Religion and Health in Early Childhood: Evidence from South Asia

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Version: May 11, 2015

Abstract: This paper studies early childhood health in India, Bangladesh and Nepal, focusing on inequalities in anthropometric outcomes by religious adherence. India and Nepal have Hindu majorities, while Bangladesh is predominantly Muslim. The results suggest that Muslim infants have an advantage over Hindu infants in height-for-age in India (for boys and girls) and in Bangladesh (for boys). However this advantage disappears beyond 12 months of age, at which point Hindu children in all three countries are found to have significantly better anthropometric outcomes than Muslim children. We report tests that rule out mortality selection and undertake falsification and robustness exercises that confirm these findings. Further results suggest that exposure to Ramadan fasting *in utero* may lead to positive selection of Muslim male infants, partially explaining the Muslim infant health advantage, but this does not fully explain the shift from Muslim advantage in infancy to Hindu advantage in childhood across all three countries.

J.E.L. Classification Codes: O12, I12, Z12

Key words: Child Health, Religion, Hindu, Muslim, India, Bangladesh, Nepal

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Thanks to participants at the "Child Health in Developing Countries" session at AEA 2013, especially Andrew Foster, Sonia Bhalotra and our discussant, Chih-Ming Tan. Thanks to seminar participants at Boston College, Clark, Northeastern, Rutgers, the University of Connecticut, Monash, Deakin and to participants at the Royal Economic Society Meetings 2015. We are grateful to Bhaskar Mazumder for sharing the Ramadan calendar observance dates, and express our thanks to Albert Park, Grace Lordan and Abhijeet Singh for assistance with the Young Lives data for Andhra Pradesh, India. We thank Alessandro Tarozzi for assistance with the Health Survey for England data set and, along with Monica Dasgupta, for providing valuable comments on an earlier draft of this paper. Abdullah Al Mahmud Shawon provided excellent research assistance with the Bangladesh data. The usual disclaimer applies. Address for correspondence: Elizabeth Brainerd, Susan and Barton Winokur Professor in Economics and Women's and Gender Studies, Department of Economics, MS 021, Brandeis University, Waltham, MA 02454. Tel.781.736.4816. Email: ebrainer@brandeis.edu. Nidhiya Menon, Associate Professor of Economics, Department of Economics, MS 021, Brandeis University, Waltham, MA 02454. Tel. 781.736.2230. Email: nmenon@brandeis.edu.

I. Introduction

Children in the Indian subcontinent are among the most undernourished in the world. In Bangladesh and Nepal, for example, over 40 percent of children less than five years of age suffer from chronic undernourishment; in India, 45 percent of all children under age 3 were stunted in the most recent Demographic and Health Survey.[1] The rates of stunting and undernourishment (low weight-for-age) in all three countries are higher than in many countries of sub-Saharan Africa with lower levels of per capita income and higher rates of infant and child mortality (Deaton and Dreze 2009; Jayachandran and Pande 2015). There is some evidence, albeit inconsistent, that this trend has continued during the 1990s and early 2000s, a period of time when both India and Bangladesh experienced significant economic growth and made rapid progress in reducing poverty. Even among affluent Indian households, a substantial proportion of children are undernourished by most anthropometric indicators (Deaton and Dreze 2009).

This paper investigates the puzzle of child undernourishment in India, Bangladesh and Nepal by comparing differences in child health outcomes by religious affiliation. As discussed below, the religious affiliation of a child's family provides information on the likely dietary restrictions encountered by a child in his or her early growing years, on the child's exposure to fasting *in utero* during the Muslim holy month of Ramadan, and on possible differences in women's autonomy and control over household resources across religions. All of these are factors that may contribute to the high rate of stunting and wasting among the children in these countries. Since one is born into one’s religious identity and marriage is restricted to one’s caste

[1]This is the share of children whose height-for-age z-scores are at least 2 standard deviations below the mean for the reference population; stunting indicates chronic undernourishment. Sources: National Institute of Population Research and Training (Bangladesh) 2013; Ministry of Health and Population (Nepal) 2012; International Institute for Population Sciences (India) and Macro International 2007.

and faith in these regions,[2] these three countries provide an especially pertinent context in which to analyze the causes of inequality in child health status by religious identity.

We focus on children from birth to five years of age. The health of children at these young ages is critically important, as a wealth of recent evidence demonstrates that negative health shocks in this period can have large, long-lasting effects extending well into adulthood (Currie and Vogl 2013). While most of this literature has focused on children in the developed world, children in developing countries are likely to be even more vulnerable given the prevalence of insults to health (nutritional, environmental and toxic) and widespread adherence to behavior that may have harmful effects on children's health, such as fasting during pregnancy. Negative health shocks to children in developing countries have only recently begun to receive attention in the economics literature (Jayachandran 2009; Maccini and Yang 2009; Almond and Mazumder 2011; Currie and Vogl 2013; Brainerd and Menon 2014).

This paper uses a number of datasets to assess inequalities in child health by religion. Our main analysis uses several recent rounds of the Demographic and Health Surveys (DHS) for India, Bangladesh and Nepal to examine differences in child anthropometric measures by religion, age and gender within each country. The DHS surveys provide a rich source of data on child, mother, and father characteristics, including detailed fertility histories of women aged 15 to 49. The period we analyze is approximately 1999–2011 (depending on the country), a time span in which all three countries experienced strong economic growth and declining poverty rates. Our results indicate that Muslim infants (age less than 12 months) have a significant advantage in height-for-age and weight-for-age z-scores over Hindu infants in India, as well as in Bangladesh for male infants (for height-for-age) and for female infants (for weight-for-age).

[2] There has been some rise in interfaith marriages in India, but this is localized to the upper-class socioeconomic group.

This advantage does not persist past infancy, however: the Muslim advantage is reversed in children age one to five years, and Hindu children are significantly taller and heavier than Muslim children in all three countries at these ages. Falsification checks and robustness tests confirm these patterns as do two additional data sets for South Asian children described in greater detail below. These data sets allow us to rule out mortality selection as a cause of the reversal and further suggest that the early Muslim advantage is likely to be cultural – and possibly linked to religious practices – rather than country-specific.

While a Muslim advantage in child survival in India is well-known (Bhalotra, Valente and van Soest 2010; Guillot and Allendorf 2010), the pattern of Muslim advantage in infancy, its reversal after 12 months to Muslim disadvantage, and its consistency across these three countries has (to the best of our knowledge) not been previously documented. As we demonstrate below, the reversal in Muslim health advantage is not explained by static differences in family background or living conditions between Muslim and Hindu children (such as mother's education, mother's height, age at marriage, work experience, access to sanitary facilities, or household assets), nor is it explained by differences in child characteristics such as birth order, breastfeeding, prenatal care, or disease incidence. The Muslim advantage in height for male infants is especially surprising for India, in which the preferential treatment of boys (thought to be greater among Hindus; see Jayachandran and Pande 2015) begins even *in utero* (Bharadwaj and Lakdawala 2012) and extends after-birth to lengthier breastfeeding and greater vitamin supplementation (Jayachandran and Kuziemko 2011; Barcellos, Carvalho and Lleras-Muney 2014). We test for possible explanations for the reversal of the Muslim health advantage and find that for boys in India, the most likely explanation is the observance of fasting during Ramadan by Muslim women, which appears to lead to positive selection of male infants in India but still has long-lasting negative health effects on all surviving children. However this does not explain the patterns among girls, nor does it explain the reversal of the health advantage for Muslim infants in Bangladesh. In this sense, the Muslim health advantage in infancy and its later reversal in these three countries remain a puzzle.

II. Background and related literature

The three countries we study in this paper were selected because they share many features -- historical, economic as well as social. In addition to being neighbors geographically, the basic stock of people on the Indian subcontinent is composed of two genetically diverse populations with different autosomal markers that assimilated approximately three to six thousand years ago (from 1200 to 3500 BC as per Reich *et al*. 2009). Further, the Muslim conquests of parts of the northern Indian subcontinent (parts of North India and modern day Pakistan and Bangladesh) from the thirteenth to the sixteenth centuries mostly resulted in conversion of the original inhabitants to Islam, rather than the settlement of a separate heterogeneous population (Durant and Durant 1935). Hence today's Muslims in India, Pakistan, Nepal and Bangladesh originated from a similar genetic make-up to Hindus in the region, indicating that documented dissimilarities in child health outcomes among these religious groups are most probably due to behavior and not genetic composition.[3]

In addition to the same historical antecedents, the three countries are similar along several socio-economic and cultural dimensions. Some of these similarities are illustrated in Table 1: despite recent growth, the three countries remain poor with GDP per capita ranging from $241 in Nepal to $622 in India in 2006, and high poverty rates in the range of 57 to 77 percent of the

[3] It is possible that culture itself is part of biology as in the broad gene-culture discussion espoused in Richerson and Boyd (2005) which notes that aspects such as lactose-intolerance may have developed as early as six thousand years ago. However, we have no empirical evidence that indicates that such intolerance differentially affects very young Hindu and Muslim children in these countries.

population. Only half of the adult female population in the region is literate and populations are largely rural, ranging from 74 percent of the population in India to 85 percent in Nepal. The total fertility rates and infant mortality rates are similar across countries, as is the median age at first marriage for women (15 to 17 years). India and Bangladesh were part of the same country until 1947, when partition of India divided the country along religious lines (Bangladesh was referred to as "East Pakistan" from 1947 to 1971; it gained independence in 1971).[4]

Religion plays a central role in the lives of much of the population in the region. The two main religious communities in these countries are Hindus and Muslims; India and Nepal have Hindu majorities whereas Bangladesh has a Muslim majority.[5] Religious practices differ in a number of ways between Muslims and Hindus: in addition to the strict adherence to a vegetarian diet practiced by the majority of upper-caste Hindus, Muslims do not consume pork and fast during daylight hours in the holy month of Ramadan (including pregnant Muslim women). In addition, Muslims are not allowed to consume alcohol of any kind. Moreover, it is widely acknowledged that there are significant differences in women's education and health status, practices involving personal health and hygiene, and access to medical care and diet among Hindus and Muslims (Sachar *et al*. 2006). In particular, while Muslim women tend to be taller, they are less educated, marry at a younger age, are less likely to work and less likely to seek prenatal or antenatal care from a doctor compared to Hindu women (in our DHS data). Differences in medical care by religion may filter through to child outcomes as Muslim children are more likely to have had diarrhea or a fever in the last two weeks compared to Hindu children.

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[4] We would have liked to use data from Pakistan as well. However, religious adherence is not included in the DHS questionnaires for Pakistan.

[5] Restricting the sample to only Hindus and Muslims, 82 percent of households in India and 95 percent of households in Nepal in the DHS surveys are Hindu, followed by 18 percent and 5 percent Muslim, respectively. In Bangladesh, about 91 percent of households are Muslim versus 9 percent Hindu.

