Article

Missing Women and India's Religious Demography

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Abstract

This article explores the relationship between religion, caste, infant mortality and fertility across Hindus and Muslims in India using recent data from the 2006 National Family Health Survey. The analysis shows that Muslims exhibit lower infant mortality rates relative to Hindus, and that this difference is not adequately explained by socio-economic status, location and policy variables. We argue that the combination of gender preference and heterogeneity in desired fertility across religious groups offers one potential explanation for the observed differences in mortality rates. Our data support this view; the difference in infant mortality between Muslims and Hindus is concentrated at higher birth order and among girls, irrespective of their birth order. We also show that there are differences in mortality between lower-caste Hindus and higher caste Hindus in our sample.

Keywords

Religion, infant mortality, desired versus realized fertility, sex ratio, gender bias

Introduction

India is well-known for striking demographic patterns: excess female mortality and significant regional variation in fertility as well as child mortality are two of these (Das Gupta, 2005; Dyson & Moore, 1983; Kishor, 1993; Sen, 1992, 2001; Visaria 1971).[1] A recent literature argues that demographic indicators also vary significantly across India's religious groups. Fertility is known to be higher among Muslims than it is among Hindus (Basu, 1997; Dharmalingam & Morgan, 2004;

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Iyer, 2002; Jeffery & Jeffery, 1997).[2] Similarly, mortality differences are very pronounced between Hindus and Muslims (Guillot & Allendorf, 2010). Infant mortality among Muslims, at 59 per 1,000, is lower than for Hindus, which stands at 77 per 1,000 (Borooah & Iyer, 2005a). Similarly, child mortality, at 83 per 1,000 for Muslims, is substantially lower than among Hindus, at 107 per 1,000 (IIPS and ORC Macro International, 2000). The survival advantage of Muslim children despite the higher fertility of their mothers is particularly puzzling in light of the higher levels of poverty in this community as noted by the recent and well-publicized Sachar Committee Report (Government of India, 2006). Some recent studies of mortality have tried to assess the factors that explain the religious differences in mortality, mainly the important study by Guillot and Allendorf (2010). This analysis finds that among Muslims in India, there is less discrimination against girls than among Hindus whenever the family already has male births, or in the case of first births. On the other hand, this study also argues that there is more discrimination against Muslim girls when the family already has female births.

This article extends this existing literature on religion and demography in India by performing a comparative analysis of infant mortality across religious and caste groups using data from the National Family Health Survey of 2005–2006. Our analysis divides our population into four subgroups: Muslims, Scheduled Castes (SC), Scheduled Tribes (ST) and a group that we called higher caste Hindus that includes OBCs as well as other non-scheduled castes. We estimate survival probabilities for children and control for a number of important socio-economic, geographic and demographic variables such as socio-economic status, nutrition and female labour force participation. Our findings confirm that Muslim infant and child mortality is considerably lower than that for the Hindus, even after accounting for the wide range of socio-economic characteristics available to us.

We provide a potential explanation of the mortality differentials. Our explanation begins with the recognition that Muslims have higher fertility than Hindus, and this is not entirely explained by their observable characteristics such as socio-economic status or location. We infer from this that Muslims may prefer larger families than Hindus and argue that consequently, a Muslim child is more likely to be born within optimal family size and thus to experience a lower risk of mortality. Empirical evidence provides support for this hypothesis.

Our explanation also highlights the role of gender. First born Hindu girls in higher castes display higher mortality risks than their Muslim counterparts. Our conjecture is that even though both Hindus and Muslims may prefer sons over daughters, the Hindu preference for smaller families may induce a higher level of daughter-aversion as early as the first birth, resulting in a higher female mortality rate for this group. Taken together, our results lead to the conclusion that discussions about 'missing women' and excess child mortality in India may be significantly enriched by considering the effects of religion and differences in desired fertility.

An additional contribution of this article is to look at the variations in mortality within Hindus, by caste. In particular, we examine the differences between scheduled castes and other Hindu groups in comparison to Muslims and show that the across-religion differences in mortality are more significant than the within-religion differences. To that extent, our analysis both supports and differs from the study by Guillot and Allendorf (2010).

The rest of the article proceeds as follows: the second section explores child mortality and its socio-economic determinants. The third section discusses how religion, fertility and mortality might be linked. The fourth section concludes.

Child Mortality and its Socio-economic Determinants

Our description of contemporary India uses data from the 2005–2006 National Family Health Survey, henceforth NFHS.[3] The NFHS interviewed a total of 123,385 women in 109,041 households located in 29 states of India and is intended to be representative at both state and national levels. The religious composition of the households is consistent with the findings of the 2001 Indian Census (henceforth Census): 73.4 per cent of households are Hindu, 12.3 per cent are Muslim, 9.2 per cent are Christian, 2 per cent are Sikh, and the remainder are of other religious affiliations. Among Hindus, the caste composition of our population also mirrors the one obtained from the Census; 17.3 per cent of respondents reported that they belonged to a 'Scheduled Caste', 13.9 per cent respondents reported that they belong to a 'Scheduled Tribe'. India's scheduled castes and scheduled tribes are those castes and tribes recognized by the Indian Constitution as deserving special recognition in respect of education, job reservation in employment and political representation.

For the analysis in this article, we restrict our sample to only Hindu and Muslim women who are married and have had at least one child. This results in a sample of 79,054 women. 11,042 of these women (13.9 per cent of the sample) identify themselves as Muslim, 12,715 (16 per cent of the sample) identify themselves as SC and 10,596 (13 per cent) identify themselves as ST. The remainder are higher caste Hindus. This is admittedly a heterogeneous category that includes OBCs as well as a variety of other higher castes. We group them together mainly because previous literature has highlighted the high levels of poverty in the muslim community, making them more economically comparable to SC and ST groups (Government of India, 2006).

Panel A of Table 1 presents summary statistics of key variables for the entire female sample. We also conduct extensive analysis on the child sample, which includes 252,728 children who are born to 84,609 mothers in the female sample. The information was gathered from birth histories and is therefore representative of children who are alive as well as those who died; it also includes children living within the household and those who left. Summary statistics for the child sample is presented in Panel B of Table 1.

Table 1. Summary Statistics of Key Variables Used in our Analysis, Separately for Woman and Child Samples

Variable	Mean	Standard Deviation
Panel (A): Woman Sample		
Number of children born	3.035	1.791
Sterilized	0.396	0.489
Use contraception	0.572	0.495
Ideal number of girls	0.936	1.51
Ideal number of boys	1.175	1.577
Ideal sex-ratio	0.85	0.359
Age at first marriage	17.782	3.803
Woman completed primary school	0.436	0.496
Woman never attended school	0.407	0.491
Husband completed primary school	0.607	0.488
Husband never attended school	0.227	0.419
Land (acres)	0.476	5.692
Household below poverty line	0.548	1.51
Wealth Index Score	0.794	99.361
Rural	0.562	0.496
Panel (B): Child Sample		
SC	0.178	0.383
ST	0.141	0.348
UC	0.509	0.5
Female	0.48	0.5
FB	0.329	0.47
SC × Female	0.086	0.281
ST × Female	0.068	0.253
UC × Female	0.243	0.429
SC × FB	0.055	0.228
ST × FB	0.041	0.199
UC × FB	0.184	0.388
FB × SC × Female	0.024	0.153
FB × ST × Female	0.019	0.136
FB × UC × Female	0.076	0.266
FB × Female	0.142	0.349

Source: Authors' research.

