance σ_2^2, and to be independent of error terms (StataCorp LP, 2013). The interclass correlation coefficient (ICC) denoted by $\boldsymbol{\rho}$ for this model and is calculated as follows:

$$\rho = Corr(Y_{ij}, Y_{ij}) = \sigma_2^2/(\sigma_1^2 + \sigma_2^2)\text{……..}(2)$$

In model 1 we include only state level random effects; and in models 2 and 3 we add the other individual/household level variables of interest such as education, asset quintile, etc.; and variables indicating a woman's connection with the maternal and child health system (whether she obtained any ANC or PNC) in 2005.

Next, going on to the second dependent variable: a binary variable indicating whether a woman had an unintended birth between 2005 and 2012, we used mixed effects logistic regression. The most basic equation partitions the variance in unintended births across individuals, and states is:

$$\ln\left(\frac{P_{ij}}{1-P_{ij)}}\right) = \beta_{0j}; \qquad \text{-------- (3)}$$

$\beta_{0j} = \delta_{00} + \mu_{0j}$

Where p_{ij} reflects the probability of ith woman in jth state having an unintended birth. The logit of unintended birth is a function of a randomly varying state specific component β_{0j}. The state specific component is determined by the size of the random

effects term μ_{0j}. The ICC can be calculated to estimate the importance of clustering in unintended births (Snijders and Bosker 2000) using the following formula:

$ICC=\Gamma_0/(\Gamma_0+\Pi^2/3)$------ (4)

Where Γ_0 is the estimated variance of the random effects term $\mu_{0j,}$ and Π is the quantity 3.14159. Using IHDS data, we find that without including any covariates, the ICC is 0.10. This suggests that for unintended births, about 10% of the variance lies between states and 90% is between women in a state. The goal is to reduce this unexplained between-state variance through inclusion of individual, and household factors that account for compositional differences between states.

The next step adds a series of individual and household level control variables, to take into account the compositional differences between districts. This equation includes:

$$\ln\left(\frac{P_{ij}}{1-P_{ij)}}\right)= \beta_{0j} + \beta_{1j}X_{1i}\text{--------(5)}$$

Where X_{1i} represents woman specific characteristics such as birth cohort (age), parity, and education; and the other substantive variables of interest that are operationalized at an individual level (e.g. household wealth). In the final model 3 we add variables indicating a woman's contact with the maternal and child health system.

Change in the between-state variance reflects the importance of compositional differences across states. The above example describes our modeling strategy for the bivariate variable, unplanned fertility.

In summary, we estimate hierarchical regression models for two dependent variables: a) ideal family size in 2005; and b) women who have at least one unintended birth between 2005 and 2012. For each of these dependent variables, we run two sets of

model: i) model 1: with only random intercepts for state groups; and ii) model 2: model 1+ all other individual and household characteristics (except ANC/ PNC use in 2005); and iii) model 3: model 2+ ANC and PNC use as reported in 2005. Model 3 is indicative of a woman's connection with the maternal and child health system, which in turn reflects availability of maternal healthcare facilities in the region.

These hierarchical models that take into account geographical clustering at state level; and thus regional heterogeneity is taken into account (for e.g. these models account for the fact that women's ideal family size within states, are not independent, since women residing in different states could have different exposure to characteristics specific to that state). All analyses is done using Stata 15. The hierarchical models are estimated using Mixed command in STATA, and it includes random intercepts for the state of residence. Finally, for both sets of regressions we calculate the Intra-Class Correlation Coefficient (ICC) in STATA, in order to estimate the importance of state-wise clustering in fertility intentions and behavior (Snijders and Bosker 2000; Desai and Wu 2010).

Since data on ANC/PNC is limited to women who had a child in the five years preceding the 2005 survey, sample for model 3 is smaller than that for model 2 (i) 8,348 compared to 19,132 for the dependent variable: ideal family size; and ii) 5,903 compared to 13,128 for the dependent variable measuring unintended births). In order to consistently analyze changes in ICC, we present all three models for the final smaller sample, but models estimated on the larger sample (i.e. 13,128 and 19,132 women respectively for the two dependent variables) show qualitatively similar results and do not affect the discussion and conclusion.

Individual Level Determinants of Fertility

Our focus on examining inter-state differences in fertility relies on examining changes in inter-state variance by adding controls for known individual level correlates of fertility preferences and behaviors. While we control for a range of individual characteristics such as education and household income, we also control for somewhat more distal factors that have been hypothesized to shape both demand for children, and individuals' ability to implement their preferences:

Ideational Factors

Theories from sociology, psychology, cognitive sciences and communication studies propose various processes through which people form attitudes. Some of these processes would include socialization, processing social information, social learning and social influence. These theories focus on structural (such as an individual's position in a given network) and ideational (such as attitudes and beliefs of other members in a network) forces. Theories further stress the importance of disseminating new information and putting them in practice amongst individuals belonging to various networks. Mead (1967) emphasized on the importance of role taking, and interaction with network members in the shaping of an individual's self (including his/her attitude). Various studies examine the impact of media on an individuals' development of their behavior and self-identity (e.g. Barber and Axinn, 2004; Bennett,1975; Gamson et. al., 1992; Gamson and Modigliani,1989).

The idea that smaller family size is preferable is often spread through various communication networks that may or may not be a part of family planning program initiatives. Under the thesis of ideational forces (Cleland and Wilson, 1987) empirical

work may be categorized into research on a) diffusion; b) impact of mass media and c) social interaction of ideas about fertility and actual fertility behavior (Freedman, 1997). Bongaarts and Watkins (1996), Watkins (1992) and Watkins et al., (1995), studied diffusion through social interactions, in different types of natural groups. They emphasize the importance of social networks in the dissemination of ideas on fertility, and thus in shaping fertility preferences.

Studies have suggested that newspaper, radio and television campaigns lead to a rise in available knowledge and communication on use of contraceptives and family planning issues, declines in fertility desires and rise in use of sterilization. These relationships have been found in contexts of various countries such as Iran, Brazil, Guatemala, Nigeria, Zambia, Columbia, Gambia etc. (review by Hornik and McAnany, 2001).

Technological innovation, and access to effective contraception has been an important determinant in bringing about declines in unintended pregnancy and fertility especially for those with comparatively bigger families (Ryder 1973; Westoff 1972; Westoff and Bankole 1996). \ Barber and Axinn, 2004 examine the role of mass media (as a means of social change) that impacts an individuals' behavior principally through ideational mechanisms. They use data for 1091 couples in the Chitwan Valley Family Study and find that exposure to mass media is associated with fertility behavior, inclination towards have smaller families, weaker son preferences and greater toleration of contraceptive use.

The first demographic transition in Europe, and the ongoing fertility decline in the developing countries can be somewhat attributable to the diffusion of new ideas and

types of contraception (Bongaarts and Watkins, 1996). When individuals communicate on new ideas about fertility, family size, gender roles, information on experience and acceptance towards modern contraceptives their exposure to available information and their interaction with others impacts their attitudes towards their acceptability of high fertility and ways to restrict births (Montgomery and Casterline 1993,1996, Kohler 2001; Kohler et al. 2001; Buhler and Kohler 2004). Qualitative research conducted in Italy and Germany show that interpersonal communication is also seen as an important factor in determining fertility behavior (Bernadi 2003; Bernadi et al.2005).

The framework of the diffusion theory has been studied in the context of India particularly to falls in fertility in South India. In regions where fertility decline began earlier, the rate of diffusion was faster across social and cultural groups compared to regions where fertility decline begun later (Guilmoto and Rajan 2001). Dommaraju and Agadjanian (2009) find that the rate of diffusion in the Southern States was faster compared to the Northern States where it was almost absent. Appel et. al (2002) found that in southern India diffusion of low fertility took place across caste, religious and economic groups.

While a host of factors have been identified to promote diffusion of ideas regarding importance of family limitation and knowledge about contraceptive use (see National Research Council 1999), we focus on two key determinants. The first set of factors relate to the exposure of women to mass-media and the second relates to the connection of households with formal institutions. Role of newspapers, television and radios is often seen as key force promoting ideational change (Faria and Potter 1999). The second set of factors identifies connections to formal institutions. Studies (e.g. Basu

and Sunder 1988) also document that social networks, and connections to individuals who travel in the larger world and may be exposed to what has come to be known as "developmental idealism" (Thornton et al. 2015), a complex of ideas regarding value of delayed marriage, smaller families and use of contraception.

Following is a description of how we operationalize these variables:

Exposure of women in the household to mass media: The IHDS survey asks whether women in the household were exposed to television, radio and newspaper. The response to this question was, none, sometimes, and regularly. We recode this to, no exposure, and at least some exposure (this combines the categories sometimes and regularly). Next, we recode the missing values on this question, to no exposure to any form of mass media. The index for exposure of women in the household to mass media is an additive index (ranging from 0-3), that takes a value of 0 if women in the household have no exposure to any form of mass media, and takes a value 3 if women in the household have at least some exposure to all 3 forms of mass media. The missing responses were recoded to 0 (indicating no exposure to mass media). We create dummy variables for each category of the index and take no exposure to mass media as the reference group.

Number of formal social networks: The household questionnaire in 2005 asked: 'Do you or any members of your household have personal acquaintance with someone who works in any of the following occupation. a) Medical profession, b) Schools, and c) Government services.' Each of these had a binary no (0), yes (1) response. We construct an additive index that counts the total number of formal social networks, and ranges from 0 (no formal social networks) to 3 (all three formal social networks). The missing responses were recoded to 0. We create dummy variables for each category of this index,

and take no formal social networks as the reference group. A limitation of this variable is that we only look at whether the family member knows anyone in the formal sector, but does not capture the type of the network, this is because for a large proportion of our sample, data on type of network is missing, and we did not want to lose those cases.

Intra-Household Bargaining Power

Research and public policies assume that women's ability to implement their fertility preferences is dependent upon their ability to obtain cooperation from other family members. Past studies have found that women's empowerment influences her fertility intentions, and her ability to implement her intentions into actual behavior (for e.g. Upadhyay and Karasek 2012; Kishor and Subaiya 2008, Balk 1994, Hindin 2000, Upadhyay et al. 2014). In an extensive review article based on 60 studies examining the relationship between women's empowerment and fertility, Upadhyay et al. 2014, find that the most commonly used measure of women's empowerment was women's role in household decision making (used in 37 of the 60 articles). In the present study, along the lines of assumptions by Upadhyay and Karasek 2012, we assume that, as a woman is more empowered, she will have higher aspirations for herself and her children, which would lead to her lowering the ideal number of children she wants, and the actual number of children she has, so that she has more resources to spend on herself and her children. We include markers of women's decision-making authority in the household as a marker of gender empowerment.

Household Decision Making Ability: In the IHDS survey, eligible women in 2005 were asked who (respondent, husband, senior male, senior female, other, or no one) had the most say in the following household decisions: a) what to cook on a daily basis, b)

whether to buy an expensive item such as television or refrigerator) how many children to have; if they have children: d) what to do if a child falls sick, e) whom should ones' child marry. The response to each of these questions takes a value of 1 if the respondent (the eligible woman) has the most say, and takes a value of 0 otherwise. We recode the missing values on this question, to 0. In order to construct this variable we look into all decisions except the decision on what to cook on a daily basis, since this is usually a decision that is taken by women. We construct an additive index for the number of decisions in which the respondent has the most say. This ranges from 0 (indicating that the woman doesn't have the most say in any of the household decisions), to 4 (indicating that the woman has the most say in all four decisions). We create dummy variables for each category of this index, and take most say in no decision as the reference group.

Contact with Health Systems

The next two variables measure a woman's contact with the maternal and child health care system, and is limited only to those who had a birth between January 2000, and the time when she was interviewed in 2005, and had valid data on maternal healthcare utilization for their last birth. If women have availed antenatal and postanatal check-ups in the past, it would mean that they have had a connection with reproductive health workers in the recent past.

Antenatal checkup (ANC): This is a binary variable measuring whether a woman obtained any antenatal checkup during her last pregnancy (as reported in 2005). It takes a value '1' if a woman obtained at least one antenatal check-up during her last pregnancy, and takes a value of '0' if a woman had obtained no antenatal checkup during her last pregnancy.

Postnatal checkup (PNC) index: This index takes a value ranging from 0 to 2. This variable takes a value of 0 if a woman and her child obtained no postnatal check-up, a value of 1 if at least one of them obtained a postnatal check-up, but more than 24 hours after birth but within 2 months of birth, and takes a value of 2 if at least one of them obtained a postnatal checkup within 24 hours of birth as per WHO recommendations (WHO 2014).

Socio-economic Individual and Household Characteristics

In addition to the more distal factors influencing fertility behaviors such as social networks and exposure to mass media, we also control for some of the key socio-economic household and individual level characteristics that have been shown in the past literature to affect fertility. These include:

Education, parity, and age: woman's education level (dummy variables are constructed for six categories namely: illiterate, some primary education, primary complete, secondary complete, higher secondary complete, and college or higher); number of living children in 2005 (parity in 2005); and age group (dummy variables are constructed for 5 age categories: 18-20, 21-25, 26-30,31-35, and 36-40 respectively).

Household Wealth: Household asset quintile (dummy variables are constructed for 5 categories, ranging from the poorest to the richest households);

Caste and Religion: Caste and religion are frequently identified as primary axes along which social intercourse as well as social stratification takes place (Desai and Dubey, 2011; Desai et al. 2010). A salient characteristic of the Hindu religion is the division into castes. This classification is hierarchal in nature, and was historically based on

occupation. Under article 341 of the Indian constitution, the lowest ranking castes are now part of an official list or schedule, and are referred to as Scheduled Castes (SC). In a similar manner, all indigenous tribes of India are part of an official schedule under article 342 of the Indian constitution, and are referred to as Scheduled Tribes (ST). Historically both groups have lived on the margins of the mainstream Indian society. Scheduled Tribes, often live in isolated regions where employment and occupational opportunities as well as health services are limited. While Scheduled Castes are not geographically isolated, they also suffer from exclusion, particularly in access to health services (Sabharwal et al. 2014).

Hence, we control for caste and religion of individuals by including indicators for caste group (dummy variables constructed for 4 categories namely, Forward Caste groups (such as Brahmins, Kayasthas, Kshatriyas, etc.); and lower caste groups: Scheduled Castes (SC), Scheduled Tribes (ST), and Other Backward Classes (OBC)); and indicator for religious group (dummy variables are created for each of the following categories: Hindu, Muslim and Other Religions).

While an increase in education is expected to be associated with lower fertility (for e.g. Jejeebhoy, 1995; Murthi et. al, 1995); some studies in the Indian context have shown that Muslim women are likely to have higher fertility and lower contraception use compared to Hindu women (for e.g. Dharmalingam and Morgan 2004; Kulkarni and Algarajan, 2005). On the other hand the hypothesized relationship between caste and fertility is not very clear (Malhotra et al. 1995). While on one hand people belonging to lower castes are poorer, and people belonging to poorer families will be expected to have more children in order to obtain an additional source of labor income; on the other hand

literature on social stratification indicates that 'status' concerns might lead to higher fertility amongst upper caste groups (Malhotra et al. 1995; Miller 1981).

Area of residence: This is a variable with 4 different categories namely: metro cities, other urban areas, more developed villages and less developed villages. There is a lot of variation in terms of urban and rural areas in India. While some large Indian cities have global influence, some other urban areas are hardly different from bigger villages (Desai et al. 2009). Therefore, the IHDS classifies urban regions into: a) metro cities (Mumbai, Kolkata, Delhi, Chennai, Hyderabad, and Bangalore), b) other urban areas. Similarly, rural areas are divided into two groups based on an index of infrastructural development. Villages that have ample infrastructure (such as paved roads, access to urban centers, postal and telephone connections, access to electricity that powers lights and television) are coded as more developed villages; and villages that have poor infrastructure are coded as less developed villages.

Descriptive Statistics

Two-child norm seems to have taken a firm hold in India. In the overall national sample, about 1 per cent women said they didn't want any children. Figure 2 shows that 4.1% had an ideal family size of 1, 58.9% women had an ideal family size of 2, 23.1% women had an ideal family size of 3, and about 12.8% had an ideal family size of 4 or more.

<Figure 2 about here>

Table 2 shows the distribution of ideal family size across different states. This table also shows a strong preference for two-child families in most states. The two States that are exceptions with respect to this are Bihar and Uttar Pradesh. In Bihar, majority women

had an ideal family size of 4 or more children (36.29%), followed by an ideal family size of 3 children for 36.29%; whereas in Uttar Pradesh, majority women (35.42 %) had an ideal family size of 3, and the second highest preferred family size was 2 children (for 33.92% women).

<Table 2 about here>

Table 3 shows average ideal family size in 2005 (column 1), and the percentage women, who had at least one unintended birth between 2005, and 2012 (column 2) across 22 state groups. The average ideal family size in 2005 in India was 2.45, the average in EAG states was higher than the all India average at 2.74, while the average ideal family size for non-EAG states was lower (2.21) than the all India average. While looking separately at the 22 States, it can be seen that average ideal family size in 2005, was greater than the all India average in the States of Jammu and Kashmir, Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh, Madhya Pradesh, Assam and other Northeastern States. There was only one state: Bihar (3.18),where average ideal family size in 2005 was above 3 children.

<Table 3 about here>

Column 2 in Table 3 shows the state-wise distribution of the percentage women who had at least one unintended birth between 2005 and 2012. As mentioned earlier, this is limited to a smaller sample size of 13,128 women, who had children less than or equal to ideal family size in 2005. We find that almost 18% of women in this sample had at least one unintended birth between 2005 and 2012, i.e. exceeded ideal family size as expressed in Wave 1 interview. The percentage of women who had unintended births was much higher in EAG States (more than 25%), and lower in non-EAG States (almost 12%)

compared to the national average. Proportion of women who had at least one unintended births between 2005 and 2012 were the lowest in Kerala (less than 4%), followed by Tamil Nadu (less than 5%), Andhra Pradesh (less than 9%), and Karnataka (less than 10%); and the highest in Uttarakhand (36.6%), followed by Bihar (33.5%), Delhi (29.3%), Jharkhand (25.4%), and Uttar Pradesh (24%). It is important to remember, that the IHDS is not designed to be representative at the state level and small samples render state-wise ranking indicative rather than definitive. Column 3 in Table 3 shows the total fertility rates (TFR) for women aged 15-49 aggregated from National Family Survey (NFHS III, 2005-06) report, and as depicted in figure 1.

Summary statistics for the independent variables in this analysis are presented in Appendix Table 1. We present the distribution of our two primary fertility outcomes, desired fertility, and unplanned fertility across different independent variables in Table 4. Bivariate statistics show a wide variation in fertility intentions (column 1), and behavior (column 2) across education levels, income, area of residence, number of decisions in which a woman has the most say, exposure to mass media, any connection to formal social networks, and maternal health care utilization during the last birth, as reported in 2005.

<Table 4 about here>

It can be seen that ideal family size in 2005 (column 1) decreases with an increase in education, and is the highest for illiterate women (about 2.7), and the lowest for college educated women (below 2). Column (2) shows that while only about 9% women with college education have at least one unintended birth, almost 21% women who are illiterate have at least one unintended birth. A similar pattern is observed by

household socio-economic status. The ideal family size decreases with an increase in household assets, while for women belonging to poorest families ideal family size is 2.8, for women belonging to richest families it is 2.1. Percentage women having an unintended birth decrease significantly as household wealth increases. While more than 24% women belonging to poorest households have at least one unintended birth between 2005 and 2012; less than 11 % women belonging to the richest households have at least one unintended birth.

Differences in ideal family size across areas of residence, show that ideal family size is highest in less developed villages (2.6), followed by more developed villages (2.4), other urban areas (2.3), and lowest in metro cities (2.1). Percentage women having at least one unintended birth, is the highest in less developed villages (almost 23%), and the lowest in metro cities (less than 11%).

Next we look at the relationship between the number of decisions in which women relatively have the most say, and fertility intentions and behavior. Women who do not have the most say in any household decisions have the highest average ideal family size in 2005, compared to women who have the most say in all 4 major household decisions. A greater percentage of women who didn't have the most say in any household decision were likely to have an unintended birth between 2005 and 2012, compared to women who had the most say in all 4 household decisions.

