The Consequences of Unintended Fertility for Maternal and Child Health in India

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Abstract

Data from the Indian National Family Health Survey of 2005-06 are used to explore how intention status of pregnancy (at the time of conception) influences the likelihood of the mother having a safe delivery, the child receiving a full set of vaccinations, the child being stunted, and neonatal and postneonatal mortality. Logistic regression is used for all the outcomes, in conjunction with a sibling-difference model to address unobserved heterogeneity. Infant mortality is additionally modeled using discrete time survival analysis. Preliminary results indicate that unintended births (both mistimed and unwanted) are about 30% more likely than wanted births to be delivered unsupervised by any medical personnel, 60% less likely to have received all the recommended immunizations, and 20% more likely to be stunted. Given the high levels of unintended fertility (21% of births) in India, these are important findings, which underscore the importance of continued and increasing investments in family planning.

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Introduction

The Indian National Family Health Survey (NFHS) conducted in 2005-06 revealed that of the births in the five years preceding the survey, 21 percent were unintended pregnancies (IIPS and Macro International 2007). While 10 percent were mistimed births (i.e. at the time of conception, they were wanted later), 11 percent were completely unwanted. Mistimed births represent the divergence between women's desired birth spacing and their actual spacing. Unwanted births represent the divergence between women's desired fertility and their actual fertility. Both these gaps then indicate the important role that family planning can readily play in enabling women to fulfill their reproductive aspirations, by allowing them to either better space their births or have fewer children. Arguably, this alone could be sufficient *raison d'être* for family planning programs. However, even setting aside the problem of women's unfulfilled desires, there ostensibly exist significant, tangible repercussions of unintended fertility. These could take the form of negative effects on the unintended child, the mother, the family, and ultimately even the community and society at large. It is then imperative to further our understanding of the ramifications of unintendedness, and we do so in this paper by analyzing the health consequences of unintended fertility in India, for mother and child.

Past Research

We examine the relationship between 'unintendedness' – defined to include both mistimed and unwanted births – and the likelihood of safe delivery, complete vaccination, stunting, neonatal mortality, and postneonatal mortality. Marston and Cleland (2003) using retrospective DHS data (like in this paper) from Bolivia, Egypt, Kenya, Peru, and the Phillipines, find that intention status of the pregnancy had no effect on whether the delivery was supervised or not, except in Peru (and possibly in Kenya) where unwanted births were more likely to be unattended. In fact, they found that in Egypt unwanted births were more likely to be supervised than wanted births. They also find a significant positive association between unintendedness and incomplete vaccination in Egypt, Kenya, and Peru, but not in the Philippines or Bolivia. Jensen and Ahlburg (1999), using DHS data from 11 countries and one Indian state found that wanted children had higher levels of vaccination in countries where vaccination levels were low. Marston and Cleland again (2003) find that the only country (of their five) in which there is any significant relationship between intention status and stunting is in Peru, where unwanted children were more likely to be stunted than wanted children. Montgomery *et al* (1997a) using DHS data find that excess and unwanted fertility are negatively associated with height-for-age in the Dominican Republic. Of all the outcomes in our analysis, infant mortality has probably received the most attention in studies of the effects of unintendedness. Montgomery *et al* again (1997a) find that excess fertility was

weakly associated with higher mortality in Egypt, Philippines, and Thailand. However, in an analysis using data from Bangladesh, Montgomery *et al* (1997b) found no effects of unwantedness on child mortality. Put together, there seems to be some evidence pointing to unfavorable outcomes for mothers and children

Measurement and Analytical Issues

Our study relies on retrospective data on pregnancy intention. These type of data have been called into question because of the issue of *ex post* revision i.e. postpartum, or even following conception, women may characterize as wanted a pregnancy that was unwanted at the time of conception (Bankole and Westoff, 1998; Williams and Abma, 2000). The most directly relevant work on this is by Koenig *et al* (2006) where they compare prospective and retrospective descriptions of intendedness in four Indian states. Their results highlight a distinct tendency for births prospectively classified as unwanted to be retrospectively described as having been wanted or mistimed leading to an underestimation in the levels of unintended childbearing. They suggest that the main reason seems to be either that mothers adapt to the reality of a new birth or are reluctant to describe an existing child as having initially been unwanted. If unintended births are hypothesized to have worse outcomes, their characterization as being wanted has the effect of diluting the positive outcomes of the group of wanted births. This then makes the two groups seem less distinct in terms of their outcomes, and underestimates the negative effects of unintendedness. This is less problematic than it may first seem, to the extent that our estimates can be thought of as a lower bound on the negative impact of unintendedness. In a perfect universe, with perfect measurement, we would only find more reason to reduce the number of unintended births.

