Seasonal Effects of Water Quality: The Hidden Costs of the Green Revolution to Infant and Child Health in India

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Religion and Health in Early Childhood: Evidence from the Indian Subcontinent

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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. Results confirm a relative Muslim advantage for children less than 12 months of age in height-for-age and weight-for-age z scores primarily in India, possibly reflecting better nutritional intake from a non-vegetarian diet and the positive health endowment of Muslim women who tend to be taller than Hindu women. 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 to affirm these findings.

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

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I. Introduction

Children in the Indian subcontinent are among the most undernourished in the world. In Bangladesh and Nepal, for example, over half of the children under five years of age suffer from chronic malnutrition. In India, the share of children who are stunted or of low weight-for-age exceed the proportion of children with these markers of undernourishment 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). 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 arising from differences in son preference across religions. All of these are factors that may contribute to the high rate of stunting and wasting among the children of India, Nepal and Bangladesh. Since one is born into one's religious identity and marriage is restricted to one's caste and faith in these regions,[1] these three countries provide an especially pertinent context in which to analyze the causes of inequality in child health status by religious identity.

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

We focus on children from birth to four 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 2012). 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 2012; Brainerd and Menon 2012).

One of the puzzling features of the persistent undernutrition in South Asia is its relatively low responsiveness to the rapid economic growth rates in the last two decades. Real GDP per capita nearly tripled in India between 1990 and 2010 and doubled in Bangladesh over the same period (Figure 1). Growth by this measure increased more slowly in Nepal but real GDP per capita was nevertheless roughly 50 percent higher by the end of the period. In all three countries, however, rates of stunting and undernourishment remain stubbornly high: according to World Bank data, the prevalence of stunting in India was 66.2 percent in 1990 versus 47.9 percent in 2007.[2] The measures of stunting and undernourishment (low weight-for-age) are among the highest in the world, and are higher than in countries in sub-Saharan Africa with a similar level of GDP per capita (approximately $400 per capita), as illustrated in Figure 2.

This paper uses two datasets to assess inequalities in child health by religion. We begin by using the two most recent rounds of the Demographic and Health Surveys (DHS) for India,

[2] This is the share of children under age 5 whose height-for-age z-scores are at least 2 standard deviations below the mean for the reference population. Source: WDI, accessed Nov. 29, 2012.

Bangladesh and Nepal to examine differences in child anthropometric measures by religion and gender within each country, and how these differences have evolved over time.[3] 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 – 2007 (depending on the country), a time span in which all three countries experienced strong economic growth and declining poverty rates. Our results indicate that in India and Bangladesh, Muslim infants (age less than 12 months) have a significant advantage in height-for-age and weight-for-age z scores over Hindu infants. Beyond 12 months of age, however, the advantage is reversed, and Hindu children are significantly taller and heavier than Muslim children up to age four. Next we use the first two rounds of Young Lives (YL) data from Andhra Pradesh, India to corroborate these results. The YL data are a longitudinal data set that tracks anthropometric and other measures for two thousand children beginning from age 6-18 months in 2002; the same cohort is tracked in 2006 and 2009. The YL data allow tests to rule out mortality selection and confirm the patterns in the DHS data sets. We end the paper by considering possible explanations of our findings; overall the reversion in child health status beyond the first year remains robust across these countries.

II. Background and previous 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

[3] We cannot use all three of the available rounds for each country since child anthropometric information is missing in the earliest Bangladesh DHS.

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 as opposed to 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.[4]

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 population. Only half of the adult female population in the region is literate and populations are largely rural (ranging from 70 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).[5]

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

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[4] 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 India.

[5] We would have liked to use data from Pakistan as well. However, there is no comparable round of data for Pakistan from the late 1990s in the DHS.

Hindu majorities whereas Bangladesh has a Muslim majority.[6] 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, access to medical care and diet among Hindus and Muslims. In particular, while Muslim women tend to be taller, to smoke or chew tobacco more and to have higher levels of hemoglobin, they are less educated, marry at a younger age, less likely to work and less likely to seek prenatal or antenatal care from a doctor, compared to Hindu women. Differences in seeking 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.

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

[6] 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, over 90 percent of households are Muslim versus 10 percent Hindu.

infants and young children in developed countries. Further, Bhalotra *et al*. (2010) demonstrates that within India, Muslim children have a significantly higher probability of infant survival than do Hindu children, despite the lower socioeconomic status of Muslims in India (the reversal in child health outcomes beyond infancy is not addressed in this paper). Beyond these three papers, however, few papers have investigated the impact of religion-based practices on child health.

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 a variety of 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, but may also reduce the status of women in the family and society more generally. Some analysts argue (Menon 2012), in fact, 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 higher risk of poor infant health outcomes; in addition young age at marriage indicates 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 test this hypothesis in our empirical work (described below) using a control for the woman's age at first marriage as a proxy for female empowerment. We also control for the woman's age at birth.

We conclude this discussion by noting the controversy regarding the nutritional status indicators used in this and other papers. Like most researchers in this area, we use the standard measures of height-for-age and weight-for-age provided in the DHS and the Young Lives data for India in our analysis. These indicators are based on the WHO growth charts of well-nourished children in a variety of countries (Brazil, Ghana, India, Norway, Oman and the United States) whose mothers do not smoke and who are raised in a healthy environment. The use of an international reference population is based on numerous growth studies indicating that there are few ethnic differences in growth potential across populations. While genes are important determinants of individual height, studies of genetically similar and dissimilar populations under various environmental conditions indicate that differences in height across most populations are largely due to environmental factors: despite differences in genetic make-up, different populations are capable of growing at similar rates. In other words, well-nourished populations tend to follow the same growth curves whether the population is European, African, or North American in origin (Martorell and Habicht 1986).

Bhagwati and Panagariya (2012) question whether an international reference population is appropriate for measuring child health status in India; these authors argue that Indian children may indeed be genetically shorter and lighter than the WHO reference population, so the nutritional deficiencies among the population are highly exaggerated. While we acknowledge this possibility, we take the view articulated in Deaton and Drèze (2009) that the scientific evidence for this position is weak due to the historical catch-up in height differences across many populations that were once presumed to be due to genetics. Moreover, given that the average height of children in India, Bangladesh and Nepal is nearly two standard deviations below that of the average child in the reference population, it is still of value to investigate the source of this deficiency, regardless of the benchmark used for comparison.

III. Methodology

We use linear regression models in investigating 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 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, child's hemoglobin level for India and Nepal, and indicators for whether child was exposed to Ramadan *in utero* in either the first, second or third trimesters), 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). 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 second round (2005-06 for India, 2007 for Bangladesh and 2006 for Nepal) 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. 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 the most recent two rounds of the Demographic and Health Surveys for each country: India 1998-99 and 2005-06, Bangladesh 1999-2000 and 2007, and Nepal 2001 and 2006, and keep children aged four years and below since anthropometrics are reported consistently only for this age-group. 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 four. 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 both survey rounds for each country), separated by religion. Table 3 reports summary statistics for state-specific characteristics for both survey rounds in each country. At each level (child-specific, women-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 (for children less than or equal to four years of age), women-specific variables are reported for each woman so that the number of births a woman has had does not weight her importance in the summary statistics.

The summary statistics for the child outcomes we study are shown in the top panel of Table 2. As discussed previously, 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).[7] 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 -1.7 in India and Bangladesh and is slightly worse in Nepal at -1.9; two standard deviations below the mean of zero is considered to be stunted. 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 -1.9 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.[8] Muslims tend to have larger families as evident from the summary statistics for the order of birth variable, and 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,

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[7] Deaton and Dreze (2009) note that for Indian children, the weight-for-age z score is the preferred measure of under-weight (as opposed to weight-for-height).

[8] 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.

possibly reflecting their non-vegetarian diet.   However, Muslim children in Nepal do not show much of 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 (given the years of birth in the DHS rounds, children are at risk of exposure from 1993 to 2007).