Both ideal family size in 2005, and percentage women who had unintended births between 2005 and 2012 did not vary much by the number of social networks in the formal sector; though those who had connections with all three social networks had a lower ideal family size; and also a smaller percentage of women with all three social

networks had unintended births, compared to those with no connections in the formal sector.

The ideal family size as reported in 2005 is higher on an average for women who reside in households that have exposure to fewer forms of mass media. Percentage women having unintended births between 2005 and 2012 is also higher if women reside in households that have no exposure to mass media (about 24%), compared to women who reside in households where women have exposure to all forms of mass media (about 11%).

Finally, variables measuring exposure to maternal healthcare utilization during the last birth are indicative of connectivity with the maternal and child health system, and thus the availability of healthcare facilities in the region of residence. Women who had obtained at least one ANC during her last birth (as reported in 2005), was likely to have a lower average ideal family size in 2005 (2.4), compared to women who received no ANC (3) during her last birth. A larger percentage of women who didn't receive any ANC during their last birth were likely to have at least one unintended birth (more than 39%), compared to those who received at least one checkup (about 24%). Similarly, for PNC use during the last birth (as reported in 2005), average ideal family size in 2005 was lower for women who received any postnatal checkup, compared to those who did not. Also, a higher percentage of women didn’t obtain any postnatal checkup during their last birth (as reported in 2005) were likely to have at least one unintended birth between 2005 and 2012.

Results from Multi-level Regressions

Results from hierarchical multi-level regressions are presented in Tables 5 and 6. Each table contains three columns. Column 1 includes only state-level variation at the second level without any independent variables; column 2 adds individual level correlates of fertility preferences, and behaviors; and column 3 adds contact with health services for antenatal and post natal care.

As the discussion of statistical models notes, this approach allows us to partition the variance into two components, within and between states. The Intraclass Correlation Coefficient describes the component of variance that can be attributed to between state variance. In as much as between state differences are a function of individual characteristics such as education and economic status, addition of these factors should reduce the size of ICC between models 1, 2 and 3.

Desired Family Size.

Table 5 shows the results from the hierarchical linear regression model for the family size women would have wanted had they been able to choose their family at the start of their reproductive career. This variable was reported at Wave 1 interview in 2005. Model 1 is the basic model without any individual/household level predictors. This model enables us to obtain the baseline ICC, with the goal of decreasing it's magnitude upon adding other individual and household variables (in model 2), and variables indicative of maternal healthcare utilization (model 3). ICC of 0.13 in model 1 suggests that 13% of the variation in ideal family size in 2005 is between states, and 87% of the variation in ideal family size in 2005 is between women residing in the same state. Model 2 adds the individual, and household level independent, and other control variables to model 1. Note

that the within state component includes both systematic variation between women based on their education, economic status, social networks and a host of other individual characteristics identified in the literature reviewed above as determinants of fertility preferences as well an unmeasured component reflecting idiosyncratic variation between individuals. Adding individual /household level factors reduces the ICC from about 0.13 to 0.09, which indicates a 35% decline between model 1 and 2. This means that a substantial part of the inter-state variation in ideal family size is explained by the variables included in model 2. In Model 3, we add contact with the health system during prior delivery. Addition of these variables reduces the ICC to 0.08, which indicates a 39% decline from the null model. Thus, individual and household level factors; and connection that women have with maternal and child health workers explains a significant part of inter-state variation in ideal family size.

<Table 5 about here>

Results from model 2 show that, of key socio-economic and demographic variables; being illiterate (compared to having primary or higher level education); belonging to poorest households (compared to that for richer households); belonging to Muslim and other religious groups (compared to Hindu groups); residing in a less developed village (compared to a metro city); belonging to ST and OBC caste groups (compared to forward caste groups); having a higher number of living children; and being 18-20 (compared to being 21-30 is associated with having higher ideal family size in 2005. Having three formal social networks (compared to no social networks in the formal sector), and, having the most say in more number of household decisions (having the most say in one or two decisions compared to not having the most say in any decision) is

linked to having smaller ideal family size. Finally, in model 3 ANC, and PNC use in 2005 are added to model 2, while the significance level and directions for all other independent and control variables remain similar to that in model 2, model 3 shows that obtaining at least one ANC (compared to obtaining none), and the first PNC within 24 hours of birth (compared to obtaining none), during the last birth is associated with having a smaller ideal family size.

Unplanned Birth

Table 6 shows the results from the hierarchical logistic regression model examining the likelihoods of having at least one unintended birth between 2005 and 2012. Model 1 is the basic model without any individual/household level predictors. ICC of about 0.10 in this model.** Adding individual, and household level variables in model 2, reduces the variance of the random effects coefficient and reduced the ICC from 0.101 to 0.095 i.e. about 6% decline between model 1 and model 2. Adding the ANC, and PNC use variables in model 3, decreases the variance of the random effects coefficients and reduced the ICC to 0.092, a 9% decline from the null model. Comparison of changes in ICC between the two dependent variables, desired fertility and unplanned births is striking. Whereas a vast proportion of inter-state variation in desired fertility appears to be related to differing composition of women living in these states, the same cannot be said of unintended fertility. This is more evident as we look at the variation in unintended fertility between women with different characteristics.

** Interpretation of ICC for logistic regressions is not strictly comparable to the one for multilevel linear models continuous since it depends on the prevalence of outcome in clusters of interest. Furthermore, the between-cluster variance is defined on a different scale (e.g., the log-odds scale in a logistic regression), than the binary response scale (Austin and Merlo 2017).

Results from model 2 show that while education, and income reduce the likelihood of having unplanned births, women need to reach very high levels of education or income before this effect is large enough to be significant. Whereas for desired fertility, even a small amount of education has a large and significant effect, for unplanned births, college education is required before we see any impact. Similarly, there is only a small reduction in likelihood of unplanned births between women in the bottom 60 percent of household wealth index.

Age, however, appears to have an interesting relationship with unplanned births. Younger women seem to be particularly susceptible to experiencing unplanned birth. Since they are also most likely to desire smaller families, this is clearly a niche where unmet need for contraception appears to be the greatest. Unplanned births appear to be higher among Muslim, Scheduled Caste and Scheduled Tribe households, identifying another population that seem to be poorly served by existing service delivery infrastructure. Among other factors we control for, having no connections in the formal sector (compared to having one connection), and having the most say in no household decisions (compared to having the most say in a couple of household decisions) is associated with greater likelihoods of at least one unintended birth between 2005 and 2012. Results from model 3 add variables indicating a woman's connection with the maternal and child health system. Results from model 3 show that obtaining at least one antenatal checkup during their last birth (as reported in 2005) is associated with lower likelihoods of unintended birth between 2005 and 2012.

Discussion and Conclusion

This chapter has examined regional differences in fertility in India through the prism of desired and unintended fertility using prospective data. Descriptive statistics presented in Table 3 show tremendous variation between states. Whereas Southern state of Karnataka had desired family size of 2.2 children with less than 10% women having an unintended birth, Bihar in Northern India had desired fertility of 3.18 with about a third of the women reporting unintended birth. While these results highlight well established regional differences in fertility with states in the Hindi speaking heartland of India showing greatest desired as well as unintended fertility, they also shed interesting light on possible processes through which these differences emerge.

States in India are almost like mini nations, they differ tremendously in social, political and economic culture and have tremendous independence in running their health programs. Even when central government pays for some the major schemes such as maternal protection schemes, its operation is left to states creating very different service delivery climate with some states able to efficiently administer these schemes and others being lackadaisical in their governance.

Our results suggest that a substantial proportion of variation in fertility preferences between states can be explained by individual factors such as education, and income. Poorer states with less educated populations such as, Bihar and Uttar Pradesh have higher desired family size. Almost 40 percent of inter-state variation in fertility preferences is reduced once we take into account differences in these individual attributes. However, this same, well established pathway to reduced fertility does not apply easily to unintended fertility. Education, and income reduce unintended births, but

only after they reach a very high threshold. Whereas, even secondary enrolment reduces desired family size, it requires college education to make a significant dent in the likelihood of unintended births. This lack of association at individual level translates into the fact that between state variance in unintended births remains almost impervious to addition of individual variables with only 9 percent decline in between-state ICC.

This suggests that the unobserved component of interstate variance is very strong and not easily explainable through individual factors. Some of this could be attributed to the exclusion of socio-cultural differences across regions such as differences in kinship patterns, extent of coresidence with parents, and gender relations (Desai et al. 2010; Dyson and Moore 1983). It is also possible that regional differences in the quality of family planning services may result in large inter-state variation. Although we tried to capture state provision of health services through variables that capture use of antenatal and postnatal care, addition of these variables do not seem to make a dent in interstate variance. We argue that this is because the measures of service delivery we have access to are focused on maternal and child health services and may be quite distinct from provision of family planning services. While the same health workers are supposed to provide maternal and child health services as well as family planning services, these are two distinct activities and it is not possible to assume that the providers who prioritize one activity will also prioritize the other.

Our results also highlight two types of populations that seem to most at risk of having unintended fertility. Young women below 25 have a preference for having smaller families, but they also seem to be most at risk of being unable to implement their preferences. Muslims, Scheduled Castes, and Scheduled Tribes also seem to be most at

risk of having unintended births. These observations identify niche populations that may be most at risk of being excluded from the service delivery systems may require special programming.

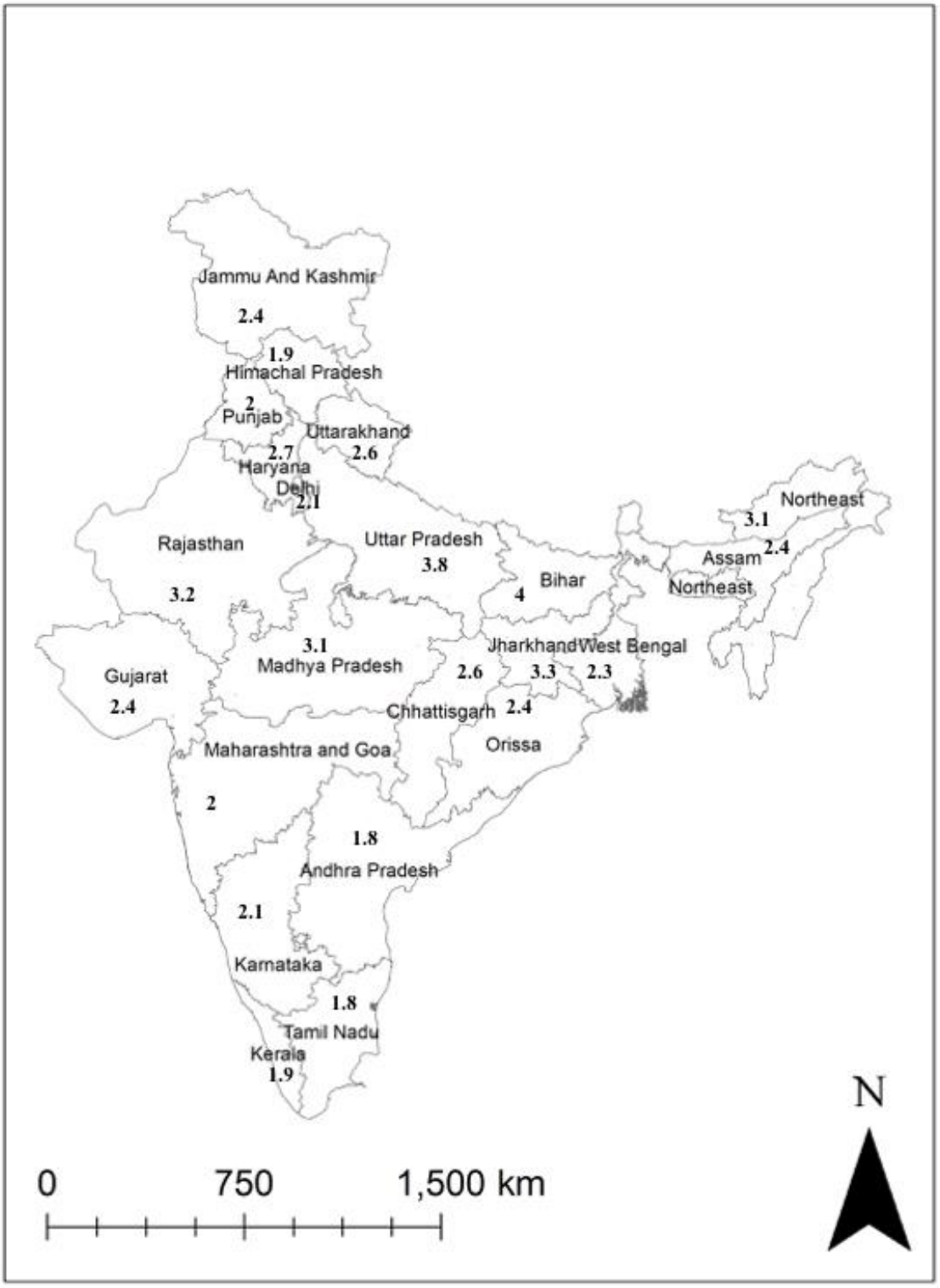
At a broader level, these results document an interesting puzzle. Individual factors that have been long established in fertility research, education, economic status, gender relations in the household and social networks, seem to play an important role in shaping fertility preferences. However, our ability to predict unintended fertility seems to be far more limited. Even education, the greatest weapon in the armory of demographic research, seems to be only weakly correlated with unintended births. This should be an important area of future research.

It is important to note possible limitations of this analysis as we interpret the results. Firstly, for measuring fertility preferences we use 'ideal family size' as the key dependent variable, this measure could be subject to ex-post rationalization, whereby women adjust their ideal family size to be near their actual family size, which causes an overestimation of wanted fertility (for e.g. Bongaarts, 1990,2011; Bhushan and Hill, 1995; Lightbourne, 1985; Westoff, 1991). However, by limiting our sample to those who had children lower than, or equal to ideal family size in 2005; and subsequently checking whether this sub-group of women had more number of living children in 2012, than their ideal family size in 2005, enables us to partially address this limitation. Secondly, we have assumed that fertility preferences as expressed at Wave 1 interview reflect long term predisposition on the part of individuals towards having a particular number of children and taken deviation from over the subsequent eight years as unintended fertility. However, individuals may have adjusted their fertility preferences upwards, and what we

define as unintended fertility may well reflect a change in preference rather than inability to implement preferences. In spite of this caveat, we suggest that longitudinal data on preferences and their implementation provide us with a way of looking at regional differences in fertility that has not been feasible to date with cross-sectional data and deserves further attention.

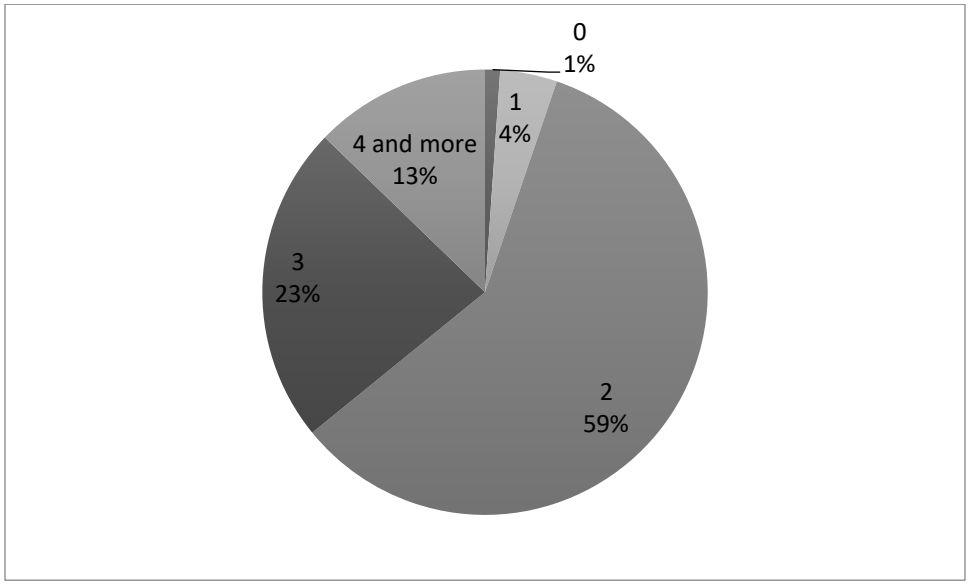
In conclusion, our study uses data from the first nationally representative panel survey in India, and examines factors that impact regional differences in fertility preferences, and on the ability to crystallize these preferences. Results highlight that while socio-economic traits of individuals and their households' account for a significant portion of regional differentials in fertility preferences, they account for a much smaller proportion of differentials in unintended births across regions. Our study implies that unobserved factors such as cultural norms, social structure, and particularly the quality of regional healthcare systems could play a much bigger part in explaining differences in unintended births compared to fertility preferences.

Figure 1. State-wise Total Fertility Rates (TFR) (15-49) using NFHS- III 2005-06



Source: Published report of National Family Health Survey (NFHS).

Figure 2. Distribution of ideal family size in 2005 (weighted)



Sample size, n=19,132, using IHDS-1 data

Table 1. Contextual Characteristics of the Key State Groups (in 2005)

State	Per Capita Income(in Rs) (1)	Doctor Delivery for last birth (%) (2)	Household Access to Flush Toilets (%) (3)	Household Access to any Electricity (%) (4)	No. of Assets Owned (5)	Male Literacy (%) (6)	Female Literacy (%) (7)
All India	5,999	42	23	72	11	81	60
Jammu and Kashmir	8,699	66	22	98	12	75	52
Himachal Pradesh	9,942	37	28	98	14	95	81
Uttarakhand	6,857	20	39	80	13	88	70
Punjab	9,125	47	43	97	18	85	72
Haryana	9,443	36	18	94	16	83	57
Delhi	15,000	62	64	99	19	92	78
Uttar Pradesh	4,300	15	13	45	10	76	48
Bihar	3,530	29	5	35	7	71	39
Jharkhand	4,833	33	13	61	9	78	51
Rajasthan	6,260	25	22	64	11	75	38
Chhattisgarh	5,306	21	7	68	8	76	50
Madhya Pradesh	4,125	16	24	76	9	78	49
Northeast	13,352	66	20	87	12	92	86
Assam	6,000	24	81	70	10	85	77
West Bengal	6,250	40	23	53	10	77	65
Orissa	3,450	36	5	43	8	81	60
Gujarat	6,300	57	40	88	14	86	63
Maharashtra & Goa	7,975	68	18	87	13	91	76

Andhra Pradesh	6,241	82	21	89	12	70	49
Karnataka	5,964	57	20	91	11	82	65
Kerala	9,987	98	67	90	16	98	97
Tamil Nadu	7,000	79	38	90	13	86	70

Source: IHDS 2005.