There is clear evidence that maternal nutrition linked to religious practices affects the health outcomes of infants and children. In particular, two recent papers demonstrate that fasting during Ramadan by pregnant Muslim women is linked with worse health outcomes on a variety of measures for individuals who were *in utero* during Ramadan: birth weights are lower and the proportion of male births is lower (Almond and Mazumder 2011), and long-term health outcomes are also affected, with adults who were *in utero* during Ramadan having a higher incidence of symptoms associated with chronic diseases such as type 2 diabetes and coronary heart disease (van Ewijk 2011). This is consistent with the large body of evidence surveyed in Almond and Currie (2010) demonstrating the long-term effects of negative health shocks to infants and young children in developed countries. Further, Bhalotra, Valente and van Soest (2010) demonstrate that within India, Muslim children have a significantly higher probability of survival in infancy than do Hindu children, despite their lower socioeconomic status (the reversal in child health outcomes beyond infancy is not addressed in this paper; see also Guillot and Allendorf 2010). Other papers that explore the impact of religious practices on child health outcomes include Ghuman (2003), Ha *et al*. (2014) and Iyer and Joshi (2013).

Religious beliefs may also affect child health through their impact on female empowerment and autonomy within the household. Among Hindus, for example, male children are favored relative to female children as they are a source of old-age support and for other socio-cultural reasons. Son preference translates directly into more attentive care (immunizations, breastfeeding) and better health outcomes for male children relative to female children (Barcellos, Carvalho and Lleras-Muney 2014), but may also reduce the status of women in the family and society more generally. Some analysts argue (Menon 2012) that the underlying cause of child undernutrition in South Asia is the relatively low status of women in the region.

Women's empowerment affects child nutrition both directly and indirectly: young age at marriage, for example, directly affects child health because adolescent births have a high risk of poor infant health outcomes; in addition young age at marriage may indicate low status of the woman within the household. Low female autonomy and decision-making power can reduce resources directed toward children within the household and thereby worsen child outcomes. We control for the woman's age at first marriage, age at birth, literacy, and an indicator for currently working as proxies for female empowerment and child access to resources. Although all are important, work experience in particular may have ambiguous effects. Classical models of bargaining would predict that work experience has positive impacts on child health by concentrating resources in the hands of mothers dependent on their social background (Luke and Munshi 2011). Alternatively, children of working mothers may score lower on health scales as their attention is diverted from child care. We find that these proxy measures of empowerment do contribute to height-for-age and weight-for-age z-scores among children; however they do not explain the changes in child health outcomes by religious adherence that we observe.

Given that religion importantly shapes many aspects of life in South Asia, this paper studies differences in child health by religion to shed light on child malnutrition in these regions. The hypotheses that we test are three-fold: first, can we confirm a Muslim advantage in infancy across these countries and if so, are the explanatory factors tied to observances related to diet and fasting? Second, does this advantage persist in older children and if not, are behavioral factors important? And finally, are the relative child health differences across Hindu-Muslim children in poor countries also evident in developed contexts? This would suggest that variations in anthropometrics by religious identity are likely to be cultural and linked to daily practices rather than solely decided by the child's economic environment.

III. Methodology

We use linear regression models to investigate the impact of religion on children's anthropometric outcomes. Our basic empirical specification takes the following form:

$$H_{ijt} = \beta_0 + \beta_1 Hindu_{ijt} + \beta_2 X_{ijt}^{c} + \beta_3 X_{ijt}^{w} + \beta_4 X_{ijt}^{h} + \beta_5 X_{ijt}^{HH} + \beta_6 X_{jt}$$

$$\beta_7 M + \beta_8 T^b + \beta_9 T + \beta_{10} S_j + \beta_{11}(T\ x\ S_j) + \varepsilon_{ijt} \qquad (1)$$

where H_{ijt} denotes a health outcome (discussed below) for child *i* in state (or region) *j* in year *t*, $Hindu_{ijt}$ is a dummy variable for the religious affiliation of the child's household, X_{ijt}^{c} are child-specific indicators (order of birth, gender, whether child was nursed, whether child had diarrhea, fever or cough in the previous two weeks), X_{ijt}^{w} are woman (mother)-specific indicators (measures of maternal risk factors such as tobacco use in India and Nepal, education and work characteristics, prenatal or antenatal check-ups with a doctor, and mother's demographic characteristics including age at birth, age at first marriage, and general health as measured by height and hemoglobin levels in India and Nepal), X_{ijt}^{h} are husband (father)-specific indicators (age, education, and work characteristics), X_{ijt}^{HH} are household-specific indicators (rural/urban indicator, age and gender of household head, indicators for access to electricity and ownership of assets such as radios, refrigerators, televisions, motorcycles, and cars, as well as information on sources of drinking water, toilet facilities and years lived in place of residence), and X_{jt} is a state(region)-specific indicator (per capita net/gross state/region domestic product for India and Nepal). In order to control for time trends and regional-level heterogeneity, equation (1) includes month of conception dummies (M), year of birth dummies (T^b), a time indicator for the round of DHS data in each of the three countries (T), region dummies (S_j), and interactions of time dummy T and region dummies S_j. ε_{ijt} is the standard idiosyncratic error term, and standard errors are clustered by state or region. The coefficient of interest is β_1: the relative impact of adherence to Hindu practices on child health. For India, two categorical variables for religion are included in the regression: whether the household is lower-caste Hindu (both Hindu and a member of a scheduled caste or scheduled tribe) or upper-caste Hindu. The omitted category is Muslim. For Nepal and Bangladesh, a single categorical variable is used (Hindu/Muslim). We restrict the analysis to Hindu and Muslim households only (the data also contain information on Christian and Buddhist children) as these households form the largest religious groups in these countries. With this restriction, we drop about 5 percent of the Indian sample, 10 percent of the Nepal sample, and less than 1 percent of the Bangladesh sample.

IV. Data and summary statistics

We use several recent rounds of the Demographic and Health Surveys for each country: India 1998-99 and 2005-06, Bangladesh 1999-2000, 2004, 2007 and 2011, and Nepal 2001 and 2006, and keep children aged five years and below since anthropometrics are reported consistently for this age-group.[6] These data include maternal risk factors and demographic characteristics that are asked of all women between the ages of 15-49, as well as detailed reproductive histories on year and month of delivery of every child born, gender of the child, and information on height-for-age and weight-for-age z-scores for children less than age five.[7] Table 2 presents summary statistics of child-specific, woman-specific, husband-specific, and household-specific characteristics in our sample for each country (pooling the data for all survey rounds for each country), separated by religion. Table 3 reports summary statistics for state-specific characteristics for both survey rounds in India. At each level (child-specific, women-

[6]We do not use the 2011 DHS for Nepal because child anthropometric measurements were taken only in households eligible for the 'male' subsample in this year (about one-third of the 'female' sample). Because domestic and international work-related migration is substantial in Nepal and largely comprised of prime-age men, this sample of children may be unrepresentative (see Lokshin, Bontch-Osmolovski and Glinskaya 2010 for an analysis of the significant effect of work-related migration and remittances on poverty in Nepal).

[7] The 1998-99 DHS for India only includes anthropometric data for children aged three and younger.

specific, household-specific, and state-specific), results are reported for unique observations. Hence for example, while the child-specific variables are reported at the child-level, women-specific variables are reported for each woman so that the number of births a woman has had does not weight her importance in these statistics.

The summary statistics for the child outcomes we study are shown in the top panel of Table 2. We use two anthropometric measures of child health: height-for-age z-score and weight-for-age z-score. Height-for-age z-score measures stunting, and is considered an indicator of long-term health status that fluctuates little in response to short-term changes in diet. Weight-for-age is a marker of underweight and reflects both stunting and wasting (low weight-for-height).[8] The data in Table 2 indicate that across religious groups, children in all three countries are malnourished by these measures: among Hindu children, the average height-for-age z-score is -1.9 in India, -1.8 in Bangladesh and is slightly worse in Nepal at -2.1. Among Muslim children in these countries, height-for-age varies along similar thresholds and is notably worse than Hindu children within each country. Similarly, the average weight-for-age z-score is roughly -1.8 in all three countries, indicating that the average child in the region is well below conventionally accepted thresholds for adequate nutrition (also centered at zero) by this measure.

Other measures summarized in Table 2 indicate few notable differences across the three samples by religious affiliation. Breastfeeding rates are high in all three countries.[9] Muslims tend to have larger families as evident from the statistics for the order of birth variable, and

[8] Deaton and Dreze (2009) note that for Indian children, the weight-for-age z-score is the preferred measure of child nutritional status, encompassing both chronic and acute malnutrition (as opposed to weight-for-height which reflects current, short-term nutritional status). For all rounds of the DHS data, we use the z-scores based on the revised (2006) WHO growth charts.

[9] It is important to control for breastfeeding as its timing and weaning can have important effects on patterns of child growth, especially in developing countries (Kruger and Gericke 2002). The results (discussed below) remain the same when the indicator for whether the child was breastfed is replaced with a duration variable that measures months of breastfeeding.

children with this denomination are also more likely to have had diarrhea, fever, and cough in the last two weeks compared to Hindu children in the same country. Lower incidence of anemia is evident from the relatively higher level of hemoglobin among Muslim children in India, possibly reflecting their non-vegetarian diet. However, Muslim children in Nepal do not show an advantage in terms of this variable compared to Hindu children in that country (there is no information on hemoglobin levels in the Bangladesh DHS). A sizeable proportion of Muslim children were *in utero* during Ramadan in all three countries.

In terms of woman-specific characteristics, Muslim women are less likely to seek prenatal or antennal care, are marginally taller, have somewhat higher hemoglobin levels and report smoking or chewing tobacco more (in India), in comparison to Hindu women. Average age at first marriage is very young (about 17 years) and even younger among Muslims. Women are more likely to be literate in Bangladesh than in India or Nepal, but in the latter countries, Muslim women are comparatively less educated. Relatively more Hindu women are likely to report they are working, and rates of female work are particularly high in Nepal compared with the other two countries possibly reflecting the consequences of the 1996-2006 civil-war that resulted in widespread displacement of men. Women's average age ranges from 26 to 29 years and the average husband's age ranges from 32 to 36 years across the three countries (summary statistics for men are reported in Appendix Table 1). Although women in Bangladesh report relatively high rates of literacy, among Hindus, the proportion of uneducated husbands is highest for that country. Moreover, within each country, Muslim men are more likely to be uneducated as compared to Hindu men. Most males report working outside the home in these data. Further, populations are overwhelmingly rural in all three countries.

Summary statistics for other variables indicate that in India and Bangladesh, over 90 percent of households are male-headed. For Nepal, this proportion is lower at about 84 percent. In terms of the religion variable, among Hindus, 35 percent are lower caste Hindus and 65 percent are upper caste Hindus in the Indian sample. Reflecting their minority status, only 18 percent of the population in India is Muslim. In contrast, 91 percent of the sample is Muslim in Bangladesh, with those reporting Hinduism as their religion comprising a minority at about 9 percent. Similar to India, Hindus are a majority in Nepal at 95 percent. Other indicators of ownership of consumer durables (refrigerator, motorcycle, car) suggest that on average, the status of Indian households is relatively high compared to Bangladesh and Nepal. However, within India, Muslims fare worse. This fact is underscored when access to electricity and piped water for drinking (a relatively clean source) is taken into account. Muslims fare relatively better in terms of access to electricity and clean drinking water in Bangladesh.

Table 3 reports descriptive statistics for variables at the state level in India. Information on per capita GDP for India is collected from the Economic Organization and Public Policy Program (EOPP) database at the London School of Economics. Information on external deaths (described below), malaria and TB deaths and deaths from fever are used in the robustness checks of the main results and are collected from different editions of India's *Statistical Yearbooks*, *Agricultural Statistics*, and *Vital Statistics of India*. The time-varying consumer price index (CPI) for India is for agricultural laborers (base: 1986-87=100) and is collected from the *Statistical Yearbook of India 2013* and the *Statistical Pocketbook of India 2002*.