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 to report smoking or chewing tobacco more (mainly 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 age ranges from 26 to 29 years and the average husband's age ranges from 32 to 36 years across the three countries. Although women in Bangladesh report relatively high rates of literacy, 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 reveal 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 is lower caste Hindus and 65 percent is upper caste Hindus in the Indian sample. Reflecting their minority status, only 18 percent of the population in India is Muslim. Alternatively, 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. 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; however, Muslims fare relatively better in terms of these measures in Bangladesh and Nepal. Finally, there is little evidence of recent migration within these countries since the average years of residence (years lived in current place of residence) ranges from 12 to 16 years, with Muslim households residing for relatively more years in their current place of residence within each country.

Table 3 reports descriptive statistics for variables at the regional level in the three countries.[9] Information on per capita GDP is collected from the Economic Organization and Public Policy Program (EOPP) database at the London School of Economics for India, and World Development Indicators, United Nations Development Program (UNDP) and International Monetary Fund (IMF) sources for Bangladesh and Nepal. Information on external deaths (described below), malaria and TB deaths, deaths from fever and regional numbers of primary and secondary schools are used in the robustness checks of the main results and are collected from different editions of country-specific *Statistical Yearbooks*, *Agricultural Statistics*, *Reports on Sample Vital Registration System of Bangladesh* and *Vital Statistics of India*. Table 3 reports that rainfall levels are comparatively high in Bangladesh and Nepal in relation to India. Finally, time-varying consumer price index (CPI) for India is for agricultural

[9] Note that per capita GDP is not comparable across countries in this table, as it is reported in national currency units. See Table 1 for a comparable measure, indicating that India has the highest per capita GDP of these countries.

laborers (base: 1986-87=100) and is collected from the *Statistical Yearbook of India 2013* and the *Statistical Pocketbook of India 2002*. Time-varying CPI for Nepal is for food and beverages in urban areas (base: 1995-96=100) and is collected from the *Statistical Yearbook of Nepal 2009*.

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 India and Nepal, Hindu children have higher z-scores than do Muslim children for the sample as a whole and for the rural population. In India the coefficient is .078 for upper caste Hindus, indicating that the height-for-age z-score for upper caste Hindu children is .078 standard deviations higher than for Muslim children, holding constant many characteristics of the child, mother, father, household, and state. In Nepal the coefficient on Hindu is .140, and as in the India regression, this is statistically significant at the five percent level. The coefficient on Hindu in Bangladesh is positive (.056) but statistically insignificant, possibly reflecting the minority status of Hindus in this country. Disaggregating by age, these better outcomes for Hindu children are apparent only for children aged one year and above; the coefficient on Hindu becomes statistically significant for Bangladesh as well when the regression is estimated only for children aged more than twelve months. The coefficient ranges from .112 in India to .148 in Nepal. Notably, the sign on the Hindu coefficient flips for children under one year of age in India and 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. These results for India and Bangladesh echo findings of a “Muslim advantage” in infant survival that has been documented in studies including Bhalotra *et al*. (2010).[10] Figure 3 plots coefficient estimates on the Hindu variable (with confidence levels) for children in the three countries disaggregated by six month age groups. From this it is clear that there is a Muslim advantage in infancy in India and Bangladesh, but transitions to a Hindu advantage (denoted by the point at which coefficient estimates cross the solid line at zero on the y-axis) in India occur shortly after 24 months for lower caste Hindu children and before 24 months for upper caste Hindu children. The transition to Hindu advantage in the Muslim majority country of Bangladesh occurs before 18 months of age; Muslim advantage is mostly absent in Nepal except for a brief manifestation among older children at 42 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 and for both boys and girls in Bangladesh. Son preference is a possible explanation for better male child outcomes in India although 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.[11] As expected, the worse outcomes for Hindu infants are true for girls in India, both lower caste and upper caste Hindu, while lower caste male infants are also disadvantaged relative to Muslim male infants by this measure. Hindu male infants compare favorably to Muslim male infants in Nepal (no evidence of a Muslim advantage); there is no evidence of a Muslim advantage among infants in Bangladesh either when the sample is disaggregated by gender. In summary, long-term health status as embodied in height-for-age z

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[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.

[11] 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. Hence son-preference and within-sibling differences do not appear to have implications for earlier or subsequent child anthropometric outcomes in these data.

scores indicates that Hindu children have an advantage over Muslim children in India, Bangladesh and Nepal, with most of this advantage appearing just beyond 12 months in age.

The results for weight-for-age z-scores presented in Table 5 are less clear-cut. 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. A Hindu advantage is evident for children in the 13-48 month age-group only in Bangladesh. As the estimates in Table 5 show, this Hindu advantage among Bangladeshi children 13-48 months in age is primarily for boys. Upper caste boy children in this age-group in India also depict a Hindu advantage. The other consistent finding for this measure is that infant girls in India in Hindu households have significantly lower weight-for-age z-scores than do infant girls in Muslim households. As above, these gender differences in health status among girl infants and children likely reflect the well-documented phenomenon of son preference in India, which also characterizes Nepal though to a lower extent (Rose 1999, Clark 2000). Muslim survival advantage in infancy is evident only for India in Table 5 where lower caste Hindu infants are found to have comparatively low weight-for-age z scores. In summary, the Hindu advantage evident in height-for-age z scores among children over 12 months of age resonates in terms of weight-for-age z scores primarily for India and Bangladesh, mainly for boy children.

Tables 4 and 5 show the results only for the main coefficient of interest (Hindu); however, several of the additional controls merit discussion.[12] 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

[12] The full set of results for the complete sample in each country is presented as Appendix Table 1.

have children who start out at a disadvantage at birth. Appendix Table 1 shows that the 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, and are intended as a proxy for the woman's bargaining position within the household; as discussed above women who are very young at marriage likely have lower status and less control over resources within the household.[13] The coefficient on mother's age at birth is positive and statistically significant mostly in Nepal, as expected, 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.) The indicator for whether child was nursed is insignificant in these models, possibly because rates of nursing are uniformly high with little variation.[14] Incidence of recent illness such as diarrhea and fever has strong negative effects on standardized measures of height and weight, whereas access to prenatal and antenatal care has significant beneficial impacts. Children of literate mothers fare better in all countries whereas maternal smoking has a

[13] Recent evidence in Coffey *et al*. (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.

[14] 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.

harmful effect mainly in terms of height-for-age z scores in Nepal. Working mothers have children who score lower on height and weight measures, but only in India, 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 India and Nepal, 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 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 the countries studied.

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 threshold. Hence, 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 India and Nepal even without conditioning on age. The first two columns of Table 4 show that in the full sample and in rural areas of these countries, Hindu children have an advantage compared to Muslim children. Since these samples include all children (no delineation by age), 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 portray itself in the older group of surviving children as a lower-caste Hindu advantage.

Second, we analyze whether there are systematic differences in observable and unobservable characteristics in the population of Hindu children, conditioning on age. Table 6 reports differences in means of characteristics between Hindu children 0-12 months and 13-48 months in the three countries. If it is indeed the case that older Hindu children are distinct compared to the younger group, 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 distinct across child age-groups. Those that favor older children in Bangladesh include only recent incidence of fever; as in the case of India, this variable is included in the main model and does not abate Hindu advantage beyond age one. The only variable that favors the older cohort of children in Nepal is the higher proportion of recent diarrhea among younger children. Again, this variable is included as a control 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.[15] 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. Summary statistics for the Young Lives data from rounds 2002 and 2006 in India are shown in Appendix Table 2 (as before, we keep only Hindu and Muslim children; less than 5 percent of children belong to other religious

[15] 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).

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 2.[16] From the first two columns, it is clear that an upper-caste Hindu advantage is still evident among children in the older age cohort (and Muslim advantage in infancy is absent). The last two columns of Table 7 address mortality 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

[16] 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.

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 the same children at two points in time, selective mortality by religion cannot be an explanatory factor.[17]

VII. Robustness checks

Assets, number of births and external deaths

In this section, we examine other causes that may underlie the reversal in Muslim advantage beyond infancy. It is possible that some of the differences in child health outcomes are due to differences in wealth or family size by religion. This is especially true in India where Muslims are, on average, of lower socio-economic status and have larger households. Table 8 presents several falsification tests to examine these explanations. The first two columns test whether wealth, as measured by assets owned by the household (since ownership of bicycles and motorcycles is fairly widespread, asset ownership is proxied by whether the household owns a car or a refrigerator), differs systematically between Hindu and Muslim households across the two child age-groups we analyze. As indicated in Table 8, there are no statistically significant differences in ownership of these consumer durables between religious groups across the child age-groups we study. Since this was a period of rapid economic growth especially in India and Bangladesh, it is notable that Hindus and Muslims did not differ in ownership of assets (which are thought to increase in times of prosperity) in these countries yet differed in terms of child health outcomes in infancy and beyond. This finding also plausibly rules out other omitted

[17] Alderman *et al*. (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.

variables that may be systematically correlated with religious identity and child anthropometric measures across these countries in consistent ways.