Table 2. Distribution of state-wise ideal family size in 2005# (weighted)

State	0	1	2	3	4+	Missing
All India	1.04	3.9	55.53	21.84	12.01	5.68
Jammu and Kashmir	2.31	1.36	37.7	35.32	13.16	10.14
Himachal Pradesh	0.92	15.39	76.68	4.75	1.29	0.97
Uttarakhand	0	3.58	53.35	25.55	15.16	2.36
Punjab	12.43	4.54	61.07	15.03	4.21	2.72
Haryana	0.73	1.85	61.61	23.49	1.66	10.65
Delhi	0.41	0.38	71.17	17.43	6.49	4.12
Uttar Pradesh	1.23	1.56	33.92	35.42	21.57	6.29
Bihar	0	2.79	22.05	35.93	36.29	2.93
Jharkhand	0	1.35	43.53	35.1	17.07	2.94
Rajasthan	0.39	1.91	61.99	22.51	6.7	6.51
Chhattisgarh	0	0.55	53.03	32.68	8.38	5.36
Madhya Pradesh	0.06	0.96	57.99	20.88	16.85	3.25
Northeast	1.43	9.65	42.37	9.11	22.66	14.78
Assam	2.22	0.61	39.65	26.22	11.59	19.71
West Bengal	0.63	11.59	68.54	9.35	3.61	6.28
Orissa	0	4.71	62.2	21.01	8.2	3.88
Gujarat	0.24	4.27	72.22	14.97	0.77	7.54
Maharashtra & Goa	0.52	2.59	61.5	17.44	10.62	7.33
Andhra Pradesh	1.71	4.03	65.35	19.71	4.87	4.34
Karnataka	3.61	3.68	67.15	10.11	8.79	6.66
Kerala	0.29	3.48	71.26	14.1	4.65	6.21
Tamil Nadu	0.5	8.98	75.75	8.32	3.68	2.77

#Indicates proportion with ideal family size 0,1,2,3,4 and more, across States.
n=20,464

Table 3. Ideal family size in 2005 and Unintended Births between 2005 and 2012*

State	Average Ideal Family size (1)	Percentage women who have atleast one unintended birth between 2005 and 2012+ (2)	TFR 2005-06 (3)
All India	2.45	17.56	2.7
EAG States	2.74	25.42	3.1
Non-EAG States	2.21	11.7	2.4
Jammu and Kashmir	2.64	14.8	2.4
Himachal Pradesh	1.9	23.33	1.9
Uttarakhand	2.57	36.61	2.6
Punjab	1.95	15.39	2
Haryana	2.26	22.97	2.7
Delhi	2.31	29.28	2.1
Uttar Pradesh	2.85	23.99	3.8
Bihar	3.18	33.51	4
Jharkhand	2.74	25.42	3.3
Rajasthan	2.37	23.98	3.2
Chhattisgarh	2.54	20.74	2.6
Madhya Pradesh	2.57	23.03	3.1
Northeast	2.67	15.05	3.1
Assam	2.57	13.78	2.4
West Bengal	2.04	14.76	2.3
Orissa	2.34	17.66	2.4
Gujarat	2.13	23.38	2.4
Maharashtra & Goa	2.39	10.74	2
Andhra Pradesh	2.24	8.57	1.8
Karnataka	2.2	9.73	2.1
Kerala	2.22	3.75	1.9
Tamil Nadu	2.06	4.5	1.8
Sample Size	19,132	13,128	

* Calculations for columns (1) and (2) based on data for ever-married women aged 18-40 from IHDS 2005, and 2012. TFRs reported in column (3) come from National Family Health Survey III, 2005-06 report for women aged 15-49. Average TFR for EAG and non-EAG States based on State-groups used from NFHS.
+ Limited to those who had children less than or equal to ideal family size in 2005.

Table 4. Distribution of indicators of Fertility intentions and behavior by key independent variables (%)

	Ideal Family size in 2005 (1)	Has an unintended birth between 2005 and 2012+ (2)
Education in 2005		
Illiterate	2.69	20.95
Pre Primary	2.45	16.61
Primary	2.27	17.41
Secondary	2.1	10.83
High Secondary	2.07	11.21
College	1.92	8.96
Asset Quintile		
Poorest	2.82	24.22
Second Quintile	2.66	21.72
Third Quintile	2.4	17.8
Fourth Quintile	2.25	13.57
Richest	2.1	10.91
Area of Residence		
Metro Cities	2.07	10.81
Other Urban	2.25	14.22
More Developed Villages	2.4	14.52
Less Developed Village	2.63	22.7
Number of decisions in the household where the woman has the most say		
0	2.48	18.84
1	2.45	17.28
2	2.28	12.69
3	2.38	15.17
4	2.33	8
Number of Social Networks in the Formal Sector		
0	2.47	18.67
1	2.47	16.26
2	2.47	18.7
3	2.34	15.09
Score on Exposure to Mass media		
0	2.73	23.95

1	2.45	16.95
2	2.34	16.42
3	2.17	11.12
Any ANC during the last birth#		
Yes	2.35	23.89
No	3.04	39.11
Postnatal Checkup during last birth#		
No Postnatal check-up	2.66	29.83
First check-up after 24 hours of birth	2.26	21.92
First check-up within 24 hours of birth	2.29	23.93

Limited to those who have a birth between Jan 2000-interview date in 2005
+ Limited to those who had children less than, or equal to ideal family size in 2005.

Table 5. Beta coefficients from hierarchical linear regression examining women's ideal number of children in 2005

	Model 1	Model 2	Model 3
Education (Reference group: Illiterate)			
Incomplete primary		-0.037	-0.030
		(0.0341)	(0.0341)
Primary		-0.124***	-0.113***
		(0.0226)	(0.0226)
Secondary		-0.162***	-0.149***
		(0.0347)	(0.0347)
Higher secondary		-0.135**	-0.119**
		(0.0440)	(0.0440)
College and higher		-0.179***	-0.166***
		(0.0498)	(0.0498)
Asset Quintile(Reference group:Poorest)			
Second quintile		-0.110***	-0.103***
		(0.0268)	(0.0268)
Third quintile		-0.186***	-0.172***
		(0.0293)	(0.0293)
Fourth quintile		-0.241***	-0.222***
		(0.0343)	(0.0344)
Richest		-0.231***	-0.208***
		(0.0416)	(0.0417)
Area of Residence(Reference group:Metro Cities)			
Other Urban		0.019	0.029
		(0.0470)	(0.0469)
More Developed Villages		0.059	0.064
		(0.0475)	(0.0474)
Less Developed Village		0.134**	0.135**
		(0.0481)	(0.0480)
Religion(Reference group:Hindu)			
Muslim		0.353***	0.356***
		(0.0274)	(0.0274)
Other Religion		0.114**	0.120**
		(0.0395)	(0.0395)
Caste Group(Reference group: Forward Caste Groups)			
Scheduled Castes (SC)		0.036	0.036
		(0.0260)	(0.0260)
Scheduled Tribes (ST)		0.253***	0.241***
		(0.0368)	(0.0368)
Other Backward Classes (OBC)		0.067**	0.065**
		(0.0223)	(0.0222)
Number of living children		0.218***	0.213***
		(0.0102)	(0.0102)
Age Category(Reference group: 18-20)			
21-25		-0.084*	-0.083*
		(0.0328)	(0.0328)
26-30		-0.122***	-0.120***
		(0.0363)	(0.0363)
31-36		-0.045	-0.044

		(0.0383)	(0.0382)
36-40		0.021	0.016
		(0.0476)	(0.0476)
Number of household decisions where the woman has most say (Reference Group: no decisions)			
1		-0.046*	-0.045*
		(0.0204)	(0.0203)
2		-0.092**	-0.090**
		(0.0324)	(0.0324)
3		-0.094	-0.090
		(0.0600)	(0.0599)
4		-0.045	-0.027
		(0.0617)	(0.0617)
Number of formal social networks(Reference Group: no connection)			
1		0.033	0.035
		(0.0221)	(0.0221)
2		0.005	0.005
		(0.0252)	(0.0252)
3		-0.077**	-0.076**
		(0.0272)	(0.0272)
Exposure of women in to household to mass media (Reference Group: no exposure)			
1		-0.002	0.002
		(0.0234)	(0.0233)
2		-0.013	-0.009
		(0.0265)	(0.0265)
3		0.004	0.009
		(0.0353)	(0.0353)
Any antenatal check-up			-0.111***
			(0.0236)
Postnatal Checkup (Reference Group: No post natal checkup)			
First check-up after 24 hours of birth			-0.028
			(0.0221)
First check-up within 24 hours of birth			-0.075**
			(0.0267)
Constant	2.411***	2.047***	2.136***
	(0.0694)	(0.0807)	(0.0814)
Random effects Parameters			
Constant (level 2 State of Residence))	-1.137***	-1.485***	-1.517***
	(0.1540)	(0.1572)	(0.1580)
Constant (residual)	-0.191***	-0.297***	-0.299***
	(0.0077)	(0.0077)	(0.0077)
ICC	0.131	0.085	0.08
Observations	8,348	8,348	8,348
Number of State Groups	22	22	22

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Table 6. Beta coefficients from hierarchical logistic regression examining likelihoods of a woman having at least one unwanted birth++

	Model 1	Model 2	Model 3
Education (Reference group: Illiterate)			
Incomplete primary		-0.124	-0.117
		(0.1303)	(0.1304)
Primary		-0.127	-0.109
		(0.0844)	(0.0848)
Secondary		-0.171	-0.158
		(0.1327)	(0.1331)
Higher secondary		-0.258	-0.239
		(0.1731)	(0.1737)
College and higher		-0.465*	-0.448*
		(0.2085)	(0.2089)
Asset Quintile(Reference group:Poorest)			
Second quintile		-0.074	-0.066
		(0.0999)	(0.1001)
Third quintile		-0.199+	-0.186+
		(0.1109)	(0.1117)
Fourth quintile		-0.376**	-0.354**
		(0.1321)	(0.1331)
Richest		-0.576***	-0.554***
		(0.1637)	(0.1648)
Area of Residence(Reference group:Metro Cities)			
Other Urban		-0.152	-0.138
		(0.1956)	(0.1958)
More Developed Villages		-0.343+	-0.335+
		(0.1969)	(0.1970)
Less Developed Village		-0.239	-0.235
		(0.1981)	(0.1982)
Religion(Reference group:Hindu)			
Muslim		0.676***	0.682***
		(0.1044)	(0.1045)
Other Religion		0.127	0.130
		(0.1504)	(0.1503)
Caste Group(Reference group: Forward Caste Groups)			
Scheduled Castes (SC)		0.371***	0.370***
		(0.0990)	(0.0991)
Scheduled Tribes (ST)		0.309*	0.297*
		(0.1387)	(0.1391)
Other Backward Classes (OBC)		-0.008	-0.012
		(0.0873)	(0.0874)
Number of living children		0.090*	0.083+
		(0.0436)	(0.0439)

Age Category(Reference group: 18-20)			
21-25		-0.040	-0.037
		(0.1029)	(0.1030)
26-30		-0.339**	-0.334**
		(0.1215)	(0.1216)
31-36		-0.794***	-0.795***
		(0.1373)	(0.1375)
36-40		-1.180***	-1.188***
		(0.2310)	(0.2313)
Number of household decisions where the woman has most say (Reference Group: no decisions)			
1		-0.056	-0.050
		(0.0791)	(0.0792)
2		-0.325*	-0.315*
		(0.1387)	(0.1388)
3		0.015	0.019
		(0.2423)	(0.2429)
4		-0.011	0.018
		(0.2606)	(0.2609)
Number of formal social networks(Reference Group: no connection)			
1		-0.198*	-0.196*
		(0.0872)	(0.0873)
2		0.041	0.050
		(0.0977)	(0.0978)
3		0.075	0.089
		(0.1055)	(0.1058)
Exposure of women in to household to mass media (Reference Group: no exposure)			
1		0.015	0.020
		(0.0879)	(0.0880)
2		-0.004	0.002
		(0.0998)	(0.1000)
3		-0.057	-0.053
		(0.1389)	(0.1390)
Any antenatal check-up			-0.206*
			(0.0884)
Postnatal Checkup (Reference Group: No post natal checkup)			
First check-up after 24 hours of birth			-0.030
			(0.0868)
First check-up within 24 hours of birth			0.109
			(0.1024)
Constant	-1.155***	-0.613*	-0.481+
	(0.1354)	(0.2789)	(0.2851)
Random effects Parameters			
Var(_Constant (level 2 State of Residence))	0.369**	0.345**	0.332**
	(0.1258)	(0.1216)	(0.1187)

ICC	0.101	0.095	0.092
Observations	5,903	5,903	5,903
Number of State Groups	22	22	22

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

++ Limited to those who had children less than or equal to ideal family size in 2005, and those who had at least one birth between Jan 2000 and interview date in 2005. The dependent variable measure whether these women exceed their ideal family size in 2005, and go on to have at least one unwanted birth between 2005 and 2012.

Appendix Tables

Appendix Table 1: Weighted summary statistics for analytical sample of women in India aged 18–40 in 2005

	N	Percentage/Mean (Standard Deviation)
Indicators of fertility desires and unintended births		
Ideal number of children desired in 2005	19,132	2.448(0.881)
Percentage women who had unintended births between 2005 and 2012+	13,128	17.56
Independent Variables		
Score on Exposure to Mass media		
0	19,132	24.67
1	19,132	32.21
2	19,132	29.39
3	19,132	13.73
Number of formal social networks		
0	19,132	45.15
1	19,132	21.81
2	19,132	16.69
3	19,132	16.35
Number of household decisions (except cooking) where the woman has most say		
0	19,132	64.12
1	19,132	22
2	19,132	8.12
3	19,132	2.26
4	19,132	3.49
Postnatal Checkup		
None	8,453	67.05
First check-up after 24 hours of birth	8,453	20.46
First check-up within 24 hours of birth	8,453	12.49
Any antenatal check-up	8,408	74.59
Asset Quintile		
Poorest	19,132	18.20
Second quintile	19,132	20.10
Third quintile	19,132	24.29

Fourth quintile	19,132	21.05
Richest	19,132	16.26
Number of living children in 2005	19,132	2.3(1.196)
Area of residence	19,132	
Metro Urban	19,132	5.48
Other Urban	19,132	17.91
More Developed Villages	19,132	35.87
Less Developed Villages	19,132	40.73
Religion		
Hindu	19,132	83.73
Muslim	19,132	11.23
Other Religion	19,132	5.04
Caste Group		
Forward Castes (FC)	19,132	26.80
Scheduled Castes (SC)	19,132	23.10
Scheduled Tribes (ST)	19,132	7.17
Other Backward Classes (OBC)	19,132	42.93
Age Category		
18-20	19,132	8.31
21-25	19,132	21.87
26-30	19,132	16.16
31-36	19,132	31.03
36-40	19,132	22.63
Education		
Illiterate	19,132	47.85
Incomplete primary	19,132	7.73
Primary	19,132	28.67
Secondary	19,132	8.54
Higher secondary	19,132	4.04
College and higher	19,132	3.17

+ Limited to those who had children less than or equal to ideal family size in 2005.

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Chapter 4: Determinants of Unmet Need for Contraception and its Impact on Subsequent Unintended Births in the Indian Context

Abstract

India is the second most populous country in the world, and is set to become the most populous country by 2027 (United Nations Population Division 2019). There are limited longitudinal studies examining the unmet need of contraception for limiting births, and the consequent unintended births in this context. Using longitudinal data from the India Human Development Survey, for 13,170 currently married, non-pregnant, fertile, women aged 18-40 in 2005, who along-with their husbands did not want any more children, this study examines differences in unmet need for contraception, for limiting births, amongst different groups of women across 496 rural and urban districts. Thereafter, the impact of unmet need for contraception on subsequent unintended births between 2005 and 2012 is examined using multi-level logistic regression. Women who have a living son, belong to richer families where women have greater exposure to mass media, and reside in areas where a higher percentage of women avail of antenatal care, are less likely to have an unmet need for contraception. For a unit increase in the proportion of women in the district availing antenatal care, there is a 92% decrease in the odds of having an unmet need for contraception, after controlling for all other factors. Women with unmet need for contraception in 2005 are more than twice as likely as those with no unmet need to have an unintended birth between 2005 and 2012, after controlling for women's individual, household and contextual characteristics. The study indicates the need to make family planning information, and services available in Empowered Action Group (EAG) States, especially to those belonging to socio-economically weaker families.

Introduction

Fertility intentions are important but imperfect predictors of contraceptive usage and fertility behavior (England et al., 2016; Hayford and Agadjanian, 2012; Moreau et al., 2013; Schoen et al., 1999; Yoo, Guzzo, and Hayford, 2014; Edin and Kefalas, 2005), this is particularly true given that between 2010-14, 44% pregnancies, and 23% births across the world were unintended (Bearak et al. 2018). Unmet need for contraception refers to the gap between a woman's fertility intention and her contraceptive behavior. It is a better measure of the extent to which women can attain their fertility goals using effective modern methods of contraception, compared to measures such as the modern contraceptive prevalence rate, or demand for contraception (Bongaarts and Hardee, 2017). Inconsistency in fertility intention and contraceptive use occurs because: (a) motivation for having an additional child may have been over- or under-estimated due to measurement problems, (b) socio-economic, and demographic factors specific to women, and c) lack of access to Family Planning Clinics and high quality services.

In order to meet targets of the millennium development goals (MDG) and the sustainable development goals (SDG) of providing universal access to reproductive and sexual health, family planning programs help women and men attain their preferred targets by giving them access to and knowledge about effective contraception (Cleland et al., 2006; Bongaarts and Hardee, 2017). Even though there have been initiatives to improve and raise access to modern contaception in low and middle income countries, in 2015 less than half of the demand for family planning in these countries was met by modern methods; as a consequence there were around 191 million women with unmet need for modern contraception in these countries (Alkema et al., 2013; United Nations

2015; Metheny and Stephnson, 2017). Unmet need for modern contraception would lead to unintended births, and about 73 million unintended pregnancies occur in the developing world (Sedgh et al., 2014). Unintended pregnancies have adverse impact on the health and well-being of women and families. Rise in use of modern contraception methods has shown to be associated with a decline in unintended pregnancy (Singh et al., 2009; Liu et al., 2008). Fulfilling unmet need could reduce pregnancy related deaths by up to 30% (Cleland et al., 2012). It is estimated that about 86,366 maternal deaths in India could be avoided by using family planning methods (Ahmed et al., 2012).

India has one of the oldest and longest running family planning (FP) programs. In order to enhance delivery in this context, maternal and child health (MCH) and FP were combined through the National Population Policy-2000, the National Health Policy-2002, the Reproductive and Child-Health Program (Phase-I-1997-2004, Phase-II-2005-10) and the National Rural Health Mission (2005-2012) (MoHFW, 1997; MoHFW, 2000; MoHFW, 2002; MoHFW, 2005; Yadav and Dhillon, 2015). However, despite this, about 50 per cent of estimated 48.1 million pregnancies in India in 2015 were unwanted or mistimed (Singh et al. 2018). Much of this is attributable to relatively low levels of contraceptive use, which produces both unmet need and unintended births (Yadav and Dhillon, 2015; International Institute for Population Sciences, Macro International,2007). A recent review by Cleland et al. 2020, is the first to combine evidence from 28 longitudinal studies in the context of low- and middle income countries in Asia and Africa, on the associations between a woman's desire to stop or continue child-bearing, and subsequent fertility. While they didn't find a consistent relationship between a woman's intention to delay having a birth and subsequent fertility; they find that a

woman's intention to stop, or continue having children is predictive of subsequent fertility. Moreover the desire to stop childbearing was seen to translate into subsequent fertility when there was an increase in contraception use in the population. The role of unmet need in translating into subsequent unintended fertility are best observed through panel studies (Jain and Winfrey, 2017). Relatively few panel studies across contexts that have examined this relationship (Westoff and Bankole 1998; Jain 1999; Casterline, El-Zanaty, and El-Zeini 2003; Roy et al. 2008; Kodzi, Casterline, and Aglobitse 2010; Jain et al. 2014). Longitudinal studies that examine the fertility intentions and subsequent behavior are limited in number in the Indian context (Roy et al. 2008, Koenig et al. 2006, Vlassoff, 1990, 2012; Speizer et al., 2013; MacQuarrie et al. 2011). Past studies in the Indian context have used data from a few cities in a single state or are limited to rural regions: in a single district or in four states. The present study, is the first in the Indian context to use nationally representative data, and apply multilevel models, to examine which groups of women are most likely to not use any form of contraception when they intend to stop childbearing; and subsequently how that translates into having an unintended birth. Using nationwide data allows us to examine the variation in relationships of interest across different institutional and cultural contexts.

This chapter adds to the existing literature on fertility intentions, unmet need for contraception, and subsequent unintended births, using data from the first nationally representative panel data from India Human Development Survey (IHDS). Specifically, we examine the association between women's socio-economic characteristics, exposure of women in the household to mass media, exposure of women residing in the district to the MCH system, and the unmet need for contraception. Thereafter, we examine how

women's unmet need for contraception in 2005 affects whether they have at least one unintended birth between 2005 and 2012.