Secondly, we combine the categories of mistimed and unwanted births. Although these two are conceptually different (the former were unwanted at that time; the latter are fully unwanted), it is common practice in the literature to combine them. Unwanted births are hypothesized to have worse outcomes than mistimed births, so merging them into one category will have the effect of understating the negative effects of being unwanted and overstating the negative effects of being mistimed. We set aside the distinction in this paper arguing that (i) the aim should be to minimize the overall negative consequences that can stem from either of these types of births, and (ii) family planning can help in reducing both kinds of births. What this ultimately yields, like above, is a conservative estimate of the negative impact of unintendedness. Separating the mistimed births would only results in a stronger negative effect of unwantedness.

Lastly, there is the issue of unobserved heterogeneity. A very small number of authors have attempted to explicitly tackle the problem of the potential correlation of pregnancy intention status with some unmeasured variable(s) that also affects the outcome of interest. Chalasani *et al* (2008), using data from Bangladesh, find significant negative effects of unwantedness on neonatal and postneonatal mortality if the child was unwanted due to being "excess quantity" , and just on postneonatal mortality if the child was unwanted due to being the "wrong sex". The authors use family fixed effects models (and a natural experiment approach) to address the unobserved heterogeneity. They find that estimates from the fixed effects model were stronger than in the simple model that ignores selection on unobservables (i.e. larger negative effects of unwantedness emerged). Joyce *et al* (2000) employ the same approach with data from the United States. However, in their case, the inclusion of family fixed effects reduces the strength of the association between unwantedness and adverse prenatal and postpartum maternal behaviors. Rosenzweig and Wolpin (1980) similarly find that the positive relationship between unintendedness and well-baby care disappears with the inclusion of fixed effects. Clearly, any effort at accurately estimating the relationship between unintendedness and maternal and child health must account for unmeasured variation. Following these papers, we also use family fixed effects and present the results alongside those from simple regression (without fixed effects).

Data

We use data from Indian National Family Health Survey of 2005-06 (NFHS-III) to explore how intention status of pregnancy influences various outcomes related to mothers and children. In NFHS-III information was collected from a nationally representative sample of 109,041 households, 124,385 women ages 15-49, and 74,369 men ages 15-54. It covered 99 percent of the India's population living in 29 states (IIPS and Macro International 2007). The survey had a two stage design in urban areas and three stage design in rural areas and results are only representative after weighting. Adult women ages 15-49 in all the selected households were interviewed, while adult men ages 15-54 were interviewed only in a randomly selected subset of households[1]. Men and women were asked about their background characteristics, reproductive behavior and intentions, knowledge and use of contraception, involvement in health care, health and nutrition, attitudes towards gender roles, sexual life, and knowledge of HIV/AIDS and other sexually transmitted infections.

The present analysis is restricted to children born in the five years preceding the survey. The outcome measures we examine are as follows. First, whether or not the delivery was safe (i.e.

[1] Men age 15-54 were eligible for an interview in all sampled households in seven states, namely Andhra Pradesh, Karnataka, Maharashtra, Manipur, Nagaland, Tamil Nadu, and Uttar Pradesh. In the remaining 22 states, all men age 15-54 were eligible for interview in a 38 percent sub-sample of households.

one or both of: (i) took place in medical institution; (ii) was supervised by trained medical personnel). Second, whether or not the child received the full set of vaccinations (as recommended by WHO guidelines); this analysis is restricted to children who are in the age group of 12-23 months. Third, whether or not the child was stunted (height below minus two standard deviations from the median of the reference population). Fourth, whether or not the child died between birth and completed age 28 days (neonatal mortality). Fifth, whether or not the child died between completed ages 29 days and 11 months, conditional on survival through the neonatal period (postneonatal mortality).

