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# Religion and Childhood Death in India

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## Abstract
Muslim children in India face substantially lower mortality risks than Hindu children. This is surprising because one would have expected just the opposite: Muslims have, on average, lower socio-economic status, higher fertility, shorter birth-spacing, and are a minority group in India that may be expected to live in areas that have relatively poor public provision. Although higher fertility amongst Muslims as compared with Hindus has excited considerable political and academic attention in India, higher mortality amongst Hindus has gone largely unnoticed. This paper considers this seeming puzzle in depth.

**Keywords:** religion, child mortality, Muslim, Hindu, India

**JEL Classification:** I12, O12, J13

**Electronic version:** **http://www.bris.ac.uk/Depts/CMPO/workingpapers/wp185.pdf**

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## 1. Introduction

### Motivation

In his keynote address at the annual conference of the European Society of Population Economics in 2005, Timothy Guinnane argued that religion explains much of the variation across Europe in the timing of the fertility transition; in particular, religion effects seem to dominate the effects of women's education. He speaks of the extent to which culture effects are compositional as a "remaining puzzle". He states that "this may be an uncomfortable fact for economists", but "religion really matters**"**. Although there is a recent surge of interest amongst economists in ethnicity effects, especially in education (e.g. Fryer and Levitt 2004, Wilson et al 2005), there remains limited research on religion effects in economics, and especially so in the area of health.

The analysis in this paper is motivated by the observation that Muslim children in India face lower mortality risk than Hindu children. This is puzzling because knowledge of religion-differences in the predictors of mortality risk suggests that the opposite should be the case. In particular, Muslims have, on average, lower socio-economic status, higher fertility and shorter birth intervals, and they are thought to accord a lower status to women within the household.[1] Moreover, as they are a minority group in India, we may expect that the areas in which they are concentrated receive relatively poor public services. Although higher fertility amongst Muslims as compared with Hindus has excited considerable political and academic attention in India, higher mortality amongst Hindus has gone largely unnoticed and there appears to be no previous research that has set out to explain it. Indeed, the only multivariate analysis that we are aware of appears in our earlier work (Bhalotra and van Soest 2007). Using data from the state of Uttar Pradesh, where about 17% of the population is Muslim, we find that Muslim-status is associated with a 1.6%-point reduction in neonatal mortality. This is a remarkably large fixed religion effect, obtained after controlling for a rich set of covariates (birth-spacing, the survival status of the previous sibling, maternal age at birth, education of the mother and father, caste, the gender and birth-order of the child, and the child's cohort) and mother and village level unobserved heterogeneity.

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[1] There is considerable evidence that, when mothers have greater power in the household or the community, children benefit in terms of their health and education (e.g. Thomas 1990).

**Framework**

Family characteristics ($X$) such as income and mother's education determine child healthcare behaviours or "inputs" ($I$). The child's mortality propensity is then a function of these inputs, the child's biological endowment ($E$) determined before birth (e.g., birth order, maternal age at birth, gender, maternal height, race, and residual frailty), and disease occurrence shocks ($e_M$) (see, e.g., Wolpin 1997). It is convenient to write the set of L input functions ($1_l$) and the mortality equation as

$$I_{lij} = a_l' X_j + e_{Ilij} \qquad (1_l)$$

$$M_{ij} = b' I_{ij} + d_1' E_j + d_2' E_{ij} + e_{Mij} \qquad (2)$$

Where $I_{lij}$ is the $l$th column element of the L-dimensional vector of inputs $I_{ij}$ $X_j$ is a vector of family characteristics, $E_j$ a vector of mother-specific endowments, $E_{ij}$ a vector of child-specific endowments, and $e_{Ilij}$ and $e_{Mij}$ are residuals. Substituting the *input equations* ($1l$) into Eq. (2) yields the following reduced form showing the impact of the vector of characteristics $X_j$ on mortality:

$$M_{ij} = g' X_j + d_1' E_j + d_2' E_{ij} + (b' e_{Iij} + e_{Mij}) \qquad (3)$$

where $e_{Iij} = \left(e_{I1ij} \quad e_{I2ij} \quad \ldots\ldots\ldots \quad e_{ILij}\right)'$.

Religion may influence child health in the following ways. First, it may be correlated with socio-economic characteristics ($X_j$) that influence the level of inputs (e.g., wealth and women's education). Second, religion may influence inputs conditional upon characteristics ($e_I$). This would be the case if, for instance, religious rules prohibited meat or alcohol consumption, prescribed hygiene rules or cultivated breastfeeding norms. Third, the child's biological endowment ($E$) may differ across religions, for instance, because of differences in phenotype. Fourth, exposure to disease ($e_M$) may also be correlated with religion due, for instance, to a different geographical distribution of religious communities. Fifth, religion may influence "returns" to the variables entering Eq. (1) and Eq. (2), which we may think of as religious "agency". For example, endowments may translate differently into health outcomes if preferences for child health or for the health of certain children (e.g., female children) are religion-specific, in which case $d_1$ and $d_2$ are religion-specific. There may also be differences in the way characteristics translate into inputs ($a_l$). For instance, one religion may constrain women's "agency" more than the other, or one religion may simply be more efficient in its use of health inputs ($b$). This discussion is only meant to be illustrative, its purpose being to suggest that religion may influence mortality through endowments, characteristics and

potentially endogenous behaviours. It is useful to distinguish fixed or time-invariant factors from factors that are more policy amenable, that is, factors that we might imagine Hindus could emulate from Muslims to bring their mortality risks down to similar levels.

This paper profiles differences in characteristics and behaviours of the two communities with a view to understanding the extent to which these resolve or deepen the paradox, as the case may be. In Section 2, we outline the apparent paradox. In Section 3, we consider the role of characteristics and agency in determining the level of health inputs (Eq. 1). In Section 4, we turn to differences in inputs and endowments and returns to these (Eq. (2)). In Section 5, we consider the potential role played by compositional factors. Section 6 presents results of descriptive regressions aimed at synthesising the discussion. Section 7 concludes.

## 2. The Apparent Paradox

### Data

The data are drawn from the first and second rounds of the National Family Health Survey of India (NFHS-1 and NFHS-2) conducted in 1992/93 and 1998/99 (see IIPS 1995 and IIPS and ORC Macro 2000). These surveys interviewed ever-married women aged 13-49 and 15-49 at the time of the survey and obtained from them complete fertility histories, including number of live births, birth intervals, and the time and incidence of child deaths. The survey contains information on relevant individual, household and community characteristics.

Births in the pooled sample occur during 1954-1999. Since the number of births in 1954-1959 is small, we drop children born in these years (0.09% of the sample). We drop the 10.53% of births that occur in households of religions other than Muslim or Hindu.[2] So, from now, we refer to the Hindu-Muslim differential as *the mortality differential.* We also drop mothers who have had a multiple birth, and this removes 2% of mothers and 3.24% of children. The proportion of multiple births amongst Muslims is 1.47% and amongst Hindus is 1.27%.[3] We right-censor the data to allow for full exposure to under-5 mortality, thus dropping 20.92% of observations. The sample used to analyse under-5 mortality has 356,236 live births of 105,891 mothers, and contains 85.94% Hindu and 14.06% Muslim children.

Antenatal and postnatal care are analysed for a restricted sample of recent births for which this information is available: the last three births if they occurred in the four years preceding the interview date for NFHS-1, and the last two births if they occurred in the three years preceding the interview date for NFHS-2. Unless specified otherwise, we pool data

[2] Hindu mortality exceeds that of Sikhs and Christians. This is not investigated further.
[3] It is standard practice in the demographic literature to restrict the analysis to singletons as death risks are many times higher for multiple births and, although relatively rare, they can skew the statistics.

from the two rounds of the NFHS. All summary statistics presented in tables and graphs are weighted, using the sampling weights provided in the surveys, to correct for sampling design and for non-response.

**The mortality differential by child age**

In developing countries, most child deaths occur in the first four weeks of life (the neonatal period), after which the risk of death declines continuously and falls sharply after age 5. Neonatal risk factors tend to be "biological", the role of environment and care rising as the child ages (e.g. Wolpin 1997).

Averaged over 1960-95, the overall mortality rates for the neonatal, infant and under-5 categories are 6.65%, 10.70%, and 14.14% respectively. The religion differential in under-5 mortality is 2.6%-points, the rate being 14.52% amongst Hindus and 11.92% amongst Muslims. The religion differential in infant and neonatal mortality is 2.09%-points and 1.18%-points respectively. The fact that Muslim children exhibit a survival advantage in the first month of life suggests a possible role for phenotype or for maternal health. And the fact that the religion differential grows (in absolute terms) with child age suggests a possible role for nutrition and health care. The religion differences in mortality are large. To put their size in perspective, note that the Hindu disadvantage is 17.91% of baseline mortality risk amongst Hindus in the under-5 category. The average annual rate of decrease in under-5 mortality risk between 1960 and 1995 was 0.65%-points p.a., which is only a fourth of the religion differential. And the more widely discussed gender differential in under-5 mortality is only 0.43%-points (in contrast to the religion differential of 2.6%-points)

## Evolution of the mortality differential across time

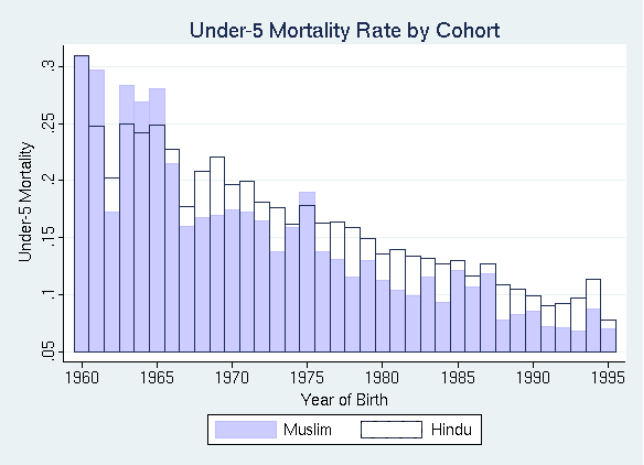
Lower mortality amongst Muslim as compared with Hindu children is not a recent phenomenon, being apparent in our data since about 1966 (see Figure 1);[4] also see Bhat and Zavier (2005).[5] For children born in 1965-70, the under-5 mortality rate was, on average, 21.31% for Hindus and 19.44% for Muslims. In 1990-1995, these rates had fallen to 9.50% and 7.58% respectively. Over the 36-year period spanned by the data, under-5 mortality declined at an average rate of 0.64%-points p.a. amongst Hindus and 0.66%-points p.a. amongst Muslims. For births occurring during 1965-70, Muslim children show a survival advantage of 0.50, 1.40 and 2.53 %-points in the neonatal, infant and under-5 age-groups

[4] It is noteworthy than there was no Hindu disadvantage in 1960-1965.

[5] See their Table 6, p.389, which reports the relevant means from the National Sample Surveys of 1963/4 and 1965/6, the Sample Registration Survey of 1979, Census 1981 and 1991, and the National Family Health Surveys (NFHS) of 1992/3 and 1998/9. While data on mortality from surveys such as the NFHS can be subject to large sampling errors, SRS and Census data are not likely to suffer this problem. The religion difference investigated here therefore seems real.

respectively. The corresponding figures for 1990-95 are 1.61, 2.33 and 2.99%-points. Comparing these points, the differential appears to have increased. However it is clear from Figure 1 that it fluctuates over time. Comparison of particular years is also likely to be affected by sampling variation.

**Figure 1**




Sample of children fully exposed to under-5 mortality risk

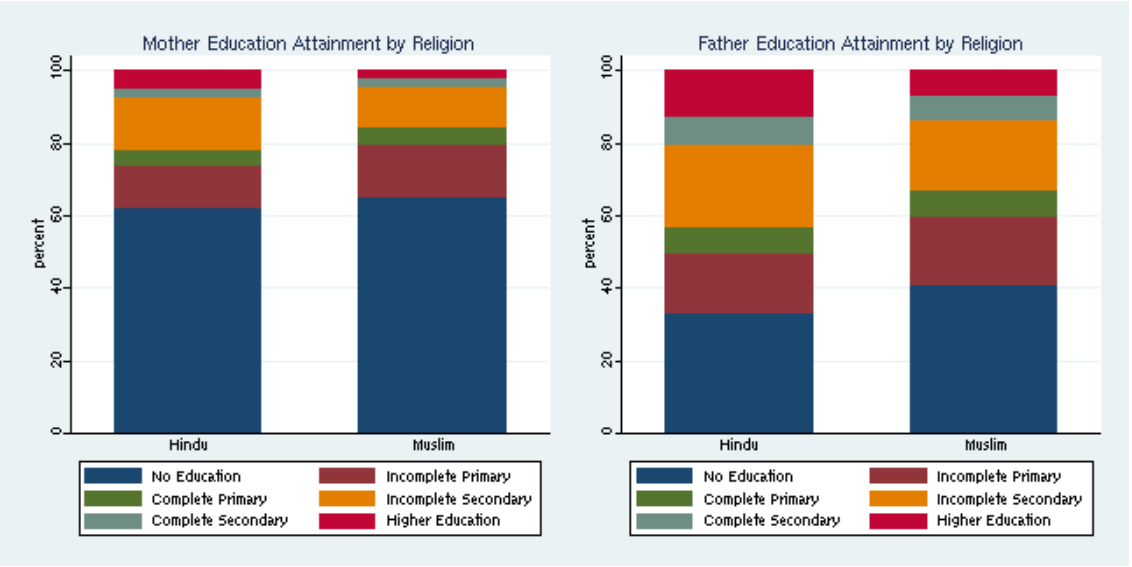
## 3. Differences in Characteristics and Agency

In this section, we consider differences in fixed socio-economic characteristics between the two religious communities, and how these might influence the mortality differential (refer equation 1). The characteristics discussed here are summarised, by religion, in Table 1, and under-5 mortality rates, by characteristic and religion, are reported in Appendix Table 1.

### Socio-economic characteristics

Hindu mothers are, on average, more educated than Muslim mothers, and the Hindu educational advantage is even more pronounced amongst fathers (see Figure 2 and Table 1). Several studies have established a direct effect of education on mortality conditional on income. If income is not held constant, education will also proxy permanent income. For both reasons the education differential between the communities leads us to expect lower mortality amongst Hindus, contrary to what we observe.

**Figure 2**

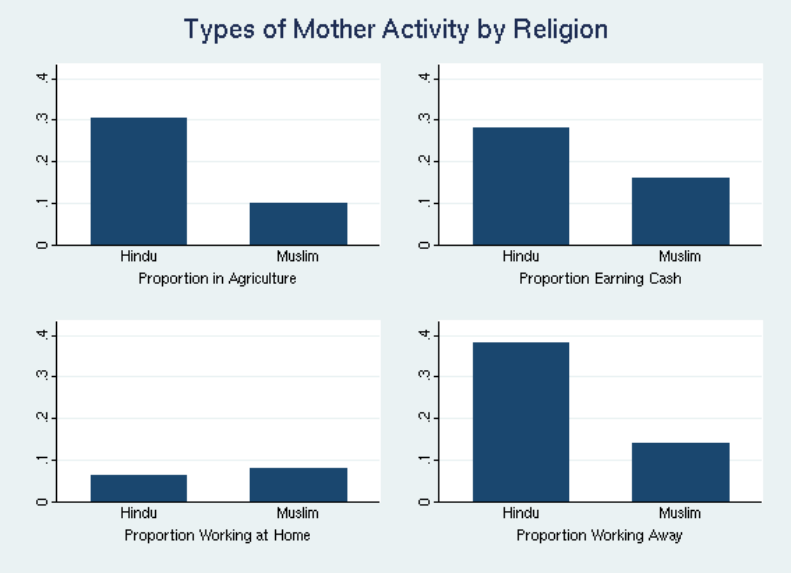



See Table 1.