Theoretical Framework on contraception use

Contraception use is a combination of the interaction between the demand, supply and the limitations in obtaining contraceptives (Simmons 1992). Demand and supply of children is impacted by several socio-economic, cultural and ideational factors and acted upon by couples through 'rational' decisions made on contraception usage (Coale 1973; Ahmed and Mosley, 2002).

a) Cost of limiting births

The motivation of a couple to stop childbearing and thus use contraception (given the number of children they have) is linked to the prospective costs associated with stopping childbearing. These costs would include economic costs (e.g. cost of obtaining knowledge about and access to effective contraceptive methods), opportunity cost (e.g. time lost by women with high level of education in having an additional child rather than getting work for pay), and psychological costs (e.g. stress experienced due to violating societal beliefs on contraception use) (Bulatao and Lee, 1983; Easterlin and Crimmins, 1985). Thus couples who have at least the number of children they desire will use a method of contraception to stop childbearing if its' costs doesn't outweigh their motivations (Barber and Axinn, 2004).

An increase in women's education can cause a decline in the demand for children because increased levels of education increase the wage that a woman can obtain in the job market. This increases the value of a woman's time and thus the opportunity cost associated with a child (Cochrane, 1979; Jejeebhoy, 1995; Murthi et al 1995). For women

who do not want more children, fertility behavior is often seen to be more consistent with reported fertility intentions for those with higher levels of education compared to those with lower levels of education (De Silva 1991; Foreit and Suh 1980; Freedman et al. 1975; Hermalin et al. 1979). This may be because education increases women's contraceptive knowledge and access.

In the South and South-East Asian context it is important to take into account son-preference while studying fertility intentions and behavior (Hermalin et al., 1979; Foreit and Suh, 1980; Vlassoff, 1990; De Silva, 1991; Islam & Bairagi, 2003; Roy et al ., 2008; Vlassoff, 2012). Couples who do not have a son are more likely to have additional children (Clark, 2000; Dharmalingam et al., 2014). This would be due to the psychological costs associated with not having a son in a context where having a son is seen as essential.

b) Role of Mass Media:

Exposure to mass media is a means of social learning, and boosts contraception use (Etana and Gurmu, 2018; Barber and Axinn, 2004; Westoff and Koffman, 2011; Goni and Rahman, 2012; McNay et al., 2003). This can happen through a) transmission of family planning messages that enhance women's knowledge about and use of specific methods; and b) acting as a means for having greater exposure to modern norms (for e.g. showing the value of smaller family size) to women who are exposed to various forms of mass media (McNay et al., 2003; Mwaikambo et al., 2011; Etana and Gurmu, 2018). Studies in the context of less developed countries in Asia and Africa have shown that exposure to mass media is associated with using contraceptives (for example, Westoff and Bankole, 1997; 1999; Olaleye and Bankole, 1994; Goni and Rahman, 2012; Barber

and Axinn, 2004; Etana and Gurmu, 2018); and decreasing fertility (for example Jensen and Oster, 2009 in India; Barber and Axinn, 2004 in Nepal; Bankole et al., 1996 in Nigeria; and Westoff and Rodriguez, 1995 in Kenya).

c) **Availability of Family Planning Services**

In case of women who do not want any more children, the proximate cause of not fulfilling their intention would be being sexually active without using proper contraceptives. The other more distant determinants would be more complicated. Often women may not be using contraceptives because of lack of awareness of modern family planning practices, difficulty in access of contraceptives or due to worries about side effects of using contraceptives. Also, force from immediate family, extended family and society can influence women to deviate from their intentions and have more children even if they do not want more (Hayford and Agadjanian, 2012).

Family planning programs in a large number of countries occurred after mortality rates reduced and other dimensions of development caused declines in fertility preferences, which led to a possible demand for contraceptives amongst people; thus making fertility an important aspect of policy planning. The first task of family planning programs was not to reduce fertility preferences but to make contraceptives accessible in order to address the issue of unmet demand. Once these programs started their main objective was to bring about a rise in the usage of contraceptives and bring about declines in fertility (Freedman, 1997).

The Matlab experimental study in Bangladesh looked at the impact of family planning interventions on fertility preferences. Koenig et al., (1987) found that reduction in fertility preferences in intervention areas and control areas were not very different.

However in the regions where the intervention took place there was a rise in the usage of contraceptives and fertility reduced. This finding was supported by many qualitative studies (e.g. Simmons et al., 1988; Simmons, 1996). A number of studies, for e.g. Phillips et al., (1996) (who replicated the Matlab results with improved and comparable surveys on fertility preferences), Arends-Kuenning et al., (1999) and Bongaarts (1995) (who conducted a cross-national multivariate analysis) find that family planning programs crystallize latent demand or change indeterminate aspiration about not wanting to have more children to a definitive demand for contraceptives. However, other studies have found that family planning programs impact demand, even before demand is created by other means (Cochrane and Guilkey, 1995; Guilkey and Jayne, 1997).

Sample and Methods

The main aim of this study is to get a better understanding of unmet need for contraception for different groups of women residing in different districts of India, and how addressing this unmet need for contraception can help women avoid having unintended births. Fertility rates differ across regions in India, a group of northern states - Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttarakhand, and Uttar Pradesh—have higher fertility rates, and accounted for 46% of India's population in 2011, and 53% of the growth, and are referred to as the Empowered Action Group (EAG) States (Registrar General India 2011). Different Government health and family planning programs are directed towards these states. Southern States in contrast comprised of 21% of India's total population in 2011 but contributed to just 15% of the national population growth from 2001 onwards. Past studies find that women residing in this region have lower likelihoods of using maternal healthcare services, (such as adequate antenatal care

checkups) (International Institute for Population Sciences Macro International 2007; P. K. Singh et al. 2012; L. Singh et al. 2012; Chatterjee and Sennott 2020).

Numerous studies in the past have concentrated on individual, and household level variables while studying the unmet need for contraception, and were guided by theories of health behavior, like the health belief model (Becker 1974; Green and Murphy 2014) and the theory of reasoned action (Fishbein 1979). More recent studies have highlighted the importance of focusing on contextual factors such as: quality of reproductive health services, and community level beliefs while studying unmet need for contraception (Stephenson et al. 2007, Stephenson and Tsui 2002, Stephenson and Tsui 2003, Stephenson et al. 2008, de Oliveira & Dias, 2014, Metheny & Stephenson 2017, Mutumba et al. 2018, Solanke et al. 2019). Metheny and Stephenson (2017) emphasize the relevance of social ecological theories (Bronfenbrenner 1979; Heise 1998; McLaren and Hawe 2005) in giving a more inclusive framework for understanding the hierarchies of the effect on unmet need, by highlighting the interaction between individuals, and the communities they reside in (Bronfenbrenner, 1979, 2004). For example, greater community level exposure to health related knowledge could help change norms in the community about high fertility, and skepticism towards using contraceptives, and could lead to declines in unmet need (Wakefield, Loken, and Hornik 2010; Cleland, Ndugwa, and Zulu 2011, Metheny and Stephenson, 2017).

In the present study therefore we consider the differences in unmet need for contraception by a woman's i) individual characteristics (her education and whether she has a living son), ii) household level characteristics (income quintile and exposure of the

women to mass media) and, iii) district level characteristics (percentage women in the district who avail antenatal care during their last pregnancy).

We use a basic measure of unmet need for contraception that has been widely used in the literature (for e.g. Bongaarts and Bruce 1995, Bradley et al. 2012, Sedgh and Hussain 2014). Women who do not want any more children in 2005, but do not use any contraception are seen as having unmet need. Women were asked:

'How many children do you want in addition to the number of children you have?'

This measure of fertility preference is not affected by ex-post rationalization and measurement error. Women do not always prefer giving specific answers on the question on ideal number of children that they want. They often answer "up to God", in which case all births they have, are accounted for as wanted (e.g. refer Bonagaarts 1990, 2011).†† Retrospective measures are subject to ex-post rationalization, i.e. women would adjust the number of children they want to be nearer the actual number of children they have had. This would cause an overestimation of wanted fertility (for e.g. Bongaarts, 1990,2011; Bhushan and Hill, 1995; Lightbourne, 1985; Westoff, 1991). In the present study we use prospective measures, which are not subject to ex-post rationalization. We also use a stronger definition of 'want no more children', since we account for both husbands and wife's fertility preference and only use data for women who have had, at least one child.

The data used in this chapter are from the India Human Development Survey

†† The present data set also has questions on the ideal number of children a woman wants and we do not use it in order to avoid this measurement error.

(IHDS) 2005 and 2012. The present analysis examines the determinants of unmet need for contraception. It begins with currently married women aged 18-40 in 2005, who were not pregnant in 2005, and who reported that they did not desire any more children in 2005. Women with no children were dropped from the analysis, since women with no children, who claim that they do not want any more children, would be outliers in the Indian context and, should be analyzed separately. Further, women, who were not fertile in 2005 were excluded from the study. Many studies find temporary modern methods to be more effective as compared to traditional methods (Cleland et al., 2014; Basu, 2005; Erfani and Yuksel-Kaptanoglu, 2012; Singh and Darroch, 2012 etc.), however some other studies argue that traditional methods are also a preferred and effective form contraception (Fisher and Szreter, 2003; Gribaldo et al., 2009; DeGraff and Siddhisena, 2015). In the Indian context, although about 50% married women use modern contraceptives, and sterilization is the most common method of contraception (used by about 36% married women aged 15-49) (International Institute for Population Sciences and ICF 2017); in many states, traditional methods for birth spacing are preferred over modern methods (Pathak et al. 1998; Ram et al. 2014). In the present study, we define both modern, and traditional method users as having no unmet need for contraception.

Because of sampling design of the IHDS, for the contextual analysis, we cannot have a good estimate for the whole district, but we get estimates separately, for rural and urban parts of districts. Thus we treat rural and urban areas of the districts as separate districts. The sample in our analyses consists of 13,170 women across 496 districts.

Variables

Outcome Variables: We focus on two key outcome variables in this study.

a) Unmet need for contraception in 2005:

We try to understand the role of unmet need for contraception in shaping the disjunction between fertility preferences, and behavior. In the present study we examine reasons why women do not use any contraception despite wanting to stop childbearing, and we refer to women who do not want any more children but who do not use any method as having an unmet need for contraception (for e.g. refer to Sedgh et al. 2016). We construct a binary variable that takes a value of 1 if the woman has an unmet need for contraception in 2005, and takes a value of zero otherwise.

b) Unintended Births between 2005 and 2012:

If a woman had one or more births between 2005 and 2012, after expressing their desire not to have an additional child in 2005, then the dependent variable takes a value of one; otherwise the variable takes a value of zero.

Independent variables: The key independent variables are listed below.

a) Socio-economic and cultural factors:

i) Women's Education**:** This variable is classified into six categories namely; illiterate, pre-primary, primary and post-primary, secondary and post-secondary, high secondary and some college and, college graduate, thereafter, we construct dummy variables for each of the categories and take illiterate as the reference group.

ii) Household Asset Quintile: This variable specifies the asset quintile to which the woman's family belongs. There are 5 quintiles and, we take the poorest as the omitted category.

iii) Living son: This is measured by looking at whether women have a son who is alive. This is a binary variable that takes a value of 1, if the woman has a son who is alive in

2005 and takes a value of 0 otherwise.

b) Exposure of women in the household to mass media in 2005:

The IHDS administers questions on 'exposure of the women in the household to mass media: radio, television and newspaper' and for each of these three sub-questions, there are three responses namely: 'never, sometimes, regularly'. For each form of mass media (television, radio and newspaper), we construct two categories: no exposure and at least some exposure (this includes the responses: sometimes and regularly). An index for exposure to mass media is created, by adding the recoded responses for these questions. This index takes values between 0 (no exposure to any form of mass media by women of the household) to 3 (at least some exposure to all three forms of mass media by women of the household). Dummy variables are created for each of these categories. Since media exposure, particularly television watching, is shared by women in the household, we assume that a response to the general question about media exposure for women also applies to the index woman.

c) Availability of contraception in 2005:

According to the Indian health system, one government provided clinic called sub-centre is available per 5,000 individuals and is staffed by Auxilliary Nurse Midwife (ANM) who is supposed to provide ante-natal care as well as contraception. Thus, in theory, contraception should be widely available. However, there is ample evidence that the availability and quality of antenatal care, delivery care and contraception varies widely across the country (Desai and Wu, 2010). Although, we do not have an accurate measure of contextual availability of contraception, we argue that since the same ANM is supposed to provide antenatal care as well as family planning services, the percentage of

women in the district who get antenatal care during their last pregnancy (post January 2000) provides a good proxy for woman's contact with maternal and child health system (MCH), and availability of contraceptive services. Information regarding family planning is given to women during antenatal care, and the greater the proportion of women obtaining antenatal care in the district, the more likely is it for women residing in that district to have information on and access to contraceptive methods.

In order to construct this variable, we aggregate up data on whether a woman got antenatal checkup during her last pregnancy from IHDS 2005 to the district level. Data on antenatal check-up was collected for ever-married women aged 15-49 in 2005, for all those who had at least one birth between Jan 2000 to the interview date in 2005. Proportion of women who obtained antenatal care in the district was calculated by dividing the total number of women in the district who had a birth between January 2000 and the interview date in 2005, and obtained at least one antenatal checkup; by the total number of women in the district who had a birth between January 2000, and the interview date in 2005. Both sampling design and differences between urban and rural areas in service delivery requires that we get estimates separately for rural and urban parts of a district.

Control Variables

The individual level control variables in the study are measured in 2005. The important control variables used in the study are: age group of the woman, parity, and, caste/religion groups. At the district level control variables are type of district (urban or rural) and state group (EAG versus non-EAG State).

Analyses

Multilevel models takes into account both individual level factors, and the social context (Snijders and Bosker, 2011). These models are better compared to multiple linear regression models in scenarios where data are clustered in some way (Kreft & de Leeuw, 1998; Raudenbush & Bryk, 2002; Snijders & Bosker, 2011; Preacher et al. 2011). These models correct for biases in parameter estimates that occur due to clustering; ignoring multilevel structure could lead to biases in parameter estimates, and in their standard errors (Guo and Zhao, 2000). When observations are clustered into higher-level units, the observations are no more independent, and thus one of the key assumptions of linear, and binary regression models is violated, and these models would underestimate standard errors.

In the present study, the odds of a woman having unmet need for contraception are not independent of each other because women from the same district could have similar exposure to characteristics specific to that district; therefore in the present study we use a two level model using hierarchical linear modeling (HLM) software. HLM takes into account the non-independence of observations within groups.

In the first part of the analysis, we calculate stepwise two-level multivariate logistic regressions adding each of the hypothesized mechanisms to a baseline model that regressed 'unmet need for contraception' on the key independent and control variables. In model 1, we include only the state group (EAG versus non-EAG), and area of residence to show the regional differences in the odds of a woman having an unmet need. In model 2, the district level independent variable - proportion of women in the district availing antenatal care is added. This model would enable us to highlight the role of the quality of

maternal healthcare services in the district in determining differences in unmet need between EAG and non-EAG States. The third model adds the individual level variables for women's own education, asset quintile to which the woman's household belongs, whether the woman has a living son in 2005, the index for exposure of women in the household to mass media and, the individual level control variables on age, parity and caste/religious group to model 2.

For the second part of the analyses, we calculate stepwise logistic regression (single level model) examining whether a woman who previously claimed to not want any more children, has an unintended births between 2005 and 2012. Model 1 examines the impact of unmet need for contraception in 2005 on unintended births between 2005 and 2012. Model 2 adds in the individual level socio-economic and cultural variables, exposure of the women in the household to mass media, district level variable on antenatal care, district level control variables (state group and type of district) and, individual level control variables (age of the woman, parity, caste/religious group).

Results

<Table 1 about here>

Table 1 shows percentage women using contraception in the current sample of 13,170 currently married, non-pregnant, fertile women, aged 18-40, who along with their husbands do not want any more children in 2005. About 31% women in the sample have an unmet need for contraception in 2005; majority women (about 52%) in the sample resort to permanent methods (female or male sterilization; and hysterectomy), 3% use traditional methods (abstinence and withdrawal); and about 15% use other modern methods that include condoms, oral pills, diaphragm/jelly, injectible, and Copper T/IUD.

In EAG States unmet need for contraception in 2005 is higher than national average (about 46% women residing in this region have an unmet need for contraception), in contrast unmet need for contraception amongst women residing in non-EAG States is much lower (less than 20%). While about 66% women in non-EAG States use permanent methods (such as sterilization), only about 32% women residing in EAG states use permanent methods; traditional method usage is slightly higher amongst women residing in non-EAG States, finally other modern methods are used by a greater percentage of women in EAG states (about 20%), compared to non-EAG States (about 11%).

<Table 2 about here>

Table 2 shows the weighted summary statistics of the key dependent, independent and control variables. About 31% women in our sample of 13,170 currently married, non-pregnant women, who had atleast one child, and were aged 18-40 in 2005, had an unmet need for contraception. About 21.35% women in the sample have atleast one unintended birth between 2005 and 2012. The majority of women in the sample were illiterate (about 50%), whereas less than 3% women had a college degree or higher. About 18% women in the sample belong to the poorest families, and about 16% belong to the richest families. About 24% women in the sample belonged to households where women had no exposure to mass media, and only about 14% resided in households where women had exposure to all three forms of mass media. More than 91% of the women in our sample (limited to those who had atleast one child in 2005) had atleast one son alive; and average parity was 2.76 (the highest percentage women in the sample had two children, about 36%, whereas less than 7% had only one child). Most women in the sample belonged to the age group 31-35 (about 38%), followed by the age group 36-40 (about 30%). About

43% of the women in the sample belonged to Other Backward Classes (OBC), 28% belonged to forward castes (FC), 23% to Scheduled Castes (SC) and about 7% to Scheduled Tribes (ST). Majority women in the sample are Hindus (85%), followed by Muslims (10%), and other religions (5%). 41% women resided in EAG States; and on an average about 81% women in the district of residence obtained any antenatal checkup.

<Table 3 about here>

Table 3 shows percentage of women with unmet need for contraception in 2005 by the key independent and control variables. While women who are illiterate have the highest unmet need for contraception (about 37% illiterate women have an unmet need for contraception), percent women with unmet need stays around 24 to 25% even for women with higher education. About 44% women belonging to the poorest households have an unmet need for contraception in 2005, percentage of women with unmet need for contraception usually declines with an increase in household asset quintile. There is little difference in percentage of women with unmet need for contraception between those who have a living son and those who don't, though it is slightly higher amongst the former group. Results from the bivariate table show that some exposure to mass media is associated with lower percentage of unmet need (compared to no exposure); while about 44% of the women with no exposure to mass media have an unmet need for contraception, only about 21% with those with exposure to all three forms of mass media have an unmet need for contraception. There is no clear relationship between parity and unmet need from table 3, except that it is highest amongst those who have only one child (these could be younger women, with a weaker intention to stop childbearing), followed by those who had four or more children (who could probably have low access to

knowledge about, and access to various methods of contraception). Percentage of women with unmet need for contraception is higher in EAG states, rural areas of residence, and amongst women who reside in districts where a lower percentage of women availed any antenatal checkup (ANC) during their last birth.

<Table 4 about here>

Table 4 shows the odds of having an unmet need for contraception in 2005. In order to examine this, we start off by looking at the regional variation in unmet need for contraception between the EAG and the non-EAG States. Model 1 in Table 4 shows that women residing in districts that are parts of the northern EAG States are more than twice as likely as those residing in non-EAG States to have an unmet need for contraception; additionally women residing in urban parts of districts were only 60% as likely as those residing in rural parts to have an unmet need for contraception. In model 2 the district level variable measuring a woman's contact with the MCH system, and as an indicator for access to knowledge about, and availability of contraception is introduced. There is a 93% decrease (OR=0.067) in the odds of having an unmet need for contraception with a unit increase in the proportion of women in the district availing antenatal care. The associations between state group and unmet need lose significance on including the district level variable on the proportion of women availing antenatal care in the district. Accessibility to public sources of healthcare, poor quality of healthcare, and long waiting times are seen to be a major constraint of the healthcare system in EAG States (Kumar and Mishra, 2015; Narang 2011; Kumar and Singh,2016; Powell-Jackson et al. 2013). Difference between EAG, and non-EAG States at the district level is possibly captured through the variable that indicates the quality of MCH facilities in the area of residence;

and hence the variable indicating the state group loses significance. Model 3 adds the individual and household level factors. Adding in these variables reduces the impact of the contextual variable measuring a woman's contact with the MCH system, only slightly, and the variable remains significant. There is a 92% decrease (OR=0.08) in the odds of having an unmet need for contraception, with a unit increase in the proportion of women in the district availing antenatal care, even after we take into account all the individual, and household level variables.