Another explanation for the results in Tables 4 and 5 is that family size varies systematically 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 important role in determining human capital outcomes. To assess whether this is a valid concern in our samples, the last two columns in Table 8 regress log number of births by year on the religion dummy variables and our full set of control variables (including child’s order of birth). There is no evidence that the number of births varies systematically by religious affiliation, indicating the absence of family size effects in these countries.

Table 8 also reports results for accidental deaths (for India and Bangladesh; there is no information for Nepal) as a falsification check. In India, these are defined as the state-wise number of deaths from bites/stings, accidental burns, falls, drowning, accidental poisoning, transport and other accidents, and suicides and homicides, normalized by total state population. In Bangladesh, external deaths are region-wise number of deaths from suicide, murder, burns, snake bites, accidents, poisoning, drowning and rabies per 100,000 people. There is no reason to expect a systematic association between such deaths and religious affiliation, and estimates in the third and fourth columns of Table 8 confirm that this is indeed the case.

VIII. Other possible explanations

Disease environment, public investments, rainfall, prices

Tables 9 and 10 present results for another set of specification checks for omitted variables that include incidence of diseases (malaria and tuberculosis), weather (rainfall) and prices.[18,19] Region and time-varying malaria and tuberculosis (TB) information is available for India (number of deaths from malaria and TB normalized by state population) and Bangladesh (death rate from fever due to malaria, typhoid, dengue, other, per 100,000 people, and death rate due to TB per 100,000 people) only. For Nepal, given the absence of malaria and TB data, we use information on public schools (number of primary and secondary schools by development region) to proxy for the disease environment which is affected by public investments in health and human capital (there is widespread evidence that government investments in schools and health clinics are correlated in that regions that receive more schools are also likely to receive more resources that build health; see Pitt *et al*. (1993)).[20] Controlling for disease is important

[18] In results not reported in the paper, 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 age-disaggregated 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*, various years, and for Bangladesh from *the Report on the Sample Vital Registration System*, various years.

[19] 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.

[20] There is little evidence of majority group favoritism in public-sector investments that augment human capital since these results are apparent for Hindus only with respect to Muslims (and not other minorities) in India and Nepal. Further, controlling for state-level public subsidies (measured by national central assistance) from 2000-2006 in India (these data are not available for Bangladesh or Nepal) does not change the age-disaggregated patterns even though such assistance has statistically significant positive

since it may directly impact child health, or have indirect effects by affecting mother's health (Brainerd and Menon 2012). Rainfall may have long-lasting implications for child's human capital as in Maccini and Yang (2009). Table 9 presents results for height-for-age z scores and Table 10 for weight-for-age z scores. For height-for-age in particular, controlling for malaria and TB, the number of schools, and average rainfall does not change the child health results. The Hindu advantage for older children remains apparent and does not diminish in the three countries. For weight-for-age in Table 10, the Hindu advantage in India and Nepal beyond age one is still evident but is measured imprecisely. In Bangladesh, a Muslim advantage in infancy still reverts to a Hindu advantage beyond the first year.[21]

We also examine the impact of food prices on child health outcomes, as proxied by the CPI (for agricultural laborers in India and food and beverage in urban areas in Nepal; no information is available for Bangladesh). Previous research has shown (Meng *et al*. 2009) that nutrient availability can decline during periods of economic growth due to increased food prices. As a result, the positive effect of income growth on nutrient availability may be more than offset by changing relative prices during a period of liberalization, as occurred in China in the mid-1990s. After controlling for price in the regressions, the coefficients on Hindu are virtually unchanged for India and Nepal as evident from the last two columns of Tables 9 and 10.[22]

Vegetarian diet (anemia) and in utero exposure to Ramadan fasting

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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.

[21] Since the dependent variables are z-scores, differences across religious populations in mean 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 do not matter.

[22] Further, adding region and time-varying controls for calories (in Kcal by rural/urban), protein intake (in g. by rural/urban) and fat intake (in g. by rural/urban) per capita per day in India did not change results.

Nutritional deficiencies from dietary restrictions may be another source of differences in the health of children in India, Nepal, and Bangladesh. 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.[23] 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 mainly Hindu, has a relatively large proportion of Muslims and Christians who follow a non-vegetarian diet. Even among non-vegetarians in India, consumption of meat and fish is not more frequent than once or twice a week, since these commodities are relatively expensive. Further, dedication to dietary restrictions is widespread; even wealthy upper-caste Hindus in India will almost never consume meat. Given the absence of detailed dietary information in the DHS data, we include measures of hemoglobin (Hb) levels for children and mothers in India and Nepal (no information on hemoglobin is available for Bangladesh). 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 low consumption of meat and fish.

The first two columns of Tables 11 and 12 present these results for height-for-age and weight-for-age z scores, respectively. It is clear that controlling for Hb levels does not eliminate the Hindu advantage among older children in terms of height-for-age in Table 11; even lower caste Hindu children appear to fare better compared to Muslim children in India after inclusion of this control. The previous pattern for Nepal continues to hold true. There is some loss in significance for the older group of Indian children in the weight-for-age regressions in Table 12; however, findings for Nepal continue to remain in line with those obtained before. These results

[23] The proportion of India that is strictly vegetarian (no meat or eggs) ranges from 20-31 percent.

underscore that differences in diet tied to religious affiliation do not explain the reversion from Muslim to Hindu advantage beyond age one.

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 consequences for child health and long-term well-being (Almond and Mazumder 2011 and van Ewijk 2011), then this might explain why the Muslim advantage in infancy dissipates beyond the first year. The DHS data contains information on month and year of birth of each child. Using a nine-month gestation cycle, we created month and year of conception variables for Muslim children in the three countries, and then based on retrospective information for the months in which Ramadan was observed from 1993 to 2007 (the earliest and most recent year of conception for children in our sample), created three indicator variables for whether Ramadan overlapped with pregnancy in the first, second or third trimesters. The third and fourth columns of Table 11 and 12 report results from the model that includes these trimester exposure variables. There is evidence in India and Nepal that including the Ramadan exposure measures diminishes the Hindu advantage beyond age one in height-for age. However, this is not true for older Hindu children in Bangladesh who continue to fare better than Muslim children.[24] Further, the Hindu advantage among children beyond the first year continues to remain evident in Nepal (and Bangladesh) when weight-for-age is taken into account. The final two columns of Tables 11 and 12 report results when all controls are considered together (disease, rainfall and Ramadan exposure are included together in the main models for standardized height and weight; we cannot include hemoglobin since as noted above, that information is absent for Bangladesh). The Hindu

[24] 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. These results are available on request.

advantage in height-for-age returns for older children in India and remains the same for older children in Bangladesh. Only in Nepal, where the proportion of Muslims is relatively low at 5 percent, does the Hindu advantage in children beyond 12 months of age remain absent. However, the last column of Table 12 shows that in terms of weight-for-age, the Hindu advantage is still evident among older children in Nepal. Hence, of all the factors we consider for the reversion in anthropometric measures beyond the first year, exposure to Ramadan appears to have the most explanatory power. However this is mostly for Nepal; previously documented patterns in the health of infants and older children continue to remain discernible in India and Bangladesh.

IX. Conclusion

The widespread malnutrition of children on the Indian subcontinent 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 of children and families, and to establish that remarkably similar patterns of child malnutrition by religious affiliation occur across all three countries we study: Muslim children less than a year old have better height-for-age and weight-for-age z scores than do Hindu children, but after one year of age this 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 status in the home (a proxy measure for rank and stress experienced during and after pregnancy), disease exposure, weather, food prices, hemoglobin levels, and *in utero* exposure to Ramadan.