We first examined the intention status of pregnancy by various socio-economic and demographic characteristics (Table 1). Intention status is measured from women's reports that the pregnancy was wanted then, later or never. For each child born in the five years before the survey, NFHS-III asked women whether at the time of conception, the pregnancy was wanted at that time (wanted), wanted at a later time (mistimed), or not wanted at all (unwanted). We use the term 'unintended' to describe both unwanted and mistimed births.

We examined the five outcomes in terms of intention status of pregnancy and the other socio-economic and demographic characteristics of mother and the household in bivariate analysis (Table 2). It is well-known that there are factors other than pregnancy intention, notably socio-economic and demographic characteristics of the mother and the household, that influence the outcomes. We, therefore, use multivariate analysis to estimate the adjusted effects of intention status of pregnancy on the outcomes after controlling for these other characteristics. The variables included in the final models are: standard of living of household (as measured by a complex index ranking households based on their ownership of consumer durables), religion, caste, mother's education, mother's autonomy (as measured by women's responses to questions about how much decision-making power they had in their household), mother's age at birth of the index child, media exposure, sex of the child, place of residence (urban/rural), region of residence and child's age. An immense body of past research has demonstrated that all these variables exert significant influence on healthcare utilization, and child morbidity and mortality.

Region of residence is an important variable that merits further discussion. India is comprised of 29 states and seven Union Territories. The states are broadly classified into six geographical regions, namely North, Central, East, Northeast, West and South. The north region is comprised of: Jammu & Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi, Uttaranchal and Rajasthan. The central region includes the states of Uttar Pradesh, Madhya Pradesh and Chattisgarh. The eastern region includes Bihar, Jharkhand, West Bengal and

Orissa. The northeast region is comprised of eight states, namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. The west region includes the states of Gujarat, Maharashtra and Goa. The states of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu are in the south region. Over 99 percent of India's population lives in the 29 states.

Both the intention status of pregnancy and the outcomes vary considerably across the different geographical regions of India. Unintended pregnancy ranges between 13 % in the West and 27 % in the Central region. Unsafe deliveries vary between 20 % in the South and 70 % in Central; incomplete immunization varies between 44 % in the South and 71 % in Central; and stunting varies between 33 % in the South and 49 % in Central. The different regions also have varying levels of socio-economic and demographic development.

Methods

We use simple binary logit regression and fixed effects binary logit regression models to examine the effects of intention status of pregnancy on the five outcomes related to mothers and children (Table 3). The purpose of the family fixed effects is to better account for differences in maternal and family background, and remove the part of the association between unintendedness and the outcomes that may be due to selection on these traits. It serves to address any potential unobserved heterogeneity that would lead to biased and inconsistent estimates of the coefficient on unintendedness. Also known as the sibling-difference model, it leverages the difference in outcomes within sibling pairs to remove the confounding effects of any family-specific endowments, whether genetic or environmental. Let j (j = 1, …n) denote the j^{th} household. Let i (i = 0, 1) denote the i^{th} sibling within the household where i = 0 represents the child that was wanted, and i = 1 represents the child that was unwanted. Also included in the regression equation are measured covariates (x_{ij}) that are potentially related both to the outcome and our focal variable, intendedness. The additional effect of receiving prenatal care is captured by the parameter τ. Household-level variables both observed and unobserved are captured by α_j .This gives us the sibling-specific equations:

$$y_{0j} = \beta' x_{0j} + \alpha_j + \varepsilon_{0j} \qquad (1)$$

$$y_{1j} = \beta' x_{1j} + \tau + \alpha_j + \varepsilon_{1j} \qquad (2)$$

When we difference the two equations, the household-level factors that are stable across siblings drop out and yield the following:

$$y_{1j} - y_{0j} = \beta' (x_{1j} - x_{0j}) + \tau + (\varepsilon_{1j} - \varepsilon_{0j}) \qquad (3)$$

Equation (3) tells us that the difference in outcomes between siblings is a result of their differential intendedness status, conditional on any other differences between siblings and all possible household-level unobserved endowments. This sibling-difference approach is not free of assumptions, however. For one, if intention status is related to idiosyncratic endowments of the child, endowments that are also related to the outcome, then the estimated coefficient on unintendedness will be biased. Secondly, family "fixed" effects only account for time-invariant maternal and family background variables. Notwithstanding these two issues, we submit that this approach is better than completely ignoring the heterogeneity problem.