V. Results

OLS Regressions

Results from equation (1) for the full sample and various subsets for each country are shown in Table 4 (height-for-age z-scores) and Table 5 (weight-for-age z-scores). Focusing first on height-for-age, in all three countries, Hindu children have higher z-scores than do Muslim children for the sample as a whole (for upper caste Hindus in India) and for the rural population (in India and Nepal). In India the coefficient is .076 for upper caste Hindus, indicating that the height-for-age z-score for upper caste Hindu children is .076 standard deviations higher than for Muslim children, holding constant many characteristics of the child, mother, father, household, and state. In Bangladesh the coefficient on Hindu is .080 (p-value = .086) while in Nepal the coefficient is .156 which is statistically significant at the 1.6 percent level.

Disaggregating by age, these better outcomes for Hindu children are apparent only for children aged 13 to 59 months; the coefficient on Hindu becomes larger in magnitude and is more precisely estimated for children aged more than twelve months in all three countries. The coefficient ranges from .113 for upper caste Hindus in India to .158 in Nepal. Notably, the sign on the Hindu coefficient flips and becomes negative for children under one year of age in India and Bangladesh (although it is not statistically significant for Bangladesh): Muslim children in this age group are characterized by less prevalence of stunting than Hindu children (for lower caste Hindus in India); the coefficient on Hindu becomes statistically insignificant in Nepal for children of this age-group. As noted above, these results for infants in India and Bangladesh echo findings of a Muslim advantage in infant survival that has been documented in previous studies (Bhalotra, Valente and van Soest 2010).[10] Figure 1 plots coefficient estimates on the Hindu variable (with confidence levels) for children in the three countries disaggregated by six month age groups. This illustrates that the Muslim advantage in infancy in India and Bangladesh

[10] These age disaggregated patterns remain evident for older children in Bangladesh and younger children in Nepal when children's BMI is used as the dependent variable (with mother's BMI as a control). Results for India are not estimated with precision in these alternate runs that check robustness.

transitions to a Hindu advantage (denoted by the point at which coefficient estimates cross the solid line at zero on the y-axis) shortly after 24 months for lower caste Hindu children and before 24 months for upper caste Hindu children in India. The transition to Hindu advantage in the Muslim majority country of Bangladesh occurs before 18 months of age; Hindu advantage is mostly absent in Nepal except for a manifestation among older children around 24 to 36 months.

Table 4 also reports results disaggregated by gender and age of child. These show that for older children, the comparatively better outcomes for Hindus are apparent for boys in India, for both boys and girls in Bangladesh, and for girls in Nepal. Son preference is a possible explanation for better male child outcomes for Hindus in India, particularly for first-born sons who receive preferential treatment over higher-order sons and daughters.[11] However, the results remain the same when we include a ratio of sons to all children in the family or an indicator (for each child) of whether the previous child in the family was a girl (recall that birth order is included as a control in all regressions).[12] Among infants, Hindu boys have significantly lower height-for-age z-scores than Muslim boys in India (for lower caste Hindus) and in Bangladesh, while Hindu infant girls are significantly disadvantaged among both upper and lower castes in India relative to Muslim infant girls. In contrast to India and Bangladesh, Hindu infant boys are significantly taller than Muslim infant boys in Nepal. In summary, long-term health status as reflected in height-for-age z-scores indicates that Hindu children have an advantage over Muslim children in India, Bangladesh and Nepal, with most of this advantage appearing after 12 months in age.

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[11] See Jayachandran and Pande (2015); this study analyzes the difference in height-for-age between Indian and African children and concludes that much of the difference is accounted for by preferential treatment of first-born sons by Indian parents. While son preference is prevalent among both Hindus and Muslims in India, evidence in this paper indicates that son preference is stronger among Hindus.

[12] The results remain the same even when we consider only the subsample of first-borns; however we lose some significance because of reduced sample size.

The results for weight-for-age z-scores presented in Table 5 are more mixed but follow a similar pattern to those in Table 4. For the population as a whole and for the rural population, there is no systematic difference in weight-for-age z-scores among children in India, Bangladesh and Nepal. However, when the sample is disaggregated by age, a Muslim advantage in infancy in India and a Hindu advantage for older children is evident in all three countries. Muslim infants are .262 standard deviations heavier than lower caste infants in India, with this advantage appearing mainly among girls. There is also a Muslim advantage for girl infants in Bangladesh, who are .191 standard deviations heavier than Hindu girls. The gender differences in health status by religion among girl infants again may reflect son preference in the region (Rose 1999, Clark 2000). Among older children, the coefficient on Hindu ranges from .055 (for lower caste Hindus in India) to .098 in Bangladesh; all coefficients for the 13-59 ("all") age group are statistically significant although they are smaller in magnitude and less precisely estimated than those for height-for-age z-scores in Table 4 for this age group. By gender, the Hindu advantage is apparent for upper caste Hindu boys in India, for Hindu boys in Bangladesh, and for Hindu girls in Nepal. In summary, there is some evidence of a Muslim advantage in infancy and stronger evidence of a Hindu advantage in weight-for-age z-scores for older children.

Tables 4 and 5 show the results only for the main coefficient of interest (Hindu); however, several of the additional controls merit discussion.[13] First, all of the regressions include a control for mother's height. This is because there is a biological link between maternal height and a child's size at birth (Alderman 2012, Menon 2012) which in turn affects a child's growth potential. This also captures the likely intergenerational transmission of undernutrition, in which women who themselves failed to achieve their growth potential are less healthy and have children who start out at a disadvantage at birth. Appendix Table 2 shows that the

[13] The full set of results for the complete sample in each country is presented in Appendix Table 2.

coefficient on mother's height is positive and highly statistically significant in all regressions. However, the size of the coefficient is relatively small, and excluding this control from the regressions does not change the results regarding Hindu and Muslim differences.

The regressions also include controls for mother's age when the child was born, as well as the mother's age at first marriage. Both control for the worse health outcomes that characterize children born of adolescent mothers; as discussed above women who are very young at marriage likely have lower status and less control over resources within the household.[14] The coefficient on mother's age at birth is positive and statistically significant only in Nepal (for weight-for-age), while the coefficient on mother's age at marriage is small in magnitude and generally statistically insignificant. (The results for our coefficient of interest, *Hindu*, are similar if these controls are omitted from the regression.) Other proxies for the woman's bargaining position within the household include dummies for literacy and current work. Literacy has a strong positive effect on child height and weight in all countries whereas the indicator of current work is significant only in India and in a negative direction, suggesting that working mothers may be less able to monitor child health and care. The indicator for whether child was nursed is insignificant in most of these models possibly because rates of nursing are uniformly high with little variation.[15] Incidence of recent illness such as diarrhea and fever has strong negative effects on standardized

[14] Recent evidence in Coffey, Khera and Spears (2013) supports this idea by documenting that in rural Indian joint families, younger daughters-in-law have shorter children. To explain our patterns, daughter-in-law status must matter differentially by religion and by age of child, in particular, Hindu mothers should be affected relatively more than Muslim mothers especially when the child is young. Since we find some evidence that this is the case in India and Nepal, we included a variable measuring daughter-in-law status for mothers in the models as an additional control for rank in the household and possibly stress experienced during and after pregnancy. Since our results remain the same, these estimates are not separately reported but are available on request.

[15] Although there is little variation in rates across countries, we find some evidence that weaning patterns in India (only) differ by religion and by age of the child. In particular, low caste Hindu infant boys appear to be weaned relatively earlier than Muslim infant boys and among older children, Hindu girls are weaned relatively later than Muslim girls. Since this may contribute to the age patterns we document, controlling for breastfeeding is important in our models. However, as noted above, including a nursing indicator or a variable measuring actual months that the child was breastfed does not change our results.

measures of height and weight, whereas access to prenatal and antenatal care has significant beneficial impacts. Maternal smoking has a harmful effect mainly in terms of height-for-age z-scores in Nepal, and children of more educated fathers in households with assets and access to electricity, with relatively clean septic facilities residing in rich regions, have comparatively high anthropometric measures in these countries. The Hindu advantage in height-for-age is evident in the full sample for all three countries, even with inclusion of controls for mother's education, mother's economic and work status, mother's health and habits, recent illness for children, and the household's access to clean drinking water and septic facilities. It appears that while these factors have some explanatory power for the health outcomes of children in this region, they cannot fully account for the comparative Hindu advantage beyond age one in these countries.

VI. Mortality Selection

One reason for the reversal in Muslim advantage beyond age one may be that the weakest Hindu children do not survive beyond that age. As a result, anthropometric measures for Hindu children may appear comparatively high for children who are no longer infants because of sample selection; stronger Hindu children are now being compared to the average Muslim child. We present several tests to show that this is not the case.

The first evidence against mortality selection is that the Hindu advantage in height-for-age z-scores, the preferred measure of long-term health, is apparent in all three countries even without conditioning on age. The first two columns of Table 4 show that in the full sample and in rural areas of India and Nepal, Hindu children have an advantage compared to Muslim children. Since there is no delineation by age in these samples, these results cannot be a consequence of selective mortality by religion. Further, in the case of height-for-age in India, the Muslim advantage in infancy is with respect to lower caste Hindus who constitute a different and smaller proportion of the Hindu population (35 percent from Table 2) as compared to upper caste Hindus. Yet the Hindu advantage beyond age one is evident among upper-caste Hindus. This pattern is inconsistent with mortality selection in infancy that should affect lower-caste Hindu children, and consequently be reflected in the older group of surviving children as a lower-caste Hindu advantage.

Second, we analyze whether there are systematic differences in observable characteristics in the population of Hindu children, conditioning on age. If mortality selection was at work, then the average characteristics of older Hindu children should be systematically different from those of younger Hindu children. Table 6 reports differences in means of characteristics between Hindu children 0-12 months and 13-59 months in the three countries. If it is indeed the case that older Hindu children are distinct, then most of the coefficients in Table 6 should be statistically significant and have a sign that indicates an advantage for the older cohort. Consider India first. The first two rows show that in terms of the standardized height and weight dependent variables, Hindu children 0-12 months have relatively high scores as compared to the older cohort. That is, infants do relatively better. As expected, infants are somewhat more likely to have had diarrhea and fever in the last two weeks and perhaps consequently, to have had more frequent check-ups with a doctor. Although the higher incidence of sickness among younger children may give older children an advantage, more frequent access to medical care works in favor of the younger Hindu child cohort. Older children also appear to have higher levels of hemoglobin (an advantage), mothers with lower age at first marriage (a disadvantage), higher proportion of mothers who smoke (a disadvantage), mothers who are taller (an advantage), mothers who work (a disadvantage) and fathers who are uneducated (a disadvantage). In terms of household characteristics, older children are slightly more likely to live in areas with hygienic septic facilities (an advantage). All of the variables that favor older children (mother's height which is a proxy for unobserved child health endowment, clean environment) are included in the models of Tables 4 and 5, yet Hindu advantage beyond age one remains evident. Results reported below discuss inclusion of hemoglobin levels for child and mother; again, the reversion from Muslim advantage to Hindu advantage beyond the 12 month threshold remains apparent.