The reversal in Muslim advantage in infancy to Hindu advantage among older children, even in a country with a Muslim majority, is a puzzle. In addition, these findings for older children indicate that although religion-based dietary restrictions may explain some part of childhood malnutrition in infants, it is unlikely to explain the relatively poor average health status of children beyond the first year in the Hindu majority countries of India and Nepal. These findings of relative differences by religion *within* countries also suggests that use of an inappropriate international benchmark for measuring child health (Bhagwati and Panagariya 2012) cannot fully account for why very young children in India, in particular, score so unfavorably in terms of standardized height-for-age and weight-for-age indicators.

Given the persistence of child stunting and wasting during a period of rising incomes and falling poverty rates, it seems clear that economic growth in and of itself is not a panacea for improving child health in this region. More targeted interventions are likely to be warranted, such as providing nutrient supplements to children who are most at risk, particularly in the early months and years of life. In addition, significant improvements in nutrition monitoring through more detailed micro-levels surveys of food consumption in all three countries would greatly aid researchers in assessing the caloric and nutrient needs of this vulnerable population.

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Figure 1: Trend in real GDP per capita

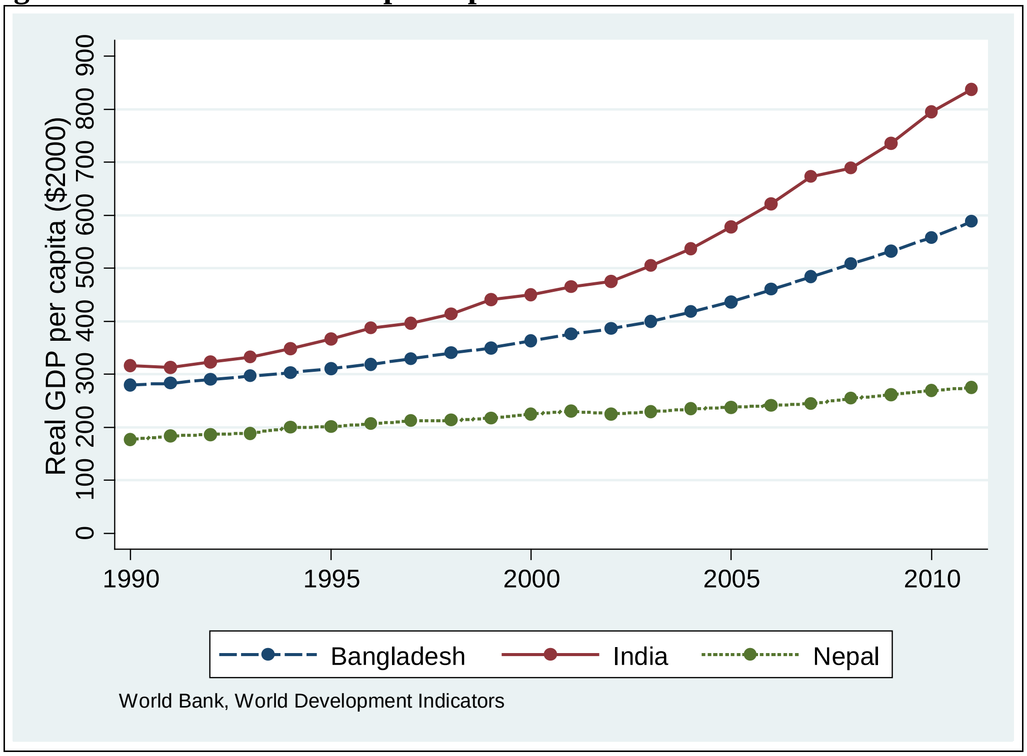


Figure 2: Child malnutrition, South Asia and Sub-Saharan Africa, 2004-2007

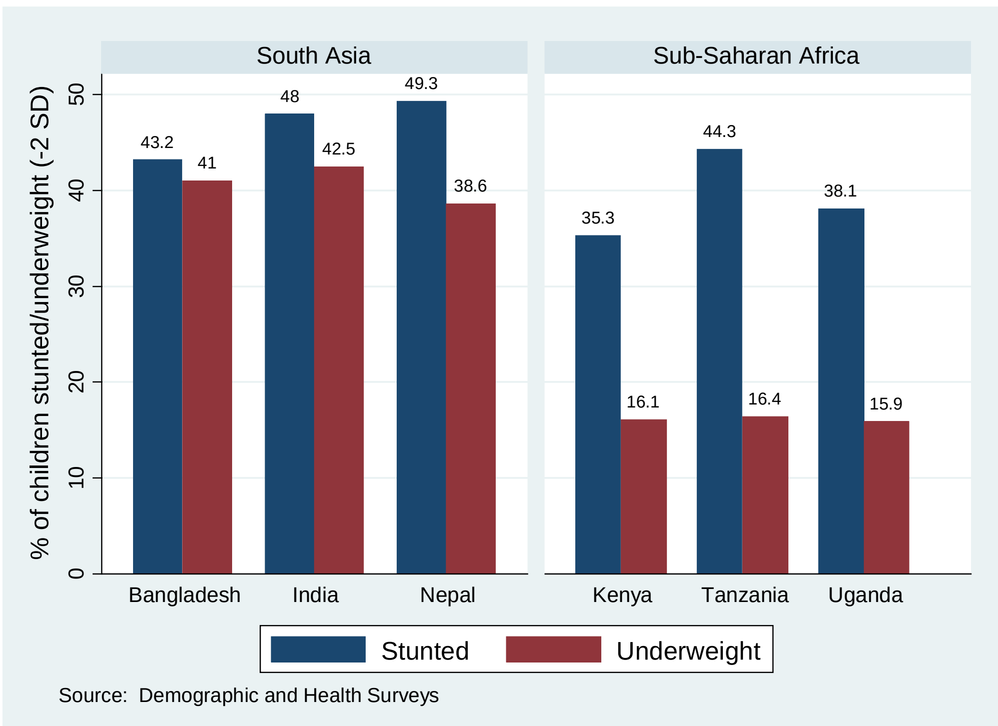
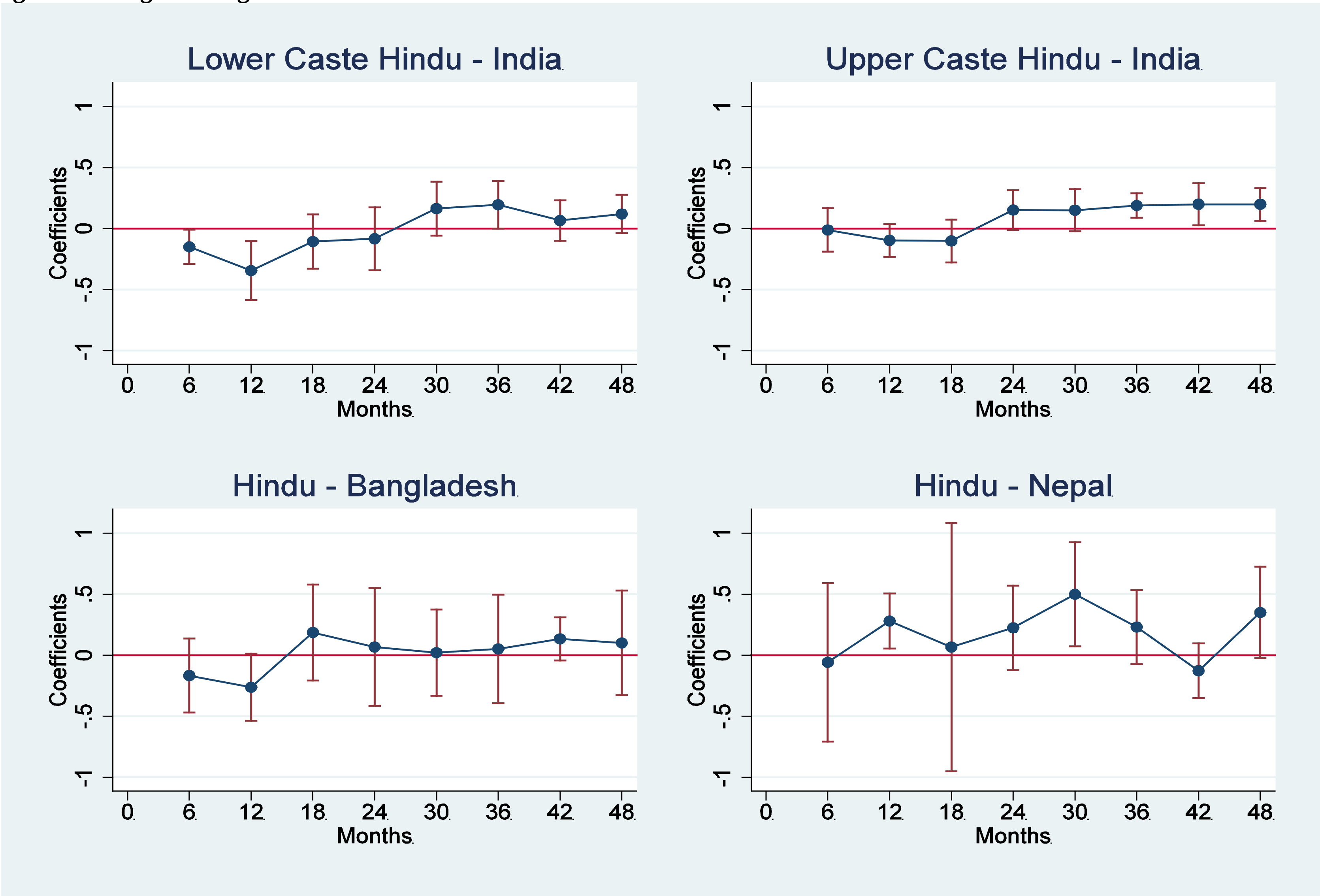