The basis of our analysis is a comparison between the demographic and socio-economic differences between four mutually exclusive subgroups of India's population: Muslims, SC, ST and higher caste Hindus. For the sake of convenience, we refer to these three groups as Muslims, SC, ST and UC Hindus respectively. We focus on these mutually exclusive categories for two reasons. First, while 30 per cent of Hindus are SC/ST, the proportion of Muslims reporting SC/ST status is approximately 2–5 per cent (Government of India, 2006). In our sample, only 452 Muslim women reported themselves as SC/ST. We included this group in our Muslim sample, and excluded them from the SC, ST and UC sample. A second reason is that among Hindus, the criteria for being a SC and ST are widely recognized, since the Indian government maintains official lists of 'Scheduled Castes' and 'Scheduled Tribes'. The overlap between SC, ST and higher caste Hindus is thus close to zero. The criteria for being an SC/ST for non-Hindus are much less clear. In the case of inter-caste marriages, we follow Hindu civil law and assign the woman the caste of her husband.

Descriptive Statistics

We begin our analysis with a comparison of the aforementioned groups along several key demographic variables. Table 2 presents two comparisons of Muslims with *(a)* higher caste or non-scheduled Hindus, *(b)* Scheduled Castes (SC) and *(c)* Scheduled Tribes (ST). Since the focus is on child mortality, we focus on the sample of women who have ever had children, as well as the sample of ever-born children.[4] We first examine estimates of mortality from the child sample. We define mortality below the age of 1 as a binary variable that take value 1 if a child died before the age of 1 and 0 otherwise. It excludes all children born less than a year ago due to censoring concerns. Mortality below the age of 5 is defined similarly. Note that the overall mortality rate of Muslim children is slightly higher than higher caste Hindus and the difference is statistically significant in the case of mortality below the age of 5. There are also statistically significant differences in mortality between Muslims and SCs and STs: Muslim children are 2 per cent less likely to die before the age of 5 than SC or ST children. Later on in this section however, we will present conditional effects and illustrate that the sign of the difference reverses, with Muslims displaying lower mortality than all three groups.

Next, we examine differences in fertility. Compared to higher caste Hindus, Muslim women have approximately 0.85 more children. Muslim women also report lower levels of permanent contraception, greater preferences for ideal numbers of boys and girls, and a lower age at first marriage. The preferences for girls however, are not statistically significant.

Cluster-level sex ratios, presented at the bottom of Table 2 however, show that Muslims have higher female-male sex-ratios than higher caste Hindus and appear to be less averse to having girls relative to boys.[5] The low female-male ratio at birth for higher-caste Hindus may at least in part be attributed to the fact

Table 2. A Comparison of Muslims, Higher Caste (UC) Hindus, Scheduled-Caste (SC) Hindus and Scheduled Tribes (ST)

	Muslim		Upper-caste Hindus		Difference (Stddev)	SC		Difference (Stddev)	ST		Difference (Stddev)
Child Sample:											
Died	39949	0.093	130733	0.092	0.0014	45768	0.12	–0.028	36278	0.12	–0.023***
					(0.0017)			(0.0021)			(0.0022)
Died before age of 1	38377	0.073	126097	0.073	–0.00032	44119	0.092	–0.019	34719	0.082	–0.0097***
					(0.0015)			(0.0019)			(0.0020)
Died before age of 5	31805	0.11	107111	0.10	0.0061***	37412	0.14	–0.027	28561	0.13	–0.024***
					(0.0020)			(0.0025)			(0.0027)
Woman Sample:											
Number of children born	11042	3.62	47288	2.76	0.85***	14115	3.24	0.38***	10596	3.42	0.19***
					(0.018)			(0.025)			(0.028)
Sterilized	11042	0.26	47288	0.43	–0.17***	14115	0.45	–0.19***	10596	0.31	–0.050***
					(0.0051)			(0.0060)			(0.0061)
Use contraception	11042	0.45	47288	0.63	–0.18***	14115	0.59	–0.14***	10596	0.42	0.034***
					(0.0051)			(0.0063)			(0.0067)
Ideal number of girls	11042	1.04	47288	0.83	0.21	14115	0.92	0.12***	10596	1.33	–0.28***
					(0.015)			(0.020)			(0.022)
Ideal number of boys	11042	1.35	47288	1.04	0.31***	14115	1.21	0.14***	10596	1.57	–0.23***
					(0.016)			(0.021)			(0.023)
Ideal sex-ratio	11042	0.84	47288	0.85	–0.0090	14115	0.83	0.014***	10596	0.90	–0.057***

(Table 2 Continued)

(Table 2 Continued)

	Muslim		Upper-caste Hindus		Difference (Stddev)	SC		Difference (Stddev)	ST		Difference (Stddev)
					(0.0041)			(0.0049)			(0.0059)
Age at first marriage	11042	17.1	47288	18.1	–1.06***	14115	16.8	0.24***	10596	18.0	–0.90***
					(0.040)			(0.042)			(0.050)
No education	11042	0.51	47288	0.33	0.18***	14115	0.54	–0.025***	10596	0.49	0.022***
					(0.005)			(0.0063)			(0.0068)
Landless	11042	0.72	47288	0.57	0.15***	14115	0.70	0.029***	10596	0.44	0.29***
					(0.0051)			(0.0058)			(0.0064)
Kucha home	11042	0.092	47288	0.068	0.024***	14115	0.13	–0.036***	10596	0.2	–0.11***
					(0.0027)			(0.004)			(0.0047)
Eat meat	11042	0.054	47288	0.024	0.029***	14115	0.027	0.026***	10596	0.057	–0.0031
					(0.0018)			(0.0025)			(0.0031)
Eat plant protein	11042	0.035	47288	0.036	–0.0013	14115	0.037	–0.0019	10596	0.035	–0.00061
					(0.0020)			(0.0024)			(0.0025)
Eat dairy	11042	0.040	47288	0.018	0.022***	14115	0.021	0.020	10596	0.043	–0.0025
					(0.0016)			(0.0021)			(0.0027)
Women's hemoglobin level	11042	191.0	47288	169.5	21.4***	14115	162.8	28.2***	10596	149.8	41.1***
					(2.31)			(2.84)			(3.08)
Women currently working	11042	0.24	47288	0.35	–0.11***	14115	0.41	–0.17	10596	0.53	–0.29
					(0.0049)			(0.0059)			(0.0063)

(Table 2 Continued)

(Table 2 Continued)

	Muslim		Upper-caste Hindus		Difference (Stddev)	SC		Difference (Stddev)	ST		Difference (Stddev)
Women self-employed	11042	0.040	47288	0.072	–0.032***	14115	0.062	–0.022	10596	0.10	–0.064
					(0.0026)			(0.0028)			(0.0035)
Women work outside home	11042	0.16	47288	0.31	–0.15***	14115	0.4	–0.23***	10596	0.55	–0.38***
					(0.0047)			(0.0056)			(0.0059)
Community/cluster Sample:											
Sex-ratio of children alive	1564	1.07	3339	0.98	0.087***	2356	1.04	–0.036	1331	1.01	0.036
					(0.019)			(0.026)			(0.026)
Sex-ratio of children ever-born	1564	1.05	3339	0.98	0.078***	2356	1.02	–0.039	1331	0.98	0.039
					(0.019)			(0.025)			(0.025)

Source: Authors' research.
Notes: * denotes significance at 10% level, ** significance at 5% level; and *** significance at 1% level.

that the practice of sex selective abortion is higher in this group (Arnold et al., 2002). However, since the NFHS data do not contain information on the prevalence and practice of abortion, this is one aspect that we are not able to investigate comprehensively and remains beyond the scope of this article. However, we do acknowledge, readily, the importance of these practices for the subject of this research.

In the sections below, we focus exclusively on the inter-group differences in child mortality and examine whether these differences persist once we control for other socio-economic, locational and nutrition-related variables.