Table 6 also reports differences in means for Bangladesh and Nepal. In comparison to India, there are fewer coefficients that are statistically different across child age-groups. Those that favor older children in Bangladesh include only recent incidence of fever and diarrhea; as in the case of India, these variables are included in the main model and do not eliminate the Hindu advantage beyond age one. Several variables favor the older cohort of children in Nepal (diarrhea, fever, hemoglobin), but again these variables are included as controls in the main model where the reversion in advantage beyond age one remains apparent.

Third, we use Young Lives data that tracks children over time to check for mortality selection. The Young Lives data set follows about 2000 children who are aged 6-18 months in the state of Andhra Pradesh, India, from 2002 onwards. These children are surveyed again in 2006 (now aged 54-65) months with an attrition rate of less than 2 percent.[16] The Young Lives data are broadly comparable to the larger DHS data for India and are representative of the population of Andhra Pradesh; the only difference is that the Young Lives households have marginally better access to public amenities and are slightly wealthier (Kumra 2008). Given these similarities, this alternate data is a good source in which to look for comparable patterns which may be attributed to religious affiliation alone.

[16]A third survey round was conducted in 2009, but given our focus on very young children, we do not use information from the latest round in which children are now between 90-101 months in age (some of the questions in the last round are also asked in a different format as compared to before).

Summary statistics for the Young Lives data from rounds 2002 and 2006 in India are shown in Appendix Table 3 (as before, we keep only Hindu and Muslim children; less than 5 percent of children belong to other religious groups). We use mostly the same variables as in the DHS regressions reported for India in Table 4 (for brevity, we focus on the long-term measure of child health, height-for-age) and report descriptive statistics differentiated by religion. Many of the patterns evident in Table 2 for India are seen here – in particular, the average YL child scores well below conventionally accepted standards for adequate nourishment, the probability that the child was nursed is high, mothers are likely to seek prenatal or antenatal care with a doctor, age of mother at birth is low, and the proportion of lower-caste Hindus is smaller than the proportion of upper-caste Hindus (Hindus are 92 percent of the population and Muslims are 8 percent). Some differences include that in comparison to Hindus, Muslim children compare more favorably in terms of height-for-age (which should work against a Hindu advantage beyond age one), weight and access to medical care. Muslim children are also less likely to have an uneducated father, to live in households that own more assets such as radios, refrigerators and cars, and to have access to electricity and piped water. These are all reasons why Muslim advantage in infancy should persist beyond the 12 month age threshold, but as shown in Table 7, this is not the case.

Table 7 reports comparable regressions to the DHS India sample in Table 4 for the YL data, including all controls outlined in Appendix Table 3.[17] From the first two columns, it is clear that an upper-caste Hindu advantage is still evident among children in the older age cohort (but Muslim advantage in infancy is absent). The last two columns of Table 7 address mortality

[17] We did not implement a child fixed effects model for several reasons. Most importantly, there is no variation in religious identity over time. Further, given the age-cutoffs for younger and older children, the sample size was too small to identify close to 2000 fixed effect parameters. Finally, we wanted comparable estimates to the empirical methods used in the study of the DHS data in Tables 4 and 5.

selection directly by restricting the sample to only those children who are between the ages of 6-11 months in 2002, and hence fall in the 54-59 month age group when they are surveyed again 48 months later in 2006. There are 230 children who are 6-11 months (consistent with our 0-12 month cut-off for younger children) in 2002 and 54-59 months (consistent with our 13-59 month cut-off for older children) in 2006. The last column of Table 7 shows that even within this small group, a Hindu advantage in height-for-age is apparent beyond age one. Since these are exactly the same children at two points in time (no child has died), selective mortality by religion cannot be an explanatory factor.[18]

VII. Hindu and Muslim children in England

Does the Hindu advantage after age one exist in other countries? As an additional check on whether these patterns are apparent in other contexts, we use the 2004 Health Survey for England data set which surveys individuals in England on their health status and behaviors; in 2004 the survey over-sampled large minority ethnic groups in England including Indians, Pakistanis, and Bangladeshis.[19] The survey contains information on the weight of infants and children, which we use to calculate weight-for-age z-scores and compare these by the child's religion for children of Indian, Pakistani, and Bangladeshi parents.[20] When we regress weight-for-age z-score on a dummy variable for Hindu and include controls for the child's gender and

[18] Alderman, Lokshin and Radyakin (2011) also investigate the role of mortality selection in India's child height measures. Using three rounds of DHS data, this study conducts a simulation exercise that imputes values to answer a counterfactual question: what would height-for-age be if young Indian children who had died were alive at the time of the surveys? They find that the extent of the bias due to selective mortality is small; differences in anthropometric measures between children who died and those who survived would have to be unjustifiably large for mortality selection to have had more than a moderate (5 percent) impact.

[19] See http://www.hscic.gov.uk/article/3741/Health-Survey-for-England-Health-social-care-and-lifestyles for further information on the survey and for data access.

[20] We assign religion (which is not asked of children) based on the reported religion of the oldest member of the household. When this information is not available, we assume that Indian children are Hindu, and Pakistani and Bangladeshi children are Muslim. All results for the Health Survey for England data are available on request.

ethnicity, the coefficient on Hindu is -0.896 for children age 0 to 12 months, with a p-value of .072 (n=56). For children age 13 to 59 months, the coefficient on Hindu is 0.622 with a p-value of 0.220 (n=338). While these sample sizes are very small and likely biased by sample selection, we nevertheless view this as suggestive evidence that the Hindu-Muslim differences in child health status are real, likely to be cultural (and/or religion-based), and are not due to country-specific explanations.

VIII. Robustness checks

In this section we examine other causes that may underlie the reversal in Muslim advantage beyond infancy and assess the likelihood that omitted variables bias the results. First, it is possible that some of the differences in child health outcomes are due to differences in wealth or family size by religion, with effects that become evident only past infancy. This is especially true in India where Muslims are, on average, of lower socio-economic status and have larger households. We test these possible explanations for India (for which we have complete data) by examining whether there are differences in wealth or family size by religion, conditional on our covariates. To test whether household wealth differs systematically between Hindu and Muslim across the two child age-groups we analyze, we regress an indicator for asset ownership (proxied by whether the household owns a car or a refrigerator) on the religion variables and our full set of control variables. The results indicate that there are no statistically significant differences in ownership of these consumer durables between religious groups across the child age-groups we study.[21] Since this was a period of rapid economic growth in India, it is notable that Hindus and Muslims did not differ in ownership of assets (which are thought to increase in times of prosperity) yet differed in terms of child health outcomes in infancy and beyond.

[21]Results for all robustness checks in this section are provided in the working paper version of this paper; see Brainerd and Menon 2015.

Another explanation for the results in Tables 4 and 5 may be that family size varies consistently by religion. Average family size among Muslims is relatively large as compared to Hindus (birth order of the average child is higher among Muslims compared to Hindus from Table 2), so median child "quality" may differ across these groups especially beyond 12 months of age when the child's environment and living circumstances play a more determining role. To assess whether this is a concern, we regress the log number of births by year on the religion variables and our full set of control variables. There is no evidence that the number of births varies systematically by religious affiliation, plausibly ruling out the role of family size in biasing our results.

A further concern is omitted variables that are correlated with both religion and child nutritional status simultaneously, causing the coefficients of interest to be inconsistent. In this case, possible omitted variables include the incidence of childhood (or maternal) disease, weather (rainfall), food prices, and nutrient intake.[22,23] Childhood disease may vary by religion if, for example, more frequent hand-washing (before prayer) by Muslims results in less frequent

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[22] In results not reported, we controlled for region-wise air temperature and the total infant mortality rate (IMR) in year of birth for children in the three countries (total infant mortality rate is available only for India and Bangladesh); this did not change any of the results. Air temperature data for India were obtained from the Indian Meteorological Department, for Bangladesh from the *Handbook of Environment Statistics* and the *Yearbook of Agricultural Statistics of Bangladesh*, various years, and for Nepal from the *Handbook of Environment Statistics*, various years. IMR data for India was obtained from the *Sample Registration System Bulletin*; for Bangladesh from *the Report on the Sample Vital Registration System*.

[23] We also controlled for inequality in India using the Gini coefficient of distribution of consumption by state and year of birth of children obtained from the Planning Commission of India website at http://planningcommission.nic.in/data/datatable/index.php?data=datatab (no comparable data is available for Bangladesh or Nepal). These results are not reported since previously documented patterns by child age do not change when the inequality measure is included in the regressions, or when the regressions are run including the Gini at the upper and lower halves of the inequality distribution. Further, in order to understand whether inequality within religions is important, we interacted the Gini coefficient with the dummy for low-caste and upper-caste Hindus and included these interactions (along with the Gini independently) in the basic models of Table 4 for India. Results indicate that patterns for older children remain the same as before. However in the sample of infants, the Muslim advantage with respect to low-caste Hindus disappears suggesting that higher inequality among Hindus may be an explanatory factor for why very young Muslim children fare relatively better. These results are available on request.

childhood or maternal disease, thus benefitting child health status.[24] Rainfall in very early childhood has been shown to impact long-run health outcomes, most likely through improved agricultural output and food availability (Maccini and Yang 2009); if vulnerability to weather shocks differs by religion, by differences in proportion of religious groups present in agriculture for example, then omission of rainfall could influence results. A similar argument applies to food prices and nutrient intake. Previous research has shown that nutrient availability can decline during periods of economic growth due to increased food prices (Meng, Gong and Wang 2009). The positive effect of income growth on nutrient availability may thus be more than offset by changing relative prices during a period of liberalization, as occurred in China in the mid-1990s. If for some reason the impact of changing food prices or nutrient availability differed between Hindus and Muslims (by differences in proportions in subsistence farming, for example), this would bias the coefficients on the 'Hindu' variable.

To test for the impact on results of the omission of these variables, we estimate separate regressions identical to those in Tables 4 and 5 for India (for ages 0-12 and 13-59 months), but including each variable of concern. If the omission of a variable is biasing the results, when the variable is included, the magnitude and significance of the coefficient of interest will change. To proxy for diseases incidence, we use the number of deaths from malaria and tuberculosis normalized by state population (the best measure available for this variable and because malaria and tuberculosis show regional and seasonal variation). Rainfall is the average rainfall in each region for each year. Food prices are measured by the CPI for agricultural laborers, and food intake is controlled for using calories (in Kcal by rural/urban), protein intake and fat intake (both

[24] Geruso and Spears (2014) argue that the "puzzle" of Muslim advantage in infancy may be wholly explained by the fact that sanitation is an important health externality that impacts the disease environment, and Hindus are significantly less likely than Muslims to use toilets or latrines. Since we control for sanitation and toilet facilities in the regressions (they use the same DHS data sets as us for India), we should not see the reversal in health outcomes beyond age one if that was the sole explanation.

in grams by urban/rural) per capita per day. In addition to reasons above, food intake might differ by religious identity through systematic differences in location of subsidized food distribution outlets such as government ration centers (we test for systematic differences in public subsidies separately – see footnote 26). For both height-for-age and weight-for-age, controlling for disease incidence, average rainfall, agricultural prices, and nutritional intake do not change the child health results; the magnitude and statistical significance of the coefficients on *Lower caste Hindu* and *Upper caste Hindu* are nearly identical to those shown in Tables 4 and 5 in all cases. The Muslim advantage in infancy remains in both measures, and this advantage still reverts beyond the first year.[25] [26]

Nutritional deficiencies from dietary restrictions may be another source of differences in the health of children in India, Bangladesh, and Nepal. As noted above, India and Nepal are predominantly Hindu where conservative adherents mostly follow a vegetarian diet, while Bangladesh is predominantly Muslim and non-vegetarian.[27] There are also variations within countries; northern Indian states such as Gujarat and Uttar Pradesh are mainly Hindu and vegetarian whereas the southern state of Kerala, while still predominantly Hindu, has a relatively large proportion of Muslims and Christians who follow a non-vegetarian diet. Given the absence of detailed dietary information in the DHS data, we include measures of hemoglobin (Hb) levels

[25] Since the dependent variables are z-scores, differences across religious populations in means should not matter. However within-variation may be a factor, for example, some groups may take longer to catch-up in height. To test for this, we re-defined child height to be a binary measure of stunting using the conventionally accepted threshold of 2 standard deviations below the mean. Results (not reported in the paper) with this non-linear formulation are similar to those in Table 4 indicating that differences in within-variance are not a factor.