Figure 3: Height-for-age coefficient estimates and confidence levels of Hindu versus Muslim children



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	-1.763	-1.835	-1.685	-1.730	-1.904	-1.988
	(1.559)	(1.588)	(1.297)	(1.277)	(1.265)	(1.393)
Weight-for-age z score	-1.885	-1.877	-1.823	-1.868	-1.897	-2.044
	(1.183)	(1.182)	(1.087)	(1.026)	(1.008)	(1.079)
Child-specific						
Age in months	25.662	26.030	29.291	29.631	29.989	29.440
	(16.221)	(16.293)	(17.584)	(17.199)	(17.094)	(17.361)
Order of birth	2.759	3.381	2.459	2.864	3.055	3.632
	(1.840)	(2.228)	(1.576)	(1.925)	(2.037)	(2.294)
Dummy for male child	0.523	0.518	0.499	0.506	0.505	0.477
	(0.499)	(0.500)	(0.500)	(0.500)	(0.500)	(0.500)
Dummy for child was	0.922	0.919	0.991	0.990	0.997	0.992
nursed	(0.267)	(0.273)	(0.096)	(0.101)	(0.055)	(0.092)
Dummy for child had	0.126	0.137	0.060	0.082	0.163	0.219
diarrhea in last two weeks	(0.332)	(0.344)	(0.237)	(0.275)	(0.370)	(0.414)
Dummy for child had	0.194	0.256	0.331	0.391	0.249	0.349
fever in last two weeks	(0.396)	(0.437)	(0.471)	(0.488)	(0.432)	(0.477)
Dummy for child had	0.240	0.282	0.396	0.400	0.309	0.384
cough in last two weeks	(0.427)	(0.450)	(0.489)	(0.490)	(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		0.231		0.335
Ramadan in first trimester		(0.432)		(0.422)		(0.472)
Child was exposed to		0.235		0.219		0.260
Ramadan in second trim.		(0.424)		(0.413)		(0.439)
Child was exposed to		0.262		0.267		0.199
Ramadan in third trim.		(0.440)		(0.442)		(0.400)
Woman-specific						
Dummy for had prenatal or	0.525	0.503	0.301	0.267	0.191	0.114
antenatal check with doc.	(0.499)	(0.500)	(0.459)	(0.442)	(0.393)	(0.319)
Age of woman	25.946	26.757	26.093	25.943	27.413	28.696
	(5.432)	(6.072)	(6.187)	(6.545)	(6.412)	(6.972)
Age at birth	24.063	24.796	23.913	23.671	24.979	26.190
	(5.261)	(5.930)	(5.907)	(6.338)	(6.186)	(6.871)
Dummy for woman is	0.378	0.346	0.519	0.524	0.426	0.117
literate	(0.485)	(0.476)	(0.500)	(0.499)	(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

	INDIA		BANGLADESH		NEPAL	
Variable	HINDU	MUSLIM	HINDU	MUSLIM	HINDU	MUSLIM
Woman-specific contd.						
Woman's height	151.318	151.608	149.288	150.188	150.544	150.739
(cms.)	(6.123)	(5.616)	(8.343)	(7.681)	(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	16.094	15.030	16.756	15.546
	(3.137)	(2.844)	(3.079)	(2.645)	(2.681)	(1.776)
Dummy for woman is	0.336	0.189	0.258	0.236	0.792	0.425
currently working	(0.472)	(0.392)	(0.438)	(0.424)	(0.406)	(0.495)
Husband's age	31.749	33.176	35.879	35.209	31.727	33.086
	(7.429)	(7.889)	(8.247)	(8.246)	(7.889)	(8.565)
Dummy for husband	0.268	0.383	0.357	0.399	0.286	0.576
has no education	(0.443)	(0.486)	(0.479)	(0.490)	(0.452)	(0.495)
Dummy for husband has	0.161	0.203	0.245	0.270	0.273	0.222
some or all prim. School	(0.368)	(0.402)	(0.430)	(0.444)	(0.445)	(0.416)
Dummy for husband has	0.366	0.295	0.235	0.171	0.275	0.120
some secondary school	(0.482)	(0.456)	(0.424)	(0.377)	(0.446)	(0.326)
Dummy for husband comp.	0.200	0.111	0.163	0.159	0.167	0.082
secondary school or higher	(0.400)	(0.314)	(0.370)	(0.366)	(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)
Log of total number of births	8.888	8.887	6.836	6.858	6.960	6.975
by year of birth	(0.297)	(0.279)	(0.276)	(0.271)	(0.303)	(0.272)
Household-specific						
Rural household	0.768	0.684	0.801	0.805	0.899	0.899
	(0.422)	(0.465)	(0.399)	(0.397)	(0.302)	(0.302)
Age of household head	42.087	41.193	42.504	39.906	40.703	42.010
	(14.801)	(14.266)	(14.152)	(13.143)	(14.208)	(14.087)
Dummy for household has	0.918	0.876	0.955	0.928	0.832	0.863
a male head	(0.274)	(0.330)	(0.207)	(0.259)	(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	0.275	0.259	0.509	0.368
radio or transistor	(0.465)	(0.461)	(0.447)	(0.438)	(0.500)	(0.483)