Women belonging to richer households, who had a living son, and who resided in households where women had greater exposure to mass media (compared to no exposure) were less likely to have an unmet need for contraception as hypothesized. More specifically, women belonging to richest households were 39% less likely than those belonging to poorest families to have an unmet need for contraception (OR=0.607); women who have at least one living son were 25% less likely than those who didn't have a living son to have an unmet need for contraception, and women who resided in households where women had exposure to all three forms of mass media (radio, newspaper and television) were about 25% less likely than those who resided in households that had no exposure to mass media to have an unmet need for contraception. Of the other socio-demographic characteristics, women who had more number of children (compared to having one child), were older, belonged to Forward Caste, Hindu families are less likely to have an unmet need for contraception.

Next, we look at the percentage women who have atleast one unintended birth between 2005 and 2012, by type of contraception used. About 40% women, who have an unmet need for contraception in 2005, go on to have atleast one unintended birth between

2005 and 2012. Surprisingly, about 10% women who had used permanent methods (predominantly sterilization) go on to have atleast one unintended birth; though not very likely, women could get pregnant even after obtaining sterilization if they obtain fertility treatments such as tubal ligation reversal surgery, and in vitro fertilization (IVF) in the interim period between 2005 and 2012. However, we think that it may reflect measurement error in Wave 1 response. In contrast, about 14% women using traditional contraceptive methods have an unintended birth between 2005 and 2012, about 24% women using other modern methods (such as oral pills, condoms, IUD etc.) have atleast one unintended birth between 2005 and 2012.

<Table 5 about here>

Table 5 shows the odds of a woman having an unintended birth between 2005 and 2012. Results from model 1 in table 5 (no controls) show that the odds of a woman with an unmet need for contraception in 2005 having at least one unintended birth between 2005 and 2012, is increased by a factor of 3.40 compared to a woman who had no unmet need for contraception in 2005, and this remains significant ($p<.001$), though modestly weaker (OR=2.47) in model 2, where we control for all other independent and control variables. The results show that unmet need remains an important predictor of unintended births, even after controlling for women's education, assets, exposure to media sources; and the district level variables. Women with greater education, a living son, belonging to richer households, with higher exposure to mass media, residing in a non-EAG State, and in regions where a greater proportion of women obtain antenatal checkups during their last birth, are significantly less likely to have an unintended birth, compared to those who are illiterate, do not have a living son, belong to the poorest households with no exposure

to mass media; and reside in EAG states, and regions where women have lesser contact with the MCH system. Looking at other socio-demographic factors, older women, who have more than one child, belong to Forward Caste, and Hindu families are less likely to have unintended births.

In summary, the results show that better quality maternal healthcare services in the district, belonging to richer families, having a son alive, having more children, being older, belonging to Forward Caste, Hindu families is associated with having lower odds of unmet need for contraception in 2005. Further, unmet need at the first wave of the survey is an important predictor of an unwanted birth by the second wave of the interview; after taking into account all other individual/household level, and district level variables; the odds of a woman having an unintended birth between 2005 and 2012 is increased by a factor of 2.47 if the woman has an unmet need for contraception in 2005.

Discussion and Conclusion

The present study is the first in the Indian context that uses data from the first nationally representative panel survey (IHDS), and applies multilevel models to examine the determinants of unmet need for contraception, and how it leads to subsequent unintended births, after taking into account other individual/household, and district level factors. This adds to the existing limited literature on unmet need for contraception, and subsequent fertility behavior in India (Roy et al. 2003; Roy et al, 2008; Vlassoff 1990,2012; Speizer et al 2013; Koenig et al.2006; MacQuarrie & Edmeades 2015). Desire to stop childbearing is seen as a strong predictor of subsequent fertility particularly when contraception is used (review by Cleland et al. 2020). Some key reasons why women could end up having children even after they want to stop

childbearing are: change of intention, pressure from husband or other family members, ineffectiveness of the contraception method used, fear of side effects of using contraception, inadequate knowledge about contraception, failure of sterilization, and death of a child (Mishra et al., 1998; Roy et al., 2003). In the present study, we take into account the spouse's desire to stop childbearing, and also the fact that the women in the sample have atleast one child alive (both signifying stronger desires to stop childbearing).

Our first focus is on the determinants of unmet need for contraception, whereby we try to figure out which sub-groups of women are more likely to have an unmet need for contraception, and why are these groups more likely to have an unmet need for contraception. Thus, one of the first implications of our study is that, it is important to understand why women who do not want any more children, do not use any method of contraception. It could be because they do not have enough information about modern methods, or that they cannot afford them, or that they have a fear about the side effects of modern methods. Future studies should examine the beliefs about side effects, and health impacts of modern contraceptive methods amongst both the users and non-users of traditional contraception in order understand if these women have correct information (DeGraff and Siddhisena, 2015).

Having an unmet need for contraception points to inadequate knowledge about, and access to contraception. The context in which women reside is very important since social capital is an important factor in studying fertility behavior. When individuals communicate regarding new ideas about fertility, family size, gender roles, information on experience regarding, and acceptance towards modern contraceptives, their exposure to available information, and interaction with others impacts their attitudes towards

acceptability of high fertility and birth control (Montgomery and Casterline, 1993,1996; Kohler 2001; Kohler et al. 2001; Buhler and Kohler, 2004). The second implication of our study is that, the quality of local maternal healthcare services has a strong independent impact on unmet need for contraception. A unit increase in the proportion of women in the district availing antenatal care brings about a 92% decrease in the odds of having an unmet need for contraception, further EAG states have worse quality MCH services compared to non-EAG. Women, who reside in areas where women have lower contact with the MCH system, would also be less likely to obtain knowledge about effective contraception. One of the key functions of family planning programs is to reduce the occurrence of unintended fertility by addressing the unmet need for contraception (Roy et al. 2008). The quality of MCH services, and it's ability to address family planning needs differs across regions (Mishra et al. 1998). A part of this can be explained by poor quality healthcare, lack of access to public healthcare facilities, and long waiting lines in EAG States, compared to that in non-EAG states (Kumar and Mishra, 2015; Narang 2011; Kumar and Singh, 2016; Powell-Jackson et al., 2013). There should be a focus on improving the quality of healthcare particularly in the poorest districts. For e.g. in rural areas, a larger number of Accredited Social Health Activist (ASHA) workers should be assigned to each village, if that village is located in a district where a low proportion of women obtain ANC.

Our results suggest that the individual/household level variables that shape the economic cost of limiting child-bearing, exposure of women in the household to mass media, caste group, religion, age and other control variables, explain some of the differences in regional unmet need for contraception, and subsequent unintended fertility.

Even after taking into account all individual level, and measurable contextual level variables, women with an unmet need for contraception are more than twice as likely as those having no unmet need to have at least one unintended birth between 2005 and 2012. This depicts the need to fulfill the unmet need for contraception amongst women in order to deal with the health hazards associated with having an unintended birth. The third key implication of the present study is that MCH workers should specifically focus on women belonging to poorest families, and help them attain adequate knowledge about, and access to contraception. Even though modern contraceptive use in India has increased over time, it stays the lowest among the poor (Singh et al. 2009; Yadav and Dhillon, 2015). Government has put in place several interventions to strengthen community based service delivery in rural areas. For example, under the National Rural Health Mission (NRHM) every village would have an ASHA worker, who would deliver contraceptives at the doorstep and provide counseling on spacing. However, there could be differences in the FP advice women obtain during ANC and PNC visits by the social groups they belong to; for e.g. women belonging to lower socio economic status have lower likelihoods of obtaining FP advice (Singh et al., 2012a; Singh et al., 2012b). Health workers should be trained to give women the same FP advice irrespective of socio-economic status, and the social group to which they belong. Finally, results from the study indicate that exposure of women in the household to mass media, influences fertility behavior (lowers the odds of having an unintended birth) as it impacts both an individual's attitudes, and preferences, and also the decisions to carry out the preferences (Barber and Axinn, 2004); and leads to an increase in available knowledge, and communication on use of contraceptives (decreases the odds of having an unmet need for contraception) and family

planning issues (Hornik and McAnany, 2001). There should be more efforts to make newspapers, television and radio accessible, particularly to the most deprived households across districts.

While this study makes significant contributions to understanding unmet need for contraception in India, and it's impact on unintended births, there are several limitations. Firstly, we examine only the unmet need for limiting births, and not at the unmet need for spacing births. Secondly, our analysis excludes pregnant women, and thus doesn't check if they got pregnant because of unmet need for contraception; this could cause us to underestimate the unmet need for contraception since some of the recent conceptions and births could be a result of unmet need for contraception (Westoff and Ochoa, 1991). Thirdly, it would be good to include more direct institutional measures of MCH capabilities for the districts in addition to those aggregated up from the survey. Fourthly, we have only taken into account women who along with their husbands do not want any more children, however we do not have information on the preference towards using contraception. Finally, we do not focus on contraception discontinuation, and method failure, which is also an important reason behind having unintended births (Jain and Winfrey, 2017).

In summary, our results show that poorer women, who do not have a living son, who reside in households here women have no exposure to mass media; and in districts where a lower proportion of women avail of antenatal checkup up, are more likely to have an unmet need for contraception. Further, women who have an unmet need for contraception in 2005, are about 2.5 times as likely as those with no unmet need for contraception, to have an unintended birth between 2005 and 2012. These results stand in

stark contrast to arguments that suggest that unmet need is an illusory concept and individuals who truly do not want a child will find a way of controlling fertility via modern or traditional contraception (Pritchett, 1994). FP interventions in India are not just strategies to stabilize population, but are also seen as means to bring about declines in maternal and child mortality (MoHFW, 2014). FP advice given during ANC and postnatal care lead to increase in contraception use, but this does not always translate into causing concomitant declines in unmet need for contraception (Yadav and Dhillon, 2015). The National Health Policy, 2017, aims to meet the need for contraception by 90%, at both national and sub-national level by 2025 (MoHFW, 2017). Our study would have implications on how this unmet need for contraception could be reduced, and which are the groups that need to be targeted. The overarching finding of this analysis, unmet need results in unwanted births should not come as a surprise, although a number of studies have argued that with a strong enough desire to avoid an additional birth, individuals will figure out how to do this using either modern or traditional methods (Pritchett, 1994). The results presented in this paper make an important contribution towards understanding the anatomy of unmet need.

Table 1. Percentage women using Contraception in 2005

Type of contraception (% using)	All India	EAG States	Non-EAG States
No method used	30.59	45.85	19.77
Traditional (Withdrawl and Abstinence)	3.03	2.01	3.76
Sterilization (Female sterlization, male sterilization, and hysterectomy)	51.66	31.75	65.78
Other modern Methods (including condoms, oral pills, Diaphragm/Jelly, injectible, and Copper T/IUD)	14.71	20.4	10.68

Sample size: 13,170 ever married, non-pregnant women, aged 18-40, with at least one child, who along with their husbands do not want any more children in 2005

Table 2. Weighted Summary Statistics

	Percentage
Dependent Variables	
Unmet Need for Contraception	30.59%
Unintended Birth	21.35%
Independent Variables:Indidividual/Household level	
Education	
Illiterate	49.58%
Pre-Primary Education	8.32%
Primary and post-primary education	27.83%
Secondary and post-secondary education	8.24%
Higher secondary and pre college education	3.39%
College and more	2.64%
Asset Quintile	
Poorest	17.72%
Asset second qunitile	19.86%
Asset third quintile	24.03%
Asset fourth quintile	22.01%
Richest	16.38%
Son alive	91.31%
Exposure to mass media (no of sources of mass media to which women in the household are exposed to)	
0	24.22%
1	33.17%
2	28.91%
3	13.70%
Parity	
1	6.89%
2	36.08%
3	31.01%
4 and more	26.02%
Age Category	
18-20	1.75%
21-25	14.33%
26-30	16.68%
31-35	37.51%
36-40	29.74%
Caste Group	
Forward caste groups	27.63%
Other Backward Class (OBC)	43.07%
Schedulded Caste (SC)	22.82%

Scheduled Tribe (ST)	6.47%
Religious Group	
Hindu	84.81%
Muslim	10.31%
Other Religion	4.89%
Independent Variables: District level	
Empower Action Group States (EAG)	42 %
Percentage women in the district who got antenatal checkup during last pregnancy	81.00%
Urban	43.00%

Number of Level 1 Units 13,170
Number of Level 2 Units 496

Table 3. Percentage unmet need for contraception in 2005 by selected characteristics

Education	
Illiterate	36.56
Pre-Primary Education	24.57
Primary and post-primary education	24.71
Secondary and post-secondary education	24.45
Higher secondary and pre college education	25.81
College and more	24.69
Asset Quintile	
Poorest	43.78
Asset second qunitile	37.49
Asset third quintile	29.03
Asset fourth quintile	21.03
Richest	23.09
Son alive	
Yes	30.24
No	34.3
Exposure to mass media (no of sources of mass media to which women in the household are exposed to)	
0	44.21
1	26.46
2	28.25
3	21.46
Parity	
One Child	44.46
Two Children	24.68
Three Children	26.64
Four or more Children	39.82
Age Category	
18-20	56.76
21-25	39.53
26-30	26.15
31-35	28.38
36-40	30.02
Caste Group	
Forward caste groups	24.2
Other Backward Class (OBC)	35.07
Schedulded Caste (SC)	30.05
Scheduled Tribe (ST)	29.98
Religious Group	
Hindu	29.32

Muslim	41.96
Other Religion	28.64
Independent Variables: District level	
State Group	
Empower Action Group States (EAG)	45.85
Non-Empower Action Group States non-(EAG)	19.77
Proportion of women in the district who got antenatal checkup during last pregnancy	
High (>=0.8)	18.7
Low(<0.8)	48.28
Area of Residence	
Urban	21.99
Rural	33.26

Table 4. Two level Logistic Regression analysis: Odds of having an unmet need for contraception in 2005

Individual Level Variables	Model 1	Model 2	Model 3
Opportunity Cost: Education (Reference group: Illiterate)			
Pre-Primary Education			1.005
			(0.078)
Primary and post-primary education			0.939
			(0.056)
Secondary and post-secondary education			0.855
			(0.128)
Higher secondary and pre college education			0.880
			(0.126)
College and more			0.881
			(0.170)
Economic Cost: Asset Quintile (Reference Group: Poorest)			
Asset second qunitile			0.793**
			(0.076)
Asset third quintile			0.701***
			(0.088)
Asset fourth quintile			0.570***
			(0.109)
Richest			0.607***
			(0.128)
Psychological Cost: Son alive			0.748***
			(0.075)
Exposure to mass media (Reference:women in the household exposed to no type of mass media)			
1			0.842**
			(0.058)
2			0.846*
			(0.073)
3			0.752*
			(0.129)
Parity (Reference Group: One Child)			
Two Children			0.525***
			(0.132)
Three Children			0.484***
			(0.138)
Four or more Children			0.541***

			(0.140)
Age Category (Reference group: 18-20)			
21-25			0.686
			(0.235)
26-30			0.444***
			(0.231)
31-35			0.460***
			(0.219)
36-40			0.471***
			(0.211)
Caste Group (Reference group: Forward Caste)			
Other Backward Class (OBC)			1.221**
			(0.070)
Schedulded Caste (SC)			1.257**
			(0.084)
Scheduled Tribe (ST)			1.257*
			(0.116)
Religious Group (Reference group: Hindu)			
Muslim			1.710***
			(0.084)
Other Religion			1.248*
			(0.105)
District level variables			
State Group: Empower Action Group States (EAG)	2.291***	1.079	0.979
	(0.211)	(0.236)	(0.204)
Proportion of women in the district who got antenatal checkup during last pregnancy		0.067***	0.08***
		(0.493)	(0.425)
Area of Residence: Urban	0.6**	0.778	0.918
	(0.168)	(0.184)	(0.186)
Intercept	0.424***	4.645***	3.837***
	(0.157)	(0.441)	(0.381)

Number of level 1 units=13,170
Number of level 2 units=496
*** p<0.001, ** p<0.01, * p<0.05
Standard Error in Parentheses

Table 5. Two level Logistic Regression: Odds of having an unintended birth between 2005 and 2012

Individual Level Variables	Model 1	Model 2
Unmet need for contraception in 2005	3.396***	2.466***
	(0.104)	(0.099)
Opportunity Cost: Education (Reference group: Illiterate)		
Pre-Primary Education		1.268+
		(0.138)
Primary and post-primary education		0.785**
		(0.087)
Secondary and post-secondary education		0.620**
		(0.166)
Higher secondary and pre college education		0.658+
		(0.220)
College and more		0.603*
		(0.225)
Economic Cost: Asset Quintile (Reference Group: Poorest)		
Asset second qunitile		0.766*
		(0.114)
Asset third quintile		0.672**
		(0.124)
Asset fourth quintile		0.605***
		(0.149)
Richest		0.632**
		(0.168)
Psychological Cost: Son alive		0.491***
		(0.097)
Exposure to mass media (Reference:women in the household exposed to no type of mass media)		
1		0.888
		(0.103)
2		0.719*
		(0.131)
3		0.607**
		(0.168)
Parity (Reference Group: One Child)		
Two Children		0.400***
		(0.137)
Three Children		0.324***
		(0.137)

Four or more Children		0.305***
		(0.161)
Age Category (Reference group: 18-20)		
21-25		0.621*
		(0.230)
26-30		0.418***
		(0.238)
31-35		0.312***
		(0.219)
36-40		0.293***
		(0.207)
Caste Group (Reference group: Forward Caste)		
Other Backward Class (OBC)		1.089
		(0.094)
Schedulded Caste (SC)		1.628***
		(0.104)
Scheduled Tribe (ST)		1.422+
		(0.179)
Religious Group (Reference group: Hindu)		
Muslim		2.108***
		(0.143)
Other Religion		1.111
		(0.138)
District level variables		
State Group: Empower Action Group States (EAG)		1.982***
		(0.138)
Proportion of women in the district who got antenatal checkup during last pregnancy		0.403**
		(0.281)
Area of Residence: Urban		1.001
		(0.147)
Intercept	0.242***	0.293***
	(0.07)	(0.247)

Number of level 1 units=13,170
Number of level 2 units=496
*** p<0.001, ** p<0.01, * p<0.05, +p<0.10
Standard Error in Parentheses

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Chapter 5: Fertility intentions and maternal health behavior during and after pregnancy‡‡

Abstract

This study examines associations between fertility intentions and maternal health behaviors during and after pregnancy among a nationally representative sample of 3,442 women from India. Two waves of data (2005, 2012) from the India Human Development Survey were analysed to investigate the influence of unwanted births on women's use of antenatal care, timely postnatal care, and the delivery setting using binary and ordered logistic regression, partial proportional odds models, and propensity score weighting. Fifty-eight per cent of sample births were unwanted. Regression results show that, net of maternal and household characteristics, women with unwanted births were less likely to obtain any antenatal care and had fewer antenatal tests performed. Unwantedness was also associated with a lower likelihood of delivering in an institutional setting and of obtaining timely postnatal care. The relationships between unwantedness and antenatal care, postnatal care, and delivery setting were robust to models accounting for propensity weighting.

Introduction

Women's utilization of maternal health services during and after pregnancy is known to be associated with better maternal and child health outcomes, reductions in

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maternal and infant mortality, and improvements in women's overall reproductive health (Li et al. 1996; McDonagh 1996; Finger 1997; WHO 2005; Mattar et al. 2007; Sines et al. 2007). Indeed, women's health behaviors during and after pregnancy are key devices of the World Health Organization (WHO)'s Safe Motherhood Initiative (AbouZahr 2003; Freedman et al. 2007). The extant research highlights several individual- and household-level factors that influence women's use of maternal health services, including women's level of education (Celik and Hotchkiss 2000), autonomy in household decision-making (Mistry et al. 2009; Story and Burgard 2012), and the accessibility and quality of local maternal health facilities (Navaneetham and Dharmalingam 2002; Wild et al. 2010).