Determinants of Child Mortality

Our empirical analysis of the determinants of mortality is based on a simple linear probability model. As before, we use dummy variables that take value 1 if the child died before the age of 1 and 5, respectively, and 0 otherwise. As mentioned earlier, we exclude children younger than 1 and 5 respectively, to address the issue of censoring. We regress each of these on dummy variables that indicate whether the child's parents are SC, ST or higher caste Hindus (Muslim is therefore the omitted category). We also include a vector of observable characteristics X_i that capture potential risk factors (to be discussed below). As before, we refer to the groups in the analysis as simply *SC, ST* and *UC* respectively. Muslims are the excluded group. Our working sample initially includes 222,712 children. Of the 218,769 children who were included in our sample, 23,107 (10.38 per cent of the sample) had died. The children's ages range from 0–37.[6] For children who died, the average age at death was 20 months.

Our control variables include a variety of other individual, family and regional characteristics. Among individual characteristics, we include a child's age, gender and a dummy variable that indicates whether or not the child is firstborn. We further include information on the child's parents; father's age, mother's age and age at marriage, and dummy variables for whether a child's mother and father had completed primary school. We control for economic status using household land holdings (in acres) and a household wealth index that has been tested in a large number of countries and has been shown to be consistent with expenditure and income measures (Filmer & Pritchett, 2001; Rustein, 1999).[7] We also control for whether the family resides in a rural area. Furthermore, we add to the regression specifications information on nutritional intakes and access to basic health care services. Because religious communities in India have a variety of dietary restrictions and prescriptions, we include dummy indicators for whether any meat, dairy or plant-protein was consumed in the 24 hours prior to the survey. To address the possibility that some groups may also receive better access to health care than others, we include cluster-level averages of vaccination rates for measles, polio, tuberculosis and DPT. The reliance on aggregates instead of individual-level or household-level variables for these indicators is particularly important in addressing the potential endogeneity issues in the relationship between mortality and vaccinations. For similar reasons, we also include cluster-level averages of female labour force participation rates. Finally, we add state fixed-effects to control for the fact that some Indian states just have had historically distinctive demographic patterns (Dyson & Moore 1983). The subset of observations that has information on all these characteristics gives us a final sample of 195,080 children.

The results of the estimation are presented in Tables 3 and 4. Five specifications are estimated for each of the two dependent variables (death before the age of 1, Table 3; and death before the age of 5, Table 4). The first is the simplest version, with control variables included only for the child-specific characteristics: gender and birth-order. The second includes controls for mother and household characteristics. The third includes controls for key community characteristics: nutritional practices and vaccination rates. The rationale for including these, as well as the coefficients, will be discussed later in this section. The fourth specification also includes community-level averages of women's labour-force participation. The final specification includes the full set of controls, but is restricted to children whose mothers are older than 40, a subgroup for which mothers have

Table 3. Linear Probability Model for Mortality Below the Age of 1

	Full Sample				Age ≥ 40
	(1)	(2)	(3)	(4)	(5)
SC	0.019***	0.014***	0.015***	0.015***	0.019***
	(0.0023)	(0.0023)	(0.0023)	(0.0023)	(0.0045)
ST	0.023***	0.015***	0.015***	0.014***	0.018***
	(0.002)	(0.0028)	(0.0028)	(0.0029)	(0.0057)
Upper caste	0.0057***	0.011***	0.012***	0.012***	0.014***
	(0.0019)	(0.0019)	(0.0019)	(0.0019)	(0.0037)
Female	–0.012***	–0.012***	–0.012***	–0.012***	–0.013***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.002)
Firstborn	–0.056***	–0.049***	–0.049***	–0.049***	–0.050***
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0019)
Mother's age		0.00066***	0.00062***	0.00061***	0.0019***
		(0.00014)	(0.00014)	(0.00014)	(0.00044)
Mother's age at marriage		–0.0018***	–0.0018***	–0.0018***	–0.0021***
		(0.00019)	(0.00019)	(0.00019)	(0.00032)
Mother never attended school		0.012***	0.011***	0.011***	0.011***
		(0.0016)	(0.0016)	(0.0016)	(0.003)

(Table 3 Continued)

(Table 3 Continued)

	Full Sample				Age ≥ 40
	(1)	(2)	(3)	(4)	(5)
Father's age		–0.000069	–0.000071	–0.000068	–0.00034***
		(0.00011)	(0.00011)	(0.00011)	(0.00018)
Father never attended school		0.0036***	0.0033***	0.0033***	–0.0002
		(0.0018)	(0.0018)	(0.0018)	(0.0032)
Land (acres)		–0.0098	–0.01	–0.01	–0.053***
		(0.01)	(0.01)	(0.01)	(0.014)
Wealth index		–0.16***	–0.15***	–0.15***	–0.21***
		(0.0098)	(0.0099)	(0.01)	(0.019)
Rural		–0.0014	–0.0016	–0.0023	–0.0042
		(0.0016)	(0.0016)	(0.0016)	(0.0031)
Ate Meat			–0.0066***	–0.0066***	–0.0055
			(0.0033)	(0.0033)	(0.015)
Ate Plant Protein			–0.0064***	–0.0064***	0.0091
			(0.0032)	(0.0032)	(0.016)
Ate Dairy			–0.0032	–0.0033	–0.041***
			(0.0035)	(0.0035)	(0.014)
Heme level			–0.00029	–0.00029	–0.00016
			(0.00031)	(0.00031)	(0.00054)
Average measles vaccinations			0.0015	0.0016	0.0036
			(0.004)	(0.004)	(0.007)
Average polio vaccinations			0.011***	0.011***	0.0035
			(0.0062)	(0.0062)	(0.011)
Average DPT vaccinations			–0.018***	–0.018***	–0.0069
			(0.0052)	(0.0052)	(0.0097)
Average female LFP				0.0061***	0.0075
				(0.0033)	(0.006)
Constant	0.080***	0.082***	0.088***	0.086***	0.049***
	(0.0037)	(0.006)	(0.0074)	(0.0075)	(0.022)
N	243140	243140	243140	243140	84527
R^2	0.018	0.024	0.024	0.024	0.026

Source: Authors' research.

Notes: (i) Children below the age of 1 are dropped from the sample (due to censoring); (ii) Estimates in column 5 pertain to the restricted sample of older women (age ≥ 40); (iii) Standard errors—shown in parentheses—are clustered at the household-level; (iv) * denotes significance at 10% level, ** significance at 5% level; and *** significance at 1% level.

in all likelihood completed their child-bearing. All models include state fixed-effects. Note that in the specification with the full set of controls, the variables that are of most interest to us – SC, ST and UC – take a positive sign and are statistically significant at the 1 per cent level, indicating that individuals in these groups face higher mortality risks than Muslims. The magnitude of the effects is quite striking: UC Hindus as well as SC and ST women are all about 1 per cent more likely to lose a child than their Muslim counterparts, even after we control for socio-economic characteristics, state of residence, community nutrition practices, community access to health care and norms regarding female laborforce participation. These results are totally the opposite of what we observed in the case of unconditional differences (see Table 2). The results in Tables 3 and 4 also suggest that SC and ST women are about 2 per cent more likely to lose a child than their Muslim counterparts. In results not shown here, we test the equality of the coefficients for UC, SC and ST and find that we reject the null hypothesis of equality.

These results permit us to evaluate a range of mechanisms that can drive the lower observed mortality among Muslims. These are discussed in the next section.