[26] We also controlled for state-level public subsidies (measured by national central assistance) from 2000-2006 in India; this does not change the patterns even though such assistance has significant positive effects on height-for-age in both age groups. The national central assistance data are obtained from http://planningcommission.nic.in/data/central/index.php?data=centab, accessed on June 10, 2013.

[27] Consumption data from the National Sample Survey indicates that up to 42 percent of households do not consume fish, meat or eggs (Mehta *et al*. 2003).

for children and mothers in India. Tarozzi (2012) notes that low Hb levels (anemia) may lead to reduced child development and increased disease incidence, and that India as a whole is characterized by low Hb levels (up to 80 percent) due to reduced consumption of meat and fish.

The first two columns of Table 8 present these results for height-for-age and weight-for-age z-scores. It is clear that controlling for Hb levels does not eliminate the Hindu advantage among older children in terms of height-for-age; even lower caste Hindu children appear to fare better compared to Muslim children in India after inclusion of this control. There is some loss in significance for the older group of Indian children in the weight-for-age regressions. These results underscore that differences in diet tied to religious affiliation do not explain the reversion.

The final explanation we consider is *in utero* exposure of Muslim children to diurnal fasting by their mothers during Ramadan. If such exposure has negative long-term consequences for child health and well-being (Almond and Mazumder 2011; van Ewijk 2011), then this might explain why the Muslim advantage in infancy dissipates beyond the first year. If exposure to fasting is important, then the Muslim disadvantage among older children should disappear when this variable is included in the models. To control for such exposure, we take advantage of the fact that the DHS data contains information on month and year of birth of each child. Using a nine-month gestation cycle, we create month and year of conception variables for Muslim children in India, and then based on retrospective information for the months in which Ramadan was observed from 1993 to 2011 (the earliest and most recent year of conception for children in our sample), create three indicator variables for whether Ramadan overlapped with pregnancy in the first, second or third trimesters. The third and fourth columns of Table 8 report results from the model that includes these trimester exposure variables. There is evidence in India that including the Ramadan exposure measures eliminates the Hindu advantage beyond age one in both height-for age and weight-for-age.[28] Although not reported in Table 8, the same is true in Nepal when the Nepal regressions are re-estimated including the Ramadan trimester exposure variables: the coefficients on Hindu for children age 13-59 months become statistically insignificant for both height-for-age and weight-for-age. For Bangladesh, however, the Hindu advantage for older children remains for both health outcomes. In India (and Bangladesh), the Muslim advantage in infancy remains with the control for Ramadan exposure. The final two columns of Table 8 report results when all variables are considered together (disease, rainfall and Ramadan exposure); in these regressions the Hindu advantage in height-for-age returns for older children in India, although the sample size is much smaller and the effect is more imprecisely estimated than before.

While this evidence is suggestive that – at least in India and Nepal – exposure to fasting *in utero* during Ramadan is detrimental to the health of Muslim children age one and over, it still does not explain the Muslim health advantage for infants. As a final test for this group, we examine the possibility that positive selection of Muslim infants caused by fasting explains the Muslim infant health advantage: exposure to fasting *in utero* may cause less viable fetuses to die, leading to positive selection of the Muslim infants who are born and are therefore healthier infants relative to Hindu infants who were not exposed to fasting *in utero*. To test this hypothesis, we estimate the same regressions as in Table 4, but restrict the sample to infants age 0 to 12 months who were not exposed to Ramadan fasting. If Ramadan fasting leads to positive

[28] To understand whether the impact of fasting differs by poverty status of the household, we included interactions of Ramadan trimester exposures and a "poor" indicator which denotes households in which husbands are illiterate. The patterns in height-for-age remain the same across countries with inclusion of these additional interaction terms in the models. We also interacted fasting with the nursing indicator to control for possible effects of dehydration that may impact child health. Again, our results remain the same. Finally, fasting measures were created for Hindu children as well to control for possible spillover effects from Ramadan. This too did not change previously documented patterns. All results are available on request.

selection of Muslim infants, we should not observe the Muslim advantage in infancy for this not-exposed group.

The results of these regressions indicate, as before, a negative and statistically significant coefficient on 'Hindu' in both India (for low caste Hindus) and Bangladesh, and an insignificant coefficient in Nepal (as before). However, when we estimate these regressions separately by gender, the coefficient on Hindu for male infants in India becomes statistically insignificant (coefficient = -.169, SE=.141 for low caste Hindus; coefficient = .060, SE=.142 for high caste Hindus), while remaining negative and statistically significant for girls in India (and for boys in Bangladesh). Since male infants are more vulnerable to health shocks than are girls, positive selection effect of Ramadan would be more likely to be apparent for boys as it is here. This suggests that positive selection of Muslim boys in India may underlie the health advantage of Muslim boys in infancy in India. However, positive selection does not explain the health advantage of Muslim girl infants in India or boy infants in Bangladesh.

IX. Conclusion

The widespread malnutrition of children in South Asia is persistent, troubling, and poorly understood. Given that religion dictates many of the rituals of daily life for much of this population – from dietary restrictions and fasting, to hand-washing and daily prayer – this paper investigates differences in child health by religion to better understand the high rates of stunting and wasting among children in these countries. The detailed data and comparative research design we use allows us to control for many socioeconomic characteristics, and to establish that similar patterns of child malnutrition by religious affiliation occur across all three countries we study: Muslim infants have the same or better height-for-age z-scores than do Hindu infants, but after one year of age any Muslim advantage disappears, and Hindu children are taller and heavier than Muslim children. Notably, this is true even in the Muslim majority country of Bangladesh. The relative differences in child anthropometric measures persist despite inclusion of detailed controls for characteristics of the child's environment and socioeconomic status which play an important role in shaping child health. The results are not explained by mortality selection and remain robust to controls for weaning patterns, mother's literacy, work experience and status in the home, disease exposure, weather, food prices, nutrient intake, and hemoglobin levels.

The reversal in Muslim advantage in infancy to Hindu advantage among older children, even in a country with a Muslim majority, is a puzzle. One plausible story that partially explains these patterns is the observance of diurnal fasting by pregnant Muslim women during Ramadan, which leads to both positively selected Muslim (male) infants and longer-term negative health consequences for all Muslim children. However this explains only some of the patterns we observe, leaving open future lines of research to explore this puzzle. A possible explanation is religion-based differences in hygienic practices, such as hand-washing before daily prayer among Muslims. If such a practice is more important for infant health than for child health, this could explain the Muslim health advantage in infancy. Another line of research would explore, using more detailed data than we have available, any differences in breastfeeding and weaning practices by religion, which may be more important for infant health than for child health. Policy implications of our work include increased awareness of the negative impacts of fasting, targeted interventions such as age-appropriate nutrient supplements to children who are at most risk, and significant improvements in nutrition monitoring at young ages through detailed micro-surveys of food consumption. Finally, further research into Muslim-Hindu differences in intra-household allocation of resources to women and children would likely further illuminate the reasons for the variation in child health outcomes we document.

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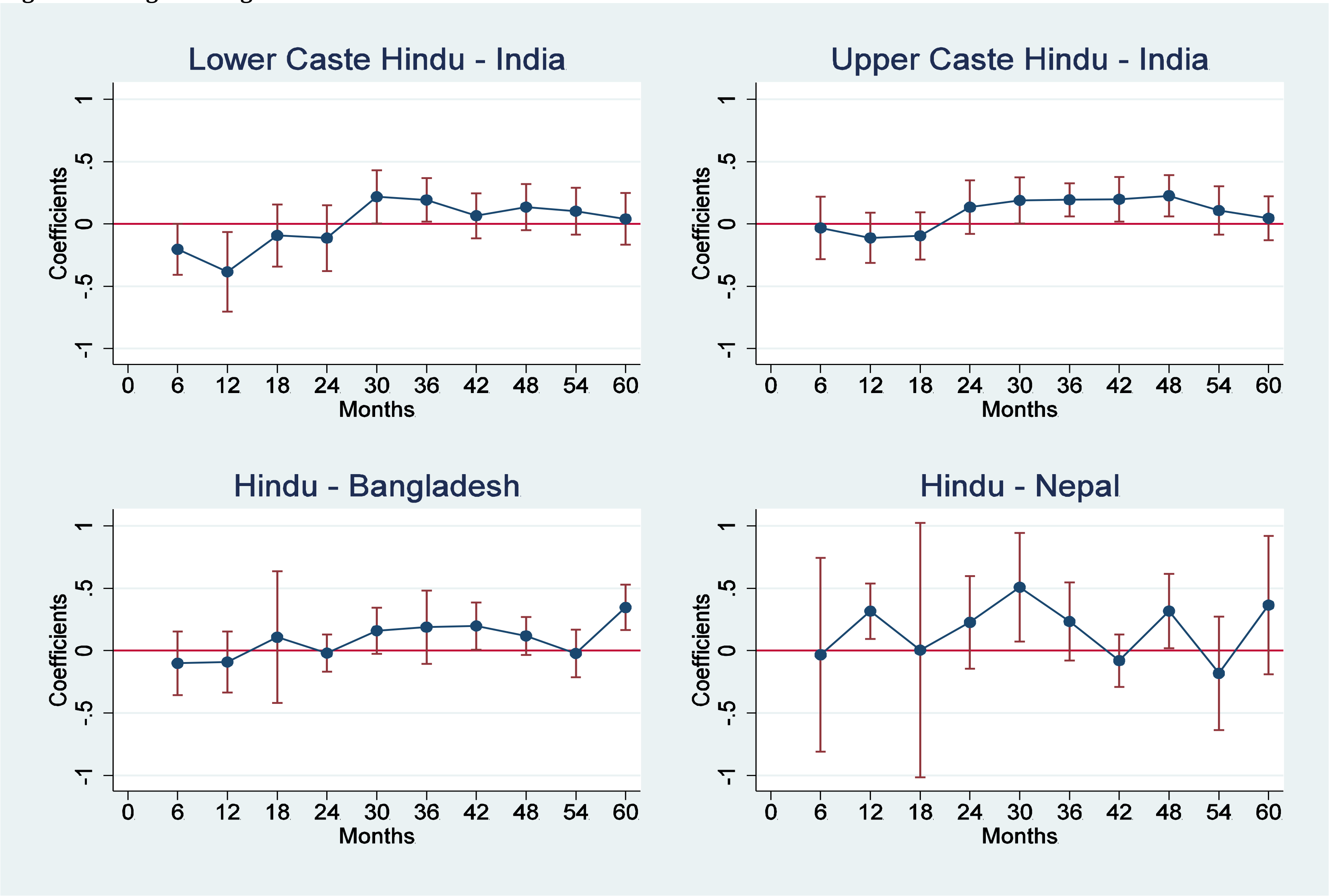
Figure 1: Height-for-age coefficient estimates and confidence levels of Hindu versus Muslim children



Source: Authors' calculations.