Table 2. Summary statistics by country and religion continued

	INDIA		BANGLADESH		NEPAL	
Variable	HINDU	MUSLIM	HINDU	MUSLIM	HINDU	MUSLIM
Household-specific contd.						
Dummy for household	0.361	0.297	0.269	0.223	0.179	0.169
owns a television	(0.480)	(0.457)	(0.444)	(0.416)	(0.383)	(0.375)
Dummy for household	0.095	0.099	0.030	0.034	0.013	0.016
owns a refrigerator	(0.294)	(0.299)	(0.172)	(0.181)	(0.114)	(0.124)
Dummy for household	0.142	0.105	0.018	0.026	0.014	0.013
owns a motorcycle	(0.349)	(0.307)	(0.135)	(0.159)	(0.116)	(0.113)
Dummy for household	0.017	0.011	0.000	0.002	0.005	0.010
owns a car	(0.131)	(0.106)	(0.000)	(0.047)	(0.072)	(0.099)
Dummy for household	0.582	0.534	0.311	0.378	0.297	0.402
owns electricity	(0.493)	(0.499)	(0.463)	(0.485)	(0.457)	(0.491)
Source of drinking water:	0.332	0.299	0.060	0.056	0.335	0.056
piped water	(0.471)	(0.458)	(0.238)	(0.231)	(0.472)	(0.231)
Source of drinking water:	0.470	0.566	0.896	0.913	0.409	0.865
ground water	(0.499)	(0.496)	(0.305)	(0.281)	(0.492)	(0.342)
Source of drinking water:	0.164	0.106	0.011	0.007	0.039	0.050
well water	(0.370)	(0.308)	(0.106)	(0.081)	(0.193)	(0.219)
Source of drinking water:	0.024	0.021	0.032	0.023	0.217	0.029
surface water	(0.154)	(0.144)	(0.176)	(0.149)	(0.412)	(0.167)
Source of drinking water:	0.009	0.008	0.000	0.001	0.001	0.000
rainwater, tanker truck, other	(0.097)	(0.091)	(0.000)	(0.032)	(0.023)	(0.000)
Toilet facility is: flush toilet	0.252	0.331	0.135	0.160	0.151	0.094
	(0.434)	(0.471)	(0.342)	(0.366)	(0.358)	(0.293)
Toilet facility is: pit toilet/	0.051	0.161	0.645	0.643	0.171	0.038
latrine	(0.220)	(0.367)	(0.479)	(0.479)	(0.377)	(0.191)
Toilet facility is: no facility/	0.694	0.480	0.185	0.139	0.674	0.868
bush/field	(0.461)	(0.500)	(0.388)	(0.346)	(0.469)	(0.339)
Toilet facility is: other	0.003	0.029	0.035	0.058	0.007	0.000
	(0.051)	(0.168)	(0.183)	(0.234)	(0.086)	(0.000)
Years lived in place of	12.328	15.162	12.004	15.044	13.523	15.940
residence	(13.296)	(15.228)	(11.172)	(14.353)	(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, 831 (81.98 percent) are Hindus and 10,074 (18.02 percent) are Muslim. Total number of observations for Bangladesh is 10,189 of which 947 (9.29 percent) are Hindus and 9,242 (90.71 percent) are Muslims. Total number of observations for Nepal is 9,833 of which 9,342 (95.01 percent) are Hindus and 491 (4.99 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/region level variables

	INDIA	BANGLADESH	NEPAL
Per capita GDP	2398.417	69.045	2125.190
	(1059.193)	(14.430)	(461.573)
External deaths	0.000	7.102	
	(0.000)	(3.637)	
Fever (from malaria, flu, typhoid, dengue, other)-specific death rate per 100,000 people		7.823	
		(3.994)	
Tuberculosis-specific death rate per 100,000 people		2.175	
		(1.082)	
Malaria cases and Tuberculosis deaths as a ratio of total population	0.002		
	(0.003)		
Number of primary schools			5978.987
			(1786.584)
Number of secondary schools			1141.487
			(547.856)
Average annual rainfall in cms.	117.690	232.055	168.389
	(53.550)	(77.054)	(35.399)
Consumer price index	333.781		94.383
	(28.802)		(23.361)

Notes: Weighted to national levels by weights provided by the DHS. Standard deviations in parentheses. Table reports statistics at the unique level for regions. Per capita GDP for India is per capita net state domestic product (base 1980-1981), for Bangladesh is per capita gross regional domestic product (US dollars) and for Nepal is per capita gross regional domestic product (constant Nepali rupees). 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. External deaths in Bangladesh measures death rates due to suicide, murder, burns, snake bites, accidents, poisonings, drowning and rabies, per 100,000 population.

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

	All	Rural	All, 0-12 months	All, 13-48 months	Male, 0-12 months	Female, 0-12 months	Male, 13-48 months	Female, 13-48 months
India								
Lower caste Hindu	.004	.034	-.239***	.063	-.188*	-.286***	.082*	.040
	(.043)	(.056)	(.077)	(.046)	(.102)	(.088)	(.047)	(.051)
Upper caste Hindu	.078**	.121***	-.061	.112***	.003	-.136**	.160***	.060
	(.028)	(.035)	(.054)	(.035)	(.010)	(.049)	(.041)	(.053)
N	36,613	23,036	7,909	28,704	4,097	3,812	15,178	13,526
R^2	.187	.179	.133	.151	.156	.133	.153	.155
Bangladesh								
Hindu	.056	.047	-.199*	.129**	-.142	-.239	.116***	.153**
	(.039)	(.051)	(.084)	(.041)	(.115)	(.141)	(.026)	(.054)
N	9,759	6,812	2,066	7,693	1,062	1,004	3,895	3,798
R^2	.190	.181	.145	.155	.188	.161	.161	.165
Nepal								
Hindu	.140**	.138***	.115	.148***	.475***	-.263	.088	.200
	(.029)	(.022)	(.077)	(.022)	(.062)	(.130)	(.081)	(.102)
N	9,321	7,813	1,912	7,409	959	953	3,708	3,701
R^2	.266	.258	.232	.178	.281	.255	.182	.193
Includes child, woman, household and region-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, 13-48 months	Male, 0-12 months	Female, 0-12 months	Male, 13-48 months	Female, 13-48 months
India								
Lower caste Hindu	-.061	-.065	-.203**	-.025	-.122	-.284***	-.008	-.039
	(.045)	(.060)	(.082)	(.038)	(.096)	(.092)	(.047)	(.037)
Upper caste Hindu	.011	.011	-.120	.046	-.020	-.231**	.081**	.015
	(.037)	(.049)	(.077)	(.031)	(.091)	(.092)	(.038)	(.035)
N	36,613	23,036	7,909	28,704	4,097	3,812	15,178	13,526
R^2	.197	.188	.199	.163	.221	.200	.174	.157
Bangladesh								
Hindu	.030	-.003	-.143	.082*	-.106	-.167	.077*	.088
	(.037)	(.033)	(.050)	(.038)	(.115)	(.093)	(.031)	(.081)
N	9,759	6,812	2,066	7,693	1,062	1,004	3,895	3,798
R^2	.207	.201	.264	.137	.312	.261	.153	.131
Nepal								
Hindu	.043	.035	.048	.055	.288**	-.255	.025	.072
	(.038)	(.037)	(.070)	(.027)	(.071)	(.191)	(.032)	(.052)
N	9,321	7,813	1,912	7,409	959	953	3,708	3,701
R^2	.247	.233	.336	.162	.374	.356	.166	.176
Includes child, woman, household and region-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. Differences in mean observable characteristics by age-group among Hindu children

Variable	INDIA	BANGLADESH	NEPAL
Height-for-age z score	0.120***	0.359***	0.386***
	(0.024)	(0.093)	(0.053)
Weight-for-age z score	0.036**	0.281***	0.016
	(0.018)	(0.083)	(0.042)
Dummy for male child	0.004	0.014	0.006
	(0.008)	(0.038)	(0.022)
Dummy for child had	0.110***	0.026	0.137***
diarrhea in last two weeks	(0.05)	(0.019)	(0.015)
Dummy for child had	0.075***	0.092**	0.098***
fever in last two weeks	(0.006)	(0.036)	(0.017)
Hemoglobin level (g/dl)	-0.635***		-1.087
	(0.024)		(0.057)
Dummy for had prenatal or	0.119***	0.173***	0.064***
antenatal check with doc.	(0.008)	(0.034)	(0.018)
Age at first marriage	0.087*	0.521**	0.060
	(0.047)	(0.227)	(0.120)
Dummy for woman is	0.003	0.055	0.028
literate	(0.008)	(0.038)	(0.021)
Dummy for woman smokes	-0.027***		-0.013
cigs./pipe/tobacco/other	(0.004)		(0.016)
Woman’s height	-0.179*	0.541	0.321
(cms.)	(0.092)	(0.566)	(0.239)
Woman’s hemoglobin	-0.037		-0.113
level (g/dl)	(0.027)		(0.073)
Dummy for woman is	-0.051***	-0.058*	-0.004
currently working	(0.007)	(0.033)	(0.019)
Dummy for husband	-0.016**	-0.055	-0.046***
has no education	(0.007)	(0.037)	(0.017)
Rural household	0.020***	0.031	0.018
	(0.006)	(0.026)	(0.012)
Dummy for household	0.003	0.019	-0.015
owns electricity	(0.008)	(0.034)	(0.022)
Source of drinking water:	0.005	-0.001	-0.003
piped water	(0.007)	(0.016)	(0.021)
Toilet facility is: flush toilet	-0.018***	0.014	-0.004
	(0.007)	(0.024)	(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 reports coefficients for the difference in means between Hindu children 0-12 months and 13-48 months in each country.