Table 4. Linear Probability Model for Mortality Below the Age of 5

	Full Sample				Age ≥ 40
	(1)	(2)	(3)	(4)	(5)
SC	0.028***	0.019***	0.022***	0.021***	0.024***
	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0050)
ST	0.042***	0.025***	0.027***	0.026***	0.028***
	(0.0037)	(0.0037)	(0.0037)	(0.0038)	(0.0064)
Upper caste	0.00044	0.0099***	0.013***	0.012***	0.015***
	(0.0024)	(0.0024)	(0.0025)	(0.0025)	(0.0041)
Female	–0.0077***	–0.0078***	–0.0078***	–0.0078***	–0.0078***
	(0.0014)	(0.0014)	(0.0014)	(0.0014)	(0.0022)
Firstborn	–0.052***	–0.042***	–0.041***	–0.041***	–0.059***
	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0022)
Mother's age		–0.00074***	–0.00067***	–0.00067***	0.0029***
		(0.00019)	(0.00019)	(0.00019)	(0.00049)
Mother's age at marriage		–0.0014***	–0.0014***	–0.0014***	–0.0024***
		(0.00026)	(0.00026)	(0.00026)	(0.00036)
Mother never attended school		0.017***	0.016***	0.016***	0.014***
		(0.0020)	(0.0021)	(0.0021)	(0.0033)

(Table 4 Continued)

(Table 4 Continued)

	Full Sample				Age ≥ 40
	(1)	(2)	(3)	(4)	(5)
Father's age		–0.00022	–0.00021	–0.0002	–0.00043***
		(0.00015)	(0.00015)	(0.00015)	(0.00021)
Father never attended school		0.0083***	0.0078***	0.0078***	0.0056
		(0.0022)	(0.0022)	(0.0022)	(0.0036)
Land (acres)		–0.0023	–0.003	–0.0031	–0.032***
		(0.014)	(0.014)	(0.014)	(0.019)
Wealth index		–0.29***	–0.27***	–0.27***	–0.33***
		(0.012)	(0.013)	(0.013)	(0.021)
Rural		–0.0017	–0.0022	–0.0029	–0.0080***
		(0.0020)	(0.0020)	(0.0021)	(0.0034)
Ate Meat			0.002	0.0019	–0.019
			(0.0075)	(0.0075)	(0.023)
Ate Plant Protein			0.017***	0.017***	0.026
			(0.0072)	(0.0072)	(0.022)
Ate Dairy			0.012	0.012	–0.0085
			(0.0084)	(0.0084)	(0.025)
Heme level			–0.00048	–0.00048	–0.00081
			(0.00040)	(0.00040)	(0.00058)
Average measles vaccinations			–0.0049	–0.0049	–0.00055
			(0.0050)	(0.0050)	(0.0077)
Average polio vaccinations			0.019***	0.019***	0.013
			(0.0081)	(0.0081)	(0.013)
Average DPT vaccinations			–0.032***	–0.032***	–0.014
			(0.0067)	(0.0067)	(0.011)
Average female LFP				0.0067	0.0073
				(0.0043)	(0.0068)
Constant	0.099***	0.15***	0.16***	0.16***	0.033
	(0.0047)	(0.0082)	(0.0100)	(0.0100)	(0.024)
N	204717	204717	204717	204717	83472
R^2	0.021	0.032	0.032	0.032	0.039

Source: Authors' research.

Notes: (i) Children below the age of 1 are dropped from the sample (due to censoring); (ii) Estimates in column 5 pertain to the restricted sample of older women (age ≥ 40); (iii) Standard errors—shown in parentheses—are clustered at the household-level; (iv) * denotes significance at 10% level, ** significance at 5% level; and *** significance at 1% level.

Socio-economic Status

A vast literature in economics and the social sciences suggests that socio-economic status, as measured by income or wealth, parental education (particularly mother's education) and location (rural versus urban) is an important determinant of the risk of child mortality (Strauss & Thomas, 1995). We thus explore the hypothesis that socio-economic status may explain the difference in demographic outcomes: households from Muslim communities might simply benefit from favorable socio-economic conditions that are conducive to lower mortality rates among children. This hypothesis does not however, seem to be supported by the data. The Sachar Committee Report (Government of India, 2006), for example, argues that both Muslims and SC/ST are substantially poorer than their higher caste Hindu counterparts. Comparisons using our dataset are presented in Table 2. Relative to higher caste Hindus, Muslims women have lower rates of schooling and are more likely to reside in landless and kutcha (non-permanent) household structures. In many respects, Muslims have similar socio-economic characteristics to Hindu SCs. Thus, in all likelihood, socio-economic status cannot by itself explain the lower mortality of Muslim children compared to their higher caste counterparts. This is a finding that was also highlighted by other recent studies such as Guillot and Allendorf (2010).

Our main specifications control for socio-economic status (see Tables 3 and 4, columns 2–5). The coefficients on socio-economic controls are as expected: mortality risks are lower when mothers married older, when mothers are educated and when households are wealthier. Religion however, continues to have a statistically significant effect on mortality risks, even while its influence is reduced when adding education controls.

Nutrition

A second possible mechanism is nutrition. It is well-known that levels of nutrition in India are low (Osmani & Sen, 2003) In our own dataset, it is documented that 46 per cent of children are underweight and 59 per cent of pregnant women, and 63 per cent of lactating women are anemic (IIPS & ORC, 2007). Table 2 indicates systematic differences in nutrition and preventive health behavior between Muslims and Hindus. While Hindus are less likely to eat meat and dairy, they are more likely to be vaccinated against measles, tuberculosis, polio and DPT. Furthermore, Muslim women are found to have significantly higher levels of hemoglobin. As noted earlier, adding nutrition variables to our main specification indicates that eating meat (which can also be an indication that the household is well-off) is associated with lower mortality. Elevated hemoglobin levels are also correlated with lower mortality risks. Finally, vaccination rates do not have consistent signs since rates can be driven by either supply or demand for vaccinations. However, whether or not we control for these variables, the correlation between religion and child mortality is barely affected (columns 3 in Tables 3 and 4).

Female Labour Force Participation

The results so far eliminate the possibility that differences in mortality rates across groups are driven by differences in female labour force participation rates. In Table 2, we indeed find that Muslim women work less than Hindu women and are also less likely to be self-employed. This can translate into more time dedicated to child care and ultimately result in lower mortality risks for children.

To account for female labour force participation, and since female labour-force participation may be endogenous, we do not include a direct control for female labour force participation in our regressions and rely instead on a community level average. Controlling for aggregate measures of female labour force participation at the cluster level, as shown in columns 4 and 5 in Tables 3 and 4, barely affects the coefficient on the SC, ST or higher caste Hindu variables. Admittedly, equilibrium female labour-force participation measures are endogenous to the outcome of interest, but adding them as controls does not affect the robust association between religion and mortality.

A word is in order about the geographic variation in mortality risks. We do not present coefficients from the specification with state-level fixed effects here, but we found that geography did in fact play a role, with lowest levels of mortality in the South, particularly in the states of Goa and Kerala, and higher levels of mortality in the North, particularly in Delhi, Uttar Pradesh, Bihar, Arunachal Pradesh, Tripura, Assam and Jharkhand. This is consistent with the broad differences in human development that have been noted for India in the past (Dyson & Moore, 1983; Dreze & Sen, 2001).[8] Finally, other econometric specifications (Cox proportional hazard models) deliver qualitatively similar results (results not shown here).

The association between religion and mortality is apparently robust to various specifications. The rest of the article is devoted to unbundling the possible channels that could drive the observed correlation. We now turn to alternative explanations for the religious differences in child mortality.