The mortality differential between Hindus and Muslims decreases as mother's education increases to the secondary level. It then appears to increase amongst mothers with higher education (see Appendix Figure 11 and Appendix Table 1).

Hindus are more likely than Muslims to be employed, this differential being especially marked amongst women (see Table 1). One would expect father's employment to increase household resources and thus favour lower mortality. The correlation of maternal employment with child mortality is less obvious. If mothers work only when an income supplement to the father's earnings is needed, then women from low-income households are over-represented amongst employed women (a composition effect). This, on its own, would tend to lead to a positive correlation between mother's employment and child mortality. A positive correlation may also arise if the child minder in place when the mother is at work is less qualified than her. These effects may or may not overwhelm the beneficial effect of maternal employment that works through an increase in household income (an income effect). Our data suggest that they do. Children of working mothers exhibit higher mortality rates (see Appendix Table 1 and Appendix Figure 12). A similar result is reported in Bhalotra (2007). It is recognised that maternal employment is endogenous, although endogeneity would only drive this result if mothers of less healthy children were more likely to work. This seems unlikely in models that condition upon the education of both parents to the extent that education proxies the permanent income of the household.

**Figure 3**




See Table 1. The proportion of mothers earning cash is 16.01% amongst Muslims and 28.05% amongst Hindus [6]

The fact that Hindu women work more often may thus explain part of the seeming puzzle of the higher mortality rates of their children. However, within each of the employment categories considered here (including non-employment), Muslim children maintain a survival advantage. (see Appendix Table 1 and Appendix Figure 12). We compared the average wealth status of the two religious groups, using an index of household ownership of durable goods and access to basic facilities.[7] The wealth index is strictly only pertinent to recent births because it measures wealth at the time of the survey. The wealth distribution is not dissimilar across the communities, although Muslims are slightly more often found in the lowest and highest quartiles, suggesting more economic inequality within the Muslim community (see Table 1 and Appendix Figure 6). Muslim children have a significant survival advantage within each wealth quartile (see Appendix Table 1 and Appendix Figure 13).

A potential explanation for the Hindu excess mortality may be that some 28% Hindus are low caste (scheduled caste or scheduled tribe), and low-caste households tend to have characteristics less favourable to survival, including poorer access to health facilities. However, while the Muslim differential is larger relative to low caste Hindus (4.92%-points), Muslims also exhibit an advantage with respect to high castes (1.65%-points).

[6] Contrary to Table 1, where the proportion of mothers earning cash is the proportion amongst working mothers, in Figure 3 it is represented with reference to the whole mother sample for comparability with the other proportions.

[7] Following Filmer and Pritchett (1999), we construct an index of household wealth using principal component analysis. Assets included in the index are ownership of a radio, fridge, bike, motorbike, car, television, and access to electricity, toilet flush, and toilet pit.

**Women's status**

Women's status may be relevant given evidence that the bargaining power of women within the household matters for child health, for example, because they have different preferences from men, with their preferences being more favourable to child health. One study finds, for instance, that women are more likely to spend household resources on food rather than tobacco (e.g. Alderman et al. 2001). So, if religion is correlated with women's status, then religion may be correlated with child health.

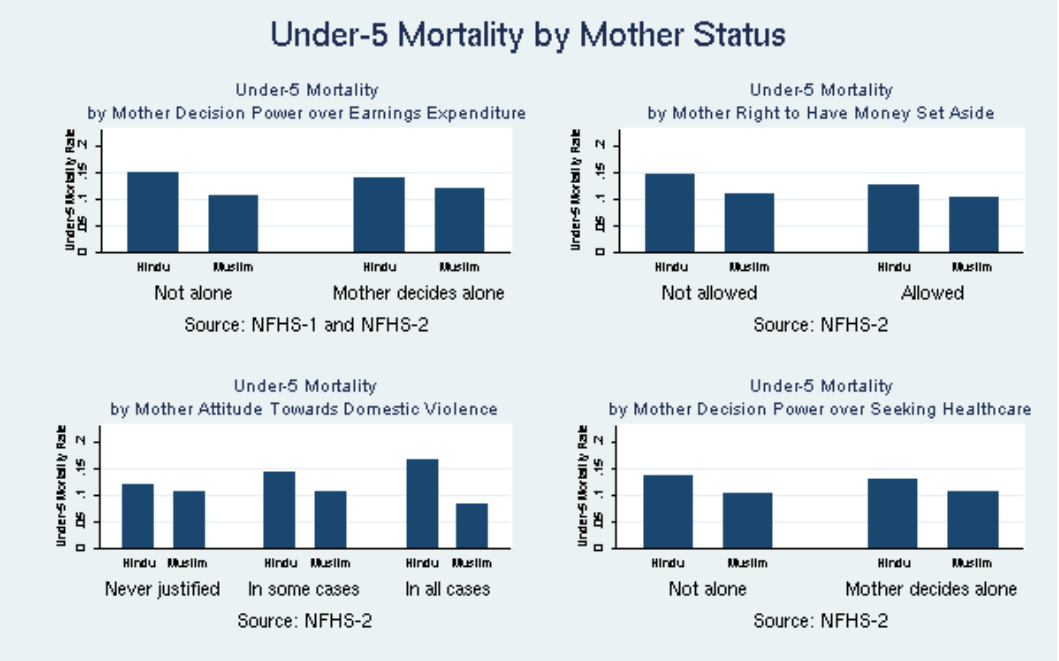
Muslim women are commonly regarded as being less "empowered" than Hindu women although, as we shall see, this view is not defended by the data. NFHS-2 asked women a number of questions designed to elicit their level of empowerment or autonomy. The questions we consider here relate to (1) the extent of control the woman has over the way that the money she earns is spent and whether she is allowed to have money set aside, (2) her attitudes regarding domestic violence and the frequency with which she was beaten in the year preceding the survey, and, more importantly for our discussion, (3) who in the household decides whether she can seek healthcare. Given evidence that female autonomy is good for child health (an agency effect), we would expect lower mortality amongst children of more empowered mothers, other things equal.

The relevant data are summarised in Table 1 and Appendix Table 1. Consider first control over cash earned. Since only 28.05% of Hindu and 16.01% of Muslim women work for cash, this information is only available for this sub-sample. Muslim mothers are less often allowed to have money set aside but they have more control over the way cash earned is spent compared to Hindu mothers. Although the mother's autonomy in setting money aside is associated with lower under-5 mortality, Muslim children's survival chances do not improve when the mother decides how to spend the money alone (see Figure 4). Fewer Muslim women think that it is justified for a husband to hit his wife in various circumstances going from "if he suspects her of being unfaithful" to "if she doesn't cook food properly". There is no significant difference in the proportion of women never beaten in the year preceding the survey.[8].Muslim mothers report more often making the decision of seeking healthcare on their own. But there is little difference in the under-5 mortality rate between mothers who say they make this decision on their own and other mothers (see Figure 4 below), which is partly due to women making this decision on their own being also more often household heads and thus at a socio-economic disadvantage. Indeed, women making this decision alone are household heads in 16.52% of cases compared to 1.43% for mothers who do not make this decision alone.

[8] The response rate is low for this sensitive question: 22.91% amongst Muslim women and 21.66% amongst Hindus. But given the negligible difference in response rates between communities, this is not likely to bias the comparison.

All in all, there is little evidence in these data that Muslim women are less empowered but the role of empowerment is unclear: although child mortality is lower amongst women with lower bargaining power in the Hindu community, this is not the case amongst Muslims (see, for instance, the bottom left panel of Figure 4 showing under-5 mortality by attitude regarding domestic violence).

**Figure 4**




See Table 1 and Appendix Table 1.

In summary, the fact that Hindus have an educational advantage deepens the puzzle, while our finding that Hindu women are more likely to work together with the fact that the Hindu averages include the lower-castes contribute to explaining it. Differences in wealth and in female autonomy are not large and appear to have little influence on the religion mortality differential.

## 4. Differences in Health Inputs and Endowments

In this section we consider differences in the levels of and returns to health inputs and endowments (refer equation 2).

### Differences in Inputs

The relevant data are in Table 3 and Appendix Table 2 Data on antenatal and postnatal care are only available for recent births in the NFHS. In this section, we consider infant rather than under-5 mortality since recent births have not been around long enough to be fully exposed to under-5 mortality risk.

For this reduced sample, the infant mortality differential between the religions is smaller than for the larger sample that we have been looking at so far (0.94%-points compared to 2.09%-points), although it is significant at the 2% level.[9] The mortality differential often loses significance when splitting the sample by input indicator despite small changes in its value (e.g., when comparing mortality between the two religions according to whether or not the mother received iron folic tables). For this reason, we do not discuss the mortality differentials conditional on each input, although these are presented, for reference, in Appendix Table 2.

**Antenatal care and place of delivery**

The data suggest that antenatal care practices are less favourable to child survival amongst Muslims. Muslim mothers receive fewer tetanus injections and iron folic tablets before birth and make fewer antenatal visits and these differences are statistically significant (see Table 3). As a consequence, fewer Muslim mothers have complete antenatal care which, in India, involves having had at least three antenatal care visits, at least one tetanus shot and iron and folic tablets.[10] Muslim mothers also deliver at home (theirs or that of a relative or friend) significantly more often than Hindu mothers. These findings reinforce the puzzle since antenatal care and delivery outside the home both significantly lower the risk of childhood mortality (see Appendix Figures 1 to 4 and Appendix Table 2).

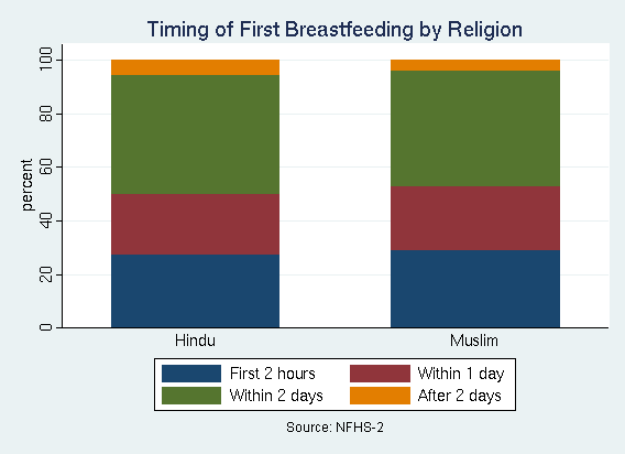
## Postnatal care

Consider breastfeeding practices. As shown in Table 3, Hindu mothers tend to wean later, although the difference in duration of breastfeeding is only noticeable for the top half of the distribution: the median being 13 months for both communities. However, Muslim mothers tend to put the baby to the breast sooner after birth (see also Figure 5). Whilst a quarter of Muslim mothers put the baby to the breast within an hour of birth, the corresponding figure is two hours for Hindu mothers. Early initiation of breastfeeding is especially important as the first milk contains antibodies and this has a positive impact on survival chances (see Appendix Table 2). This may therefore contribute to explaining the puzzle.

[9] In section 2, we stated that the religion differential in under-5 mortality has increased between the end-points of the entire period, 1960-65 and 1990-95, where we cut the data at 1995 to allow full exposure to the risk of under-5 mortality. This may appear to contradict our observation here that the infant mortality rate for recent births (1988-98) is smaller than the average infant mortality differential over the entire period (1960-98). In fact it is not, the size of this differential being sensitive to the period being considered (see Figure 1).

[10] Hindu-Muslim differences in the timing of antenatal care (ie which month of pregnancy) are insignificant.

**Figure 5**

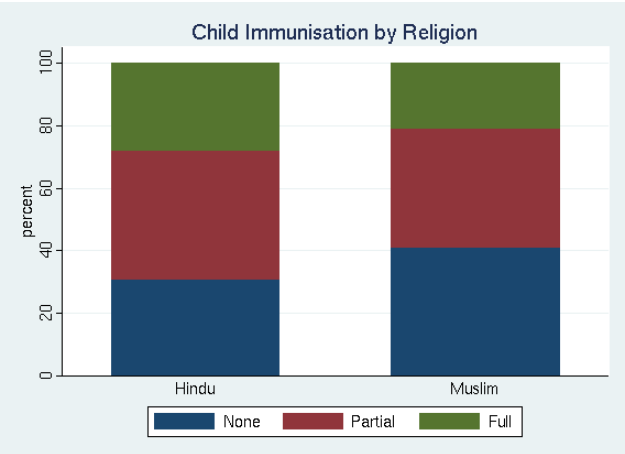



**See Table 3.**

Hindus are thought to have a ritual of offering the first-milk (colostrum) to the earth, despite scientific evidence that colostrum is rich in antibodies that prevent recurrent infections. Our data confirm a significant correlation between infant mortality and having squeezed the first milk out from the breast before the first breastfeeding. However, our data do not support the folk wisdom that Hindu women are significantly more likely to do this (see Table 3).[11]

Hindu children receive better immunisation (see Table 3 and Figure 6). However, the data on breastfeeding and immunisation are endogenously censored. Children who are not breastfed or immunised are less likely to survive and so less likely to be observed in the data.

**Figure 6**




**See Table 3**

[11] The exact question asked of respondents is "Did you squeeze out the milk from the breast before you first put NAME (index child) to the breast?" The fact that this question is specific to India suggests that it reflects an Indian cultural practice. In the ORC Macro report, squeezing out milk in this way is referred to as contrary to the recommendations for feeding infants (p.253).

Hindu mothers appear to be more aware of oral rehydration salts (ORS) than Muslim mothers, which would tend to favour Hindu children survival (see Table 1, Appendix Table 1 and Appendix Figure 14[12]). On the other hand, when asked (only in NFHS-2), whether a child with diarrhoea should be given more to drink or not, a larger fraction of Muslim mothers provide a positive response (see Table 3). Also, Muslim mothers report seeking medical treatment more often when children have diarrhoea. There is no significant difference between the two religion samples with respect to the propensity to seek medical treatment for children suffering from cough and fever in the seven days preceding the survey.

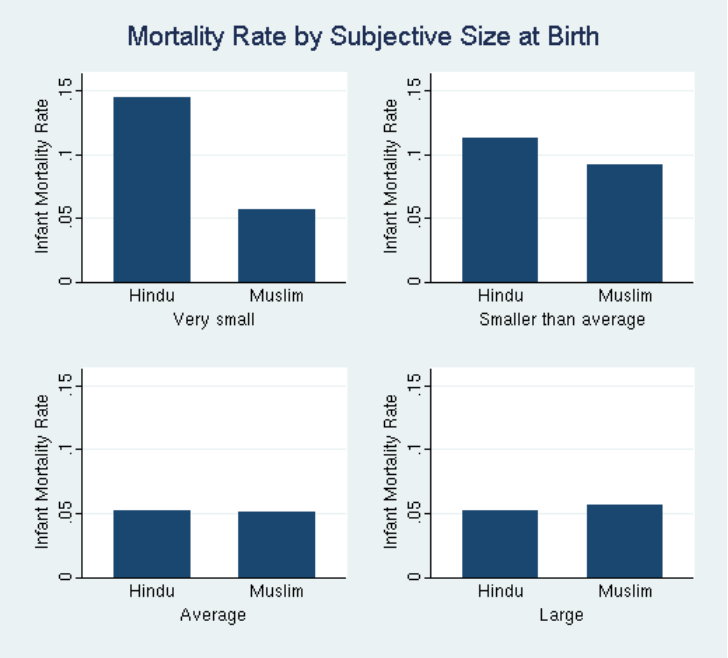
In sum, while Hindus seem to have more favourable antenatal care practices, relevant aspects of postnatal care that might contribute to the Muslims advantage include early commencement of breastfeeding and more effective care of children with diarrhoea.