An important determinant of maternal and child health that has emerged in the demographic literature is the fertility intention associated with the birth (Brown and Eisenberg 1995; Gipson et al. 2008; Singh et al. 2010; Tsui et al. 2010; Sedgh et al. 2014). Nonetheless, there has been limited research on the influence of fertility intentions on women's use of health services during and after pregnancy (Joyce and Grossman 1990; Gipson et al. 2008; Tsui et al. 2010; Kost and Lindberg 2015), which is important because inadequate use of maternal health services could lead to worse health outcomes for women and their babies, including increasing the risk of maternal mortality (Alkema et al. 2016). Evidence from the Global South suggests that in some settings unintended pregnancies are associated with lower maternal healthcare utilization, for example, receiving fewer antenatal check-ups than recommended (Eggleston 2000; Marston and Cleland 2003; Singh et al. 2013; Dibaba et al. 2013) or giving birth without the assistance of a skilled birth attendant (Marston and Cleland 2003; A. Singh, Chalasani, et al. 2012).

No studies to date have examined the association between the intendedness of births and women's timely use of postnatal care, which the present study investigates.

Our study builds on the limited research examining the relationship between fertility intentions and women's healthcare utilization during pregnancy and after birth in less developed country settings, specifically India. We aim to provide several contributions. First, whereas most of the past studies of fertility intentions and women's health behavior in India have been concentrated in rural areas (e.g., P. K. Singh et al. 2012; Singh et al. 2013; see A. Singh, Chalasani, et al. 2012 for an important exception), our study relies on nationally representative data—the India Human Development Study (IHDS)—thus providing more generalizable results. Second, we use prospective measures of fertility intentions, focusing on births that were wanted vs. those that were unwanted. Research by Koenig et al. (2006) from four states in rural India found that the retrospective measures of fertility intentions used by the current Demographic and Health Survey (DHS) could lead to significant underestimates of unwanted births. Thus, our prospective measure from a nationally representative sample is likely to provide more accurate estimates. Third, we analyse several detailed measures of ante- and postnatal care use that align with WHO recommendations for maternal and child health, but have yet to be explored in this context. Finally, we use an adaptation of a propensity score weighting approach—the inverse probability weights (IPW) estimator—as a robustness check on the regression results to help determine whether differences in maternal health behaviors among women with wanted and unwanted births are due to differential maternal traits or differences in intention status.

India is an important setting in which to investigate these issues due to its high

rates of unintended fertility and poor maternal health. As reported by Singh et al. (2018) using data from the United Nations (UN) and the National Family and Health Survey in India, nearly 50 per cent of the estimated 48.1 million pregnancies in India in 2015 were unwanted or mistimed. According to WHO, about 45,000 women in India died in 2015 due to preventable pregnancy-related complications, largely as a consequence of inadequate antenatal services and the dearth of trained professionals to supervise deliveries (Alkema et al. 2016).

Despite the high levels of unintended fertility in India, few studies have evaluated the influence of fertility intentions for pregnancies carried to term on subsequent maternal health behaviors. Rather, past studies in the Indian context have focused primarily on the impact of fertility intentions on the health of the resulting child. For example, studies have examined the relationship between unintendedness and child acute respiratory infection, diarrhoea (Jensen and Ahlburg 1999), stunting (A. Singh, Chalasani, et al. 2012; Upadhyay and Srivastava 2016), full vaccination by WHO standards, and child mortality (A. Singh, Chalasani, et al. 2012; Singh et al. 2013). Three studies from India have examined the influence of unintended fertility on women's health outcomes or behaviors. First, the study by Singh et al. (2013) of unintended pregnancy and maternal and child health found that women reporting unwanted births were 2.32 times more likely than those reporting wanted births to obtain inadequate antenatal care. Although this is one of the only studies that uses prospective data to examine the linkages between pregnancy intentions, women's use of care, and child vaccination in the context of India, it is limited to examining this relationship for residents of rural areas in four states: Bihar, Jharkhand, Maharashtra, and Tamil Nadu. A second study, by A. Singh, Chalasani, et al.

(2012) examined the association between unintended fertility and delivery supervision, using family fixed effects to account for unobserved heterogeneity. Their findings show that mistimed births were 1.3 times more likely than wanted births to be delivered in the absence of a trained birth attendant. However, this study relies on cross-sectional data, and the measurements of birth intention are retrospective, meaning that there could be recall bias due to ex-post rationalization (Lightbourne 1985; Bongaarts 1990, 2011; Westoff 1991; Bhushan and Hill 1996). Finally, L. Singh et al. (2012) examined the relationship between fertility intentions and antenatal care, safe delivery, and postnatal care among married adolescent women (aged 15–19) in rural India. Although the authors document several correlates of maternal health behavior, birth wantedness is not examined in the final regression models. Additionally, the measure of postnatal care only assesses whether women obtained one visit within 42 days of the birth. Our study extends this past work by using longitudinal data with prospective measurement of fertility intentions from India's first nationally representative panel survey (across both rural and urban areas). In addition, our study is the first in the Indian context to examine the relationship between women's fertility intentions and a detailed measure of postnatal care use that captures whether the visit meets WHO recommendations for timely care (within 24 hours of the birth).

Methods

Sample

In the present study our sample is limited to non-pregnant, currently married women aged 18–40 in 2005, who and had at least one birth between 2005 and 2012. The

sample for the current study was drawn from data for 25,479 women who participated in both participated in both rounds of the India Human Development Survey (IHDS) (2005 and 2012). Of these women, 18,737 met the sampling criteria of being non-pregnant, currently married, and aged 18–40 in 2005. Of these women, 9.5 per cent (n = 1,783) had invalid or missing data on fertility intentions and were dropped from the sample. Because our analysis focuses on whether a birth was wanted or unwanted, women had to give birth in the interim survey period; therefore, we restricted the sample to women who had at least one birth between 2005 and 2012 (as reported in 2012). We used two measures to determine whether women had a birth in the interim survey period: first, we subtracted the number of children ever born as reported in 2005 from the number of children ever born as reported in 2012. Second, we examined the number of children born after January 2005 as reported in 2012. We dropped <1 per cent (n = 17) of women because of missing data on the first measure of the number of children we calculated. Of the remaining 16,937 women eligible for the sample, 13,264 (about 78 per cent) did not have a birth in the interim period and were thus dropped, reducing the sample to 3,673 women. (About 93 per cent of the women who did not have a birth in the interim period reported that they did not want any (more) children in 2005. This is in line with India's long-running family planning programmes, including the relatively high prevalence of sterilization.) We took a conservative approach and further restricted our analysis to cases where there was consistency in the number of children reported across both measures, and thus whether the most recent birth would be labelled as wanted or unwanted (211 women were dropped for inconsistent responses). The analytic sample was also limited to women with non-missing data on all independent variables. Therefore, we dropped <1 per cent

(n = 20) of the sample due to missing data on education, which was the only independent variable with missing values. After dropping these cases, the final study sample consists of 3,442 women. The sample sizes for each model range from 3,153 to 3,345 due to missing data on the dependent variables (see Table 1).

Measures

Dependent variables. To investigate women's health behavior during and after their pregnancy, we analyse various aspects of women's use of antenatal care, characteristics of their baby's delivery, and their use of postnatal care. In 2012, all women who had at least one birth between 2005 and 2012 were asked about their use of ante- and postnatal care and the setting of the delivery for their most recent birth since January 2005. Between 2005 and 2012, 55 per cent of the 3,442 women in the sample had one child, 31 per cent had two children, and 14 per cent had three or more children. Our analysis focuses on the most recent birth. Among the 3,308 women (96 per cent of the sample) with valid data on the timing of their most recent birth, 12 per cent had given birth within the past year, 14 per cent 1<2 years ago, 16 per cent 2<3 years ago, and 14 per cent 3<4 years ago, while 44 per cent had given birth to their youngest child more than four years ago.

We analyse five dependent variables related to maternal health behavior during and after pregnancy:

(a) Any antenatal check-up: This variable measures whether women obtained any antenatal check-ups during their pregnancy. The variable takes a value of '0' if the

woman obtained no antenatal care, and '1' if she obtained at least one antenatal check-up during her pregnancy.

(b) Adequate antenatal check-ups: WHO recommends at least four antenatal check-ups during pregnancy (WHO 2006). To assess whether women obtained the WHO-recommended number of antenatal check-ups during their pregnancy, the variable takes a value of '1' if the woman had four or more antenatal check-ups during pregnancy and '0' otherwise.

(c) Antenatal check-up index: This is an additive index counting the number of different tests that the woman received during her pregnancy. Referring to their most recent birth since January 2005, women were asked: *Did you have the following performed at least once during any of your antenatal check-ups for this pregnancy? (i) weight check-up, (ii) blood test, (iii) sonogram, (iv) urine test, (v) BP check, (vi) amniocentesis, (vii) internal check-up, (viii) abdominal examination.* The index values range from '0' to '8', with '0' indicating that no tests were performed and '8' indicating that all of the tests were performed at least once during the pregnancy.

(d) Postnatal care index: This variable is an indicator of women's post-partum healthcare utilization, which is important for both maternal and infant health. WHO guidelines for postnatal care recommend that the first postnatal check-up occur within 24 hours of the birth, regardless of the place of birth (WHO 2014). The postnatal care index takes a value of '0' if the woman or her child had no postnatal check-up, '1' if the woman or her child had a postnatal check-up more

than 24 hours after the birth but within two months, and '2' if the women or her child had a postnatal check-up within 24 hours of the birth.

(e) Delivery in an institutional setting: WHO recommends delivery under the assistance of a trained person (such as a doctor, nurse, or health professional) or in an institutional setting (such as a hospital, private clinic, or nursing home) as the standard for safe delivery (Department of Making Pregnancy Safer 2007). This variable takes a value of '1' if the delivery took place in a government hospital/clinic, private nursing home, or some other institutional setting with health personnel, and it takes the value '0' if the delivery took place at home.

Independent variables. The key independent variable measures women's prospective fertility intentions. We assess whether a woman's most recent birth was wanted vs. unwanted by comparing the number of additional desired children in 2005 with the number of children born between 2005 and 2012. If the number of additional desired children in 2005 was lower than the number of children born between 2005 and 2012 (including those who died in the interim), then the most recent birth was labelled as unwanted. If the number of additional desired children in 2005 was greater than or equal to the number of children born between 2005 and 2012, the most recent birth was labelled as wanted (also see Yeatman and Sennott 2015). This variable takes a value of '1' if the last birth was unwanted and '0' if the last birth was wanted. Due to a lack of data on fertility timing preferences, our analysis focuses on differences between wanted and unwanted births and does not account for mistimed births.

We also assess several variables measuring individual- and household-level characteristics in 2005 that have been shown to be important in past research on maternal health behaviors. Socio-demographic traits are important determinants of maternal health behavior during and after pregnancy. For example, studies from less developed countries have found women who are older, are at higher parity, are less educated, and belong to poorer households exhibit lower likelihoods of adequate maternal healthcare utilization (Navaneetham and Dharmalingam 2002; Sharma 2004; Chandhiok et al. 2006; Simkhada et al. 2008; Ahmed et al. 2010; Amin et al. 2010; Pathak et al. 2010; A. Singh, Chalasani, et al. 2012; A. Singh, Padmadas, et al. 2012). In the present study we control for the woman's age (18–40), which is coded continuously because models indicated that an age-squared term was not significant. We also control for the number of living children a woman had as of 2005, her education level (illiterate (0), some primary education (1–4), primary complete (5–9), secondary complete (10–11), higher-secondary complete (12 and some college), and college degree or higher), and her household asset quintile (five dummy variables ranging from the poorest to the richest quintile).

In India specifically, maternal healthcare utilization varies by several other factors. First, women belonging to lower castes such as Scheduled Castes (SC), Scheduled Tribes (ST), and Other Backward Classes (OBC) are less likely to utilize adequate maternal healthcare facilities, such as obtaining a safe delivery and adequate ante- and postnatal care, than those belonging to higher castes (Navaneetham and Dharmalingam 2002; Pallikadavath et al. 2004; Matthews et al. 2005; A. Singh, Chalasani, et al. 2012; P. K. Singh et al. 2012). In the present study we control for the woman's caste group by including four dichotomous variables indicating membership in

a Forward Caste (FC), SC, ST, or OBC group. Second, some studies have found that Muslims are less likely to utilize safe delivery care than Hindus in India (Navaneetham and Dharmalingam 2002; P. K. Singh et al. 2012), whereas other studies have found mixed results for religious groups (Sugathan et al. 2001). We control for women's religious group using three dichotomous variables: Hindu, Muslim, or other religion. Third, a woman's region of residence is important to consider in order to understand socio-demographic processes in India. Specifically, a group of Northern states—including Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttarakhand, and Uttar Pradesh—are home to larger populations with lower educational attainment, lower status of women, less adequate administration, and a higher prevalence of traditional norms and beliefs than other states. These states have been termed 'Empowered Action Group (EAG)' states and are the focus of various government health and family planning programmes. These states accounted for 46 per cent of India's population in 2011 and 53 per cent of the growth in population from 2001-2011 (Registrar General India 2011). Past studies have found that women residing in Northern EAG states are less likely to use maternal healthcare services than women in other areas (International Institute for Population Sciences Macro International 2007; P. K. Singh et al. 2012; L. Singh et al. 2012). Therefore, in the present study we include a binary variable for state of residence that takes a value of '1' if a woman lives in an EAG state and '0' if she lives in a non-EAG state. In addition, we control for whether a woman lives in an urban area ('1') vs. a rural area ('0').

Analyses

We first calculate descriptive statistics for the variables, including percentages, means, and standard deviations. Next, we analyse two models for each dependent variable. The first model examines the bivariate relationship between the wantedness of a birth and maternal healthcare utilization as measured by women's ante- and postnatal care utilization and whether the delivery occurred in an institutional setting. Maternal healthcare utilization varies by both socio-economic and demographic characteristics; however, the characteristics of the woman and her household could also impact the wantedness of the birth and thus serve as confounding factors. Previous research has shown that fertility intentions and subsequent maternal health behavior are associated with various social, demographic, and economic variables, such as age, education, household assets, parity, and area of residence (rural vs. urban) (Dommaraju and Agadjanian 2009; Morgan and Rackin 2010; Kodzi et al. 2010; Hayford and Agadjanian 2012; Dharmalingam, et al. 2014). To account for this, in a second set of models, we assess whether the socio-demographic traits of the woman and her household mediate the relationship between the wantedness of the birth and a woman's subsequent health behavior using stepwise weighted logistic regression for binary outcome variables (i.e., any antenatal check-ups, adequate antenatal check-ups, and delivery in an institutional setting). The antenatal check-up index and postnatal care index are ordered outcome variables. While ordered logit regression is an option for these variables, it is important to test whether a critical assumption of the ordered logit model is violated in the data (the parallel lines assumption). Results from the brant test indicated that for the antenatal check-up index, the parallel lines assumption is not violated and an ordered logit model

can be used. However, for the postnatal care index, the parallel lines assumption is violated. Thus, for the postnatal care index we use the partial proportional odds model, which relaxes the parallel lines assumption for some independent variables (Williams 2016; May and Reynolds 2018). In order to determine which variables should be left unconstrained in the partial proportional odds model we used Stata's 'gologit2' command with the autofit option and an α of 0.01 (Williams 2006). Next we used the 'fitstat' option in Stata to compute the Bayesian information criterion (BIC) for the partial proportional odds model and the generalized ordered logit model. We found that the partial proportional odds model (with sample weights) was the model best suited to the postnatal care index outcome variable.

Recent studies on fertility intentions and maternal health from the United States and India have used fixed effects models (Joyce et al. 2000; Barber and East 2009; Guzzo and Hayford 2012; A. Singh, Chalasani, et al. 2012) and propensity score matching (Kost and Lindberg 2015) to correct for selection bias. Propensity score analyses are less sensitive to model specification errors than regression models (Drake 1993; Dehejia and Wahba 2002; Messer et al. 2010; Stuart 2010; McCaffrey et al. 2013; Kost and Lindberg 2015). Therefore, in the present study we use an adaptation of propensity score matching (PSM)—the IPW estimator—as a robustness check to the stepwise regression models. This adjustment is useful for disentangling the impact of a woman's fertility intentions from the impact of her other characteristics on her health behaviors. The IPW method estimates the parameters of the treatment model (the model predicting the wantedness of a birth), and calculates estimated inverse probability weights (IPWs). Thereafter, the estimated IPWs are used to calculate the predicted probabilities and predicted counts for

the outcomes measuring maternal health behaviors for women who have unwanted and wanted births (see Cattaneo 2010). Estimated predicted probabilities and predicted counts from IPW analyses help model a counterfactual condition that shows what the variation between women with wanted and unwanted births would be if they had the same likelihood of belonging to the groups in which we find them (Kost and Lindberg 2015). In addition, we include sample weights: each observation's IPW is multiplied by the sample weights in order to obtain unbiased effects based on the population of all births in India (see DuGoff et al. 2013; Kost and Lindberg 2015).

The propensity scores used for weighting are estimated from a binomial logistic regression model with women's fertility intentions (unwanted birth = '1') serving as the dependent variable. The independent variables include maternal and household characteristics that could be related to fertility intentions: age, education level, number of living children in 2005, caste, religion, household asset quintile, region (EAG vs. non-EAG state), and area of residence (urban vs. rural). Next, we estimate three sets of binomial logistic regression models analysing the relationship between fertility intentions and the binary dependent variables measuring maternal health behavior (any antenatal check-ups, adequate antenatal check-ups, and delivery in an institutional setting). We also estimate two sets of Poisson regression models analysing the relationship between fertility intentions and the ordered dependent variables (ante- and postnatal care indices). For the ante- and postnatal care indices we use Poisson regression because it is the only suitable option for ordered outcome variables using IPW in Stata. This enables us to compare the predicted probabilities and predicted counts from the unadjusted data (using only sample weights) to those of the adjusted sample (weighing each observation by the

inverse of its probability and sample weights). All data were analysed using Stata 15 (Stata Corp 2017).

Results

Table 1 shows the descriptive statistics for the sample. Unwanted births formed the majority of the births in the sample: around 58 per cent of women's most recent births were classified as unwanted and 42 per cent as wanted. Further exploration of the circumstances under which women had unwanted births showed that around 42 per cent of the women in the analytic sample who had an unwanted birth did not want any more children in 2005, and 39 per cent of the women who wanted only one (more) child in 2005 exceeded their desired fertility by having at least two by 2012 (results not shown).

Around 82 per cent of women in the sample obtained at least one antenatal check-up during pregnancy; however, only 39 per cent obtained the recommended number of check-ups (four or more) as determined by WHO. The mean score on the antenatal check-up index was 4.3 (not shown); thus, on average women received four of the eight tests during their pregnancy. Around 60 per cent of women in the sample delivered in an institutional setting, while around 40 per cent delivered at home. Almost 39 per cent of women in the sample obtained no postnatal check-ups (for themselves or their baby), 25 per cent obtained at least one postnatal check-up more than 24 hours after birth but within two months, and 37 per cent of women in the sample received their first postnatal check-up within 24 hours of the birth, therefore meeting the WHO recommendations for timely postnatal care. The average age of women in the sample was around 25 and women typically had either one or two children when surveyed in 2005. Nearly one in four women in the sample (23 per cent) belonged to the poorest households and 14 per cent to

the richest households. Twenty-three per cent of women belonged to Forward Caste groups and the rest to SC, ST, and OBC groups. The majority of the women in the sample were Hindus (80 per cent), while nearly 16 per cent were Muslims, and 5 per cent belonged to other religions. One in five women (20 per cent) in the sample resided in urban areas. Educational attainment was very low: almost half (48 per cent) of women in the sample were illiterate and only 3 per cent had obtained a college degree. Finally, 59 per cent of women resided in the EAG states, which are less developed and growing faster than the non-EAG states.