Religion, Fertility and Child Mortality

We investigate an alternative explanation for the differences in child mortality by first noting that these groups also vary in their fertility. Evidence from both developed and developing countries suggests that early child bearing, short (previous and subsequent) birth intervals and high overall fertility can all have strong effects on infant and early child mortality.[9]

Religious Differences in Fertility

It is well-known that Hindus and Muslims show very different levels of fertility. Muslim women on average bear larger numbers of children at earlier ages than women from other religious groups. Table 2 lends support to this hypothesis. Muslim women report higher fertility as well as higher levels of 'ideal' fertility, for both boys and girls. Only the Scheduled Tribes have rates which are higher. Muslims and Scheduled Tribes are also substantially less likely to use both temporary and permanent methods of contraception. The prevalence of sterilization—the dominant method of contraception in India—is the lowest for Muslims, standing at about half the level among Muslims as higher caste Hindus, and the use of temporary methods of contraception is about a third lower. Estimates of these differences are statistically significant at the 1 per cent level.

These patterns are also seen in the results of a regression of fertility on religion with the sample of all women. We examine the determinants of actual as well as desired fertility in Table 5. This analysis is conducted on the sample of all women, including childless women, who are older than 40 years of age. Summary statistics for this sample of women are presented in Table 1. Estimation on this limited sample avoids issues of selection that may be caused by differences in ages at child-bearing, and varying rates of childlessness across the three groups. The final sample consists of 77,916 women instead of 83,041 due to missing ages at marirage for some respondents.

Results are presented in Table 5 with and without a set of control variables that include a woman's age, age at marriage, education, husband's age, husband's education and socio-economic status, as measured by land-holdings, a wealth index and rural location. Note that the variables UC, SC and ST all have negative and significant coefficients, in all specifications, suggesting that these groups have lower fertility as well as desired fertility than the omitted group of Muslim women. In results not shown here, we check the robustness of these findings by omitting women's age (a possible endogenous variable). It is interesting to note that for all groups, coefficients for desired fertility are smaller in magnitude than the coefficients for actual fertility.

Higher levels of fertility among Muslims is not however, *prima facie* consistent with the finding of lower infant and child mortality documented earlier in this article. Before digging into this puzzle further however, we look at economic, cultural and religious foundations for fertility differences across religious groups. Several factors might explain higher fertility among Muslim families. We review them in turn.

Socio-economic Status

The relationship between fertility and socio-economic status is the subject of a vast literature. Increases in income are typically associated with increased education, literacy, female labour force participation and chances of child survival. All of these factors decrease the benefits of additional children and raise the costs (Becker, 2009). The impact of socio-economic status on fertility is evident in our simple regression of female fertility on indicators of religion as well as numerous measures of socio-economic status (see Table 5). Many of the coefficients for the measures of socio-economic status take the requisite signs. Women who delayed

Table 5. Linear Probability Model for Fertility

	Actual Fertility				Desired Fertility			
	Full Sample			Age ≥ 40	Full Sample			Age ≥ 40
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SC	–0.385***	–0.561***	–0.561***	–0.983***	–0.265***	–0.339***	–0.339***	–0.325***
	(0.0877)	(0.0625)	(0.0625)	(0.137)	(0.0592)	(0.0463)	(0.0463)	(0.0872)
ST	–0.172	–0.464***	–0.464***	–0.906***	0.508***	–0.176***	–0.176***	–0.218***
	(0.179)	(0.0798)	(0.0798)	(0.144)	(0.173)	(0.0805)	(0.0805)	(0.123)
UC	–0.873***	–0.753***	–0.753***	–1.294***	–0.533***	–0.442***	–0.442***	–0.405***
	(0.0861)	(0.0598)	(0.0598)	(0.129)	(0.0489)	(0.0587)	(0.0587)	(0.0983)
Mother's age		0.112***	0.112***	0.0715***		–0.00686	–0.00686	0.0134
		(0.00698)	(0.00698)	(0.00546)		(0.0191)	(0.0191)	(0.00858)
Mother's age at marriage		–0.114***	–0.114***	–0.105***		–0.0259***	–0.0259***	–0.0313***
		(0.00483)	(0.00483)	(0.00487)		(0.00684)	(0.00684)	(0.00613)
Mother never attended school		0.232***	0.232***	0.214***		0.145***	0.145***	0.138***
		(0.0324)	(0.0324)	(0.0434)		(0.0365)	(0.0365)	(0.0396)
Mother completed primary school		–0.114***	–0.114***	–0.335***		–0.0882***	–0.0882***	–0.0579
		(0.0226)	(0.0226)	(0.0449)		(0.0363)	(0.0363)	(0.0520)
Father's age		0.000561	0.000561	–0.00793***		0.027	0.027	–0.000899
		(0.00146)	(0.00146)	(0.00271)		(0.0183)	(0.0183)	(0.00368)
Father never attended school		0.120***	0.120***	0.133***		0.0117	0.0117	0.0731
		(0.0266)	(0.0266)	(0.0574)		(0.0485)	(0.0485)	(0.0467)

(Table 5 Continued)

(Table 5 Continued)

	Actual Fertility				Desired Fertility			
	Full Sample			Age ≥ 40	Full Sample			Age ≥ 40
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Land (in acres)		0.00137	0.00137	–0.00109		–0.000994	–0.000994	–0.000949
		(0.000957)	(0.000957)	(0.00409)		(0.00100)	(0.00100)	(0.00134)
Wealth index		–3.516***	–3.516***	–4.466***		–2.214***	–2.214***	–2.278***
		(0.309)	(0.309)	(0.422)		(0.214)	(0.214)	(0.314)
Rural		–0.0392	–0.0392	–0.0351		0.0850***	0.0850***	0.071
		(0.0380)	(0.0380)	(0.0594)		(0.0379)	(0.0379)	(0.0419)
Observations	77916	77916	77916	19151	76133	76133	76133	18494
Adjusted R^2	0.038	0.463	0.463	0.378	0.014	0.052	0.052	0.061

Source: Authors' research.

Notes: (i) Estimates in column 4 and 8 pertain to the restricted sample of older women (age ≥ 40);
(ii) Standard errors—shown in parentheses—are clustered at the household-level;
(iii) * denotes significance at 10% level, ** significance at 5% level; and *** significance at 1% level.

marriage, who have some education, and who reside in wealthier households have fewer children. All regressions include state-level fixed effects to control for differences in state-level factors that may affect fertility levels. Socio-economic conditions thus do not entirely explain the larger fertility outcomes of Muslim women compared to SC/ST and higher caste Hindus. Our results echo those of Almond, Elund & Milligan (2009) who find that sex-ratios among immigrant communities in Canada differ significantly across religious ethnic groups. They find relatively normal sex-ratios in the Muslim and Christian community, but highly skewed sex-ratios among other religious groups and argue that observable socio-economic characteristics do not account for these differences. A recent article by Adamou, Drakos & Iyer (2013) also argues that socio-economic factors do not account entirely for the observed difference in sex ratios by ethnicity among immigrant communities in the UK.

Minority Group Status

A second reason that might explain higher Muslim fertility is the 'minority group status' hypothesis (Goldscheider & Uhlenberg, 1969). This is the idea that their political and social insecurity as a minority group creates incentives for higher fertility than the Hindu majority group. This is likely to be particularly important where the minority feels threatened by the majority community in political, economic or social spheres (Stinner & Mader, 1975, pp. 53–59; Van Heek, 1966, pp. 125–138). This is also likely where identification with religion can be used for economic gain and rent-seeking activities. For example, greater numbers may mean better representation for minority groups in government, and greater voice in the allocations in budgets for education, health, water and so forth.