**Differences in Endowments**

Despite the unfavourable comparison presented above with respect to antenatal care, Muslim babies who were weighed at birth are significantly heavier (see Table 3). However data on birth weight are missing for about 81% and 83% of cases amongst Hindus and Muslims, respectively, and it is unlikely that the missing data are random. For example, if the missing data are concentrated amongst uneducated women and more so in one community than the other and if maternal education is correlated with birthweight then this comparison is unreliable. We therefore consider an alternative subjective birthweight variable that records less than 1% missing values. This involves the mother classifying her babies as "very small", "smaller than average", "average" or "large". Based on this classification, Muslim babies tend to be judged bigger by their mothers (see Appendix Figure 15), although this difference is only statistically significant for the "small" category, which absorbs 20.73% of Hindu births, compared to 19.71% of Muslim births (see Table 3).

[12] The question about awareness of ORS is put to all mothers, not just those who had children in the few years preceding the surveys, so that the under-5 mortality rate is meaningful for this variable.

**Figure 7**




**See Table 3 and Appendix Table 2.**

It is striking to see that the relative survival advantage of "very small" to "small" Muslim children is more marked than for higher birthweight children (see Figure 7). This may suggest that Muslims are "better" at looking after more frail newborns. But it may also simply indicate that "small" Hindu babies are, on average, smaller than "small" Muslim babies (recall that this measure is subjective).

The Muslim advantage in birth weight is consistent with the Muslim neonatal survival advantage. Since Muslims do not have better prenatal care than Hindus, it suggests that differences in endowments may play a role in explaining the puzzle.

## Mother-specific endowments

To explore this further, we consider differences between the communities in mother's height, which is a proxy for long-term health. Indian Muslims originated North of the Indian subcontinent, where the racial stock is typically taller and of bigger build. Indeed, Muslim women in our sample have a significant, if small, height advantage (see Table 2). This may explain part of the mortality differential, since child mortality decreases with mother's height (see Appendix Figure 7).

Muslim women also have better short term health as measured by body mass index (BMI). Taking the conventional definition of under-nourishment as indicated by a BMI smaller than 18.5, we find that Hindu women are more often undernourished at the time of the

survey than Muslim women (36.76% compared to 32.58%).[13] A simple regression of under-5 mortality on maternal BMI shows a significant inverse relationship (also see Appendix Figure 16).

The difference in BMI may be due to religious rules affecting maternal and foetal health. A mortality advantage has been observed for Muslim adults as well as children (see Bhat and Zavier, 2005), suggesting that these differences in diet and other religious rules may be relevant over the lifecourse. First, the complete avoidance of meat consumption by some Hindu sects may matter. In NFHS-2, women were asked about the frequency with which they consume different types of food. We used these data to compare the prevalence of vegetarianism amongst Hindus and Muslims, and we find that Muslim mothers eat meat and eggs much more often than Hindu mothers (see Table 1). We also find that children born of vegetarian mothers have higher mortality rates, and the religion mortality differential is smaller amongst vegetarian mothers (see Appendix Table 1 and Appendix Figure 6).[14] This is an important observation. Vegetarianism at higher living standards probably does not affect health as much as amongst relatively poor people.

Other religious rules that may matter are the avoidance of alcohol in the Muslim community, the hygiene imposed by daily prayers amongst Muslims, and attitudes towards tobacco use by women. In NFHS-2, respondents are asked whether they consume alcohol and tobacco. The data indicate that a significantly larger share of Hindu respondents drink alcohol compared to their Muslim counterparts, although the proportions are very small in both communities (Table 1). The opposite holds true for tobacco consumption (Table 1). Tobacco consumption is correlated with higher child mortality in both religious groups (Appendix Table 1 and Appendix Figure 6), so tobacco differentials reinforce the puzzle. However, alcohol consumption is correlated with higher child mortality amongst Hindus and lower child mortality amongst Muslims, this probably being due to a positive correlation between alcohol consumption by Muslim mothers and socio-economic status.

**Child-specific endowments**

In addition to mother-specific endowments, there are child-specific variables that may vary with religion (e.g., age of mother at birth and birth order) and "returns" to these characteristics may vary between religions due, for instance, to variations in the degree of son preference.

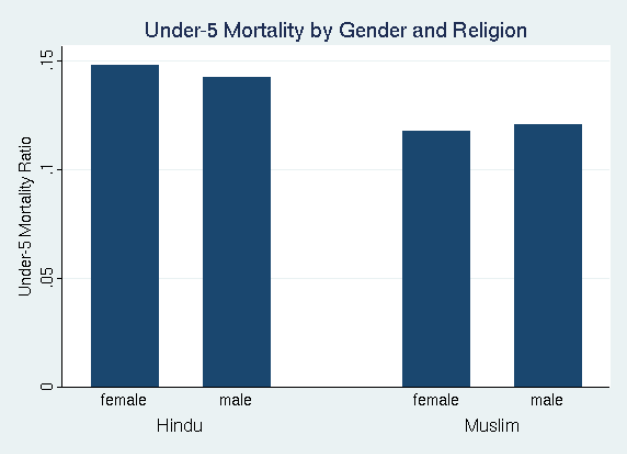
[13] These statistics exclude mothers who were pregnant at the time of the survey. Since we are, here, analysing only births in the three or four years preceding the survey, BMI at the time of the survey is a relevant indicator of maternal health around if not at birth.
[14] Defined as mothers who report never eating meat or eggs.

Fertility behaviour implies that Hindu babies are less often born to very young or older mothers, for both of whom mortality rates are larger (e.g. Bhalotra and van Soest 2007) On average, age at birth is not very different, being 22.62 years for Muslim women and 22.26 for Hindu women. Muslim children appear to have a survival advantage across the distribution of maternal age at birth, the differential being larger until about age 25, which is above the median (and mean) age at birth in the sample (see Appendix Figure 10)

There are numerous accounts of son-preference amongst Indians (e.g. Miller 1981). Although girls are, by nature, born with a survival advantage, this is seen to be eroded with age and, for India as a whole, the data suggest that the risk of death for girls begins to exceed that for boys shortly after the age of five months. For India as a whole, the infant mortality rate is larger for boys (10.30% versus 9.92%) but the under-5 mortality rate is larger for girls (14.36% versus 13.93%). The girl disadvantage has been observed to increase with birth-order (e.g. DasGupta 1987). In other words, it is the arrival of more and more girls that appears, in India, to reduce the value of the marginal girl to her parents.

Hindus may be less careful about their daughter's health than Muslims, e.g., due to the greater role of dowry amongst Hindus, and the importance they attach to having sons perform religious rites. In this case, excess mortality amongst Hindu children may be driven by excess mortality amongst girls. To investigate this, we looked at the religion differential in (under-5) mortality by gender. It is indeed the case that the religion differential is more pronounced for girls (at 3.05 % points) than for boys (at 2.18 % points), but Hindu boys are more likely to die than Muslim boys. Amongst Hindus, boys have significantly lower mortality risks than girls but the gender difference is insignificant amongst Muslims (see Appendix Table 1 and Figure 8).

**Figure 8**




**See Appendix Table 1.**

The religion differential is evident across birth-orders, tending to widen as birth order increases, although for the under-5 rate, it first narrows for second-births before becoming

larger for third and higher-order births, relative to first births (see Appendix Table 1 and Figure 9); note that the observations get quite thin after about birth order 5.

**Figure 9**

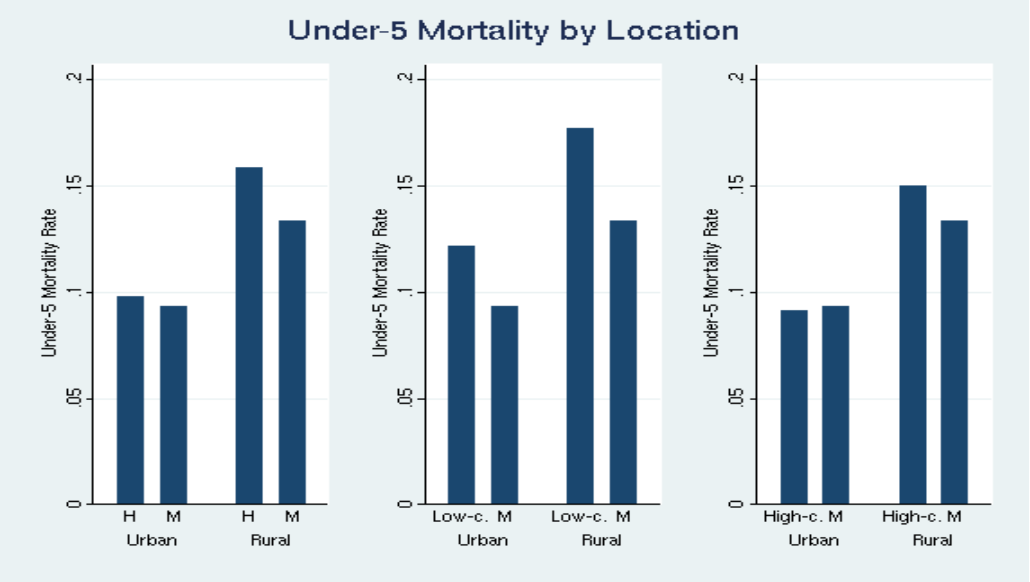

See Table 2. Graph based on a 50% random draw of the population for computational feasibility. Excludes bottom and top 1% of the distribution. Unweighted statistics.

## 5. Composition Effects

### Geographic Composition

It may be the case that Muslims have a survival advantage because they are disproportionately represented in areas where child mortality is lower for everyone (i.e., due to Muslim identity being correlated with $e_M$). For instance, as already mentioned, Muslims are more often urban dwellers than Hindus, and child mortality is lower in urban areas. Indeed, once we restrict the sample to urban households, the religion differential is not significant for under-5 mortality (see Appendix Table 1), and only weakly significant, at 5% and 8% respectively, for neonatal and infant mortality Further disaggregation shows that the Muslim advantage in rural areas is relative to both low- and high-caste Hindus but, in urban areas, it is only vis a vis low-caste Hindus (see Figure 10).

**Figure 10**

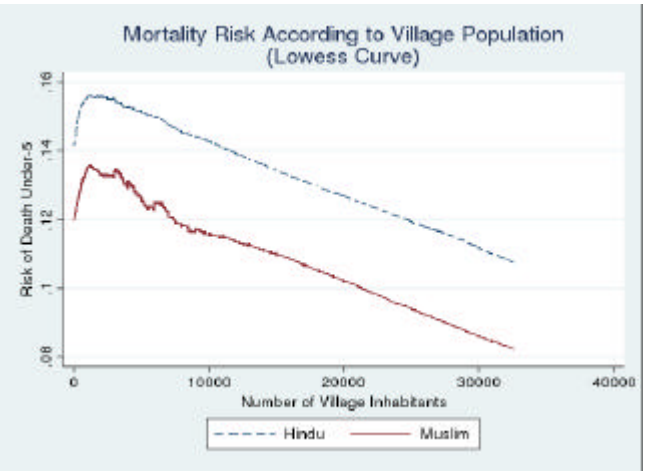



Muslim: 9.34% (urban), 13.34% (rural). All Hindu: 9.76% (urban), 15.86% (rural). Low-caste Hindu: 12.18% (urban) and 17.69% (rural). High-caste Hindu: 9.15% (urban), 15.02% (rural). Sample of children fully exposed to under-5 mortality risk only.

One reason why urban dwellers have lower child mortality rates is probably that facilities tend to be better so that characteristics and endowments may have higher "returns". We do not have information on health facilities in urban areas, but do for rural areas. We may expect that Muslims have poorer access to health facilities due to their minority status. Indeed, this is argued by Sachar et al. (2006), who report that, amongst villages with over 1000 inhabitants, villages with 10% or more Muslims are less likely to have medical facilities (see their Figure 7.1 p.142). They also report Census data indicating that the proportion of villages with medical facilities is much higher amongst larger villages (with more than 2000 inhabitants) compared to smaller villages (see Figure 7.1, p 142 in Sachar et al., 2006). Our data indicate that a significantly higher proportion of Muslim mothers live in villages with health facilities, whether we measure these to include all trained health professionals (85.04% versus 78.37%), or we restrict the comparison to availability of any health centre, i.e. hospital, primary health centre, clinic, dispensary, public or private (78.37% versus 53.10%). This appears to be due to Muslims tending to live in larger villages than Hindus. Village size appears to matter more than religion-composition in determining the location of health facilities: indeed, controlling for village population, Muslims do not have better access (see probit model estimates in Appendix Table 3).

Overall, within rural areas, the Muslim survival advantage may be related to their tendency to live in larger villages, where facilities are more abundant and mortality risks are lower (see Table 1 and Appendix Table 1). This said, the Muslim advantage is larger in smaller villages (see also Figure 11).

**Figure 11**




See Table 1. Largest 1% villages dropped. Graph based on a 50% random draw of the population for computational feasibility. Sample of children fully exposed to under-5 mortality risk only.

While the presence of local health facilities creates *potential* access, better access in practice does not necessarily follow. In particular, there is some evidence that Muslim women often complain that they encounter "unacceptable behaviour" at public health centres which "discourages them from going there" (Sachar et al., 2006, p.24). Also, we showed in Section 4 above that Muslim mothers do not systematically use available facilities more often. Consistent with this, we find that the Muslim advantage is similar in the set of households with and without access to health facilities (see Appendix Table 1).

Another aspect of Muslim-Hindu differences in geographic distribution is that the two communities are not similarly distributed across states, which is relevant since child mortality rates vary widely across states, from 5.67% in Kerala to 19.46% in Uttar Pradesh. When looking at the all-India religion differential, what matters is not only the percentage of the state population that is Muslim, but also the share of the total Muslim population in each state. The two can differ widely. For instance, although a large share of Kerala's population is Muslim (34.69% of households in our data), this small state represents only 8.36% of all Muslim households in the country. So, although mortality rates in Kerala are the lowest in the country, this can only account for a small fraction of the overall differential. And the three states that account for half of all Indian Muslims have relatively high mortality rates[15] (16.47% compared to 12.69% for the under-5 category). Within these states, the Muslim advantage is smaller than in the other states, although it is significant at 0.1% in both cases. In general, the size and significance of the religion differential in under-5 mortality varies considerably across the states. It is significant and favourable to Muslim children at the 10% level in Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Mizoram, Orissa, Tamil Nadu, Uttar Pradesh, Arunachal Pradesh, i.e., for 10 out of 26 states. On the

[15] These are Uttar Pradesh, Bihar, and West Bengal. They each count for more than 13% of the country's Muslim child population, and just under 51% altogether.