In addition, for the fourth and fifth outcomes (i.e. neonatal mortality and postneonatal mortality) we model the hazard of a child dying using a discrete-time approach in which each child's observed exposure to risk is segmented into time units that serve as the observations in the regression estimation (Allison 1982; Box-Steffensmeier and Jones 2004). Survival analysis presents the distinct advantage of allowing censored observations to contribute to analysis time. We estimate fixed effects logistic regressions using as dependent variable a binary indicator of whether or not the child died in a given time unit.

Finally, we present the regression results separately for the different geographical regions of India (Table 4). The analysis for the fourth and fifth outcome is currently underway.

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Table 1. Descriptives of independent variables by intention status of pregnancy - NFHS 2005-06

	India		
Covariate & Category	**Unintended**	**Intended**	**Total**
SLI			
Poorest	21.1	78.9	100
Poorer	22.4	77.6	100
Middle	21.4	78.6	100
Richer	19.1	80.9	100
Richest	16.2	83.8	100
Religion			
Hindu	19.5	80.5	100
Muslim	25.1	74.9	100
Other	17.8	82.2	100
Caste			
SC/ST	20.4	79.6	100
OBC	20.0	80.0	100
Other	20.8	79.2	100
Mother's education			
Non-literate	21.5	78.5	100
Upto middle school	20.3	79.7	100
Middle school and higher	17.8	82.2	100
Autonomy			
Low	20.1	79.9	100
High	20.9	79.1	100
Mother's age at birth			
Less than 20	13.3	86.7	100
20 to 30	19.7	80.3	100
Greater than 30	34.3	65.7	100
Media exposure			
None	21.2	78.8	100
Partial	20.1	79.9	100
Full	15.7	84.3	100
Sex of the child			
Male	19.3	80.7	100
Female	21.5	78.5	100
Place of Residence			
Rural	20.6	79.4	100
Urban	19.6	80.4	100
Region			
North	15.5	84.5	100
Central	26.6	73.4	100
East	21.6	78.4	100
Northeast	19.0	81.0	100
West	13.3	86.7	100
South	16.6	83.4	100
N	**10422**	**41133**	**51555**

Table 2. Descriptives of outcomes by all variables - NFHS 2005-06 data

Covariate & category	India		
	% Unsafe delivery	% No immunization	% Stunted
Intendedness			
Unintended	**60.1**	**64.2**	**45.1**
Intended	**51.4**	**57.6**	**41.8**
SLI			
Poorest	80.4	76.2	54.5
Poorer	67.9	68.9	48.6
Middle	50.7	56.6	43.0
Richer	32.5	46.7	35.0
Richest	10.8	31.0	20.8
Religion			
Hindu	52.2	58.0	42.4
Muslim	61.1	66.0	44.6
Other	39.4	48.1	36.2
Caste			
SC/ST	63.7	63.9	47.9
OBC	53.1	61.8	43.4
Other	41.7	49.4	35.4
Mother's education			
Non-literate	73.6	74.7	51.8
Upto middle school	45.1	50.1	40.3
Middle school and higher	16.6	32.9	24.9
Autonomy			
Low	54.0	60.1	42.4
High	51.6	56.6	42.6
Mother's age at birth			
Less than 20	53.3	-	47.4
20 to 30	51.1	-	40.6
Greater than 30	64.6	-	46.3
Media exposure			
None	71.7	71.8	50.6
Partial	39.2	49.2	36.9
Full	13.7	31.5	21.5
Sex of the child			
Male	-	57.9	41.6
Female	-	60.1	43.5
Place of Residence			
Rural	62.3	63.6	45.2
Urban	26.2	45.5	34.3
Region			
North	50.9	56.9	37.0
Central	70.3	70.7	49.1
East	63.3	59.6	43.9
Northeast	65.2	69.6	39.3
West	32.8	47.4	42.9
South	19.6	44.1	32.9
N	**51555**	**41552**	**41305**