We concede that these factors may be drivers of higher fertility among Muslims, but we do not believe this is an adequate explanation for the patterns seen in the data. This is for three main reasons. First, in the context of a country like India, there are many different minority groups including not only Muslims but also Sikhs, Buddhists, Christians and so forth. Muslim fertility remains higher than the average fertility in these other minority groups which are typically smaller and have even greater incentive to boost their group size. Second, in including state-level fixed effects in our specification, we control for many of the historical, institutional and cultural factors that are likely to affect the variations of politics across states. Third, in results not shown here we included estimates of the size of the Muslim population (current as well as historical) as dependent variables and found that the results were not significantly different than the results we report here with the inclusion of state fixed effects. So while we concede that the minority group hypothesis may be an explanation for higher Muslim fertility in India, it is not the only important mechanism.

Religion

The final explanation for why we might observe higher Muslim fertility is the effect of religion itself. A number of empirical studies have argued that the particular philosophical content of Islam affects demographic behaviour (Coulson & Hinchcliffe, 1978; Jeffery & Jeffery, 1997; Obermeyer, 1992; Qureshi, 1980; Youssef, 1978). Three main mechanisms have been highlighted. First, is Islam's position on birth control and abortion. Some have argued that the general opposition to both practices induces higher fertility (Youssef, 1978). The extent to which Islam influences the decision to control births however, is strongly debated and varies across different schools of Islamic jurisprudence (Obermeyer, 1992). Some schools do permit abortion up to the time when the foetus is regarded as being 'ensouled', a definition which varies to include the 40th, 80th or 120th day of pregnancy, depending on the school, after which abortion is prohibited by all schools (Musallam, 1983; Obermeyer, 1992). A second mechanism through which Islam may influence fertility is its positions on marriage. In the Koran, Muslim males are encouraged to marry, and the early and universal remarriage of widowed and divorced women is highly encouraged (Youssef, 1978, p. 88). According to Sharia law—the basis of laws applicable to Muslims in India since 1937—a man may take multiple wives, and in some cases make a unilateral decision to divorce (Coulson & Hinchcliffe, 1978, pp. 37–38). This creates incentives for women to have large numbers of children since they rely on children to secure their status in their husband's homes, or provide financial and social security in the event of divorce (Youssef, 1978).

Such arguments on the relationship between religion and fertility must however, be viewed with caution. The issues are strongly debated within Islam, and a clear consensus is lacking. Moreover, in India, Hindu and Muslim marriage patterns display similarities: early marriage is widespread in most communities, and polygyny is relatively uncommon among Muslims The variations in patterns of marriage are known to be greater across regions rather than religions (Jejeebhoy & Sathar, 2001).

An alternate explanation for the observed differences in fertility is that Muslim families have a lower level of 'daughter aversion', i.e., a disinclination to have daughters that is driven by the higher costs of raising them (Borooah & Iyer, 2005a). Furthermore, we postulate that the costs of raising girls differ significantly across religious groups. These differences are evident in the norms and regulations of marriage. An Islamic marriage or the *nikah*, is defined as a civil contract (Azim, 1997).[10] Parents and guardians exercise control over the selection of marriage partners, but within-family marriages are common (between cousins) and a dower or 'bride price' is paid to the bride or her guardian (Youssef, 1978, p. 78). The Koran recognizes the possibility of divorce and encourages remarriage of divorced or widowed women (Coulson & Hinchcliffe, 1978, pp. 37–38; Qureshi, 1980, p. 564; Youssef, 1978, p. 88). Hindu marriage presents a stark contrast. While there are indeed significant regional variations, Hindu marriages are typically between strangers, and involve dowries (Bhat & Zavier, 2003; Bloch & Rao, 2002; Botticini & Siow, 2003; Edlund, 1999; Rao, 1993). Bride-givers are regarded as below bride-takers. Women do not have property rights over these dowries and they are not returned to her or her family in the event of divorce or widowhood.

Opportunities for remarriage in the event of divorce or widowhood are limited and rare. A daughter's marriage is thus typically described as *kanyadaan*, which can be translated as the 'donation' of a daughter. Such a donation is believed to benefit Hindu families both socially and religiously (Niraula & Morgan, 1996). Such distinctions between the 'contractual' versus the 'donational' notion of marriage in Islam compared to Hinduism may have implications for the relative costs and benefits of having sons and daughters. Thus, if having daughters comes at a higher cost to Hindus that it does to Muslims, one can expect optimal family size to be lower for the former religious group.

We conclude from this discussion that Muslims may likely have higher levels of actual as well as desired fertility than both SC/ST and higher caste Hindus. Our analysis suggests that this is not entirely driven by differences in socio-economic status or location. Other factors, such as minority status and varying levels of son-preference or daughter-aversion, may play a role. In this article, we are agnostic about the strength of such mechanisms and acknowledge that there may be other factors. We simply underscore that Muslims may prefer larger families than Hindus and that this is not attributable to observable characteristics in our data.

Fertility, Birth Order, Gender Preference and Child Mortality

Our explanation for the differences in infant mortality rates between religious groups centers on the conjecture that optimal household size varies across groups. We now explore this more thoroughly using our data.

Birth Order and Religious Differences in Child Mortality

Based on the findings and the discussion of the previous section, we take it as significant that Muslims have higher fertility, and may have a taste for larger families. Thus, the likelihood that a child is unplanned and consistutes a 'household size shock' is lower among Muslim households. As a consequence, one expects lower mortality risk for unplanned children in Muslim families; this effect is likely to be most pronounced among first-born children, regardless of their gender, since optimal household size for both Hindus and Muslims is presumably larger than one. This leads to the prediction that religious differences in infant and child mortality will be lowest among first-born children.

In order to formally test our claim, we return to the linear probability model in Section 2 and include interaction terms between SC, ST and UC dummy variables and birth order of the child. More specifically, we interact the religious or caste group with a dummy variable indicating whether the child is the first born (we abbreviate this as FB). Since we predict that religious preferences in child mortality becomes starker for higher birth order children for all groups other than Muslims, we expect the sign on the interaction between non-Muslim groups and birth-order to be negative. This prediction is confirmed in the full specifications presented in Table 6, columns 1 and 5: first born children are approximately

4–6 per cent less likely to die before their first and fifth birthdays and the results are statistically significant. In regressions not shown here, we construct additional interactions for second-born children with the SC, ST and UC variables and confirm that the magnitude of the coefficient falls and in some instances, the coefficients become statistically insignificant. We do not present these results however, out of concerns that many women in the sample (particularly younger women) may not yet have had a second child. We do present results for a sample of women who are likely to have completed child-bearing (columns 4 and 8). The results are qualitatively similar. We continue to find that first-born children face reduced risks of mortality in SC, ST and UC groups relative to Muslims (the excluded group) but the coefficients lose significance due to the smaller sample size.

Thus, the religious differences in child mortality are concentrated among higher order births, lending support to the view that differences in optimal family size might be driving our findings.

Gender and Religious Differences in Child Mortality

We delve into these demographic differences further by examining the gender differences in child mortality. We interact religion and birth order with an additional indicator of whether the child was a girl. The coefficient triple interaction of UC × FB × Female for example, tells us whether first born children in higher castes have differential mortality risks for girls. A positive coefficient would suggest that first born girls in higher caste families face elevated mortality risks than the omitted group (Muslims). We also include double interaction terms with religious groups.

The results are presented in Table 6. Consistently across specifications, as well as the results in Table 3 and 4, we find evidence of a survival advantage for girls (columns 1 and 8 in Table 6).[11] However, the triple interaction *FB × UC × Female* is positive and statistically significant at the 5 per cent level. First born girls of higher caste Hindu communities are about 1 per cent more likely to die before the age of 1 than their muslim counterparts (column 3). In the sample of women over the age of 40 (column 4 and 8), the mortality risk is 1.5 per cent. Interestingly, there is no statistically significant effect for mortality below the age of 5. Similar results are not seen for the triple interaction terms involving *SC* and *ST* groups, suggesting that these groups behave largely like Muslims rather than higher caste Hindus in terms of gender-preferences for children of lower birth orders. We also find no such effect for mortality below the age of 5. We infer from this that most of the deaths that can be attributed to the mechanism described here—a preference for smaller families with boys—result in excess mortality in the first year of life.