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, region 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. Falsification and specification tests

Dependent variables	*Assets*		*Log number of births*		*External deaths*	
	0-12 months	13-48 months	0-12 months	13-48 months	0-12 months	13-48 months
India						
Lower caste Hindu	0.004	.002	.002	.002		.000
	(.004)	(.003)	(.015)	(.003)		(.000)
Upper caste Hindu	.004	.004	-0.000	.001		.000
	(.004)	(.003)	(.016)	(.003)		(.000)
N	7,910	28,722	7,910	28,722		13,532
R^2	.099	.091	.613	.387		.012
Bangladesh						
Hindu	-.002	-.002	.000	.000	.000	.000
	(.001)	(.001)	(.000)	(.000)	(.000)	(.000)
N	2,066	7,693	2,066	7,693	2,066	7,693
R^2	.023	.017	0.610	0.380	.012	.015
Nepal						
Hindu	-.004	-.010	.000	.000		
	(.006)	(.007)	(.000)	(.000)		
N	1,912	7,409	1,912	7,409		
R^2	.144	.154	0.099	0.098		
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 or region. The notation *** is p<0.01, ** is p<0.05, * is p<0.10. Regressions include Hindus and Muslims only. The asset regression for Nepal children 0-12 months conditions only on ownership of a refrigerator since otherwise, the variation is too little. No information on external deaths in Nepal. External deaths regression for India children 0-12 months is not identified due to insufficient variation in the dependent variable. The zero coefficients in the table have values beyond the third decimal place.

Table 9. Specification checks: *Dependent variable: height-for-age z-score*

Included independent variables	*Disease environment*		*Schools*		*Rainfall*		*Prices*	
	0-12 mon.	13-48 mon.	0-12 mon.	13-48 mon.	0-12 mon.	13-48 mon.	0-12 mon.	13-48 mon.
India								
Lower caste Hindu	-.215***	.050			-.239***	.063	-.239***	0.063
	(.064)	(.051)			(.077)	(.046)	(.077)	(0.046)
Upper caste Hindu	-.051	.114**			-0.061	.111***	-.061	.112***
	(.050)	(.040)			(.054)	(.035)	(.054)	(.035)
N	5,908	13,518			7,909	28,704	7,909	28,704
R^2	.137	.155			.133	.151	.133	.151
Bangladesh								
Hindu	-.199*	.129***			-.199*	.129**		
	(.084)	(.041)			(.084)	(.041)		
N	2,066	7,693			2,066	7,693		
R^2	.145	.155			0.145	0.155		
Nepal								
Hindu			0.115	0.148***	.115	.148***	.115	.148***
			(0.077)	(0.022)	(.076)	(.022)	(.077)	(.022)
N			1,912	7,409	1,912	7,409	1,912	7,409
R^2			0.232	0.178	0.232	0.178	0.232	0.178
Includes child, woman, household and reg. -specific characteristics	YES	YES	YES	YES	YES	YES	YES	YES
Includes month of concept., year of birth dummies, time dummies, 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 region. The notation *** is $p<0.01$, ** is $p<0.05$, * is $p<0.10$. Regressions include Hindus and Muslims only. Disease is measured by malaria and TB deaths (combined) in India and deaths from fever (due to malaria, typhoid, other) and TB in Bangladesh. No information on malaria/TB deaths in Nepal; data on primary and secondary schools is used instead. The disease, schools and rainfall coefficients are not reported due to lack of space. Coefficients for Bangladesh and Nepal differ beyond the third decimal place.

Table 10. Specification checks: *Dependent variable: weight-for-age z-score*

Included independent variables	*Disease environment*		*Schools*		*Rainfall*		*Prices*	
	0-12 mon.	13-48 mon.	0-12 mon.	13-48 mon.	0-12 mon.	13-48 mon.	0-12 mon.	13-48 mon.
India								
Lower caste Hindu	-.195**	-.030			-.203**	-.025	-.203**	-.025
	(.073)	(.038)			(.082)	(.037)	(.082)	(.038)
Upper caste Hindu	-.129*	.053			-0.120	.046	-0.120	.046
	(.072)	(.032)			(.078)	(.030)	(.078)	(.031)
N	5,908	13,518			7,909	28,704	7,909	28,704
R^2	.208	.164			.199	.163	.199	.163
Bangladesh								
Hindu	-.143**	.082*			-.143**	.082*		
	(.050)	(.038)			(.050)	(.038)		
N	2,066	7,693			2,066	7,693		
R^2	.264	.137			0.264	0.137		
Nepal								
Hindu			0.048	0.055	0.048	0.055	0.048	0.055
			(0.070)	(0.027)	(0.070)	(0.027)	(0.070)	(0.027)
N			1,912	7,409	1,912	7,409	1,912	7,409
R^2			0.336	0.162	0.336	0.162	0.336	0.162
Includes child, woman, household and reg. specific characteristics	YES	YES	YES	YES	YES	YES	YES	YES
Includes month of concept., year of birth dummies, time dummies, 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 region. The notation *** is $p<0.01$, ** is $p<0.05$, * is $p<0.10$. Regressions include Hindus and Muslims only. Disease is measured by malaria and TB deaths (combined) in India and by fever (due to malaria, typhoid, dengue, other) and TB (separately) in Bangladesh. No information on malaria/TB deaths in Nepal; data on schools is used instead. The disease, schools and rainfall coefficients are not reported due to lack of space. Coefficients for Bangladesh and Nepal differ beyond the third decimal place.

Table 11. Specification checks: *Dependent variable: height-for-age z-score*

Included independent variable	*Hemoglobin level*		*Ramadan trimester exposure*		*Disease, rainfall, Ramadan*	
	0-12 months	13-48 months	0-12 months	13-48 months	0-12 months	13-48 months
India						
Lower caste Hindu	-.286***	.096*	-.289***	.017	-.306***	.059
	(.099)	(.048)	(0.099)	(0.069)	(.103)	(.066)
Upper caste Hindu	-.078	.105***	-.110	0.067	-0.140	.123**
	(.055)	(.037)	(0.092)	(0.057)	(.097)	(.059)
N	4,430	26,837	7,909	28,704	5,908	13,518
R^2	.152	.179	0.133	0.151	.138	.155
Bangladesh						
Hindu			-.301**	.148**	-.301**	.148**
			(0.077)	(0.050)	(0.077)	(0.050)
N			2,066	7,693	2,066	7,693
R^2			.148	.156	0.148	0.156
Nepal						
Hindu	0.330	0.289**	-0.040	0.103	-0.040	0.103
	(0.179)	(0.071)	(0.513)	(0.126)	(0.513)	(0.126)
N	454	3,413	1,912	7,409	1,912	7,409
R^2	0.287	0.226	0.233	0.179	0.233	0.179
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 or region. The notation *** is p<0.01, ** is p<0.05, * is p<0.10. Regressions include Hindus and Muslims only. Data on hemoglobin is available only for India and for the second round of Nepal data. Coefficients for Bangladesh and Nepal by child age-group differ beyond the third decimal place for Ramadan trimester exposure and for disease, rainfall, and Ramadan. The hemoglobin, Ramadan and other coefficients are not reported due to lack of space. Their effects are mostly as expected or insignificant.

Table 12. Specification checks: *Dependent variable: weight-for-age z-score*

Included independent variable	*Hemoglobin level*		*Ramadan trimester exposure*		*Disease, rainfall, Ramadan*	
	0-12 months	13-48 months	0-12 months	13-48 months	0-12 months	13-48 months
India						
Lower caste Hindu	-.174**	-.009	-.242***	-.048	-.246***	-.031
	(.078)	(.036)	(0.069)	(0.058)	(.066)	(.047)
Upper caste Hindu	-.115	.039	-.158**	0.023	-0.180**	.053
	(.086)	(.029)	(0.069)	(0.051)	(.067)	(.047)
N	4,430	26,837	7,909	28,704	5,908	13,518
R^2	.198	.182	0.199	0.163	.209	.164
Bangladesh						
Hindu			-.038	.117**	-.038	.117**
			(0.061)	(0.037)	(0.061)	(0.037)
N			2,066	7,693	2,066	7,693
R^2			.267	.138	0.267	0.138
Nepal						
Hindu	0.187	0.184***	-0.160	0.058*	-0.160	0.058*
	(0.093)	(0.036)	(0.336)	(0.026)	(0.336)	(0.026)
N	454	3,413	1,912	7,409	1,912	7,409
R^2	0.324	0.198	0.338	0.163	0.338	0.163
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 or region. The notation *** is p<0.01, ** is p<0.05, * is p<0.10. Regressions include Hindus and Muslims only. Data on hemoglobin is available only for India and for the second round of Nepal data. Coefficients for Bangladesh and Nepal by child age-group differ beyond the third decimal place for Ramadan trimester exposure and for disease, rainfall, and Ramadan. The hemoglobin, Ramadan and other coefficients are not reported due to lack of space. Their effects are mostly as expected or insignificant.