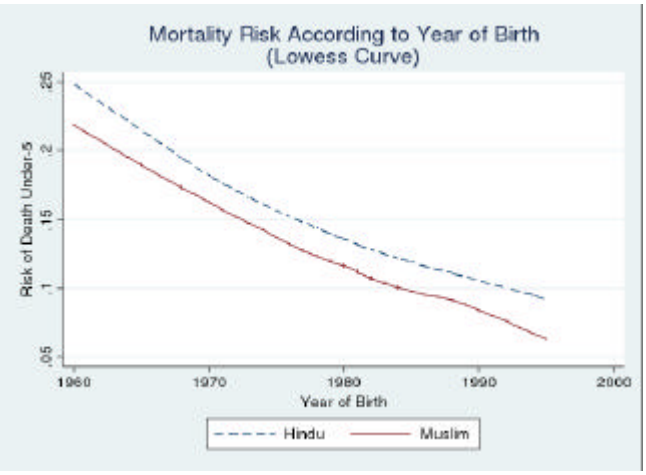
other hand, in the states of Assam, Kerala, Manipur, Nagaland and in New Delhi, Hindus enjoy a survival advantage significant at 10% or below (see Appendix Table 1).

**Demographic Composition**

In our sample, Muslim women have an average of 4.63 children in contrast to 3.85 amongst Hindus. They also have shorter birth intervals. To the extent that short birth intervals increase mortality risk (as shown in Bhalotra and van Soest 2007) and there is sibling resource competition, higher fertility may be expected to have a causal effect of raising childhood mortality risk. In this way, it deepens the puzzle.

However, higher rates of fertility amongst Muslims may exert compositional effects that work in the opposite direction. For instance, a mechanical consequence of higher Muslim fertility is that a smaller share of Muslim children are first-borns, and the demographic literature suggests that first-born children in high-mortality settings experience higher mortality rates (Chibdambaram et al. 1985). This said, mortality risk is also high at very high parity (Chibdambaram et al. 1985) and this should confer some disadvantage upon Muslim families. However, we have seen in Section 4 that Muslims have an advantage at every birth-order. The fact that this advantage is increasing in birth order is consistent with the hypothesis that, relative to Muslims, Hindus prefer lower fertility or, equivalently, prefer lower-order births. Another way in which the religion fertility differential may impact the mortality differential is as follows. Based simply on higher fertility amongst this group, Muslim children are born a bit later in time (see Table 2). Given trend improvements in health technology and services, this may contribute to their survival advantage. Figure 12 illustrates the trend improvement enjoyed by both communities. It also shows that the Muslim survival advantage has persisted over time, with some narrowing for cohorts between about 1970 and 1985.

**Figure 12**




Graph based on a 50% random draw of the population for computational feasibility. Sample of children fully exposed to under-5 mortality risk only.

Our analysis suggests several partial explanations for the observed Muslim survival advantage: earlier initialisation of breastfeeding, awareness of the importance of fluids in treating a child with diarrhoea and a greater likelihood of taking a child with diarrhoea to a facility for treatment, mothers who are taller and less likely to be undernourished, less of a differential in preferences for children by gender and birth-order, urban location and cohort composition effects. A full treatment of the question is beyond the scope of this chapter. Nevertheless, in the following section, we present results of descriptive regressions that allow us to obtain the effects of some of the variables we have considered conditional upon the others.

**6. Multivariate Regressions**

Multivariate regressions are reported in Tables 4 and 5. We do not attempt to estimate structural parameters, only to report conditional effects and, in particular, to see if a sufficiently rich specification eliminates the fixed effect associated with being Muslim.[16] This is -0.022 and -0.017 in simple regressions of an indicator for under-5 and infant mortality (respectively) on an indicator for the mother being Muslim. We use the linear probability model, and have confirmed that a probit gives very similar results. The standard errors are robust to arbitrary forms of heteroskedasticity and to allowing for clustering within villages. Allowing non-independence of the standard errors within clusters raises them, the standard error on the Muslim dummy rising by about a third.

Table 4 uses the full birth history of each mother in each of the two rounds of the NFHS. Births span 1960-1999 and there are more than 352000 observations after we drop children who have not had full exposure to the risk of under-5 mortality. In columns 1-3, the dependent variable is under-5 mortality. The specification in column 1 is re-estimated for infant mortality and these results are in column 4.

Here we summarise the main results. Controlling for mother's and father's educational level, caste (if Hindu), rural v urban location, state of residence, cohort (or time) effects, the age of the mother at birth and the gender and birth-order of the child hardly diminishes the Muslim effect. It is -0.021 for under-5 (col.1) and -0.016 for infant mortality. Columns 2 and 3 show how the under-5 estimate is altered by adding to the model first maternal height and then indicators for a vegetarian diet and for alcohol and tobacco consumption. These four variables were only collected for the second round (NFHS2), so that columns 2 and 3 are estimated on a different (and smaller) sample than that used in column 1. The coefficient drops to -0.017 with height alone. Height has a significant mortality-reducing

[16] A more careful decomposition exercise that estimates the extent to which observables can explain the religion differential in mortality is presented in Bhalotra and van Soest (2005).

effect and, as Muslim women are taller, this may explain the fall in the religion effect. However, we cannot be certain of this since the estimation sample has changed. Tobacco and vegetarianism have the expected risk-raising effect but the effect of alcohol consumption is insignificant.

Table 5 reports estimates on the sample of recent births for which we have additional information on household wealth, whether parents are currently working, and antenatal care. Since this information is for births in the three (NFHS2) or four (NFHS1) years preceding the survey, we cannot model under-5 mortality conditional upon full exposure. So these equations are for infant mortality and children born less than 12 months before the date of the survey are dropped. Pooling the two rounds of the NFHS, there are just less than 45000 births in the years 1988-1998.

The main result apparent across the columns of Table 5 is that the Muslim advantage in survival is now insignificant. It is possible that with the sample size restricted to about an eighth of that in Table 4, we do not have enough variation to estimate the religion effect. Alternatively, the *conditional* survival advantage has been eroded with time so that, in the last decade, it is genuinely insignificantly small. It is hard to make a definitive distinction between these explanations. Compare column 4 of Table 4 with column 1 of Table 5. These are identical model specifications, the first using data that go back as far as 1960, and the second starting in 1988. The standard error on the Muslim dummy is much larger in the second case (0.0043 v 0.0027) but the coefficient is also much smaller (-0.006 v -0.016). Column 2 shows that, if we drop state fixed effects, the conditional religion differential becomes significant at the 10% significance level, although it remains, at -0.008, only half as big as the differential estimated on the longer-range data. Columns 3-5 demonstrate that conditioning on further explanatory variables does not make a significant difference to the (already poorly determined) religion differential. The direct effects of the new regressors are of some interest. Whether the parents are working or not has no significant impact conditioning on other socio-economic characteristics. Above-median wealth and use of antenatal care result in significantly lower infant mortality risk. Place of delivery does not have the expected effect when conditioning on socio-economic characteristics (Column 4), and is insignificant when included along with the other antenatal care variables (Column 5). As these variables are potentially endogenous, we lay no interpretation on the coefficient estimates, our purpose being only to consider how the partial correlation of religion and mortality is affected by controlling for them. Other relevant endogenous variables that we have discussed above include breastfeeding, immunization and treatment-seeking conditional upon child disease. These are not included in the regressions either because they are only defined for alive children (treatment-seeking) so that it is impossible to estimate their impact on the probability

of death, or because they are jointly determined with survival duration (duration of breastfeeding, immunization).

The (conditional) effects of the more standard covariates are summarised here and displayed in the Tables. Refer to columns 1 and 4 in Table 4. There are large state differentials in mortality, conditional upon family and individual characteristics. Controlling for these reduces the religion differential. Rural residence is associated with higher mortality risk and, as discussed before, Muslims are less likely to live in a rural location than Hindus. Amongst Hindus, scheduled caste families face higher risk than the upper castes but, conditional on the other variables in the model, scheduled tribes do not. Mortality risk is consistently decreasing in the education of the mother and father, the effects of father's education being larger than of mother's education at higher levels of education. Mortality has been decreasing during 1960-98, and the decline has slowed in recent years. Girls face lower infant mortality risk but higher under-5 mortality risk, consistent with the view that the role of liquidity constraints and/or parental preferences relative to the role of nature grows with child age. Mortality risk appears to be consistently decreasing in maternal age at birth, in contrast to the U-shape noted in some other studies. Conditional upon maternal age at birth, mortality risk is increasing in birth-order, this effect being stronger for under-5 than for infant mortality.

**7. Conclusion**

The analysis confirms the existence of differences in education, and fertility characteristics (a greater number of children and shorter birth spacing) that are unfavourable to the survival of Muslim compared to Hindu children. Hindu women also appear to achieve better antenatal care and child immunization rates. Although the fraction of women consuming tobacco in both communities is very small, it is larger amongst Muslim women and we show that tobacco consumption by the mother has a significant positive impact on childhood mortality risk. These are some of the factors that deepen the paradox in the sense that they lead us to expect better survival chances amongst Hindu children, contrary to what is observed.

We nevertheless find some clues to the puzzle of Muslim children exhibiting a survival advantage. Muslim mothers are taller, which indicates long-term health, and are less likely to be undernourished around the time of birth. There is some evidence that a non-vegetarian diet of the mother (more prevalent amongst Muslims) lowers mortality risk, at least in India, where the median person is quite poor. Muslim mothers are less likely to work than Hindu mothers and this appears to confer an advantage on their children. Although there is no systematic evidence of one group having better access to public health services, the data indicate that Muslim mothers are more likely to seek treatment for diarrhoea, which is an important cause of child death. Seemingly greater son preference amongst Hindus may also

contribute to explaining the Muslim advantage. The religion differential is larger amongst girls, even if it is also evident amongst boys.

Some of the Muslim advantage can be explained in terms of composition effects. The average Hindu mortality rate reflects, to some degree, the higher mortality rates of lower-caste groups in the Hindu community. Muslims are more likely to live in urban areas and, within rural areas, in larger villages- and these areas tend to be better supplied with health facilities and, possibly, to be less prone to disease shocks (because of better sanitation, for example). A consequence of higher fertility is that the average Muslim child is born more recently and benefits from the improvements in health infrastructure and technology that drive the secular decline in mortality rates. Another advantage conferred by their higher fertility is that fewer Muslim children are first-borns or, related, fewer are born to very young mothers.

Reduced-form regressions of childhood mortality rates on these covariates indicate that they do not explain away the Muslim survival advantage: there is a significant fixed effect associated with being Muslim, holding constant these predictors. This would suggest either that Muslim parents tend to provide better care for given characteristics or that we are missing an important determinant of inputs contributing to child health that is strongly correlated with being Muslim. However, the data indicate that Muslim children receive poorer antenatal care and differences in postnatal care go in both directions. Furthermore, there does not seem to be a robust Muslim advantage in terms of returns to inputs. More specifically, in a regression of infant mortality on inputs and endowments alone, a Muslim dummy is only significant if we do not control for the state in which the child lives. We may gain more insight into the overall differential by looking more carefully at the religion differentials within states which, we have shown, varies considerably across states.

**References**

Alderman , H., Pierre-André Chiappori , Lawrence Haddad , John Hoddinott , and Ravi Kanbur (2001). Unitary versus collective models of the household: Is it time to shift the burden of the proof*? World Bank Research Observer* 10(1).

Bhalotra, S. (2007), Fatal fluctuations: Cyclicality in infant mortality in India, Discussion Paper, Bonn: IZA

Bhalotra, S. and A. van Soest (2005), A decomposition of the Hindu-Muslim difference in childhood mortality risk. Paper presented at the Workshop on the Microfoundations of Human Development, IIC: Delhi.

Bhalotra, S. and A. van Soest (2007), Neonatal mortality and birth-spacing in India: Dynamics, frailty and fecundity, *Journal of Econometrics,* forthcoming.

Bhat, Mari P.N. and A.J. Francis Zavier (2005). Role of Religion in Fertility Decline: The case of Indian Muslims. *Economic and Political Weekly*, 29 January: 385-402.

Chidambaram, V. C.; John W. McDonald; Michael D. Bracher (1985). Infant and Child Mortality in the Developing World: Information from the World Fertility Survey. *International Family Planning Perspectives*, Vol. 11, no.1: 17-25.

Das Gupta, Monica. (1987). Selective Discrimination against Female Children in Rural Punjab. *Population and Development Review* 13, no. 1:77-100.

Filmer, D. and L Pritchett (1999). The Effect of Household Wealth on Educational Attainment: Evidence from 35 Countries. Population and Development Review 25(1).

Fryer, RG. and SD Levitt (2004). Understanding the Black-White Test Score Gap in the First Two Years of School. *Review of Economics and* Statistics (86): 447-464.

IIPS (1995). National Family Health Survey (MCH and Family Planning), India 1992-93. International Institute for Population Sciences (IIPS). Bombay, India.

IIPS and ORC Macro (2000). National Family Health Survey (NFHS-2) 1998-99 India. International Institute for Population Sciences (IIPS). Bombay, India.

Miller, Barbara. 1981. The Endangered Sex: Neglect of Female Children in Rural North India. Ithaca, NY: Cornell University Press.

Sachar, R.. S. Hamid, T.K. Oommen, M.A. Basith, R. Basant, A. Majeed, and A. Shariff (2006). Social, Economic and Educational Status of the Muslim Community of India: A report. Prime Minister's High Level Committee. Government of India. New Delhi, India.

Wilson, D., S. Burgess and A. Briggs (2005), The dynamics of school attainment of England's ethnic minorities, Working Paper 05/130, CMPO, University of Bristol.

Wolpin, K. (1997), Determinants and consequences of the mortality and health of infants and children, Chapter 10 in Mark Rosenzweig and Oded Stark (eds.), *Handbook of Population and Family Economics*, Volume 1A, Amsterdam: North Holland.