Overall, our findings suggest that the main mechanism that accounts for religious differences in child mortality is the combination of smaller optimal family sizes for Hindu households and a preference for boys. In other words, the observed differences in child mortality across communities could be explained by Hindu

Table 6. Linear Probability Model for Birth Order Effects on Mortality

	Died Below the Age of 1				Died Below the Age of 5			
	Full Sample			Age ≥ 40	Full Sample			Age ≥ 40
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SC	0.020***	0.017***	0.025***	0.031***	0.028***	0.022***	0.033***	0.038***
	(0.0028)	(0.0030)	(0.0039)	(0.0068)	(0.0033)	(0.0038)	(0.0045)	(0.0074)
ST	0.016***	0.020***	0.025***	0.031***	0.028***	0.033***	0.038***	0.043***
	(0.0033)	(0.0035)	(0.0042)	(0.0076)	(0.0040)	(0.0045)	(0.0051)	(0.0084)
UC	0.015***	0.012***	0.019***	0.023***	0.018***	0.012***	0.021***	0.023***
	(0.0022)	(0.0023)	(0.0030)	(0.0053)	(0.0027)	(0.0030)	(0.0035)	(0.0057)
Female	–0.012***	–0.0075***	–0.011***	–0.011***	–0.0081***	–0.0038	–0.0074***	–0.0044
	(0.0011)	(0.0025)	(0.0032)	(0.0054)	(0.0014)	(0.0033)	(0.0038)	(0.0060)
FB	–0.033***	–0.049***	–0.040***	–0.036***	–0.011***	–0.041***	–0.022***	–0.042***
	(0.0025)	(0.0010)	(0.0034)	(0.0065)	(0.0038)	(0.0015)	(0.0052)	(0.0074)
SC × Female		–0.0061	–0.0093***	–0.0079		–0.0048	–0.0089	–0.0092
		(0.0037)	(0.0048)	(0.0082)		(0.0049)	(0.0057)	(0.0092)
ST × Female		–0.014***	–0.017***	–0.022***		–0.017***	–0.020***	–0.027***
		(0.0039)	(0.0049)	(0.0083)		(0.0052)	(0.0059)	(0.0093)
UC × Female		–0.0026	–0.0079***	–0.0088		–0.0016	–0.007	–0.0077
		(0.0029)	(0.0038)	(0.0064)		(0.0038)	(0.0045)	(0.0071)
SC × FB	–0.026***		–0.029***	–0.036***	–0.042***		–0.046***	–0.046***

(Table 6 Continued)

(Table 6 Continued)

	Died Below the Age of 1				Died Below the Age of 5			
	Full Sample			Age ≥ 40	Full Sample			Age ≥ 40
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(0.0036)		(0.0050)	(0.0095)	(0.0053)		(0.0071)	(0.011)
ST × FB	–0.012***		–0.018***	–0.020***	–0.021***		–0.027***	–0.021***
	(0.0038)		(0.0054)	(0.010)	(0.0060)		(0.0082)	(0.012)
UC × FB	–0.018***		–0.022***	–0.030***	–0.034***		–0.037***	–0.029***
	(0.0028)		(0.0039)	(0.0073)	(0.0042)		(0.0057)	(0.0082)
FB × SC × Female			0.0066	–0.004			0.0091	–0.00018
			(0.0071)	(0.013)			(0.011)	(0.016)
FB × ST × Female			0.01	0.0058			0.012	0.0077
			(0.0075)	(0.014)			(0.012)	(0.017)
FB × UC × Female			0.011***	0.015***			0.0095	0.0096
			(0.0046)	(0.008)			(0.0086)	(0.012)
FB × Female			0.016***	0.019***			0.023***	0.018***
			(0.0049)	(0.0094)			(0.0078)	(0.011)
Mother's age	0.00060***	0.00060***	0.00060***	0.0018***	–0.00070***	–0.00069***	–0.00070***	0.0028***
	(0.00014)	(0.00014)	(0.00014)	(0.00043)	(0.00019)	(0.00019)	(0.00019)	(0.00049)
Mother's age at marriage	–0.0017***	–0.0017***	–0.0017***	–0.0021***	–0.0014***	–0.0014***	–0.0014***	–0.0024***
	(0.00019)	(0.00019)	(0.00019)	(0.00031)	(0.00025)	(0.00025)	(0.00025)	(0.00036)

(Table 6 Continued)

(Table 6 Continued)

	Died Below the Age of 1				Died Below the Age of 5			
	Full Sample			Age ≥ 40	Full Sample			Age ≥ 40
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Mother never attended school	0.011***	0.011***	0.011***	0.0099***	0.016***	0.016***	0.016***	0.013***
	(0.0016)	(0.0016)	(0.0016)	(0.0030)	(0.0020)	(0.0020)	(0.0020)	(0.0032)
Father's age	–0.00007	–0.000071	–0.000068	–0.00033***	–0.00021	–0.00021	–0.00021	–0.00043***
	(0.00011)	(0.00011)	(0.00011)	(0.00018)	(0.00015)	(0.00015)	(0.00015)	(0.00021)
Father never attended school	0.0033***	0.0033***	0.0033***	–0.0000015	0.0079***	0.0078***	0.0079***	0.0059
	(0.0018)	(0.0018)	(0.0018)	(0.0032)	(0.0022)	(0.0022)	(0.0022)	(0.0036)
Land (acres)	–0.0091	–0.0091	–0.0092	–0.052***	–0.00092	–0.00091	–0.0012	–0.032***
	(0.010)	(0.010)	(0.010)	(0.014)	(0.014)	(0.014)	(0.014)	(0.019)
Wealth index	–0.15***	–0.15***	–0.15***	–0.20***	–0.26***	–0.27***	–0.26***	–0.32***
	(0.0099)	(0.0099)	(0.0099)	(0.018)	(0.013)	(0.013)	(0.013)	(0.020)
Rural	–0.002	–0.0019	–0.0018	–0.0034	–0.0024	–0.0023	–0.0021	–0.0069***
	(0.0016)	(0.0016)	(0.0016)	(0.0030)	(0.0021)	(0.0021)	(0.0021)	(0.0033)
Ate Meat	–0.0067***	–0.0065***	–0.0069***	–0.0034	0.0024	0.0015	0.0026	–0.012
	(0.0032)	(0.0032)	(0.0032)	(0.015)	(0.0073)	(0.0073)	(0.0073)	(0.022)
Ate Plant Protein	–0.0062***	–0.0063***	–0.0062***	0.016	0.017***	0.017***	0.017***	0.037***
	(0.0031)	(0.0031)	(0.0031)	(0.015)	(0.0071)	(0.0071)	(0.0071)	(0.022)
Ate Dairy	–0.0035	–0.0033	–0.0034	–0.038***	0.013	0.012	0.013	–0.0079
	(0.0035)	(0.0035)	(0.0035)	(0.014)	(0.0082)	(0.0082)	(0.0082)	(0.025)

(Table 6 Continued)

(Table 6 Continued)