Appendix Table 1. 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	-0.074***	-0.040***	-0.071***	-0.026***	-0.062*	-0.029
	(0.014)	(0.013)	(0.007)	(0.003)	(0.026)	(0.015)
Dummy for male child	0.030	0.056***	0.095**	0.103***	0.083**	0.096***
	(0.018)	(0.017)	(0.032)	(0.019)	(0.019)	(0.008)
Dummy for child was	-0.018	-0.055	0.117	0.100	0.279	-0.036
nursed	(0.038)	(0.035)	(0.066)	(0.094)	(0.307)	(0.261)
Dummy for child had	-0.080**	-0.097***	-0.111	-0.126***	-0.136***	-0.146**
diarrhea in last two weeks	(0.032)	(0.029)	(0.056)	(0.021)	(0.026)	(0.036)
Dummy for child had	-0.052*	-0.124***	-0.083*	-0.147**	-0.071	-0.161**
fever in last two weeks	(0.027)	(0.012)	(0.039)	(0.045)	(0.038)	(0.041)
Dummy for child had	0.032	0.038	0.000	0.015	0.094	0.080**
cough in last two weeks	(0.030)	(0.026)	(0.072)	(0.057)	(0.053)	(0.028)
Dummy for had prenatal or	0.086***	0.093***	0.135***	0.093***	0.132**	0.128***
antenatal check with doc.	(0.023)	(0.013)	(0.032)	(0.019)	(0.041)	(0.022)
Age of woman	0.261***	0.025	0.065	-0.005	-0.005	-0.186**
	(0.035)	(0.031)	(0.066)	(0.041)	(0.067)	(0.048)
Age at birth	-0.231***	-0.013	-0.043	0.015	0.024	0.191**
	(0.035)	(0.030)	(0.063)	(0.042)	(0.073)	(0.053)
Dummy for woman is	0.127***	0.115***	0.011	0.060	0.204***	0.167***
literate	(0.029)	(0.020)	(0.041)	(0.031)	(0.043)	(0.022)
Dummy for woman smokes	-0.027	-0.035			-0.169**	-0.001
cigs./pipe/tobacco/other	(0.050)	(0.033)			(0.045)	(0.017)
Woman's height	0.042***	0.029***	0.024***	0.014***	0.047***	0.028***
(cms.)	(0.002)	(0.002)	(0.005)	(0.003)	(0.001)	(0.002)
Age at first marriage	-0.006	-0.003*	-0.007	0.000	-0.006	0.009
	(0.004)	(0.002)	(0.004)	(0.006)	(0.011)	(0.007)
Dummy for woman is	-0.035*	-0.045**	-0.012	-0.020	0.023	0.008
currently working	(0.019)	(0.019)	(0.039)	(0.023)	(0.038)	(0.028)
Husband's age	-0.001	0.000	0.000	0.001	0.000	-0.001
	(0.002)	(0.002)	(0.004)	(0.003)	(0.002)	(0.002)
Dummy for husband has	0.053*	0.023	0.055**	0.032	0.016	0.049
some or all prim. School	(0.026)	(0.018)	(0.020)	(0.022)	(0.047)	(0.024)
Dummy for husband has	0.093**	0.054**	0.163***	0.085***	0.030	0.057
some secondary school	(0.037)	(0.021)	(0.022)	(0.020)	(0.033)	(0.029)
Dummy for husband comp.	0.255***	0.207***	0.372***	0.263***	0.151**	0.153***
secondary school or higher	(0.058)	(0.028)	(0.055)	(0.060)	(0.036)	(0.027)
Dummy for husband works	0.053	-0.025			0.220	0.296*
outside the home	(0.055)	(0.062)			(0.180)	(0.112)
Rural household	0.014	-0.013	-0.004	0.015	-0.080*	-0.151**
	(0.029)	(0.016)	(0.034)	(0.043)	(0.033)	(0.042)

Appendix Table 1. 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	0.000	0.001	-0.002	0.000
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Dummy for household has	-0.013	0.017	-0.091	-0.102	-0.021	-0.053***
male head	(0.030)	(0.028)	(0.055)	(0.051)	(0.034)	(0.011)
Dummy for household religion is			0.056	0.030	0.140***	0.043
Hinduism			(0.039)	(0.037)	(0.029)	(0.038)
Dummy for household is	0.004	-0.061				
lower-caste Hindu	(0.043)	(0.045)				
Dummy for household is upper-	0.078**	0.011				
caste Hindu	(0.028)	(0.037)				
Dummy for household owns a	0.036***	0.003	0.091*	0.067**	0.061	0.067*
radio or transistor	(0.030)	(0.016)	(0.036)	(0.024)	(0.036)	(0.028)
Dummy for household	0.083***	0.079***	0.082*	0.085**	0.143***	0.033
owns a television	(0.023)	(0.022)	(0.036)	(0.029)	(0.031)	(0.043)
Dummy for household	0.167***	0.158***	0.179	0.281**	0.565***	0.393***
owns a refrigerator	(0.045)	(0.036)	(0.095)	(0.094)	(0.021)	(0.060)
Dummy for household	0.140***	0.101***	0.015	-0.014	-0.088	-0.102
owns a motorcycle	(0.030)	(0.022)	(0.081)	(0.065)	(0.128)	(0.084)
Dummy for household	0.241***	0.151**	0.134	0.309	-0.219	-0.230*
owns a car	(0.071)	(0.063)	(0.081)	(0.308)	(0.109)	(0.096)
Dummy for household	0.093**	0.045	0.123***	0.061*	0.065	0.081
owns electricity	(0.033)	(0.028)	(0.015)	(0.029)	(0.074)	(0.055)
Source of drinking water:	-0.024	-0.003	0.017	-0.063	0.273***	-0.056
ground water	(0.031)	(0.032)	(0.080)	(0.048)	(0.049)	(0.033)
Source of drinking water:	0.069**	0.011	0.104	0.017	0.310**	0.026
well water	(0.029)	(0.031)	(0.144)	(0.147)	(0.073)	(0.055)
Source of drinking water:	0.070	0.037	-0.090	-0.038	0.038	0.006
surface water	(0.074)	(0.038)	(0.082)	(0.065)	(0.020)	(0.010)
Source of drinking water:	0.012	0.126	0.204	-0.227	0.141	0.071
rainwater, tanker truck, other	(0.132)	(0.082)	(0.309)	(0.346)	(0.406)	(0.278)
Toilet facility is: flush toilet	0.161***	0.030	0.138**	0.177**	-0.051	0.192**
	(0.038)	(0.037)	(0.041)	(0.058)	(0.097)	(0.051)
Toilet facility is: pit toilet/	0.072	0.008	0.043	0.029	-0.180**	0.048
latrine	(0.047)	(0.045)	(0.069)	(0.053)	(0.064)	(0.030)
Toilet facility is: no facility/	0.023	-0.072	-0.085	-0.076	-0.262**	-0.015
bush/field	(0.033)	(0.052)	(0.085)	(0.062)	(0.070)	(0.031)
Years lived in place of	-0.001	0.000	0.000	0.000	-0.001	-0.001
residence	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Per capita GDP	0.000***	0.000***	0.001*	0.002***	0.000***	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Appendix Table 1. 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	36,613	36,613	9,759	9,759	9,321	9,321
R^2	0.187	0.197	0.190	0.207	0.266	0.247

Notes: Weighted to national levels by weights provided by the DHS. Standard deviations 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 in the Bangladesh data. All husbands report working outside of the home in Bangladesh; the coefficient is thus not identified.

Appendix Table 2. 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 2. 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 2. 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.