**Table 1: Characteristics of Hindu and Muslim households**

| Binary variables: | Proportion (%) | Number of Households | Proportion (%) | | Hindu-Muslim difference (%-points) | S.L.[a] |
|---|---|---|---|---|---|---|
| | All | | Muslim | Hindu | | |
| Rural | 73.88 | 105549 | 64.39 | 75.27 | 10.88 | *** |
| **Mother's education:** | | | | | | |
| no education | 62.79 | 105362 | 65.42 | 62.41 | -3.02 | *** |
| incomplete primary | 12.05 | 105362 | 14.29 | 11.72 | -2.57 | *** |
| complete primary | 4.60 | 105362 | 4.84 | 4.57 | -0.27 | - |
| incomplete secondary | 13.90 | 105362 | 11.54 | 14.24 | 2.70 | *** |
| complete secondary | 2.59 | 105362 | 2.03 | 2.67 | 0.64 | *** |
| higher education | 4.07 | 105362 | 1.88 | 4.39 | 2.51 | *** |
| **Father's education:** | | | | | | |
| no education | 34.41 | 105135 | 41.05 | 33.44 | -7.62 | *** |
| incomplete primary | 16.91 | 105135 | 19.12 | 16.58 | -2.54 | *** |
| complete primary | 6.95 | 105135 | 6.97 | 6.95 | -0.01 | - |
| incomplete secondary | 22.34 | 105135 | 19.73 | 22.73 | 2.99 | *** |
| complete secondary | 7.63 | 105135 | 6.41 | 7.81 | 1.40 | *** |
| higher education | 11.75 | 105135 | 6.71 | 12.49 | 5.78 | *** |
| **Wealth quartile:** | | | | | | |
| 1st (poorest) | 32.93 | 105487 | 33.62 | 32.83 | -0.79 | - |
| 2nd | 19.37 | 105487 | 18.17 | 19.55 | 1.37 | ** |
| 3rd | 20.69 | 105487 | 20.14 | 20.77 | 0.62 | - |
| 4$^{th}$ (richest) | 27.01 | 105487 | 28.06 | 26.85 | -1.21 | * |
| **Labour market characteristics:** | | | | | | |
| Mother does not work | 59.58 | 105377 | 78.46 | 56.80 | -21.66 | *** |
| Father does not work | 2.97 | 105285 | 3.50 | 2.89 | -0.62 | ** |
| Mother works away | 33.86 | 105377 | 13.63 | 36.84 | 23.21 | *** |
| Mother works at home | 6.56 | 105377 | 7.91 | 6.36 | -1.55 | |
| Mother earns cash[b] | 66.31 | 40837 | 76.35 | 65.57 | -10.78 | *** |
| Mother works in agriculture | 26.24 | 105430 | 9.36 | 28.72 | 19.37 | *** |
| **Health:** | | | | | | |
| Any health facilities in village | 79.12 | 70293 | 85.04 | 78.37 | -6.67 | *** |
| Any health centre in village | 54.14 | 70262 | 62.43 | 53.10 | -9.33 | *** |
| Proportion of under-nourished mothers[c,d] | 36.24 | 48613 | 32.58 | 36.76 | 4.19 | *** |
| Knowledge of ORS | 76.34 | 71571 | 73.31 | 76.83 | 3.52 | *** |
| **Women's Status[d]:** | | | | | | |
| Decides alone to seek healthcare | 31.71 | 54298 | 34.10 | 31.35 | -2.75 | *** |
| Allowed to have money aside | 60.96 | 54137 | 58.12 | 61.39 | 3.26 | *** |
| Decides alone how to spend her earnings | 43.43 | 14385 | 56.13 | 42.35 | -13.78 | *** |
| Thinks husband may hit wife if: | | | | | | |
| suspects her of being unfaithful | 33.73 | 53860 | 35.50 | 33.46 | -2.05 | ** |
| her family does not give money | 6.94 | 54032 | 5.64 | 7.14 | 1.50 | *** |
| she shows disrespect | 34.13 | 54027 | 33.87 | 34.16 | 0.29 | - |
| goes out without telling him | 37.22 | 54046 | 38.69 | 37.00 | -1.68 | * |
| she neglects house or children | 40.67 | 54061 | 39.69 | 40.81 | 1.12 | - |
| she does not cook properly | 25.32 | 54062 | 23.72 | 25.56 | 1.83 | ** |
| may in at least one of these cases | 57.48 | 54236 | 57.75 | 57.44 | -0.32 | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| may in all of these cases | 3.43 | 53394 | 2.30 | 3.60 | 1.30 | *** |
| beaten since 15 | 23.17 | 54298 | 23.37 | 23.14 | -0.23 | - |
| In the past 12 months: | | | | | | |
| beaten once | 13.27 | 11456 | 12.18 | 13.43 | 1.26 | - |
| beaten a few times | 23.47 | 11456 | 26.47 | 23.01 | -3.45 | * |
| many times | 12.60 | 11456 | 12.56 | 12.60 | 0.04 | - |
| never | 50.66 | 11456 | 48.79 | 50.95 | 2.16 | - |
| **Other "cultural" variables[d]:** | | | | | | |
| Vegetarian mother | 28.69 | 54287 | 1.87 | 32.73 | 30.86 | *** |
| Mother uses tobacco | 15.37 | 54284 | 17.22 | 15.09 | -2.13 | *** |
| Mother drinks alcohol | 2.56 | 54273 | 0.37 | 2.89 | 2.52 | *** |
| | | | | | | |
| Continuous variables: | Mean (standard deviation) | Number of Households | Mean (standard deviation) | Mean (standard deviation) | Hindu-Muslim difference | S.L.[a] |
| | All | | Muslim | Hindu | | |
| Village population (inhabitants) | 4428.13 (6996.74) | 67358 | 7130.49 (8928.39) | 4089.60 (6284.14) | -3040.89 | *** |
| Number of children per mother | 3.95 (1.94) | 105549 | 4.63 (2.24) | 3.85 (1.87) | -0.78 | *** |

[a] Significance levels: *** is 0.1% ** is 1% * is 5% and + is 10%. [b]Share amongst working women. [c]Defined as BMI<18.5. [d] Data available for NFHS-2 only. Pooled NFHS-1 and NFHS-2 data unless specified otherwise. Sample of children fully exposed to under-5 mortality risk only.

**Table 2: Characteristics of Hindu and Muslim children.**

| | Mean (standard deviation) | Number of Children | Mean (standard deviation) | Mean (standard deviation) | Hindu-Muslim difference | S.L.[a] |
|---|---|---|---|---|---|---|
| | All | All | Muslim | Hindu | | |
| Year of birth | 1980.95 (7.17) | 356236 | 1981.54 (6.95) | 1980.84 (7.20) | -0.70 | *** |
| Birth order | 2.79 (1.82) | 356236 | 3.15 (2.05) | 2.73 (1.76) | -0.42 | *** |
| Age of mother at birth[c] | 22.31 (4.89) | 351324 | 22.62 (5.04) | 22.26 (4.86) | -0.35 | *** |
| Mother's height[b,c] | 150.95 (5.24) | 161916 | 151.26 (5.18) | 150.90 (5.24) | -0.36 | *** |

[a] Significance levels: *** is 0.1% ** is 1% * is 5% and + is 10%. [b] Data available for NFHS-2 only. [c]Bottom and top 1% of distribution were dropped on account of outliers. Pooled NFHS-1 and NFHS-2 data unless specified otherwise. Sample of children fully exposed to under-5 mortality risk only.

## Table 3: Antenatal, Natal and Postnatal Characteristics

| | Proportion (%) or Mean (s.e.), as applicable | Number of Children | Proportion (%) or Mean (standard error), as applicable | | Hindu-Muslim difference | S.L.[a] |
|---|---|---|---|---|---|---|
| | All | | Muslim | Hindu | | |
| **Antenatal care:** | | | | | | |
| Had antenatal check during first trimester | 42.26% | 41247 | 41.96% | 42.32% | 0.36%-pts | - |
| Timing of first antenatal check (months) | 4.28 (1.91) | 41247 | 4.33 (1.93) | 4.27 (1.90) | -0.07 | * |

| | | | | | | |
|---|---|---|---|---|---|---|
| Went for an antenatal visit | 62.01% | 64105 | 59.49% | 62.51% | 3.02%-pts | *** |
| Number of antenatal visits | 2.52 (2.99) | 64105 | 2.43 (2.91) | 2.54 (3.01) | 0.11 | ** |
| Received tetanus injection | 65.50% | 63731 | 63.60% | 65.87% | 2.27%-pts | *** |
| Number of tetanus injections | 1.47 (1.19) | 63731 | 1.42 (1.16) | 1.48 (1.19) | 0.06 | *** |
| Received iron folic tablets | 51.89% | 64024 | 46.12% | 53.03% | 6.91%-pts | *** |
| Had complete antenatal care (at least 3 antenatal care visits, at least 1 tetanus shot and iron folic tablets) | 34.12% | 63617 | 30.29% | 34.87% | 4.58%-pts | *** |
| **Place of delivery:** | | | | | | |
| Delivered at home | 72.92% | 63918 | 74.12% | 72.69% | -1.43%-pts | ** |
| Delivered in a public facility | 14.67% | 63918 | 12.44% | 15.11% | 2.67%-pts | *** |
| Delivered in a private facility | 12.41% | 63918 | 13.44% | 12.20% | -1.23%-pts | ** |
| **Postnatal care:** | | | | | | |
| Timing of first breastfeeding (hours)[b,e] | 36.24 (33.23) | 24246 | 34.43 (31.85) | 36.61 (33.49) | 2.18 | *** |
| Squeezed milk out before | 65.25% | 50688 | 64.45% | 65.41% | 0.96%-pts | - |
| Duration of breastfeeding (months)[e] | 14.12 (9.69) | 63144 | 13.90 (9.21) | 14.16 (9.78) | 0.26 | * |
| Knowledge of ORS[*,f] | 71.42% | 314929 | 69.66% | 71.76% | 2.11%-pts | *** |
| Mother says a child with diarrhoea should be given more to drink[*,b,c] | 29.65% | 72047 | 31.22% | 29.28% | -1.94%-pts | *** |
| Health seeking behaviour for children ill in the 7 days preceding the interview: | | | | | | |
| Some form of treatment for child with diarrhoea | 69.04% | 8496 | 74.84% | 67.89% | -6.95%-pts | *** |
| Medical treatment for child with diarrhoea | 62.32% | 8496 | 67.53% | 61.29% | -6.24%-pts | *** |
| Some form of treatment for child with cough or fever | 69.38% | 17651 | 72.47% | 68.69% | -3.78%-pts | *** |
| Medical treatment for child with cough or fever | 62.54% | 17651 | 63.64% | 62.30% | -1.34%-pts | - |
| No immunisation | 32.76% | 62733 | 41.26% | 31.09% | -10.17%-pts | *** |
| Some immunisation | 40.55% | 62733 | 37.88% | 41.08% | 3.2%-pts | *** |
| Full set (3 DPT, 3 Polio and 1 measles shot) | 26.68% | 62733 | 20.86% | 27.83% | 6.97%-pts | *** |
| Number of vaccinations | 4.05 (3.42) | 61089 | 3.38 (3.31) | 4.19 (3.42) | 0.8 | *** |
| **Child Health:** | | | | | | |
| Weight at birth | 2.80 (0.76) | 11756 | 2.91 (0.74) | 2.79 (0.76) | -0.12 | *** |
| Subjective size at birth: | | | | | | |
| Very small | 1.94% | 63703 | 1.86% | 1.95% | 0.09%-pts | - |
| Small | 20.57% | 63703 | 19.71% | 20.73% | 1.02%-pts | * |
| Average | 63.39% | 63703 | 63.97% | 63.28% | -0.7%-pts | - |
| Large | 14.10% | 63703 | 14.45% | 14.04% | -0.42%-pts | - |
| *1. Chronic undernutrition indicators* | | | | | | |
| Height-for-age score | -1.99 (1.57) | 39538 | -2.07 (1.54) | -1.98 (1.58) | 0.09 | *** |
| Stunted[d] | 49.84% | 40334 | 51.47% | 49.52% | -1.95%-pts | * |
| *2. Acute undernutrition indicators* | | | | | | |
| Weight-for-height score | -0.95 (1.09) | 39740 | -0.93 (1.04) | -0.96 (1.09) | -0.02%-pts | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Wasted[d] | 16.95% | 40547 | 16.13% | 17.11% | 0.99%-pts | - |

Unless marked *, data available only for children born in the 48 months preceding interview in NFHS-1 and in the 36 months preceding interview in NFHS-2. [a] Significance levels: *** is 0.1% ** is 1% * is 5% and + is 10%. [b]Only available in NFHS-2. [c] Data available for all mothers who have given birth in the 36 months preceding interview. [d] Defined as children below 2 standard deviations of the international reference population median. [e]Top 1% of distribution were dropped to avoid outlier bias. [f] Data available for all mothers.

**Table 4: Regressions: Sample on all births exposed to relevant mortality risk**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Dependent variable:mortality indicator** | **Under-5** | **Under-5** | **Under-5** | **Infant** |
| 1 if Muslim | -0.021** | -0.017** | -0.014** | -0.016** |
| | [7.83] | [4.80] | [3.99] | [7.40] |
| 1 if currently rural resident | 0.026** | 0.027** | 0.026** | 0.018** |
| | [11.40] | [9.98] | [9.49] | [10.25] |
| 1 if scheduled tribe | -0.001 | 0.001 | 0.003 | -0.004 |
| | [0.14] | [0.18] | [0.54] | [1.58] |
| 1 if scheduled caste | 0.019** | 0.015** | 0.016** | 0.009** |
| | [7.42] | [4.65] | [4.86] | [4.45] |
| **Mother's education** | | | | |
| incomplete primary | -0.025** | -0.025** | -0.025** | -0.016** |
| | [10.38] | [7.10] | [7.03] | [8.12] |
| complete primary | -0.024** | -0.020** | -0.020** | -0.017** |
| | [6.87] | [4.83] | [4.77] | [5.84] |
| incomplete secondary | -0.033** | -0.025** | -0.024** | -0.021** |
| | [12.73] | [6.76] | [6.58] | [10.48] |
| complete secondary and higher | -0.025** | -0.027** | -0.026** | -0.018** |
| | [7.03] | [6.06] | [5.96] | [6.50] |
| **Father's education** | | | | |
| incomplete primary | -0.015** | -0.007 | -0.007 | -0.007** |
| | [5.85] | [1.69] | [1.66] | [3.70] |
| complete primary | -0.020** | -0.017** | -0.016** | -0.008** |
| | [5.75] | [3.60] | [3.54] | [2.98] |
| incomplete secondary | -0.035** | -0.025** | -0.024** | -0.019** |
| | [13.44] | [7.36] | [7.28] | [9.61] |
| complete secondary | -0.047** | -0.038** | -0.038** | -0.026** |
| | [14.63] | [10.04] | [10.1] | [10.60] |
| Higher | -0.052** | -0.038** | -0.038** | -0.030** |
| | [15.20] | [9.02] | [9.11] | [11.38] |
| 1 if child is female | 0.005** | 0.003 | 0.003 | -0.003** |
| | [3.71] | [1.67] | [1.68] | [2.75] |
| **Mother's age at birth (omitted: 19-24)** | | | | |
| 9-15 | 0.082** | 0.078** | 0.079** | 0.067** |
| | [19.72] | [12.66] | [12.8] | [19.08] |
| 16-18 | 0.038** | 0.036** | 0.036** | 0.030** |
| | [18.28] | [12.62] | [12.8] | [17.01] |
| 25-30 | -0.026** | -0.021** | -0.021** | -0.018** |
| | [13.11] | [7.18] | [7.33] | [10.84] |
| 31-49 | -0.031** | -0.019** | -0.020** | -0.017** |
| | [9.10] | [3.68] | [3.91] | [6.56] |
| **Birth order (omitted: first-born)** | | | | |
| Second | 0.012** | 0.008** | 0.008** | -0.002 |
| | [5.77] | [3.10] | [3.08] | [1.16] |
| Third | 0.018** | 0.016** | 0.015** | 0.000 |
| | [7.90] | [4.94] | [4.88] | [0.14] |