Table 3. Effects of unintendedness on prenatal behavior of mothers and child health outcomes for India - NFHS 2005-06 data

	Unsafe Delivery			No Immunization			Stunted		
	Total Sample	Fixed Effects Sample		Total Sample	Fixed Effects Sample		Total Sample	Fixed Effects Sample	
Covariate & category	logit	No fixed effects	fixed effects	logit	No fixed effects	fixed effects	logit	No fixed effects	fixed effects
Intendedness									
Intended									
Unintended	**1.22*** **	**1.19** **	**1.28** **	**1.19*** **	**1.39*** **	**1.61*** **	**1.14*** **	**1.08**	**1.20** **
SLI									
Poorest									
Poorer	0.71***			0.79***			0.89***		
Middle	0.47***			0.54***			0.75***		
Richer	0.30***			0.45***			0.60***		
Richest	0.13***			0.30***			0.34***		
Religion									
Hindu									
Muslim	1.45***			1.68***			1.12***		
Other	1.01**			1.31***			1.03		
Caste									
SC/ST									
OBC	0.84***			1.08**			0.94**		
Other	0.68***			0.84***			0.79***		
Mother's education									
Non-literate									
Upto middle school	0.56***			0.54***			0.82***		
Middle school and higher	0.28***			0.39***			0.63***		
Autonomy									
Low									

High	0.97			0.88***			0.98		
Mother's age at birth									
Less than 20									
20 to 30	1.16***	1.25**	1.36**	-			0.85***	0.93	1.18*
Greater than 30	1.14**	0.99	0.87	-			0.85***	0.93	1.44**
Media exposure									
None									
Partial	0.73***			0.75***			0.89***		
Full	0.46***			0.68***			0.75***		
Sex of the child									
Male									
Female	-			1.05**	1.09	1.07	1.03	1.03	1.01
Place of Residence									
Urban									
Rural	1.68***			0.90***			0.91***		
Region									
South									
North	5.71***			1.14***			1.25***		
Central	6.52***			1.65***			1.48***		
East	3.99***			1.10**			1.09**		
Northeast	6.19***			2.15***			1.06		
West	2.34***			1.23***			1.58***		
Child age				1.00	0.99	0.99	1.02***	1.03***	1.02***
N	**51555**	**4519**	**4519**	**41552**	**3559**	**3559**	**41305**	**7619**	**7619**

*** p<.001, ** p<.05, *p<.10

Table 4. Effects of unintendedness on prenatal behavior of mothers and child health outcomes for the different geographic regions of India - NFHS 2005-06 data

	Total sample		Fixed effects sample		
Outcome	(logit)	Sample size	no fixed effects	fixed effects	Sample size
		North			
Unsafe delivery	1.24***	9286	1.13	1.31	969
No immunization	1.11	7461	1.06	1.12	672
Stunted	1.16**	7533	1.03	1.14	1416
		Central			
Unsafe delivery	1.46***	11659	1.06	1.11	1198
No immunization	1.84***	9409	2.21***	3.00***	865
Stunted	1.19***	9225	1.25**	1.45**	2070
		East			
Unsafe delivery	1.22**	8126	1.67**	2.02**	704
No immunization	0.99	6555	1.27	1.37	627
Stunted	1.18**	6884	1.05	1.14	1300
		Northeast			
Unsafe delivery	1.06	9655	1.26	1.42	749
No immunization	0.98	7725	1.27	1.55	557
Stunted	1.10	7693	0.97	1.09	1373
		West			
Unsafe delivery	0.85	5597	1.00	0.92	495
No immunization	1.06	4526	1.07	1.19	406
Stunted	1.10	4351	1.15	1.26	727
		South			
Unsafe delivery	1.18*	7232	1.11	0.99	404
No immunization	1.02	5876	1.35	1.47	432
Stunted	1.01	5619	0.96	0.92	733

*** p<.001, ** p<.05, *p<.10

Note: Only coefficients on unintendedness shown. Regression controls not shown include standard of living, religion, caste, mother's education, mother's autonomy, mother's age at birth (not included in no immunization model), media exposure, sex of the child (only in no immunization and stunted models), age of the child (only in stunting & immunization models).