<Table 1 about here>

Table 2 shows maternal health behaviors by the wantedness of a woman's most recent birth between 2005 and 2012, as reported in 2012. There are strong, consistent differences for women whose most recent birth was unwanted vs. wanted. Only 75 per cent of women with an unwanted birth had at least one antenatal check-up compared with 92 per cent of women who had a wanted birth. Around 32 per cent of those with an unwanted birth obtained the adequate number of antenatal check-ups as recommended by WHO compared with about half of the women whose most recent birth was wanted. For women who had unwanted births, 24 per cent had zero tests done and 6 per cent obtained all eight tests during their pregnancy. In contrast, under 9 per cent of those with a wanted birth had zero tests done, whereas almost one in five (20 per cent) obtained all eight tests. Forty-five per cent of women with an unwanted birth obtained no postnatal check-ups, whereas among women who had wanted births only 30 per cent obtained no postnatal check-ups. Similarly, 44 per cent of women with a wanted birth obtained the first postnatal check-up within 24 hours of the birth compared with only 32 per cent of women

who had an unwanted birth. Finally, half of those with an unwanted birth delivered in an institutional setting, compared with 72 per cent of women who had a wanted birth. These results highlight the strong binary relationships between women's fertility intentions and their health behaviors during and after pregnancy.

<Table 2 about here>

Table 3 shows results from stepwise weighted logistic and ordered logistic regression models, examining the relationship between birth wantedness and three binary indicators of maternal health behavior (any antenatal check-up, adequate antenatal check-ups, and delivery in an institutional setting) and one of the ordered indicators of maternal healthcare utilization (antenatal check-up index), accounting for characteristics of the woman and her household. Model 1 for each of the dependent variables shows that women who had an unwanted birth were significantly less likely to avail themselves of the recommended antenatal and delivery care than those whose birth was wanted. After accounting for the control variables in Model 2, the values of the coefficients for the relationships between wantedness and maternal health behaviors in each set of models were attenuated, suggesting that maternal and household characteristics explain some of these relationships. However, even after controlling for all maternal and household characteristics, having an unwanted birth remained a significant predictor of obtaining any antenatal care ($p<0.05$), obtaining the recommended number of antenatal tests ($p<0.01$), and delivering in an institutional setting ($p<0.01$).

As shown in Table 3, several of the control variables were significantly associated with women's maternal health behaviors in each model. The number of living children was negatively associated with each dependent variable, while household assets were

generally positively related to each outcome variable. Being from a Scheduled Tribe was positively associated with receiving any antenatal care and negatively associated with delivering in an institutional setting. Compared with Hindu women, Muslim women and those belonging to other religions were less likely to deliver in an institutional setting. Women of other religions also received lower scores on the antenatal check-up index. Living in an urban area (vs. a rural area) was positively associated with receiving an adequate number of antenatal check-ups, obtaining higher scores on the antenatal check-up index, and delivering in an institutional setting. Education was generally positively associated with women's use of antenatal care and delivering in an institutional setting, and being from an EAG state was negatively associated with all outcome variables.

<Table 3 about here>

Table 4 shows the results from stepwise partial proportional odds models (with sample weights) examining the relationship between birth wantedness and the postnatal care index. The left-hand columns under Models 1 and 2 (labelled >0) compare women with a score of '1' or '2' on the postnatal care index (any postnatal care) with those scoring '0' (no postnatal care). The right-hand columns (labelled >1) compare women with a score of '2' (postnatal care within 24 hours of birth) with those scoring '0' or '1' on the index (no postnatal care within 24 hours). Results show that women who had unwanted births had lower scores on the postnatal care index compared with those with wanted births. In other words, women with unwanted births were less likely to obtain timely postnatal care than women whose births were wanted. This relationship remained significant after controlling for maternal and household characteristics in Model 2 ($p<0.001$).

Model 2 shows that several control variables were significantly associated with the postnatal care index. Household assets were generally positively associated with the use of postnatal care whereas being from a Scheduled Tribe was negatively associated. Muslim women were less likely to obtain timely postnatal care than Hindu women (marginally significant, $p<0.10$). Living in an urban area was positively associated with women's use of timely postnatal care, as was attending secondary school (marginally significant) and completing college (marginally significant). Finally, living in an EAG state was positively associated with having a postnatal care check-up within 24 hours of the birth. (Results from stepwise binary and ordered logistic regressions and proportional odds models were consistent if we included the variable 'at least one living son in 2005'. This variable was not included in the final set of models because it reduced the sample sizes due to 99 missing values.)

<Table 4 about here>

Table 5 shows the predicted probabilities for Models 1 and 2 for each of the dependent variables in Tables 3 and 4 by the wantedness of the birth. The probability of obtaining at least one antenatal check-up for women who had an unwanted birth between 2005 and 2012 was 0.75 (Model 1); it increased to 0.80 (Model 2) after taking the control variables into account. In contrast, the probability of a woman obtaining at least one antenatal check-up when she had a wanted birth 0.92, but it decreased to 0.86 after controlling for other factors. Though the difference between obtaining at least one antenatal check-up for those with an unwanted vs. a wanted birth decreased after taking into account maternal and household characteristics, women with an unwanted birth still had significantly lower probabilities of obtaining at least one antenatal check-up

($p<0.05$). The probability of a woman with an unwanted birth obtaining adequate (four or more) antenatal check-ups was 0.32 (Model 1), whereas for those with a wanted birth it was 0.50, a significant difference ($p<0.001$). However, after taking into account maternal and household characteristics, there was not a significant difference in the probability of obtaining the WHO-recommended number of antenatal check-ups by women's fertility intentions (Model 2). The probability of a woman with an unwanted birth having all eight tests performed during antenatal check-ups was 0.08 (Model 1), compared with 0.18 for those who had a wanted birth. This difference decreased after taking the control variables into account because women with fewer household assets, lower education, more living children, and who resided in rural areas and EAG states, had lower probabilities of obtaining tests during antenatal check-ups. Nonetheless, women with unwanted births still had significantly lower probabilities of obtaining tests during antenatal check-ups than those with wanted births ($p<0.01$) (Model 2). The probability of a woman who had an unwanted birth obtaining a postnatal check-up within 24 hours of the birth was 0.31 (Model 1), compared with 0.45 for those with a wanted birth. After taking into account maternal and household characteristics this difference decreased; however, women who had an unwanted birth still had a lower probability of receiving timely postnatal care than those with a wanted birth ($p<0.001$) (Model 2). Finally, the probability of delivering in an institutional setting for women who had an unwanted birth was 0.51 compared with 0.72 for women with a wanted birth (Model 1). Although the difference between women with an unwanted and a wanted birth decreased in Model 2, the probability of delivering in an institutional setting was still significantly lower for those who had an unwanted birth than for those with a wanted birth ($p<0.01$) (Model 2).

<Table 5 about here>

Table 6 shows the predicted probabilities (for the binary indicators of maternal healthcare utilization) and predicted counts (for the ante- and postnatal care indices) that we would find if women with wanted and unwanted births were similarly distributed by socio-demographic characteristics. The IPW adjustment helps to disentangle the impact of a woman's fertility intentions from the impact of her other traits on her maternal health behaviors. The results are largely consistent after using the IPW estimator. Women with unwanted births remained significantly less likely to obtain any antenatal check-up, to deliver in an institutional setting, and to have a lower score on the indices for ante- and postnatal care than women whose births were wanted. Moreover, the difference in the postnatal care index between women with wanted and unwanted births remained significant even when antenatal care was included as an explanatory variable in the model (results not shown).

<Table 6 about here>

Discussion

Our results show that women's fertility intentions have a significant influence on maternal healthcare utilization in India, even after taking into account maternal and household characteristics that are associated with both fertility intentions and women's healthcare utilization. Specifically, we find that women who have unwanted births are significantly less likely than women whose births were wanted to obtain any antenatal check-ups, to receive the recommended tests during pregnancy, to deliver in an institutional setting, and to obtain timely postnatal care. However, since individual and household characteristics may be linked to both the wantedness of a birth and maternal

health behaviors, it can be difficult to determine if a regression model is specified correctly (Kost and Lindberg 2015). This is important because if the models were misspecified, inferences about the relationships between birth wantedness and maternal health behaviors could be inaccurate due to differences in maternal and household characteristics for women with wanted vs. unwanted births. Evaluating the relationships between the wantedness of a birth and maternal health behaviors after using propensity score weighting—an approach that renders women with wanted and unwanted births more similar in terms of observed maternal and household characteristics—reduces the sensitivity to model specification errors compared with regression models for maternal health behaviors (Drake 1993; Dehejia and Wahba 2002; Messer et al. 2010; Stuart 2010; McCaffrey et al. 2013; Kost and Lindberg 2015). After using the IPW estimator, we find that women with an unwanted birth are significantly less likely to obtain any antenatal check-ups, have fewer tests performed during antenatal check-ups, deliver less often in an institutional setting, and are less likely to obtain timely postnatal care—effects that are robust to maternal and household characteristics.

The extant research from the Global South examining the association between fertility intentions and women's health behaviors has shown mixed results. Some studies have found that unintendedness is associated with beginning antenatal care later and failing to obtain the recommended number of antenatal care visits (Eggleston 2000; Barrick and Koenig 2008; Bassani et al. 2009). Other studies have found an inconsistent relationship between fertility intentions and antenatal care utilization (Gage 1998; Marston and Cleland 2003). Thus, scholars have called for additional research on the impact of unwanted births on various dimensions of maternal healthcare in less

developed country settings (Gipson et al. 2008). Our study responds to this call, building on this body of past research in several ways. First, we rely on a prospective measure of fertility intentions that is able to capture a woman's desire for future fertility before a pregnancy occurs and therefore avoids the potential bias in retrospective measures (Koenig et al. 2006; Yeatman and Sennott 2015). Second, we use two waves of data from the first nationally representative study from India that is both generalizable and ideal for investigating the influence of fertility intentions on women's subsequent health behaviors. Finally, our study is the first to examine the association between fertility intentions and women's use of timely postnatal care—as recommended by WHO—while also accounting for possible selection bias. Together, our results highlight an important factor—maternal healthcare utilization—that could negatively influence both a woman and her baby's health during an unwanted pregnancy and even after birth, as underutilization of healthcare services is associated with poor health outcomes (Dibaba et al. 2013).

Our study found that several maternal and household socio-demographic characteristics were associated with women's healthcare utilization. First, compared with the poorest women, those belonging to the richest households were more likely to deliver in an institutional setting, and to avail themselves of adequate ante- and postnatal care. These results suggest that such women may find health facilities more affordable and accessible, a finding consistent with other research from a variety of less developed countries (Miles-Doan and Brewster 1998; Ahmed et al. 2010) and specifically in the Indian context (Kesterton et al. 2010; Pathak et al. 2010; A. Singh, Chalasani, et al. 2012; A. Singh, Padmadas, et al. 2012; P. K. Singh et al. 2012; L. Singh et al. 2012). Second,

compared with illiterate women, those with more education (primary, secondary or higher-secondary education, or a college degree) were more likely to use antenatal care facilities and to deliver in institutional settings (Sunil et al. 2006; Ahmed et al. 2010; Amin et al. 2010; Kesterton et al. 2010; A. Singh, Chalasani, et al. 2012; P. K. Singh et al. 2012). This may be because educated women are more likely to communicate with their husbands and other family members on issues linked to health (Navaneetham and Dharmalingam 2002; P. K. Singh et al. 2012), which could lead to higher levels of support for seeking health services when needed. Further, women with higher education are also more likely to have access to higher quality healthcare facilities and, in general, to use such facilities more often because they are more aware of the benefits (Celik and Hotchkiss 2000; P. K. Singh et al. 2012). Third, we found that women residing in urban areas were more likely than those in rural areas to obtain adequate antenatal and postnatal care and to deliver in an institutional setting. This is in contrast to past research from India that found no differences in adequate antenatal care utilization in urban vs. rural settings (Navaneetham and Dharmalingam 2002). These conflicting findings may result from our use of nationally representative data covering more areas of the country than in past studies. Fourth, our results suggest that women residing in non-EAG states may be more likely to have access to and knowledge about proper contraception and health facilities, given that they were more likely to utilize adequate antenatal care and safe delivery than those residing in EAG states, similar to findings from other studies (P. K. Singh et al. 2012; L. Singh et al. 2012). However, our results also showed that women in EAG states were more likely to obtain postnatal care within 24 hours of birth. This might be due to the increased government focus on improving maternal healthcare utilization

through various programmes in EAG states. For example, from 2004 to 2008, government spending under the National Rural Health Mission (NRHM) increased the number of women delivering in public health centres in EAG states. Further, an increase in women's healthcare utilization and a decrease in the cost of delivering in public health facilities has been more evident in EAG states than in non-EAG states (Mohanty and Srivastava 2013). This increase in institutional deliveries in EAG states might have led to a larger proportion of women residing in these areas availing themselves of a postnatal check-up within 24 hours of birth. Finally, consistent with past research, we found that women with more living children in 2005 were less likely to avail themselves of adequate pregnancy care (Navaneetham and Dharmalingam 2002). These women may forego extensive care during pregnancy because they have larger families and thus greater resource constraints; they are also more experienced at childbirth and therefore may have greater confidence in home delivery and caring for themselves and their babies (Wong et al. 1987; Elo 1992; Bhatia and Cleland 1995; Raghupathy 1996; Navaneetham and Dharmalingam 2002; Santhya et al. 2008; P. K. Singh et al. 2012).

Despite high levels of unintended fertility in India, few studies have evaluated the impact of unintended pregnancies carried to term on maternal healthcare utilization (Jensen and Ahlburg 1999; A. Singh, Chalasani, et al. 2012; Singh et al. 2013; Upadhyay and Srivastava 2016). This is important because enhancing global access to sexual and reproductive healthcare services and incorporating reproductive health into national policies are targets of the UN Sustainable Development Goals (SDGs) for 2030 (United Nations Secretary General 2014). Maternal health is a pivotal part of family planning policy initiatives; it is also key to India's commitments to the SDGs of ensuring healthy

lives and promoting well-being at all ages. Though maternal mortality in India has declined over time, it remains high, especially in EAG states (Sample Registration System 2018). Increasing women's use of ante- and postnatal care is likely to bring about improvements in both maternal and child health outcomes (Li et al. 1996; McDonagh 1996; Finger 1997; WHO 2005; Sines et al. 2007; Mattar et al. 2007). Moreover, our results show that unwanted births are very common among women in India—over half of the births (58 per cent) in the sample were unwanted. Thus, strategies for reducing unwanted fertility in India are critical. Increasing access to and acceptability of effective contraception and care around abortions—which are legal in India—would help ensure that women and couples are able to avoid pregnancies they do not want, which would also aid in improving both maternal and child health (see also Singh et al. 2018).

While our study makes significant contributions to understanding differences in women's use of maternal health services during and after pregnancy based on their fertility intentions, there are some limitations. First, our finding that 58 per cent of births in the sample were unwanted is higher than other estimates of unintended fertility from India, which hover around 49 per cent, including unwanted, mistimed, and ambivalently desired births (Singh et al. 2013; Singh et al. 2018). Due to a lack of data on timing preferences, we are unable to account for ambivalence or mistimed births, which may influence our estimate. This discrepancy may also be because we use a prospective measure of fertility intentions, and retrospective measures are more sensitive to ex post revisions toward intendedness (Lightbourne 1985; Bongaarts 1990, 2011; Westoff 1991; Bhushan and Hill 1996; Koenig et al. 2006; Yeatman and Sennott 2015). Additionally, the length of time between the two surveys (seven years) could have led to a

misclassification of births since women's fertility intentions could have changed over the interim period (Westoff and Ryder 1977; Kodzi et al. 2010; Sennott and Yeatman 2012; Yeatman et al. 2013). Second, the measures of the number of antenatal check-ups, the number of tests performed during antenatal check-ups, women's use of timely postnatal care, and whether the delivery was in an institutional setting for the most recent birth since 2005 were self-reported by women in 2012 and thus could be susceptible to recall bias. This may be especially relevant for the 44 per cent of women in the sample whose most recent birth occurred four or more years earlier. Finally, the variation of PSM that we use as a robustness check could be sensitive to bias when the treatment or outcome model is impacted by confounding unobserved variables (Imbens 2004, 2015; Abadie and Imbens 2006; Kebebe and Shibru 2017). Despite these limitations, we are heartened by the fact that a majority of our results and substantive conclusions are consistent with past research.

Our results linking fertility intentions and maternal health behaviors in India can inform service delivery strategies by highlighting the need to provide women with knowledge about ante- and postnatal care, and particularly the importance of receiving timely postnatal care for births regardless of where they occur. For example, expanding the use of community health workers, such as Accredited Social Health Activists, could be a fruitful strategy for improving women's early recognition of pregnancy and knowledge about care options (Vidler et al. 2016). Additionally, when women and their husbands do not want any more children, adequate facilities and services should be available and accessible to them, so that they are able to fulfil their intentions and avoid future births (Kost and Lindberg 2015). Providers of maternal health services could

improve their counselling services for all pregnant women to encourage them to seek ante- and postnatal care (Dibaba et al. 2013) aligning with the WHO recommendations. In India there are several interventions under the umbrella of the NRHM aimed at improving maternal and child health in rural regions. For example, the NRHM aims to provide every village in India with trained female community health workers who connect the public health system and the community by providing door-to-door counselling on family planning, the importance of birth spacing, and other aspects of maternal and child health in rural areas. Further, programmes such as the Janani Suraksha Yojana (JSY) (launched in 2005) and Janani Shishu Suraksha Karyakram (launched in 2011) encourage women who would deliver at home to instead deliver in institutional settings by giving them incentives such as free childbirth (including caesarean deliveries) and free transport from home to health institutions in both rural and urban areas. An impact evaluation of the JSY showed that even though the programme significantly increased the likelihood of women obtaining antenatal care and having in-facility births, implementation varied by state (the percentage of women giving birth who obtained cash payments from JSY ranged from less than 5 to 44 per cent), and women who were the least educated and poorest were not always the most likely to obtain cash payments from the scheme (Lim et al. 2010). Thus, to improve maternal and child health outcomes in India, attention will also need to be paid to the structural characteristics that serve as barriers to equal access to adequate ante- and postnatal care for all women, regardless of socio-economic status, education, region, or area of residence.

Table 1. Weighted summary statistics for analytical sample of women in India who were non-pregnant, currently married, aged 18–40 in 2005, and had a least one birth in 2005–12

	N	Percentage/mean (standard deviation)
Dependent variables		
Any antenatal check-up	3,345	81.9
Adequate (at least four) antenatal check-ups	3,299	39.3
Antenatal check-up index	3,153	
No tests done		17.1
All eight tests done		12.1
Postnatal care index	3,320	
No check-up		38.5
First check-up after 24 hours of birth		24.7
First check-up within 24 hours of birth		36.8
Delivery in institutional setting	3,326	59.5
Independent variables		
Unwanted birth	3,442	58.1
Age	3,442	24.58 (4.83)
Number of living children	3,442	1.77 (1.26)
Household asset quintile	3,442	
Poorest		22.9
Second quintile		21.7
Third quintile		24.7
Fourth quintile		16.9
Richest		13.8
Caste group	3,442	
Scheduled Castes (SC)		24.7
Scheduled Tribes (ST)		7.5
Other Backward Classes (OBC)		44.4
Forward Castes (FC)		23.4
Religion	3,442	
Hindu		79.9
Muslim		15.5
Other religion		4.7
Urban	3,442	19.9
Education	3,442	
Illiterate		47.8
Incomplete primary		6.5
Primary		28.7
Secondary		8.4
Higher secondary		5.1
College and higher		3.4
Empowered Action Group (EAG) state	3,442	58.7

Source: Authors' calculations from IHDS 2005 and 2012.

Table 2 Maternal health behaviors by fertility intentions in India, 2005–12 (weighted percentages)

	Wanted birth	Unwanted birth
Any antenatal check-up	91.5	75.0
Adequate (at least four) antenatal check-ups	49.7	31.9
Antenatal check-up index		
No tests done	8.5	23.7
All eight tests done	19.8	6.3
Postnatal care index		
No check-up	29.5	45.1
First check-up after 24 hours	26.8	23.1
First check-up within 24 hours	43.7	31.8
Delivery in institutional setting	71.9	50.6

Note: See 'Measures' subsection for further information on dependent variables and wantedness.

Source: As for Table 1.