| | | | | |
|---|---|---|---|---|
| Fourth or higher birth order | 0.048** | 0.041** | 0.041** | 0.023** |
| | [17.04] | [10.25] | [10.2] | [10.13] |
| **Cohort effects** | | | | |
| linear trend | -0.005** | -0.008** | -0.008** | -0.003** |
| | [8.36] | [6.17] | [6.10] | [7.60] |
| square of linear trend | 0.000** | 0.000** | 0.000** | 0.000* |
| | [2.77] | [3.26] | [3.28] | [2.25] |
| **States (omitted: Kerala)** | | | | |
| Goa | 0.003 | 0.010 | 0.009 | 0.007 |
| | [0.53] | [1.05] | [1.00] | [1.66] |
| Himachal Pradesh | -0.000 | -0.009 | -0.011 | 0.007* |
| | [0.10] | [1.48] | [1.85] | [2.10] |
| Jammu & Kashmir | 0.011* | 0.019** | 0.016** | 0.016** |
| | [2.52] | [3.55] | [3.02] | [4.74] |
| Manipur | 0.017* | 0.025* | 0.023* | 0.009 |
| | [2.05] | [2.20] | [2.09] | [1.52] |
| Meghalaya | 0.026 | 0.036 | 0.033 | 0.033** |
| | [1.60] | [1.81] | [1.69] | [2.60] |
| Mizoram | 0.087 | 0.191** | 0.180** | 0.072 |
| | [1.48] | [3.50] | [3.28] | [1.14] |
| Nagaland | 0.012 | 0.043 | 0.039 | 0.008 |
| | [0.54] | [1.93] | [1.76] | [0.58] |
| Sikkim | 0.028** | 0.015 | 0.012 | 0.024** |
| | [3.00] | [1.52] | [1.20] | [3.74] |
| New Delhi | 0.040** | 0.045** | 0.041** | 0.035** |
| | [8.30] | [6.22] | [5.61] | [9.41] |
| Arunachal Pradesh | -0.008 | -0.015 | -0.018 | 0.004 |
| | [0.72] | [1.27] | [1.52] | [0.38] |
| Tripura | 0.047** | 0.030** | 0.030** | 0.037** |
| | [6.91] | [3.21] | [3.14] | [6.44] |
| Andhra Pradesh | 0.018** | 0.022** | 0.022** | 0.020** |
| | [3.83] | [3.32] | [3.30] | [5.65] |
| Assam | 0.035** | -0.004 | -0.006 | 0.025** |
| | [6.16] | [0.59] | [0.88] | [6.63] |
| Bihar | 0.048** | 0.033** | 0.032** | 0.032** |
| | [10.77] | [5.81] | [5.66] | [9.68] |
| Gujarat | 0.045** | 0.053** | 0.046** | 0.038** |
| | [9.12] | [7.75] | [6.53] | [10.45] |
| Haryana | 0.031** | 0.031** | 0.025** | 0.030** |
| | [6.95] | [5.50] | [4.12] | [8.12] |
| Karnataka | 0.034** | 0.029** | 0.027** | 0.024** |
| | [7.88] | [5.62] | [5.06] | [7.08] |
| Madhya Pradesh | 0.079** | 0.090** | 0.085** | 0.058** |
| | [16.11] | [14.56] | [13.4] | [15.56] |
| Maharashtra | 0.025** | 0.030** | 0.025** | 0.020** |
| | [5.59] | [4.92] | [4.11] | [6.18] |
| Orissa | 0.064** | 0.054** | 0.051** | 0.063** |
| | [12.40] | [7.70] | [7.17] | [14.67] |
| Punjab | 0.013* | 0.026** | 0.021* | 0.021** |
| | [2.15] | [3.27] | [2.56] | [4.71] |
| Rajasthan | 0.037** | 0.071** | 0.064** | 0.035** |
| | [7.42] | [11.88] | [10.1] | [9.13] |
| Tamil Nadu | 0.037** | 0.034** | 0.034** | 0.027** |
| | [8.82] | [5.99] | [6.09] | [8.12] |
| Uttar Pradesh | 0.104** | 0.093** | 0.088** | 0.078** |
| | [23.87] | [16.12] | [14.9] | [24.54] |

| | | | | |
|---|---|---|---|---|
| West Bengal | 0.032** | 0.025** | 0.024** | 0.028** |
| | [7.26] | [4.00] | [3.86] | [8.40] |
| **Maternal health indicators** | | | | |
| mother height (cms) | | -0.002** | -0.002** | |
| | | [8.65] | [8.77] | |
| 1 if vegetarian mother | | | 0.010** | |
| | | | [3.12] | |
| 1 if mother drinks alcohol | | | -0.004 | |
| | | | [0.42] | |
| 1 if mother consumes tobacco | | | 0.012** | |
| | | | [3.58] | |
| Observations | 352817 | 160567 | 160449 | 426805 |
| R-squared | 0.04 | 0.03 | 0.03 | 0.02 |
| Robust t statistics in brackets | | | | |
| * significant at 5%; ** significant at 1% | | | | |

**Table 5: Regressions: Sample of recent births**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Dep variable: infant mortality indicator | Infant | Infant | Infant | Infant | Infant |
| 1 if Muslim | -0.006 | -0.008 | -0.005 | -0.004 | -0.003 |
| | [1.23] | [1.80] | [1.09] | [0.83] | [0.79] |
| 1 if currently rural resident | 0.008* | 0.011** | 0.003 | 0.002 | 0.008* |
| | [2.53] | [3.42] | [0.91] | [0.44] | [2.22] |
| 1 if scheduled tribe | -0.001 | -0.001 | -0.002 | -0.008 | |
| | [0.23] | [0.25] | [0.41] | [1.49] | |
| 1 if scheduled caste | 0.011* | 0.011* | 0.010* | 0.009* | |
| | [2.39] | [2.50] | [2.28] | [2.04] | |
| **Mother's education (omitted: no education)** | | | | | |
| incomplete primary | -0.003 | -0.012* | -0.001 | 0.004 | |
| | [0.72] | [2.45] | [0.31] | [0.76] | |
| complete primary | -0.013 | -0.021** | -0.011 | -0.002 | |
| | [1.85] | [2.93] | [1.49] | [0.32] | |
| incomplete secondary | -0.015** | -0.027** | -0.010* | -0.002 | |
| | [3.43] | [6.49] | [2.30] | [0.41] | |
| complete secondary and higher | -0.020** | -0.032** | -0.013* | -0.009 | |
| | [3.33] | [5.58] | [2.18] | [1.43] | |
| **Father's education (omitted: no education)** | | | | | |
| incomplete primary | -0.006 | -0.008 | -0.006 | -0.004 | |
| | [1.36] | [1.74] | [1.18] | [0.89] | |
| complete primary | -0.007 | -0.007 | -0.005 | -0.003 | |
| | [1.12] | [1.09] | [0.83] | [0.49] | |
| incomplete secondary | -0.017** | -0.014** | -0.014** | -0.012** | |
| | [4.14] | [3.33] | [3.35] | [2.98] | |
| complete secondary | -0.017** | -0.010 | -0.013* | -0.012 | |
| | [2.84] | [1.62] | [2.19] | [1.95] | |
| Higher | -0.029** | -0.020** | -0.024** | -0.019** | |
| | [5.13] | [3.61] | [4.14] | [3.24] | |
| 1 if child is female | -0.002 | -0.002 | -0.002 | -0.003 | -0.003 |
| | [0.75] | [0.82] | [0.74] | [1.22] | [1.07] |
| **Mother's age at birth (omitted: 19-24)** | | | | | |
| 9-15 | 0.065** | 0.062** | 0.065** | 0.065** | 0.070** |
| | [4.70] | [4.53] | [4.72] | [4.67] | [5.14] |
| 16-18 | 0.018** | 0.017** | 0.017** | 0.014** | 0.017** |
| | [3.34] | [3.26] | [3.21] | [2.76] | [3.34] |
| 25-30 | -0.012** | -0.012** | -0.012** | -0.011** | -0.013** |

| | | | | | |
|---|---|---|---|---|---|
| | [3.23] | [3.13] | [3.19] | [2.92] | [3.51] |
| 31-49 | -0.001 | 0.002 | -0.000 | -0.000 | -0.002 |
| | [0.18] | [0.28] | [0.08] | [0.09] | [0.37] |
| **Birth order (omitted: first-born)** | | | | | |
| Second | -0.014** | -0.015** | -0.014** | -0.015** | -0.014** |
| | [3.44] | [3.55] | [3.41] | [3.71] | [3.47] |
| Third | -0.018** | -0.018** | -0.018** | -0.020** | -0.016** |
| | [3.89] | [3.85] | [3.86] | [4.15] | [3.43] |
| Fourth or higher birth order | -0.010 | -0.007 | -0.010 | -0.015** | -0.009 |
| | [1.82] | [1.28] | [1.87] | [2.78] | [1.78] |
| **Cohort effects** | | | | | |
| linear trend | 0.014 | 0.031 | 0.013 | 0.027 | 0.030 |
| | [0.81] | [1.89] | [0.78] | [1.61] | [1.88] |
| square of linear trend | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| | [0.86] | [1.94] | [0.83] | [1.63] | [1.91] |
| **States (omitted: Kerala)** | | | | | |
| Goa | 0.009 | | 0.011 | 0.011 | 0.010 |
| | [1.12] | | [1.40] | [1.46] | [1.40] |
| Himachal Pradesh | 0.022* | | 0.025** | 0.027** | 0.021* |
| | [2.56] | | [2.89] | [3.03] | [2.40] |
| Jammu & Kashmir | 0.017* | | 0.021** | 0.020** | 0.015* |
| | [2.32] | | [2.78] | [2.64] | [2.08] |
| Manipur | 0.023 | | 0.021 | 0.016 | 0.008 |
| | [1.91] | | [1.77] | [1.48] | [0.79] |
| Meghalaya | 0.084* | | 0.083* | 0.078* | 0.071 |
| | [2.24] | | [2.20] | [2.02] | [1.92] |
| Mizoram | -0.019* | | -0.022** | -0.032** | -0.035** |
| | [2.38] | | [2.70] | [3.25] | [3.85] |
| Nagaland | -0.032** | | -0.034** | -0.046** | -0.047** |
| | [5.86] | | [6.16] | [7.41] | [7.33] |
| Sikkim | 0.003 | | 0.006 | 0.003 | -0.001 |
| | [0.19] | | [0.41] | [0.23] | [0.03] |
| New Delhi | 0.036** | | 0.039** | 0.035** | 0.028** |
| | [4.53] | | [4.93] | [4.43] | [3.81] |
| Arunachal Pradesh | 0.005 | | 0.006 | 0.006 | 0.001 |
| | [0.39] | | [0.48] | [0.47] | [0.10] |
| Tripura | 0.019 | | 0.017 | 0.019 | 0.018 |
| | [1.85] | | [1.74] | [1.94] | [1.88] |
| Andhra Pradesh | 0.026** | | 0.027** | 0.036** | 0.037** |
| | [3.20] | | [3.28] | [4.53] | [4.93] |
| Assam | 0.035** | | 0.032** | 0.029** | 0.027** |
| | [4.47] | | [4.06] | [3.74] | [3.57] |
| Bihar | 0.037** | | 0.034** | 0.023** | 0.021** |
| | [5.11] | | [4.63] | [3.10] | [3.03] |
| Gujarat | 0.030** | | 0.031** | 0.035** | 0.033** |
| | [4.51] | | [4.60] | [5.21] | [5.10] |
| Haryana | 0.042** | | 0.045** | 0.047** | 0.043** |
| | [5.24] | | [5.64] | [5.73] | [5.48] |
| Karnataka | 0.011 | | 0.012 | 0.019** | 0.019** |
| | [1.70] | | [1.86] | [2.87] | [3.11] |
| Madhya Pradesh | 0.049** | | 0.050** | 0.044** | 0.038** |
| | [6.43] | | [6.60] | [5.58] | [5.08] |
| Maharashtra | 0.011 | | 0.012 | 0.016* | 0.014* |
| | [1.65] | | [1.72] | [2.47] | [2.16] |
| Orissa | 0.044** | | 0.042** | 0.040** | 0.039** |
| | [5.38] | | [5.16] | [5.05] | [5.12] |

| | | | | | |
|---|---|---|---|---|---|
| Punjab | 0.030** | | 0.035** | 0.043** | 0.041** |
| | [2.81] | | [3.22] | [4.00] | [3.90] |
| Rajasthan | 0.039** | | 0.040** | 0.028** | 0.024** |
| | [5.51] | | [5.56] | [3.74] | [3.45] |
| Tamil Nadu | 0.015* | | 0.015* | 0.028** | 0.033** |
| | [2.28] | | [2.22] | [4.46] | [5.36] |
| Uttar Pradesh | 0.055** | | 0.053** | 0.044** | 0.042** |
| | [9.04] | | [8.67] | [6.68] | [7.02] |
| West Bengal | 0.015* | | 0.014 | 0.022** | 0.024** |
| | [2.21] | | [1.93] | [3.15] | [3.57] |
| **Antenatal care indicators** | | | | | |
| 1 if at least one antenatal care visit | | | | -0.016** | -0.018** |
| | | | | [3.46] | [3.75] |
| Number tetanus injections before birth | | | | -0.013** | -0.014** |
| | | | | [7.47] | [8.05] |
| 1 if given iron-folic tablets supplements | | | | -0.004 | -0.006 |
| | | | | [1.08] | [1.46] |
| **Place of delivery (omitted: delivered at home)** | | | | | |
| Delivered in public facility | | | | 0.009* | 0.005 |
| | | | | [2.15] | [1.29] |
| Delivered in private facility | | | | 0.011* | -0.000 |
| | | | | [2.18] | [0.03] |
| **Wealth quartiles (omitted: poorest)** | | | | | |
| second poorest | | | -0.004 | -0.001 | |
| | | | [0.93] | [0.16] | |
| third | | | -0.010* | -0.004 | |
| | | | [2.27] | [0.96] | |
| fourth (richest) | | | -0.020** | -0.012** | |
| | | | [4.17] | [2.64] | |
| **Parental employment** | | | | | |
| 1 if mother does not work | | | -0.001 | -0.002 | |
| | | | [0.20] | [0.50] | |
| 1 if father does not work | | | 0.006 | 0.005 | |
| | | | [0.60] | [0.53] | |
| Observations | 44396 | 44396 | 44209 | 43607 | 44218 |
| R-squared | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 |