Table 1. Health and development indicators, 2006

	Bangladesh	India	Nepal
Development indicators:			
GDP per capita (constant $2000)	$460	$622	$241
Poverty headcount ratio ($2/day), % of population	76.5	68.7	57.3
Adult female literacy rate (%)	51.0	50.8	46.9
% Rural population	73.9	70.4	84.6
Health and fertility:			
Total fertility rate	2.51	2.79	3.17
Infant mortality rate (per 1,000 births)	46.8	54.3	48.2
% children immunized for DPT, age 12-23 months	93	66	94
Median age at first marriage, women age 25-49	15.0	17.4	17.0

Sources: World Bank, World Development Indicators, and Demographic and Health Surveys (median age at first marriage only)

Table 2. Summary statistics by country and religion

	INDIA		BANGLADESH		NEPAL	
Variable	HINDU	MUSLIM	HINDU	MUSLIM	HINDU	MUSLIM
Dependent variables						
Height-for-age z-score	-1.944	-2.009	-1.766	-1.874	-2.079	-2.165
	(1.679)	(1.740)	(1.404)	(1.372)	(1.330)	(1.426)
Weight-for-age z-score	-1.811	-1.799	-1.659	-1.743	-1.800	-2.001
	(1.263)	(1.255)	(1.179)	(1.116)	(1.058)	(1.113)
Child-specific (Ages 0-59 months)						
Age in months	25.662	26.030	29.839	30.022	29.989	29.440
	(16.221)	(16.293)	(17.451)	(17.231)	(17.094)	(17.361)
Order of birth	2.759	3.381	2.284	2.771	3.055	3.632
	(1.840)	(2.228)	(1.426)	(1.849)	(2.037)	(2.294)
Dummy for male child	0.523	0.518	0.513	0.507	0.505	0.477
	(0.499)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)
Dummy for child was	0.922	0.919	0.988	0.985	0.997	0.992
Nursed	(0.267)	(0.273)	(0.111)	(0.120)	(0.055)	(0.092)
Dummy for child had	0.126	0.137	0.052	0.070	0.163	0.219
diarrhea in last two weeks	(0.332)	(0.344)	(0.222)	(0.255)	(0.370)	(0.414)
Dummy for child had	0.194	0.256	0.326	0.391	0.249	0.349
fever in last two weeks	(0.396)	(0.437)	(0.469)	(0.488)	(0.432)	(0.477)
Dummy for child had	0.240	0.282	0.371	0.391	0.309	0.384
cough in last two weeks	(0.427)	(0.450)	(0.483)	(0.488)	(0.462)	(0.487)
Hemoglobin level (g/dl)	10.043	10.128			11.106	10.578
	(1.679)	(1.631)			(1.450)	(1.420)
Child was exposed to		0.248		0.222		0.334
Ramadan in first trimester		(0.432)		(0.416)		(0.472)
Child was exposed to		0.235		0.230		0.260
Ramadan in second trim.		(0.424)		(0.421)		(0.439)
Child was exposed to		0.262		0.284		0.199
Ramadan in third trim.		(0.440)		(0.451)		(0.400)
Woman-specific (15-49 yrs.)						
Dummy for had prenatal or	0.525	0.503	0.369	0.309	0.191	0.114
antenatal check with doc.	(0.499)	(0.500)	(0.483)	(0.462)	(0.393)	(0.319)
Age of woman	25.946	26.757	25.857	25.926	27.413	28.696
	(5.432)	(6.072)	(5.938)	(6.393)	(6.412)	(6.972)
Age at birth	24.063	24.796	23.643	23.631	24.979	26.190
	(5.261)	(5.930)	(5.699)	(6.199)	(6.186)	(6.871)
Dummy for woman is	0.378	0.346	0.586	0.553	0.426	0.117
Literate	(0.485)	(0.476)	(0.495)	(0.497)	(0.495)	(0.322)
Dummy for woman smokes	0.062	0.078			0.223	0.131
cigs./pipe/tobacco/other	(0.241)	(0.268)			(0.416)	(0.338)

Table 2. Summary statistics by country and religion continued

Variable	INDIA HINDU	INDIA MUSLIM	BANGLADESH HINDU	BANGLADESH MUSLIM	NEPAL HINDU	NEPAL MUSLIM
Woman-specific (15-49 yrs.)						
Woman's height	151.318	151.608	149.796	150.579	150.544	150.739
(cms.)	(6.123)	(5.616)	(7.018)	(6.559)	(5.368)	(5.352)
Woman's hemoglobin	11.362	11.429			12.411	11.757
level (g/dl)	(1.754)	(1.733)			(1.685)	(1.376)
Age at first marriage	17.053	16.742	16.361	15.182	16.756	15.546
	(3.137)	(2.844)	(3.103)	(2.640)	(2.681)	(1.776)
Dummy for woman is	0.336	0.189	0.215	0.178	0.792	0.425
currently working	(0.472)	(0.392)	(0.411)	(0.383)	(0.406)	(0.495)
Log of total number of births	8.888	8.887				
by year of birth	(0.297)	(0.279)				
Household-specific						
Rural household	0.768	0.684	0.782	0.789	0.899	0.899
	(0.422)	(0.465)	(0.413)	(0.408)	(0.302)	(0.302)
Age of household head	42.087	41.193	42.359	39.972	40.703	42.010
	(14.801)	(14.266)	(13.959)	(13.328)	(14.208)	(14.087)
Dummy for household has	0.918	0.876	0.960	0.925	0.832	0.863
a male head	(0.274)	(0.330)	(0.196)	(0.263)	(0.374)	(0.345)
Dummy for household religion	0.346		1.000		1.000	
is Hinduism (lower caste for India)	(0.476)		(0.000)		(0.000)	
Dummy for household religion is	0.654					
Hinduism (upper caste for India)	(0.476)					
Dummy for household religion is		1.000		1.000		1.000
Islam		(0.000)		(0.000)		(0.000)
Dummy for household owns a	0.315	0.307	0.218	0.207	0.509	0.368
radio or transistor	(0.465)	(0.461)	(0.413)	(0.405)	(0.500)	(0.483)
Dummy for household	0.361	0.297	0.340	0.271	0.179	0.169
owns a television	(0.480)	(0.457)	(0.474)	(0.445)	(0.383)	(0.375)
Dummy for household	0.095	0.099	0.054	0.057	0.013	0.016
owns a refrigerator	(0.294)	(0.299)	(0.225)	(0.232)	(0.114)	(0.124)
Dummy for household	0.142	0.105	0.026	0.036	0.014	0.013
owns a motorcycle	(0.349)	(0.307)	(0.159)	(0.185)	(0.116)	(0.113)
Dummy for household	0.017	0.011	0.000	0.001	0.005	0.010
owns a car	(0.131)	(0.106)	(0.000)	(0.031)	(0.072)	(0.099)
Dummy for household	0.582	0.534	0.423	0.448	0.297	0.402
owns electricity	(0.493)	(0.499)	(0.494)	(0.497)	(0.457)	(0.491)
Source of drinking water:	0.332	0.299	0.063	0.079	0.335	0.056
piped water	(0.471)	(0.458)	(0.243)	(0.270)	(0.472)	(0.231)

Table 2. Summary statistics by country and religion continued

	INDIA		BANGLADESH		NEPAL	
Variable	HINDU	MUSLIM	HINDU	MUSLIM	HINDU	MUSLIM
Source of drinking water:	0.470	0.566	0.889	0.887	0.409	0.865
ground water	(0.499)	(0.496)	(0.315)	(0.316)	(0.492)	(0.342)
Source of drinking water:	0.164	0.106	0.012	0.004	0.039	0.050
well water	(0.370)	(0.308)	(0.111)	(0.062)	(0.193)	(0.219)
Source of drinking water:	0.024	0.021	0.024	0.018	0.217	0.029
surface water	(0.154)	(0.144)	(0.152)	(0.134)	(0.412)	(0.167)
Source of drinking water:	0.009	0.008	0.000	0.002	0.001	0.000
rainwater, tanker truck, other	(0.097)	(0.091)	(0.000)	(0.044)	(0.023)	(0.000)
Toilet facility is: flush toilet	0.252	0.331	0.118	0.138	0.151	0.094
	(0.434)	(0.471)	(0.322)	(0.345)	(0.358)	(0.293)
Toilet facility is: pit toilet/	0.051	0.161	0.652	0.666	0.171	0.038
latrine	(0.220)	(0.367)	(0.476)	(0.472)	(0.377)	(0.191)
Toilet facility is: no facility/	0.694	0.480	0.154	0.106	0.674	0.868
bush/field	(0.461)	(0.500)	(0.361)	(0.308)	(0.469)	(0.339)
Toilet facility is: other	0.003	0.029	0.036	0.054	0.007	0.000
	(0.051)	(0.168)	(0.185)	(0.226)	(0.086)	(0.000)
Years lived in place of	12.328	15.162	12.277	15.342	13.523	15.940
residence	(13.296)	(15.228)	(11.928)	(14.858)	(12.547)	(11.501)

Notes: Weighted to national levels by weights provided by the DHS. Standard deviations in parentheses. Total number of observations for India is 55,905 of which 45, 805 (81.93 percent) are Hindus and 10,074 (18.02 percent) are Muslim. Total number of observations for Bangladesh is 23, 123 of which 2,130 (9.21 percent) are Hindus and 20,993(90.79 percent) are Muslims. Total number of observations for Nepal is 11,872 of which 11,296 (95.15 percent) are Hindus and 576 (4.85 percent) are Muslims. Table reports statistics at the unique level for children (aged four years or lower), women and households.

Table 3. Summary statistics for state-level variables for India (on-line appendix)

	INDIA
Per capita GDP	2377.785
	(1072.551)
External deaths	0.000
	(0.000)
Malaria cases and Tuberculosis	0.002
deaths as a ratio of total population	(0.002)
Average annual rainfall in	168.310
cms.	(39.150)
Consumer price index	339.800
	(28.668)
Per capita calories	2049.065
	(135.826)
Per capita protein intake	56.144
	(7.652)
Per capita fat intake	38.874
	(11.931)

Notes: Weighted to national levels by weights provided by the DHS. Standard deviations in parentheses. Table reports statistics at the unique level for states. Per capita GDP for India is per capita net state domestic product (base 1980-1981). External deaths in India measures deaths due to bites/stings, accidental burns, falls, drowning, accidental poisoning, transport and other accidents, suicides and homicides, normalized by total population.