Table 3. Logistic and ordered logistic regression models examining fertility intentions and maternal health behaviors in India, 2005–12

	Any antenatal check-up		Adequate antenatal check-ups		Antenatal check-up index		Delivery in institutional setting	
Variables	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Unwanted birth	−1.274***	−0.458*	−0.744***	−0.122	−0.946***	−0.298**	−0.917***	−0.471**
	(0.1699)	(0.1992)	(0.1213)	(0.1501)	(0.1073)	(0.1154)	(0.1246)	(0.1535)
Age	–	−0.005	–	0.011	–	0.021	–	0.018
		(0.0201)		(0.0151)		(0.0143)		(0.0161)
Number of living children	–	−0.328***	–	−0.204**	–	−0.275***	–	−0.204**
		(0.0865)		(0.0730)		(0.0505)		(0.0676)
Household asset quintile								
Second quintile	–	0.288	–	0.432*	–	0.212	–	0.183
		(0.2006)		(0.1913)		(0.1616)		(0.1765)
Third quintile	–	0.810***	–	0.958***	–	0.600***	–	0.288
		(0.2445)		(0.2143)		(0.1613)		(0.2038)
Fourth quintile	–	1.410***	–	0.602**	–	0.761***	–	0.399+
		(0.3006)		(0.2153)		(0.1752)		(0.2176)
Richest	–	1.033*	–	0.502*	–	0.838***	–	0.919**
		(0.4078)		(0.2502)		(0.2023)		(0.2957)
Caste group								
Scheduled Castes (SC)	–	0.263	–	−0.128	–	−0.056	–	−0.110
		(0.2396)		(0.1700)		(0.1477)		(0.1843)
Scheduled Tribes (ST)	–	1.001***	–	0.073	–	0.209	–	−0.719**
		(0.2902)		(0.2717)		(0.2008)		(0.2605)
Other Backward Classes (OBC)		−0.048 (0.2103)	–	0.209 (0.1506)	–	0.209+ (0.1246)	–	−0.187 (0.1584)
Religion								
Muslim	–	−0.041	–	−0.154	–	−0.179	–	−0.635**
		(0.2446)		(0.2003)		(0.1502)		(0.1942)
Other religion	–	−0.518	–	0.241	–	−0.507**	–	−0.659**
		(0.3321)		(0.2509)		(0.1753)		(0.2470)
Urban	–	0.303	–	0.331*	–	0.467***	–	0.882***
		(0.1951)		(0.1337)		(0.1096)		(0.1438)
Education								
Incomplete primary	–	0.298	–	0.145	–	0.273	–	−0.176
		(0.3347)		(0.2277)		(0.1806)		(0.2160)
Primary	–	0.891***	–	0.712***	–	0.870***	–	0.318+
		(0.2155)		(0.1708)		(0.1377)		(0.1650)
Secondary	–	0.818+	–	0.824**	–	0.811***	–	0.651*
		(0.4233)		(0.2561)		(0.1865)		(0.2880)
Higher secondary	–	1.368*	–	1.151***	–	0.885***	–	0.809**
		(0.6312)		(0.2752)		(0.2188)		(0.3080)
College and higher	–	2.774**	–	1.762***	–	1.285***	–	3.341**
		(0.8555)		(0.3196)		(0.2273)		(1.0556)

Empowered Action Group (EAG) state	–	−1.280***	–	−1.218***	–	−1.817***	–	−0.636***
		(0.1989)		(0.1279)		(0.1154)		(0.1353)
Ancillary parameters[1]								
cut1	–	–	–	–	−2.179***	−2.371***	–	–
					(0.0989)	(0.3745)		
cut2	–	–	–	–	−1.611***	−1.667***	–	–
					(0.1021)	(0.3671)		
cut3	–	–	–	–	−1.339***	−1.303***	–	–
					(0.1027)	(0.3627)		
cut4	–	–	–	–	−1.118***	−0.993**	–	–
					(0.0985)	(0.3620)		
cut5	–	–	–	–	−0.777***	−0.509	–	–
					(0.0910)	(0.3612)		
cut6	–	–	–	–	−0.262**	0.227	–	–
					(0.0869)	(0.3592)		
cut7	–	–	–	–	0.493***	1.284***	–	–
					(0.0875)	(0.3770)		
cut8	–	–	–	–	1.519***	2.598***	–	–
					(0.1034)	(0.3705)		
Constant	2.374***	2.630***	−0.014	−0.696+	–	–	0.942***	0.694+
	(0.1506)	(0.5446)	(0.0875)	(0.3979)			(0.1007)	(0.4190)
Sample size	3, 345	3,345	3,299	3,299	3,153	3,153	3,326	3,326

[1]These are cut points that are used to differentiate the adjacent categories of the antenatal check-up index. For example, cut1 is the estimated cut point on the latent variable that differentiates those with no tests performed during antenatal check-ups from those with a score of 1, 2, 3, 4, 5, 6, 7, or 8 on the antenatal check-up index, when values of the independent variables are zero.

Notes: Robust standard errors in parentheses. Model 1 includes birth wantedness only, whereas Model 2 includes all control variables. Stepwise weighted logistic regression is used for the binary outcome variables (any antenatal check-up, adequate antenatal check-ups, and delivery in institutional setting), while an ordered logit model is used for the antenatal check-up index. The reference categories
for household asset quintile, caste group, religion and, education; are poorest households, those belonging to Forwards Castes,
those who are Hindus, and women who are illiterate.
*** p<0.001; ** p<0.01; * p<0.05; +p<0.10

Source: As for Table 1.

Table 4. Partial proportional odds models examining fertility intentions and timely postnatal care in India, 2005–12

Variables	Postnatal care index Model 1		Postnatal care index Model 2	
	>0 (Any postnatal care)	>1 (Postnatal care within 24 hours)	>0 (Any postnatal care)	>1 (Postnatal care within 24 hours)
Unwanted birth	−0.588***	−0.588***	−0.438***	−0.438***
	(0.1049)	(0.1049)	(0.1144)	(0.1144)
Age	–	–	−0.007	−0.007
			(0.0123)	(0.0123)
Number of living children	–	–	−0.047	−0.047
			(0.0515)	(0.0515)
Household asset quintile				
Second quintile	–	–	0.032	0.032
			(0.1614)	(0.1614)
Third quintile	–	–	0.548**	0.548**
			(0.1702)	(0.1702)
Fourth quintile	–	–	0.205	0.205
			(0.1766)	(0.1766)
Richest	–	–	0.459*	0.459*
			(0.2030)	(0.2030)
Caste group				
Scheduled Castes (SC)	–	–	−0.014	−0.014
			(0.1514)	(0.1514)
Scheduled Tribes (ST)	–	–	−0.460*	−0.460*
			(0.2070)	(0.2070)
Other Backward Classes (OBC)	–	–	0.119	0.119
			(0.1242)	(0.1242)
Religion				
Muslim	–	–	−0.278+	−0.278+
			(0.1452)	(0.1452)
Other religion	–	–	0.085	0.085
			(0.1863)	(0.1863)
Urban	–	–	0.352***	0.352***
			(0.1046)	(0.1046)
Education				
Incomplete primary	–	–	−0.232	−0.232

			(0.2035)	(0.2035)
	Primary	–	–	0.183	0.183
				(0.1332)	(0.1332)
	Secondary	–	–	0.337+	0.337+
				(0.1977)	(0.1977)
	Higher secondary	–	–	−0.066	−0.066
				(0.2096)	(0.2096)
	College and higher	–	–	0.389+	0.389+
				(0.2305)	(0.2305)
Empowered Action Group (EAG) state		–	–	−0.172	0.622***
				(0.1218)	(0.1283)
Constant		0.815***	−0.214*	0.756*	−0.793*
		(0.0829)	(0.0845)	(0.3524)	(0.354)
N		3,320	3,320	3,320	3,320

Notes: Robust standard errors in parentheses. Model 1 includes birth wantedness only, whereas Model 2 includes all control variables. The left-hand columns under Models 1 and 2 (labelled >0) compare women with a score of '1' or '2' on the postnatal care index with those who have a score of '0'; the right-hand columns (labelled >1) compare women with a score of '2' on the index with those who have a score of '0' or '1'. The reference categories for household asset quintile, caste group, religion, and education; are poorest households, those belonging to Forwards Castes, those who are Hindus, and women who are illiterate.

*** p<0.001; ** p<0.01; * p<0.05; + p<0.10

Source: As for Table 1.

Table 5. Predicted probabilities of maternal health behaviors by fertility intentions in India, 2005–12

	Any antenatal check-up		Adequate antenatal check-ups		Antenatal check-up index (full score)		Postnatal care index (first check-up within 24 hours of birth)		Delivery in institutional setting	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Wanted birth	0.915	0.856	0.497	0.406	0.180	0.134	0.447	0.423	0.719	0.653
Unwanted birth	0.750	0.804	0.319	0.383	0.078	0.108	0.310	0.326	0.506	0.560

Note: Model 1 includes birth wantedness only, whereas Model 2 includes all control variables.
Source: As for Table 1.

Table 6. Predicted probabilities of maternal healthcare utilization and predicted counts for check-up indices for women with wanted and unwanted births in India, 2005–12, with and without using IPW estimator

	Wanted birth	Unwanted birth
Without IPW		
Any antenatal check-up	0.856*	0.804*
Adequate antenatal check-ups	0.406	0.383
Antenatal check-up index	4.369**	4.151**
Postnatal check-up index	1.090***	0.899***
Delivery in institutional setting	0.653**	0.560**
Adjusted with IPW		
Any antenatal check-up	0.851*	0.802*
Adequate antenatal check-ups	0.424	0.388
Antenatal check-up index	4.435+	4.170+
Postnatal check-up index	1.125***	0.924***
Delivery in institutional setting	0.650**	0.557**

Note: Models using IPW do not allow for ordered outcome variables. Therefore, in this table we treat both the ante- and postnatal care indices as count variables and use Poisson regression in order to compare results with and without the IPW adjustment. The only suitable option for ordered outcome variables using IPW in Stata is Poisson regression.

*** p<0.001; ** p<0.01; * p<0.05; + p<0.10
Source: As for Table 1.

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Chapter 6: Conclusion

Introduction

Work done in this dissertation attempts to obtain a better understanding of the determinants, and consequences of unintended fertility, using longitudinal data in the Indian context. In this chapter I summarize the key findings of the dissertation, address some of the limitations of the study, discuss some implications of the study, and finally discuss future directions briefly.

Summary of Key Findings

Analyses presented in this dissertation focus on three inter-related questions relating to fertility intentions, subsequent behavior, and its consequences, using longitudinal data from two rounds of the first nationally representative panel data in the Indian context-the India Human Development Survey (IHDS). Prospective measures of fertility intention enable me to understand which sub-groups of women are most likely to have an unmet need for contraception in 2005, and subsequently how this unmet need for contraception impacts the likelihood of having unintended births between 2005 and 2012. The dissertation also examines the differentials in maternal healthcare utilization in 2012, amongst those whose last birth was categorized as ‘unwanted’ versus those whose last birth was ‘wanted’.

Some of the key findings of my research are: a) regional differentials in fertility intentions (as measured by ideal family size in 2005) are explained to a large extent (about 40%) by individual and household level characteristics; however regional differences in having an undesired birth were explained to a much smaller extent (about 9%) by individual, and household level factors. This led me to examine differences in unintended births across regions in greater details.

b) Amongst women who wanted to limit child bearing in 2005, poorer women, who do not have a living son, who reside in households where women have no exposure to mass media and in districts where a lower proportion of women avail antenatal checkup up, are less likely to use any form of contraception (and are thus more likely to have an unmet need for contraception). Further, women who have an unmet need for contraception in 2005, are about 2.5 times as likely as those with no unmet need for contraception, to have an unintended birth between 2005 and 2012, after taking into account all other individual/household, and district level characteristics.

c) Net of maternal and household characteristics, women with unwanted births were less likely to obtain any antenatal care, had fewer antenatal tests performed, were less likely to obtain timely postnatal care, and had lower likelihoods of delivering in an institutional setting.

Limitations

One of the key limitations in this study is the fact that since the time gap between the two surveys was seven years, women's fertility intentions could have changed in the interim period (Westoff and Ryder 1977; Kodzi et al. 2010; Sennott and Yeatman 2012; Yeatman et al. 2013). This could have caused a misclassification of births, as wanted and

unwanted. Secondly, the focus in this thesis is only on the unmet need to limit births, and not on unmet need for spacing births. Thirdly, analyses examining determinants of unmet need for contraception do not include pregnant women, and thus do not account for the possibility that women who were pregnant in 2005 could be pregnant because they had an unmet need for contraception; this could cause us to underestimate the unmet need for contraception (Westoff and Ochoa, 1991). Finally, the measures of antenatal care, and postnatal care utilization during the last birth a woman had since 2005 were self reported by women in 2012, and may be susceptible to recall bias.

Implications and Outlook

The present study has policy implications with regard to which sub-groups of women are most likely to have an unmet need for contraception, and thus least likely to avoid unintended births, and more likely to experience negative outcomes associated with having unintended births. Firstly, it is seen that women residing in Empowered Action Group (EAG) states are the most likely to have higher unmet need for contraception, unintended births, and lower maternal healthcare utilization (similar to findings by P.K Singh et al., 2012, L Singh et al. 2012). Our study shows that some of this is explained by the differences in maternal healthcare quality across regions (for e.g. a larger percentage of districts that have a higher proportion of women who used maternal healthcare services during their last birth are based in non-EAG states, and the difference in unmet need for contraception across EAG and non-EAG states are to an extent explained by this). Between 2005 and present times the Government has focused on improving the quality of maternal healthcare utilization through various programs, such as the National Rural Health Mission (NRHM) that was introduced in 2005. Studies have shown that

NRHM has addressed both supply side, and demand side limitations by raising public spending on health, with particular focus in EAG states. NRHM has increased the number of deliveries in public health centers by generating demand for health services, and also reduced perinatal, neonatal and maternal deaths (Lim et al. 2010, Khan et al. 2010, Office of Registrar General, 2011). Further, rise in women's healthcare utilization, and a fall in cost of delivering in public health facilities has been more evident in EAG states compared to non EAG states (Mohanty and Srivastava 2013). However, differences between states persists due to differentials in political commitment, administrative efficacy, state spending and utilization of funds under the NRHM. Thus, while improving the quality of maternal health care services through various Government programs, and expanding the network of accredited social health activists (ASHA), with a particular focus on regions with poor health infrastructure could be a fruitful strategy for improving women's early recognition of pregnancy and knowledge about care options (Vidler et al. 2016), state level implementation of policies, and leakages in the public health system is something that needs to be studied in greater detail.

Next, another interesting question that comes up from the present study is whether the availability of health facilities in the locality, auxiliary nurse midwife (ANM) (village level health worker, and the first contact point between community and health services), or ASHA workers is enough? The implications from the dissertation show that women with lower levels of education, belonging to poorest households, belonging to Scheduled Castes (SC) or Scheduled Tribes (ST) households, and belonging to Muslim families (compared to Hindu families) are most likely to have an unmet need for contraception, and subsequent unintended births; and also lower maternal healthcare utilization during

their last births. Bringing in the intersectionality perspective while designing policies regarding access to maternal healthcare utilization is important (Dey et al. 2018, Weber and Parra-Medina 2003). This implies that ANM, ASHA, and other health workers should give more time in counselling, and supporting women from marginalized communities, raising awareness about all contraception choices available to them, and also explaining thoroughly the advantages of obtaining antenatal checkups, and timely postnatal checkups for women and their children. Qualitative studies, and in-depth interviews with women, and health care workers would enable us to get a more complete picture of this. For e.g. quality of a person's interaction with health clinic staff, is important in determining whether they end up using contraception (Schuler and Goldstein 1986; Stash 1999). In interviews conducted by Stash 1999 in the context of Chitwan Valley Nepal, some women say that doctors are more likely to examine patients who are knowledgeable, very well; whereas they tend not to treat those cannot speak for themselves very well. In the Indian context too, a few studies show that the way a woman is treated by health workers is dependent on her caste, and socio-economic status (for e.g. Sabharwal et al. 2014; A. Singh, Chalasani, et al. 2012; P. K. Singh et al. 2012). Following are some examples of caste based discrimination in ANC, and PNC services as reported by women in an article by Sabharwal et, al 2014:

"The ANM talks to SC women and children unwillingly. This is because she considers SC women and children as dirty and backward. If any SC women ask any question, the ANM says, 'Kya karoge puchkar? Tum nahi samjhoge, dava mil gayi aab jaoo'" ('What will you do with the information? You would not understand, it is enough that you have

received the medicine, now just go.')." (SC Women FGD, FGD No. 42,231, Village No. 15, Maharajganj, Uttar Pradesh, 2012) (cited from Sabharwal et al.2014, Pg 159)

"The ASHA, who belongs to a higher caste, does not visit the lower caste localities to give advice as per the guidelines and the problems faced by pregnant women and to give other necessary information. Instead she sends her husband to give information, we feel shy and intimidated by him." (SC Women the FGD, FGD No. 12,241, Village No. 16, Jabalpur, Madhya Pradesh, 2012) (cited from Sabharwal et al.2014, Pg 160)

"The ASHA never visits any SC family within seven days of the childbirth for the check-up of the newborn whereas she regularly visits the higher caste families after childbirth for check-ups." (SC Women FGD, FGD No. 72,231, Village No. 15, Malda, West Bengal, 2012)) (cited from Sabharwal et al.2014, Pg 161)

Such instances and many others, indicate the need to train, and counsel health workers to provide adequate services to all communities, and prohibit discrimination based on caste, and class. In the context of Sri Lanka, Karra et al. 2018 find that discrimination faced by ethnic minorities in receiving postpartum counselling is attributable to ethnic discordance between women, and their primary health midwife. Their study suggests that matching women, and their providers on ethno-linguistic background could help reduce disparities in care. Similarly, in the Indian context, having more ANMs, ASHAs, midwives, and nurses belonging to SC, ST communities, may help in reducing disparities in maternal healthcare utilization.

Future Directions

The previous section discussed some of the possible implications of the dissertation, and highlighted the need for more qualitative studies that would help have a better understanding disparities in unmet need for contraception, inability to crystallize preferences, and maternal healthcare utilization. There are several inter-related problems relating to the ones discussed in the dissertation, that can be answered using data from India Human Development Survey (IHDS). There are two sets of problems that I plan to work on in the future, that will be extensions from my dissertation work. First, using data from the IHDS, I want to study how rural women who intend to have no more children, use available infrastructure to gain access to (and knowledge about) contraception. I want to particularly focus on how their communication with spouses, and physical mobility, influence their use of the available infrastructure. I anticipate that, women who reside in villages that have medical facilities that provide contraception (such as Primary Healthcare Centers (PHCs), sub-centers etc.), and are located closer to a pharmacy are less likely to have an unmet need for contraception. Further, I expect that, whether women can obtain access to contraception or not, would be moderated by the gender norms in their households. This study will help address why women residing in rural regions of India are not able to stop child-bearing, even when they want to. It will also help address policy relevant questions such as:

a) Is having a pharmacy or a PHC in a village enough to address the unmet need for modern contraception? If not, then how can quality of infrastructure available be improved?

b) How do household gender norms in the household and area of residence impact a woman's ability to access modern contraception?

The second paper that would take work from my dissertation forward, would examine the impact of wantedness of a birth on subsequent child health and well-being (such as timely breast-feeding, full immunization etc). Few studies in the Indian context highlight some potential child health consequences of unintended births (Jensen and Ahlburg 1999; A. Singh, Chalasani, et al., 2012, Singh et al. 2013, Upadhyay and Srivastava 2016, Singh et. al 2017). There are several data and methodological limitations in the past studies. First, most studies in the Indian context examining the relationship between the intendedness of a birth, and child health focus on one or only a few (often rural) states, (see for exception A. Singh, Chalasani, et al., 2012) which limits generalizability. Second, the majority of the studies use retrospective data to measure fertility intentions (see for exception Singh et al. 2013) and several studies have shown that these measures may be biased, especially in underestimating unwanted births (Koenig et al. 2006). This paper will build on the past research on fertility intentions and child health in India while addressing several limitations of past work.

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