Robust t statistics in brackets
* significant at 5%; ** significant at 1%

## Data Appendix

**Appendix Table 1: Under-5 mortality rate and religion differential by selected characteristics**

| | Under-5 mortality rate (%) | | | Difference (%-points) | S.L. [a] |
|---|---|---|---|---|---|
| | All | Muslim | Hindu | | |
| All | 14.14 | 11.92 | 14.52 | 2.60 | *** |
| NFHS-1 | 15.28 | 13.42 | 15.58 | 2.16 | *** |
| NFHS-2 | 13.00 | 10.51 | 13.44 | 2.93 | *** |
| Female child | 14.36 | 11.76 | 14.81 | 3.05 | *** |
| Male child | 13.93 | 12.07 | 14.25 | 2.18 | *** |
| Urban | 9.67 | 9.34 | 9.76 | 0.41 | - |
| Rural | 15.55 | 13.34 | 15.86 | 2.53 | *** |
| Village population lower quartile | 14.21 | 11.69 | 14.64 | 2.94 | *** |
| Village population >=median | 12.04 | 10.84 | 12.32 | 1.48 | *** |
| Village population top quartile | 11.38 | 10.31 | 11.65 | 1.34 | *** |
| **Under-5 mortality by state:** | | | | | |
| Andhra Pradesh | 12.40 | 7.21 | 12.92 | 5.71 | *** |
| Assam | 12.66 | 14.18 | 11.94 | -2.24 | *** |
| Bihar | 14.29 | 13.67 | 14.42 | 0.75 | - |
| Goa | 7.26 | 7.30 | 7.26 | -0.04 | - |
| Gujarat | 12.45 | 10.36 | 12.65 | 2.29 | ** |
| Haryana | 11.40 | 12.41 | 11.34 | -1.07 | - |
| Himachal Pradesh | 8.49 | 6.15 | 8.54 | 2.39 | - |
| Jammu & Kashmir | 8.81 | 8.33 | 9.22 | 0.89 | - |
| Karnataka | 12.88 | 10.97 | 13.17 | 2.20 | ** |
| Kerala | 5.67 | 6.25 | 5.27 | -0.99 | * |
| Madhya Pradesh | 17.65 | 10.91 | 18.11 | 7.20 | *** |
| Maharashtra | 10.66 | 8.66 | 10.98 | 2.32 | *** |
| Manipur | 7.59 | 14.05 | 6.92 | -7.12 | *** |
| Meghalaya | 9.07 | 9.91 | 8.79 | -1.12 | - |
| Mizoram | 14.95 | 4.95 | 16.35 | 11.40 | + |
| Nagaland | 8.80 | 12.64 | 7.12 | -5.52 | + |
| Orissa | 16.02 | 12.99 | 16.07 | 3.08 | + |
| Punjab | 8.06 | 8.08 | 8.06 | -0.02 | - |
| Rajasthan | 13.15 | 12.25 | 13.24 | 0.99 | - |
| Sikkim | 9.76 | 5.06 | 9.84 | 4.78 | - |
| Tamil Nadu | 12.43 | 8.97 | 12.69 | 3.71 | *** |
| West Bengal | 12.44 | 12.98 | 12.25 | -0.73 | - |
| Uttar Pradesh | 19.46 | 14.75 | 20.46 | 5.71 | *** |
| New Delhi | 8.41 | 9.97 | 8.20 | -1.77 | + |
| Arunachal Pradesh | 7.81 | 2.24 | 7.94 | 5.70 | + |
| Tripura | 12.56 | 14.13 | 12.38 | -1.75 | - |
| States where % Muslim below average | 13.05 | 9.81 | 13.36 | 3.56 | *** |
| States where % Muslim higher than average [b] | 15.50 | 12.99 | 16.19 | 3.21 | *** |
| Not 3 largest Muslim states | 12.69 | 9.81 | 13.06 | 3.26 | *** |
| 3 Largest Muslim states [c] | 16.47 | 13.96 | 17.07 | 3.11 | *** |
| **Under-5 mortality by mother's education:** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| no education | 16.60 | 13.80 | 17.10 | 3.29 | *** |
| incomplete primary | 11.13 | 8.60 | 11.64 | 3.04 | *** |
| complete primary | 9.79 | 7.32 | 10.23 | 2.91 | *** |
| incomplete secondary | 7.22 | 6.26 | 7.35 | 1.09 | * |
| complete secondary | 5.19 | 5.96 | 5.09 | -0.87 | - |
| higher education | 4.20 | 2.30 | 4.33 | 2.04 | ** |
| **Under-5 mortality by father's education:** | | | | | |
| no education | 17.72 | 14.74 | 18.32 | 3.58 | *** |
| incomplete primary | 14.91 | 11.64 | 15.53 | 3.89 | *** |
| complete primary | 13.69 | 9.96 | 14.31 | 4.35 | *** |
| incomplete secondary | 11.51 | 9.17 | 11.85 | 2.68 | *** |
| complete secondary | 9.34 | 7.19 | 9.65 | 2.46 | *** |
| higher education | 7.62 | 7.04 | 7.67 | 0.63 | - |
| **Under-5 mortality by wealth quartile:** | | | | | |
| 1st (poorest) | 18.39 | 15.83 | 18.81 | 2.98 | *** |
| 2nd | 15.01 | 12.42 | 15.41 | 2.99 | *** |
| 3rd | 13.05 | 10.86 | 13.42 | 2.56 | *** |
| 4th (richest) | 8.14 | 7.41 | 8.28 | 0.88 | ** |
| **Under-5 mortality by labour market characteristics:** | | | | | |
| Mother works | 15.58 | 13.30 | 15.77 | 2.47 | *** |
| Mother does not work | 13.13 | 11.52 | 13.52 | 2.00 | *** |
| Mother does not work away | 13.22 | 11.52 | 13.62 | 2.10 | *** |
| Mother works away | 15.88 | 14.27 | 15.98 | 1.70 | *** |
| Mother works, no cash | 15.85 | 14.79 | 15.91 | 1.12 | - |
| Mother works for cash | 15.42 | 12.77 | 15.68 | 2.91 | *** |
| Mother does not work in agriculture | 13.34 | 11.60 | 13.73 | 2.12 | *** |
| Mother works in agriculture | 16.25 | 14.72 | 16.33 | 1.62 | ** |
| Father works | 14.16 | 11.90 | 14.54 | 2.64 | *** |
| Father does not work | 13.57 | 12.36 | 13.85 | 1.49 | - |
| **Under-5 mortality by village health facilities:** | | | | | |
| No Health Facility | 17.12 | 15.07 | 17.32 | 2.25 | *** |
| Health Facility | 15.13 | 12.93 | 15.47 | 2.54 | *** |
| No Health Centre | 16.75 | 14.66 | 16.98 | 2.32 | *** |
| Health Centre | 14.50 | 12.37 | 14.86 | 2.49 | *** |
| **Under-5 mortality by mother's BMI level** | | | | | |
| Not undernourished mother | 11.72 | 9.50 | 12.12 | 2.62 | *** |
| Undernourished mother | 14.44 | 12.19 | 14.77 | 2.57 | *** |
| **Under-5 mortality by mother's status [d]:** | | | | | |
| Mother does not decide alone to seek health care | 13.15 | 10.44 | 13.62 | 3.17 | *** |
| Mother decides alone | 12.68 | 10.64 | 13.06 | 2.42 | *** |
| Mother not allowed money set aside | 14.00 | 10.91 | 14.58 | 3.67 | *** |
| Mother allowed money set aside | 12.34 | 10.22 | 12.70 | 2.48 | *** |
| Does not decide alone how to spend her earnings | 14.75 | 10.60 | 15.05 | 4.40 | *** |
| Decides alone how to spend her earnings | 13.61 | 11.98 | 13.82 | 1.84 | * |
| If suspects her of being unfaithful: | | | | | |
| May not hit wife | 11.90 | 10.16 | 12.21 | 2.05 | *** |

| | | | | | |
|---|---|---|---|---|---|
| May hit wife | 14.86 | 11.11 | 15.54 | 4.44 | *** |
| If her family does not give money: | | | | | |
| May not hit wife | 12.79 | 10.62 | 13.18 | 2.57 | *** |
| May hit wife | 15.53 | 8.87 | 16.33 | 7.46 | *** |
| If she shows disrespect: | | | | | |
| May not hit wife | 12.34 | 10.77 | 12.62 | 1.85 | *** |
| May hit wife | 14.16 | 9.97 | 14.86 | 4.90 | *** |
| If she goes out without telling him: | | | | | |
| May not hit wife | 12.30 | 10.76 | 12.57 | 1.81 | *** |
| May hit wife | 14.06 | 10.15 | 14.75 | 4.60 | *** |
| If she neglects house or children: | | | | | |
| May not hit wife | 12.54 | 10.97 | 12.83 | 1.86 | *** |
| May hit wife | 13.61 | 9.82 | 14.23 | 4.41 | *** |
| If she does not cook properly: | | | | | |
| May not hit wife | 12.38 | 10.45 | 12.74 | 2.28 | *** |
| May hit wife | 14.60 | 10.75 | 15.20 | 4.44 | *** |
| May never hit wife | 11.65 | 10.66 | 11.83 | 1.17 | ** |
| May in at least one of the above cases | 13.94 | 10.43 | 14.54 | 4.11 | *** |
| May not always hit wife | 12.83 | 10.54 | 13.24 | 2.70 | *** |
| May in all of the above cases | 15.87 | 8.18 | 16.65 | 8.47 | *** |
| Not beaten since 15 | 12.40 | 10.02 | 12.83 | 2.80 | *** |
| Beaten since 15 | 14.90 | 12.11 | 15.39 | 3.28 | *** |
| Under-5 mortality if, in the past 12 months, beaten: | | | | | |
| Beaten once | 14.71 | 9.17 | 15.56 | 6.39 | *** |
| Beaten a few times | 14.66 | 12.37 | 15.12 | 2.75 | ** |
| Many times | 17.16 | 12.24 | 17.95 | 5.72 | *** |
| Never | 14.46 | 12.47 | 14.80 | 2.32 | ** |
| **Under-5 mortality by possibly "cultural" characteristics:** | | | | | |
| Not vegetarian mother[d] | 12.41 | 10.47 | 12.93 | 2.46 | *** |
| Vegetarian mother[d] | 14.39 | 13.13 | 14.40 | 1.27 | - |
| Mother does not consume tobacco[d] | 12.38 | 9.64 | 12.85 | 3.21 | *** |
| Mother consumes tobacco[d] | 15.77 | 13.79 | 16.19 | 2.40 | *** |
| Mother does not drink alcohol[d] | 12.96 | 10.54 | 13.40 | 2.86 | *** |
| Mother drinks alcohol[d] | 14.41 | 5.84 | 14.63 | 8.79 | *** |
| Mother does not know ORS | 18.37 | 14.00 | 19.38 | 5.38 | *** |
| Mother knows ORS | 12.89 | 10.52 | 13.32 | 2.81 | *** |
| **Under-5 mortality by birth order:** | | | | | |
| First-born | 14.45 | 12.92 | 14.67 | 1.75 | *** |
| Second | 13.39 | 12.02 | 13.59 | 1.58 | *** |
| Third | 13.02 | 10.47 | 13.42 | 2.95 | *** |
| Fourth or higher birth order | 15.18 | 11.83 | 15.93 | 4.10 | *** |

[a] Significance levels: * ** is 0.1% ** is 1% * is 5% and + is 10%. [b]I.e., West Bengal, Kerala, Uttar Pradesh, Bihar, Assam, Jammu & Kashmir, Meghalaya, Nagaland. [c]These are Uttar Pradesh, Bihar and West Bengal. They each account for more than 13% of the country's Muslim child population, and just under 51% altogether. [d] Data available for NFHS-2 only. Pooled NFHS-1 and NFHS-2 data unless specified otherwise. Sample of children fully exposed to under-5 mortality risk only.

**Appendix Table 2: Infant mortality rate and differential by antenatal, natal, and postnatal characteristics**

| | Infant mortality rate (%) | | | Mortality differential (%-points) | S.L.[a] |
|---|---|---|---|---|---|
| | All | Muslim | Hindu | | |
| All children for whom some antenatal, natal and postnatal information is recorded | 6.89 | 6.16 | 7.04 | 0.94 | * |
| **Infant mortality by antenatal care characteristics:** | | | | | |
| Antenatal check after first trimester | 5.22 | 4.69 | 5.32 | 0.63 | - |
| Antenatal check during first trimester | 3.93 | 3.41 | 4.02 | 0.61 | - |
| Did not receive iron folic tablets | 8.69 | 7.94 | 8.86 | 0.92 | - |
| Received iron folic tablets | 4.52 | 3.67 | 4.66 | 0.99 | * |
| Did not receive a tetanus injection | 9.88 | 9.29 | 10.00 | 0.71 | - |
| Received a tetanus injection | 4.66 | 4.07 | 4.77 | 0.70 | + |
| Did not receive complete antenatal care | 7.92 | 7.29 | 8.05 | 0.76 | - |
| Received complete antenatal care | 3.87 | 3.16 | 3.99 | 0.83 | + |
| Did not go for an antenatal visit | 10.10 | 8.77 | 10.38 | 1.61 | * |
| Went for an antenatal visit | 4.67 | 4.16 | 4.76 | 0.60 | - |
| **Infant mortality by place of delivery:** | | | | | |
| Delivered at home | 7.28 | 6.95 | 7.35 | 0.40 | - |
| Delivered in public facility | 4.99 | 3.13 | 5.30 | 2.16 | ** |
| Delivered in public facility | 3.87 | 3.41 | 3.97 | 0.56 | - |
| **Infant mortality by postnatal care characteristics:** | | | | | |
| Did not squeeze milk out | 2.78 | 3.03 | 2.73 | -0.29 | - |
| Squeezed milk out | 3.63 | 3.18 | 3.71 | 0.53 | - |
| Mother says a child with diarrhoea should be given more to drink* | 8.55 | 6.65 | 9.04 | 2.39 | *** |
| Mother says a child with diarrhoea should be given less or the same amount to drink* | 9.92 | 7.83 | 10.42 | 2.59 | *** |
| *Infant mortality differential by child immunisation status:* | | | | | |
| No immunisation | 14.59 | 10.75 | 15.58 | 4.83 | *** |
| Some immunisation | 0.94 | 0.84 | 0.96 | 0.13 | - |
| Full immunisation[b] | 0.21 | 0.14 | 0.22 | 0.07 | - |
| **Infant mortality by indicator of child health at birth:** | | | | | |
| *Subjective size at birth* | | | | | |
| Very small | 12.92 | 5.74 | 14.37 | 8.63 | ** |
| Small | 10.91 | 9.14 | 11.25 | 2.11 | * |
| Average | 5.21 | 5.10 | 5.23 | 0.13 | - |
| Large | 5.34 | 5.73 | 5.26 | -0.47 | - |

[a]Significance levels: *** is 0.1% ** is 1% * is 5% and + is 10%. [b]3 DPT, 3 Polio and 1 measles shot .Unless marked with *, data available only for children born in the 48 months preceding interview in NFHS-1 and in the 36 months preceding interview in NFHS-2. *Data available for all mothers who have given birth in the 36 months preceding interview. Sample of children fully exposed to infant mortality risk only.