Table 4. OLS regression results: *Dependent variable: height-for-age z-score*

	All	Rural	All, 0-12 months	All, 13-59 months	Male, 0-12 months	Female, 0-12 months	Male, 13-59 months	Female, 13-59 months
India								
Lower caste Hindu	-.001	.034	-.296***	.067	-.263**	-.313***	.106**	.024
	(.048)	(.065)	(.097)	(.049)	(.119)	(.112)	(.049)	(.057)
Upper caste Hindu	.076**	.124***	-.085	.113***	-.017	-.164***	.181***	.042
	(.032)	(.040)	(.080)	(.040)	(.130)	(.057)	(.043)	(.063)
N	34,752	21,871	7,197	27,555	3,721	3,476	14,524	13,031
R^2	.197	.187	.121	.155	.144	.127	.161	.158
Bangladesh								
Hindu	.080*	.067	-.104	.134**	-.143*	-.056	.183**	.094***
	(.039)	(.048)	(.069)	(.039)	(.074)	(.107)	(.072)	(.022)
N	20,271	14,015	4,383	15,888	2,231	2,152	8,086	7,802
R^2	.196	.182	.139	.163	.176	.137	.179	.162
Nepal								
Hindu	.156**	.157**	.149	.158***	.550***	-.302	.058	.252**
	(.039)	(.037)	(.112)	(.023)	(.085)	(.177)	(.078)	(.089)
N	9,149	7,653	1,877	7,272	941	936	3,637	3,635
R^2	.269	.225	.197	.180	.256	.227	.184	.196
Includes child, woman, household and region- or state-specific characteristics	YES	YES	YES	YES	YES	YES	YES	YES
Includes month of conception and year of birth dummies	YES	YES	YES	YES	YES	YES	YES	YES
Includes time dummies, state (or region) dummies, and their interactions	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Weighted to national level using weights provided by the DHS. Standard errors in parentheses are clustered by state or region. The notation *** is p<0.01, ** is p<0.05, * is p<0.10. Regressions include observations on Hindus and Muslims only – the Hindu dummy is thus interpreted in relation to Muslims.

Table 5. OLS regression results: *Dependent variable: weight-for-age z-score*

	All	Rural	All, 0-12 months	All, 13-59 months	Male, 0-12 months	Female, 0-12 months	Male, 13-59 months	Female, 13-59 months
India								
Lower caste Hindu	-.076	-.084	-.262**	-.031	-.187	-.329***	-.011	-.046
	(.047)	(.059)	(.094)	(.039)	(.112)	(.114)	(.054)	(.036)
Upper caste Hindu	.013	.012	-.157	.055*	-.075	-.250**	.093**	.022
	(.037)	(.049)	(.092)	(.030)	(.110)	(.115)	(.043)	(.032)
N	34,752	21,871	7,197	27,555	3,721	3,476	14,524	13,031
R^2	.169	.147	.145	.168	.155	.164	.177	.167
Bangladesh								
Hindu	.053	.013	-.095	.098*	.037	-.191*	.139***	.060
	(.052)	(.057)	(.084)	(.046)	(.102)	(.097)	(.037)	(.068)
N	20,271	14,015	4,383	15,888	2,231	2,152	8,086	7,802
R^2	.164	.140	.162	.145	.192	.164	.153	.148
Nepal								
Hindu	.065	.059	.015	.085**	.240	-.325	.019	.144*
	(.047)	(.046)	(.124)	(.043)	(.123)	(.244)	(.016)	(.054)
N	9,149	7,653	1,877	7,272	941	936	3,637	3,635
R^2	.181	.150	.218	.155	.253	.251	.147	.169
Includes child, woman, household and region- or state-specific characteristics	YES	YES	YES	YES	YES	YES	YES	YES
Includes month of conception and year of birth Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Includes time dummies, state (or region) dummies, and their interactions	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Weighted to national level using weights provided by the DHS. Standard errors in parentheses are clustered by state or region. The notation *** is p<0.01, ** is p<0.05, * is p<0.10. Regressions include observations on Hindus and Muslims only – the Hindu dummy is thus interpreted in relation to Muslims.

Table 6. Coefficients for the difference in means between Hindu children 0-12 months and 13-59 months in each country

Variable	INDIA	BANGLADESH	NEPAL
Height-for-age z-score	0.350***	0.338***	0.534***
	(0.022)	(0.072)	(0.056)
Weight-for-age z-score	0.112***	0.232***	0.120***
	(0.017)	(0.062)	(0.046)
Dummy for male child	-0.011	0.012	0.007
	(0.007)	(0.026)	(0.021)
Dummy for child had	0.119***	0.037***	0.134***
diarrhea in last two weeks	(0.005)	(0.012)	(0.015)
Dummy for child had	0.088***	0.119***	0.095***
fever in last two weeks	(0.005)	(0.024)	(0.017)
Hemoglobin level (g/dl)	-0.512***		-1.097***
	(0.022)		(0.056)
Dummy for had prenatal or	0.062***	0.138***	0.065***
antenatal check with doc.	(0.007)	(0.024)	(0.017)
Age at first marriage	-0.175***	0.173	0.061
	(0.038)	(0.151)	(0.118)
Dummy for woman is	-0.073***	0.038	0.025
Literate	(0.006)	(0.025)	(0.021)
Dummy for woman smokes	-0.034***		-0.015
cigs./pipe/tobacco/other	(0.003)		(0.016)
Woman's height	-0.375***	-0.203	0.306
(cms.)	(0.080)	(0.329)	(0.237)
Woman's hemoglobin	-0.038*		-0.119*
level (g/dl)	(0.023)		(0.071)
Dummy for woman is	-0.035***	-0.057***	-0.006
currently working	(0.006)	(0.021)	(0.019)
Dummy for husband	0.016**	-0.043*	-0.043**
has no education	(0.006)	(0.024)	(0.017)
Rural household	0.040***	0.003	0.021*
	(0.005)	(0.018)	(0.012)
Dummy for household	-0.040***	0.025	-0.012
has electricity	(0.007)	(0.025)	(0.021)
Source of drinking water:	-0.029***	0.005	-0.006
piped water	(0.006)	(0.011)	(0.020)
Toilet facility is: flush toilet	-0.062***	0.022	-0.004
	(0.005)	(0.015)	(0.018)

Notes: Weighted to national levels by weights provided by the DHS. Standard deviations in parentheses. The notation *** is $p<0.01$, ** is $p<0.05$, * is $p<0.10$.

Table 7. OLS regression results for Young Lives sample: *Dependent variable: height-for-age z-score*

	All children 0-12 months	All children 13-59 months	Same children 0-12 months	Same children 13-59 months
India				
Lower caste Hindu	.026	.336	.480	.388
	(.125)	(.198)	(.313)	(.272)
Upper caste Hindu	.109	.333**	.347	.503*
	(.140)	(.150)	(.346)	(.256)
N	979	1054	230	230
R^2	.432	.476	.678	.698
Includes child, woman, and household-specific characteristics	YES	YES	YES	YES
Includes time dummies, site (cluster) dummies, state dummies, and their interactions	YES	YES	YES	YES

Notes: Standard errors in parentheses are clustered by site (cluster). The notation *** is p<0.01, ** is p<0.05, * is p<0.10. Regressions include observations on Hindus and Muslims only – the Hindu dummy is thus interpreted in relation to Muslims. There are fewer children in these models than in Appendix Table 2 given the age cut-offs.

Table 8. Specification checks for India

Included independent variable	*Hemoglobin level*		*Ramadan trimester exposure*		*Disease, rainfall, Ramadan*	
	0-12 months	13-59 months	0-12 months	13-59 months	0-12 months	13-59 months
Height-for-age z-score						
Lower caste Hindu	-.354**	.106**	-.375**	.031	-.398**	.070
	(.133)	(.051)	(0.141)	(0.082)	(.152)	(.081)
Upper caste Hindu	-.115	.107**	-.163	0.077	-.212	.136*
	(.084)	(.042)	(.138)	(0.071)	(.145)	(.074)
N	4,183	25,803	7,197	27,555	5,489	13,021
R^2	.152	.184	0.122	0.155	.128	.164
Weight-for-age z-score						
Lower caste Hindu	-.268***	-.016	-.350***	-.045	-.364***	-.054
	(.090)	(.037)	(0.068)	(.053)	(.077)	(.049)
Upper caste Hindu	-.162*	.042	-.244***	0.041	-.276***	.048
	(.079)	(.030)	(0.071)	(.045)	(.069)	(.048)
N	4,183	25,803	7,197	27,555	5,489	13,021
R^2	.173	.187	0.146	0.168	.149	.164
Includes child, woman, household and region-specific Characteristics	YES	YES	YES	YES	YES	YES
Includes month of concept. and year of birth dummies	YES	YES	YES	YES	YES	YES
Includes time dummies, region dummies, and their Interactions	YES	YES	YES	YES	YES	YES

Notes: Weighted to national level using weights provided by the DHS. Standard errors in parentheses are clustered by state. The notation *** is p<0.01, ** is p<0.05, * is p<0.10. Regressions include Hindus and Muslims only.

Appendix Table 1 (Table 2 continued). Summary statistics by country and religion

	INDIA		BANGLADESH		NEPAL	
Variable	HINDU	MUSLIM	HINDU	MUSLIM	HINDU	MUSLIM
Woman-specific contd.						
Husband's age	31.749	33.176	35.289	35.109	31.727	33.086
	(7.429)	(7.889)	(7.732)	(8.527)	(7.889)	(8.565)
Dummy for husband	0.268	0.383	0.292	0.372	0.286	0.576
has no education	(0.443)	(0.486)	(0.455)	(0.483)	(0.452)	(0.495)
Dummy for husband has	0.161	0.203	0.268	0.278	0.273	0.222
some or all prim. School	(0.368)	(0.402)	(0.443)	(0.448)	(0.445)	(0.416)
Dummy for husband has	0.366	0.295	0.249	0.194	0.275	0.120
some secondary school	(0.482)	(0.456)	(0.433)	(0.395)	(0.446)	(0.326)
Dummy for husband comp.	0.200	0.111	0.191	0.157	0.167	0.082
secondary school or higher	(0.400)	(0.314)	(0.394)	(0.363)	(0.373)	(0.274)
Dummy for husband works	0.982	0.982	1.000	1.000	0.998	0.994
outside the home	(0.132)	(0.133)	(0.000)	(0.000)	(0.050)	(0.079)

Notes: Weighted to national levels by weights provided by the DHS. Standard deviations in parentheses. Total number of observations for India is 55,905 of which 45, 805 (81.93 percent) are Hindus and 10,074 (18.02 percent) are Muslim. Total number of observations for Bangladesh is 23, 123 of which 2,130 (9.21 percent) are Hindus and 20,993(90.79 percent) are Muslims. Total number of observations for Nepal is 11,872 of which 11,296 (95.15 percent) are Hindus and 576 (4.85 percent) are Muslims. Table reports statistics at the unique level for children (aged four years or lower), women and households.