	Died Below the Age of 1				Died Below the Age of 5			
	Full Sample			Age ≥ 40	Full Sample			Age ≥ 40
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Heme level	–0.00033	–0.00034	–0.00034	–0.00019	–0.00053	–0.00054	–0.00054	–0.00085
	(0.00031)	(0.00031)	(0.00031)	(0.00053)	(0.00039)	(0.00039)	(0.00039)	(0.00057)
Av measles vaccinations	0.002	0.0019	0.002	0.0045	–0.0043	–0.0043	–0.0043	0.00069
	(0.0039)	(0.0039)	(0.0039)	(0.0069)	(0.0049)	(0.0049)	(0.0049)	(0.0076)
Av polio vaccinations	0.011***	0.011***	0.011***	0.0036	0.020***	0.020***	0.020***	0.013
	(0.0061)	(0.0061)	(0.0061)	(0.011)	(0.0080)	(0.0080)	(0.0080)	(0.013)
Av DPT vaccinations	–0.018***	–0.017***	–0.018***	–0.0079	–0.033***	–0.032***	–0.032***	–0.016
	(0.0052)	(0.0052)	(0.0052)	(0.0095)	(0.0066)	(0.0067)	(0.0066)	(0.011)
Av female LFP	0.0064***	0.0065***	0.0065***	0.0073	0.0071***	0.0072***	0.0071***	0.0071
	(0.0032)	(0.0032)	(0.0032)	(0.0059)	(0.0042)	(0.0042)	(0.0042)	(0.0067)
Constant	0.081***	0.083***	0.081***	0.047***	0.15***	0.15***	0.15***	0.032
	(0.0074)	(0.0075)	(0.0076)	(0.022)	(0.0099)	(0.0100)	(0.010)	(0.024)
N	243140	243140	243140	84527	204717	204717	204717	83472

Source: Authors' research.

Notes: (i) Mortality under the age of 1 and 5 (columns 1–4 and then 5–8) exclude children aged 1 and 5 respectively;
(ii) Estimates in columns 4 and 8 pertain to the restricted sample of older women (age ≥ 40);
(iii) Standard errors—shown in parentheses—are clustered at the household-level;
(iv) * denotes significance at 10% level, ** significance at 5% level; and *** significance at 1% level.

households wanting small families with a majority of boys. Note that this explanation makes no assumptions about differences in son-preference or daughter-aversion across Hindus and Muslims. The effects documented here would however be reinforced if Muslims genuinely face lower costs of raising daughters, and are less averse to having daughters. We believe that this is an interesting and important topic for future research.

Conclusion

In this article, we use recent data from the 2006 National Family Health Survey to explore the relationship between religion, fertility and mortality outcomes across caste and two major religious groups – Hindus and Muslims – in India. We find that there are differences between SC/ST Hindus and higher caste Hindus in fertility and mortality, but these differences diminish in significance with the inclusion of control variables. We also find that while Muslims are poorer and have more children than Hindus, they also exhibit lower infant mortality rates. Socio-economic status, location and policy variables do not adequately explain this mortality difference. In this article, we provide a new explanation: We argue that since Muslims may prefer larger families, they may be more tolerant of having daughters, particularly early on in their fertility history. Hindus on the other hand, desire small families, and will want to have sons as early as possible. This results in skewed sex-ratios among first- and second-born children in the Hindu community. Our empirical analysis supports these conclusions. Muslim girls, particularly those who are first-born show the lower mortality risks than their wealthier counterparts in the higher caste Hindu community. We conclude from this that the interaction between religion and demographic behaviour in India is worthy of greater attention from both academics and policy-makers.

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Notes

1. According to the 2001 Census, India has 933 females for every 1,000 males, which implies that as many as 35–37 million women in India may be 'missing' (Agnihotri, 2000; Drèze & Sen, 1996; Klasen, 1994; Oster, 2005; Sen, 2003). The estimate of the

number of missing women is based on comparisons with Europe and North America, which have 1,050 females per 1,000 males.

2. An often-cited figure from the National Family Health Survey conducted in 1998–1999, shows that the Total Fertility Rate (TFR) for Hindus and Muslims was 2.8 and 3.6 respectively.
3. The first NFHS survey was conducted in 1992–1993, and the second in 1998–1999. All three surveys were conducted in conjunction with the Ministry of Health and Family Welfare (MOHFW), Government of India. Funding for the survey was provided by the United States Agency for International Development (USAID), the United Kingdom Department for International Development (DFID), the Bill and Melinda Gates Foundation, UNICEF, UNFPA and the Government of India. Technical assistance was provided by Macro International Maryland, USA.
4. The proportion of childless women does not significantly differ between Hindus and Muslims. 9.8 per cent of Hindus and 9.7 per cent of Muslims report that they are childless. The difference, 0.1 has a t-statistic of 0.20 and a p-value of 0.838.
5. Sex-ratios are measured at the level of the cluster/village rather than at the level of a woman. Since a sex-ratio is defined as the number of females relative to the number of males, it can only be constructed for a woman who has had at least one male birth. When aggregating at the level of the village or cluster (which was the NFHS primary sampling unit) however, this problem is alleviated, since it is an average of female and male deaths for a broad group of women. In results not shown here, we also examine the sex-ratios of ever-born children for SC/STs, higher castes and Muslims for women over the age of 40, a group that has presumably completed child-bearing. We found that these sex-ratios were far less distorted, and were on average at 1,068 for all three groups. There was no statistically significant difference between them. We find this most interesting, but are unable to analyze these differences in sex-ratios across cohorts more extensively. This is mainly because the estimation of sex-ratios for particular age-groups results in a loss of precision for the estimates. This is further complicated by the possibility of measurement error in reporting of births increases with the age of the respondent. In all these cases, the differences are statistically significant.
6. For those children who had died, the age variable was coded as age-at-death.
7. The wealth index is constructed by combining information on 33 household assets and housing characteristics such as ownership of consumer items, type of dwelling, source of water, and availability of electricity into a single wealth index. These 33 assets are as follows: household electrification, type of windows, drinking water source, type of toilet facility, type of flooring, material of exterior walls, type of roofing, cooking fuel, house ownership, number of household members per sleeping room, ownership of a bank account, ownership of a mattress, a pressure cooker, a chair, a cot/bed, a table, an electric fan, a radio/transmitter, a black and white television, a color television, a sewing machine, a mobile phone, another other telephone, a computer, a refrigerator, a watch or clock, a bicycle, a motorcycle or scooter, an animal-drawn cart, a car, a water-pump, a thresher and a tractor. Each household asset is assigned a weight (factor score) that is generated through principal components analysis. The resulting asset scores are standardized in relation to a normal household and is then assigned a score for each asset, and scores were summed for each household; individuals are ranked according to the score of the household in which they reside.

8. There is no evidence that the size of the Muslim population explains these effects. In a separate analysis that is not shown here, we also explore the regional patterns of mortality, and more precisely the heterogeneity of the Muslim-infant mortality association across regions. Among our explanatory variables, we include interactions of the variable Muslim with dummy variables corresponding to different regions. The results indicate that the interaction, and the overall regional effect is most significant in the states and Union Territories of the North West (Jammu and Kashmir, Himachal Pradesh, Uttaranchal, Haryana, Punjab, Delhi, Rajasthan and Uttar Pradesh). The regional effect is in fact insignificant in the South (Goa, Karnataka, Kerala and Tamil Nadu) as well as in the North-East (Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Assam, West Bengal and Jharkhand). In other regions, the Muslim effect as well as the regional effect remain significant, but less so than in the Northwestern states. The stronger disparities between Hindus and Muslims in the North and in particular the North West is consistent with the findings of previous studies (Dyson & Moore, 1983, Dreze & Sen, 2001, Jejeebhoy & Sathar, 2001).
9. See Commission on Behavioral and Social Sciences and Education (1998) for a review of the literature.
10. For a Muslim marriage to be legally valid, it needs to meet four conditions: proposal by one party; acceptance by the other; the presence of a sufficient number of witnesses (two in Sunni law) and a formal expression of both the proposal and the acceptance at the same meeting (Azim, 1997).
11. Note that our sample consists of ever-born children. Aborted pregnancies would not be included in this sample.

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