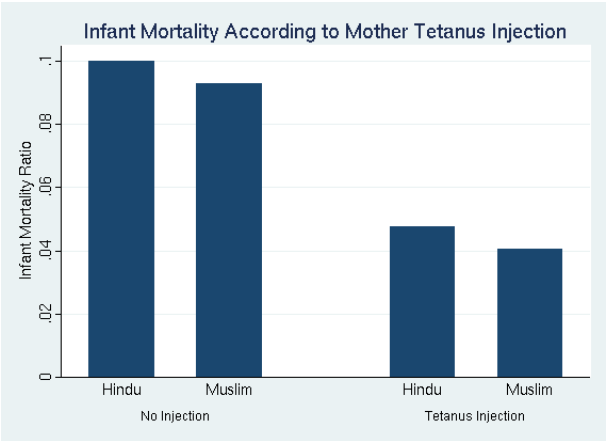
**Appendix Table 3: Probit regressions with dependent variable indicator for any health centre in the village**

| | (1) | (2) |
|---|---|---|
| Muslim | 0.212** | -0.112* |

| | | |
|---|---|---|
| | [13.97] | [-6.62] |
| Log village population | | 0.591***<br>[110.11] |
| Constant | 0.095***<br>[18.85] | -4.406***<br>[-107.05] |
| Observations (households) | 70262 | 67242 |
| R-squared | 0.002 | 0.16 |

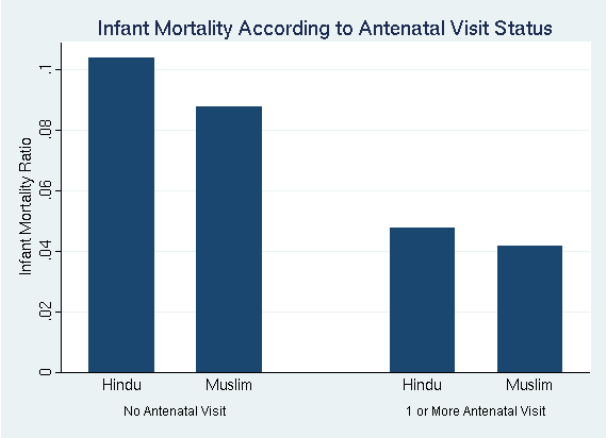
## Appendix Figures:

**Appe ndix Figure 1**



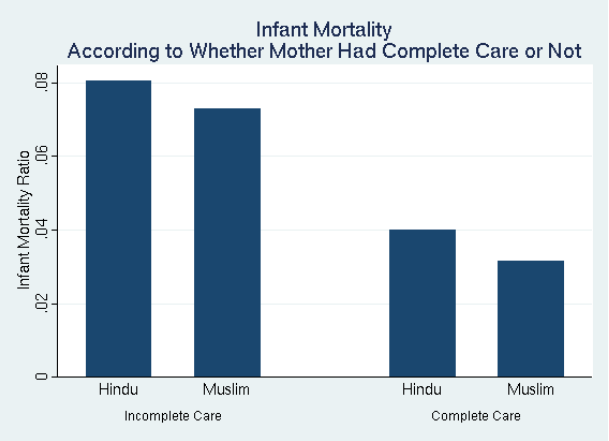

**See Table 3 and Appendix Table 2.**

**Appendix Figure 2**



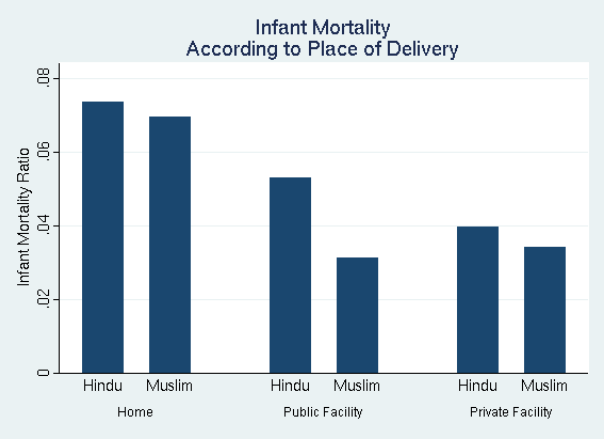

**See Table 3 and Appendix Table 2.**

**Appendix Figure 3**



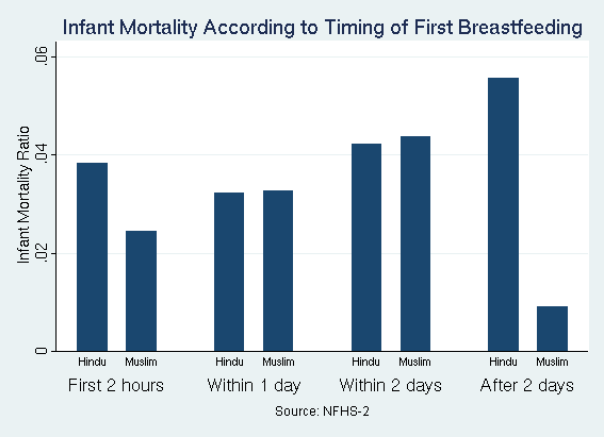

**See Table 3 and Appendix Table 2.**

**Appendix Figure 4**



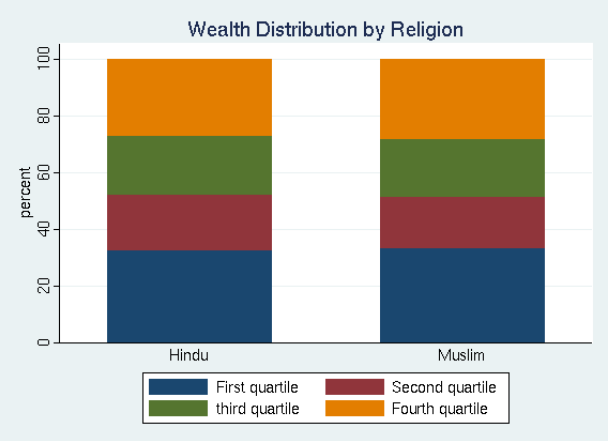

**See Table 3 and Appendix Table 2.**

**Appendix Figure 5**



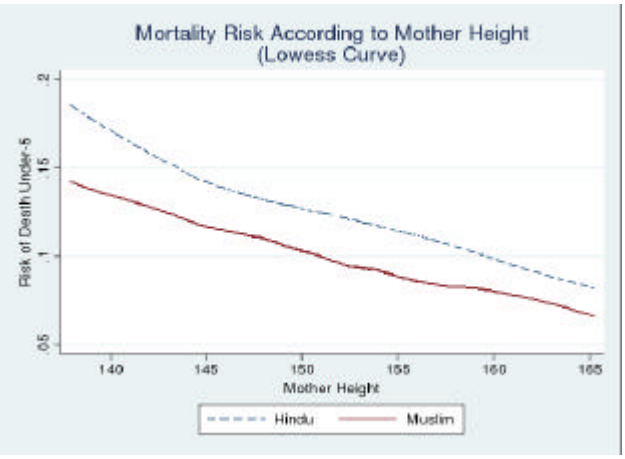

**See Table 3 and Appendix Table 2.**

**Appendix Figure 6**



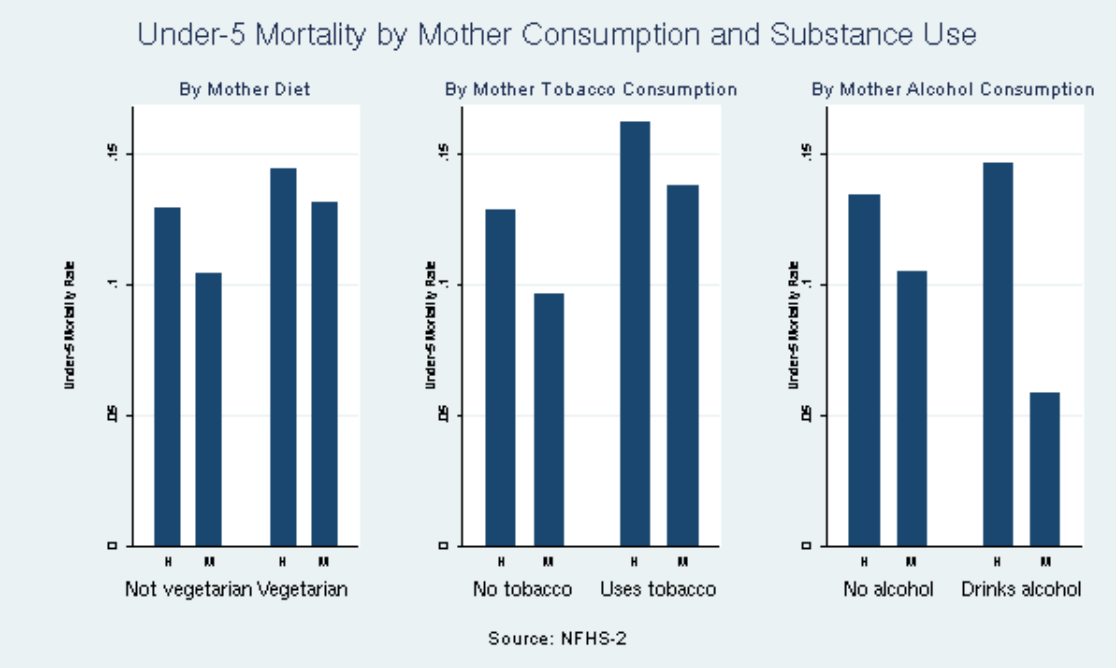

**See Table 1.**

**Appendix Figure 7**



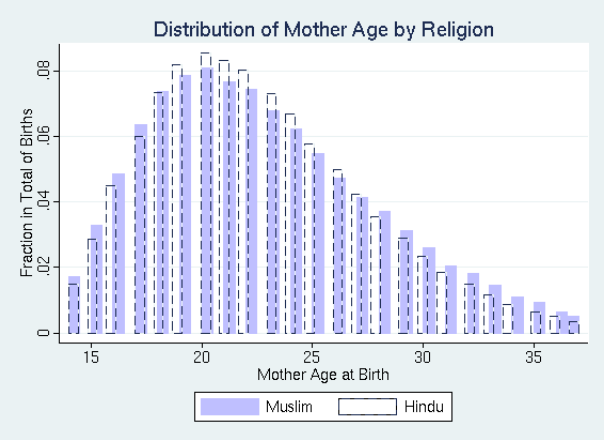

Graph based on a 50% random draw of the population for computational feasibility. Excludes bottom and top 1% of the distribution. Sample of children fully exposed to under-5 mortality risk only.

**Appendix Figure 8**



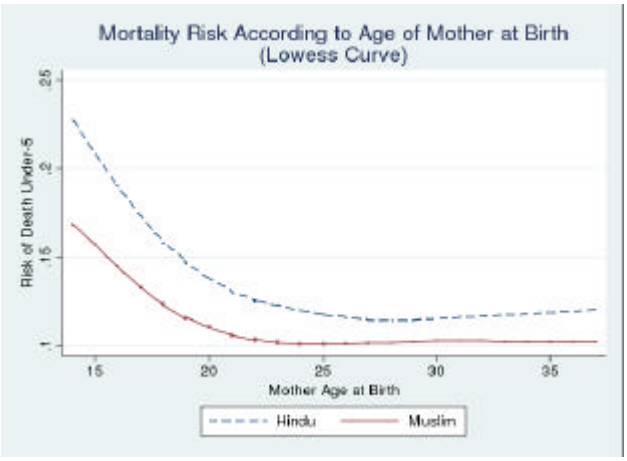

**See Table 1 and Appendix Table 1.**

**Appendix Figure 9**



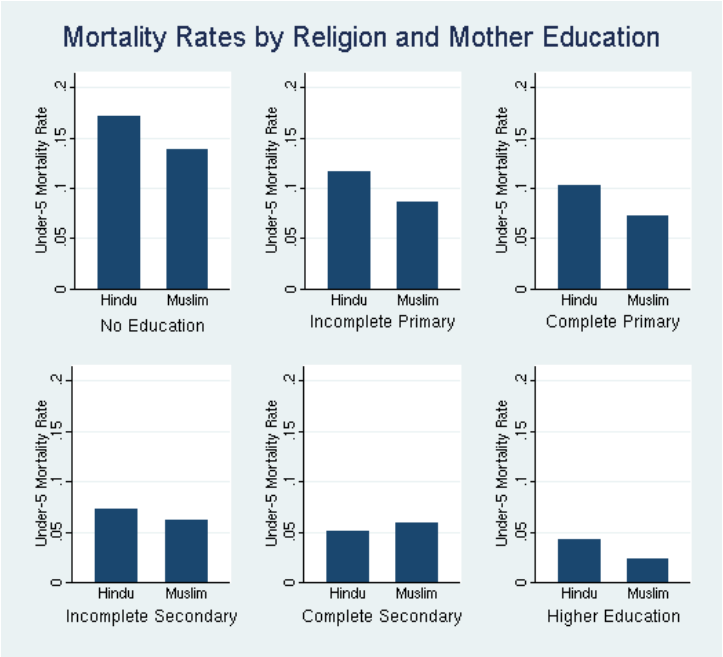

See Table 2. Excludes bottom and top 1% of the distribution. Unweighted statistics.

**Appendix Figure 10**



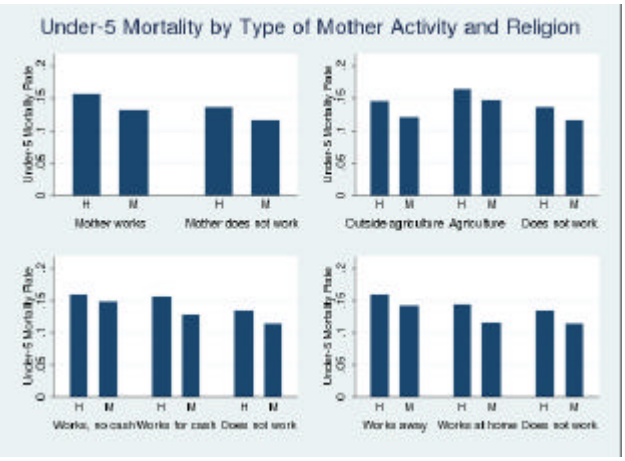

Graph based on a 50% random draw of the population for computational feasibility. Excludes bottom and top 1% of the distribution. Sample of children fully exposed to under-5 mortality risk only.

**Appendix Figure 11**




**See Table 1 and Appendix Table 1.**

**Appendix Figure 12**

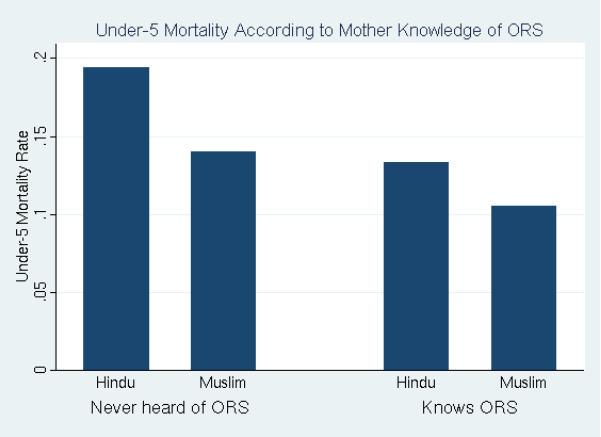



**See Table 1 and Appendix Table 1.**

**Appendix Figure 13**

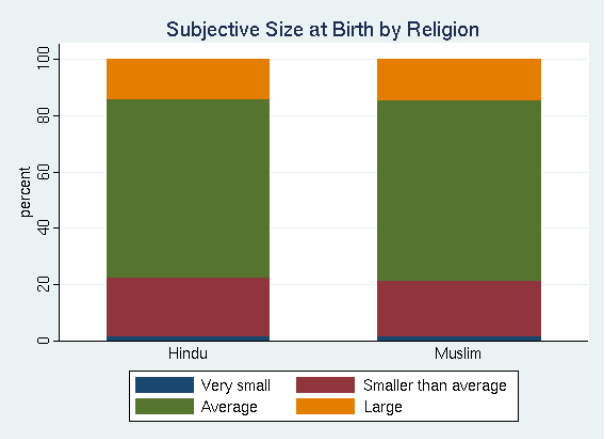

**See Table 1 and Appendix Table 1.**

**Appendix Figure 14**



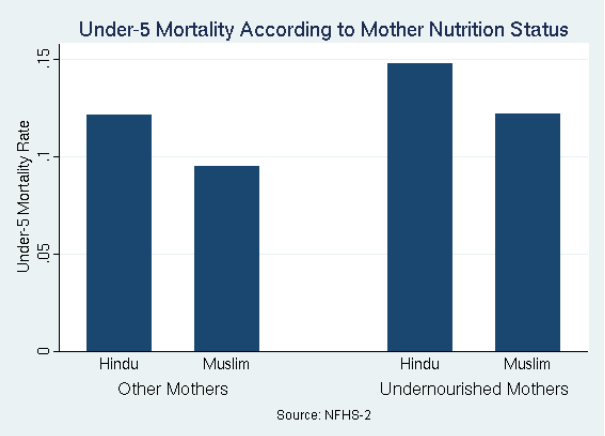

**See Table 1 and Appendix Table 1.**

**Appendix Figure 15**




**See Table 3.**

**Appendix Figure 16**




**See Table 1 and Appendix Table 1.**