Appendix Table 2. Full set of results for "All" models in main results

	INDIA		BANGLADESH		NEPAL	
Variable	height z	weight z	height z	weight z	height z	weight z
Order of birth	-0.077***	-0.047***	-0.081***	-0.048***	-0.060*	-0.038*
	(0.015)	(0.015)	(0.013)	(0.004)	(0.024)	(0.014)
Dummy for male child	-0.016	0.037	0.001	0.054**	0.003	0.052***
	(0.018)	(0.022)	(0.024)	(0.019)	(0.014)	(0.008)
Dummy for child was	-0.028	-0.070*	-0.045	0.004	0.263	-0.040
nursed	(0.035)	(0.037)	(0.083)	(0.068)	(0.351)	(0.281)
Dummy for child had	-0.067*	-0.096***	-0.069**	-0.107***	-0.132**	-0.137**
diarrhea in last two weeks	(0.037)	(0.033)	(0.025)	(0.015)	(0.031)	(0.040)
Dummy for child had	-0.049*	-0.122***	-0.088*	-0.184***	-0.070	-0.151**
fever in last two weeks	(0.025)	(0.015)	(0.038)	(0.027)	(0.042)	(0.048)
Dummy for child had	0.015	0.026	-0.003	0.015	0.097	0.072*
cough in last two weeks	(0.029)	(0.027)	(0.029)	(0.021)	(0.049)	(0.029)
Dummy for had prenatal or	0.096***	0.125***	0.148***	0.136***	0.141**	0.139***
antenatal check with doc.	(0.027)	(0.013)	(0.026)	(0.016)	(0.036)	(0.023)
Age of woman	0.196***	0.081**	0.017	0.032	-0.064	-0.158**
	(0.034)	(0.034)	(0.042)	(0.032)	(0.064)	(0.053)
Age at birth	-0.164***	-0.067*	0.006	-0.015	0.082	0.165**
	(0.033)	(0.033)	(0.038)	(0.032)	(0.068)	(0.058)
Dummy for woman is	0.133***	0.141***	0.046*	0.082***	0.209***	0.177***
literate	(0.029)	(0.020)	(0.023)	(0.015)	(0.038)	(0.022)
Dummy for woman smokes	-0.014	-0.034			-0.187**	-0.002
cigs./pipe/tobacco/other	(0.056)	(0.042)			(0.045)	(0.025)
Woman's height	0.048***	0.034***	0.037***	0.026***	0.049***	0.033***
(cms.)	(0.002)	(0.002)	(0.005)	(0.004)	(0.001)	(0.002)
Age at first marriage	-0.007	-0.005*	-0.005	-0.003	-0.003	0.009
	(0.004)	(0.003)	(0.004)	(0.002)	(0.011)	(0.008)
Dummy for woman is	-0.040*	-0.045**	0.0003	-0.001	0.032	0.033
currently working	(0.020)	(0.020)	(0.030)	(0.041)	(0.039)	(0.031)
Husband's age	-0.001	-0.001	0.003	-0.0002	0.000	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Dummy for husband has	0.056*	0.029	0.049**	0.030**	0.029	0.071*
some or all prim. school	(0.032)	(0.018)	(0.020)	(0.009)	(0.043)	(0.029)
Dummy for husband has	0.092**	0.068**	0.148***	0.065*	0.045	0.073**
some secondary school	(0.043)	(0.025)	(0.021)	(0.034)	(0.031)	(0.025)
Dummy for husband comp.	0.262***	0.240***	0.360***	0.277***	0.140**	0.179***
secondary school or higher	(0.060)	(0.030)	(0.049)	(0.060)	(0.038)	(0.032)
Dummy for husband works	0.059	-0.062			0.211	0.279*
outside the home	(0.066)	(0.078)			(0.181)	(0.113)
Rural household	-0.002	-0.015	0.027	0.007	-0.093**	-0.166**
	(0.032)	(0.020)	(0.018)	(0.017)	(0.032)	(0.044)

Appendix Table 2. Full set of results for "All" models in main results

	INDIA		BANGLADESH		NEPAL	
Variable	height z	weight z	height z	weight z	height z	weight z
Age of household head	0.001	0.000	-0.0005	0.0003	-0.002	-0.001
	(0.001)	(0.001)	(0.0006)	(0.001)	(0.001)	(0.001)
Dummy for household has	-0.014	0.013	-0.027	-0.045***	-0.017	-0.062***
male head	(0.029)	(0.026)	(0.026)	(0.007)	(0.033)	(0.009)
Dummy for household religion is			0.080*	0.053	0.156***	0.065
Hinduism			(0.039)	(0.052)	(0.039)	(0.041)
Dummy for household is	-0.001	-0.076				
lower-caste Hindu	(0.048)	(0.047)				
Dummy for household is upper-	0.076**	0.013				
caste Hindu	(0.032)	(0.037)				
Dummy for household owns a	0.035	0.005	0.081***	0.049***	0.080	0.082*
radio or transistor	(0.036)	(0.020)	(0.012)	(0.011)	(0.040)	(0.030)
Dummy for household	0.088***	0.088***	0.119***	0.123***	0.137***	0.032
owns a television	(0.027)	(0.021)	(0.027)	(0.027)	(0.019)	(0.036)
Dummy for household	0.168***	0.161***	0.181***	0.234***	0.577***	0.383***
owns a refrigerator	(0.045)	(0.042)	(0.043)	(0.049)	(0.040)	(0.079)
Dummy for household	0.154***	0.118***	0.136*	0.081	-0.088	-0.092
owns a motorcycle	(0.029)	(0.022)	(0.057)	(0.044)	(0.126)	(0.101)
Dummy for household	0.209**	0.117**	0.128	0.383	-0.239	-0.229*
owns a car	(0.085)	(0.054)	(0.167)	(0.289)	(0.130)	(0.104)
Dummy for household	0.097***	0.055**	0.117***	0.106***	0.073	0.093
owns electricity	(0.028)	(0.025)	(0.014)	(0.026)	(0.074)	(0.058)
Source of drinking water:	-0.035	-0.003	-0.059	-0.036	0.273***	-0.071
ground water	(0.035)	(0.033)	(0.075)	(0.051)	(0.056)	(0.042)
Source of drinking water:	0.064**	0.014	-0.125	-0.126	0.323**	0.027
well water	(0.030)	(0.033)	(0.133)	(0.145)	(0.080)	(0.066)
Source of drinking water:	0.093	0.060	-0.127	-0.052	0.027	-0.008
surface water	(0.081)	(0.044)	(0.073)	(0.078)	(0.022)	(0.007)
Source of drinking water:	0.025	0.123*	0.324	0.075	0.087	-0.045
rainwater, tanker truck, other	(0.114)	(0.067)	(0.203)	(0.327)	(0.446)	(0.352)
Toilet facility is: flush toilet	0.199***	0.050	0.087*	0.120***	-0.063	0.311***
	(0.053)	(0.039)	(0.042)	(0.022)	(0.104)	(0.053)
Toilet facility is: pit toilet/	0.098	0.025	0.021	0.022	-0.169*	0.166**
Latrine	(0.059)	(0.045)	(0.026)	(0.134)	(0.075)	(0.037)
Toilet facility is: no facility/	0.040	-0.081	-0.114***	-0.124***	-0.259**	0.083*
bush/field	(0.036)	(0.049)	(0.033)	(0.024)	(0.077)	(0.034)
Years lived in place of	-0.001	-0.001			-0.000	-0.001
Residence	(0.001)	(0.001)			(0.002)	(0.002)
Per capita GDP	0.000***	0.000***			0.000***	0.000**
	(0.000)	(0.000)			(0.000)	(0.000)

Appendix Table 2. Full set of results for "All" models in main results

	INDIA		BANGLADESH		NEPAL	
Variable	height z	weight z	height z	weight z	height z	weight z
N	34,752	34,752	20,271	20,271	9,149	9,149
R^2	0.197	0.169	0.196	0.164	0.269	0.181

Notes: Weighted to national levels by weights provided by the DHS. Standard errors clustered by region in parentheses. . The notation *** is p<0.01, ** is p<0.05, * is p<0.10. Regressions include Hindus and Muslims only. There is no information on smoking, years lived in current residence, or regional GDP per capita in the Bangladesh data. All husbands report working outside of the home in Bangladesh; the coefficient is thus not identified.

Appendix Table 3. Summary statistics for Young Lives sample (2002 and 2006)

	INDIA	
Variable	HINDU	MUSLIM
Dependent variables		
Height-for-age z-score	-1.320	-1.115
	(1.449)	(1.437)
Child-specific		
Age in months	14.463	13.458
	(11.996)	(9.455)
Order of birth	1.867	2.00
	(0.991)	(1.006)
Dummy for male child	0.528	0.639
	(0.499)	(0.482)
Dummy for child's health is same	0.880	0.915
or above others of this age	(0.325)	(0.279)
Dummy for child was nursed	0.964	0.935
	(0.187)	(0.246)
Dummy for child has long-term	0.060	0.056
health problems	(0.238)	(0.231)
Child's weight in kilograms	8.209	8.335
	(2.026)	(1.673)
Woman-specific		
Dummy for had prenatal or	0.549	0.787
antenatal check with doc.	(0.498)	(0.411)
Age of woman	23.774	25.046
	(4.373)	(5.008)
Age at birth	22.571	23.922
	(4.259)	(4.904)
Woman's height	151.298	152.990
(cms.)	(6.611)	(5.173)
Dummy for woman is	0.538	0.194
currently working	(0.499)	(0.396)
Husband's age	29.777	31.138
	(5.791)	(6.513)
Dummy for husband	0.335	0.187
has no education	(0.472)	(0.391)
Dummy for husband has	0.228	0.245
some or all prim. School	(0.420)	(0.432)
Dummy for husband has	0.155	0.181
some secondary school	(0.362)	(0.386)
Dummy for husband comp.	0.281	0.387
secondary school or higher	(0.450)	(0.489)

Appendix Table 3. Summary statistics for Young Lives sample (2002 and 2006) continued

	INDIA	
Variable	HINDU	MUSLIM
Household-specific		
Rural household	0.793	0.239
	(0.405)	(0.428)
Household size	5.418	5.645
	(2.346)	(2.504)
Age of household head	39.960	40.490
	(14.776)	(15.517)
Dummy for household has	0.916	0.903
a male head	(0.278)	(0.297)
Dummy for household is	0.348	
lower caste Hindu	(0.476)	
Dummy for household is	0.652	
upper caste Hindu	(0.476)	
Dummy for household religion is		1.000
Islam		(0.000)
Dummy for household owns a	0.215	0.258
radio or transistor	(0.411)	(0.439)
Dummy for household	0.048	0.148
owns a refrigerator	(0.215)	(0.357)
Dummy for household	0.009	0.026
owns a car	(0.093)	(0.159)
Dummy for household	0.811	0.961
owns electricity	(0.391)	(0.194)
Source of drinking water:	0.144	0.465
piped water	(0.351)	(0.500)
Source of drinking water:	0.071	0.097
ground water	(0.256)	(0.297)
Source of drinking water:	0.623	0.381
well water	(0.485)	(0.487)
Source of drinking water:	0.148	0.045
surface water	(0.355)	(0.208)
Source of drinking water:	0.015	0.013
rainwater, tanker truck, other	(0.120)	(0.113)
Toilet facility is: flush toilet	0.157	0.490
	(0.364)	(0.502)
Toilet facility is: pit toilet/	0.099	0.303
latrine	(0.299)	(0.461)
Toilet facility is: no facility/	0.739	0.194
bush/field	(0.439)	(0.396)

Appendix Table 3. Summary statistics for Young Lives sample (2002 and 2006) continued

	INDIA	
Variable	HINDU	MUSLIM
Household-specific contd.		
Toilet facility is: other	0.005	0.013
	(0.070)	(0.113)
Years lived in place of	10.199	10.506
Residence	(9.342)	(9.774)

Notes: Standard deviations in parentheses. Total number of observations is 1,897 children in 2002 of which 92 percent are Hindu and 8 percent are Muslims. Total number of observations is 1,931 children in 2006 of which 93 percent are Hindu and 7 percent are Muslim. Children with other religious affiliations are excluded in both years. Table reports statistics at the unique level for children (aged 5-76 months), women and households.