Food Consumption Patterns and Malnourished Indian Children: Is there a Link?

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Abstract

Despite its economic success, India has made little progress towards meeting its Millennium Development Goal targets of reducing undernourishment, particularly among children. Using nationally representative data, our analysis finds evidence of an improvement in the height-for-age z-scores (measure of long-term health), but a worsening in weight-for-height z-scores (measure of short-run health) for children aged 0 – 3 over the period 1998/1999 – 2005/2006. There is also a worsening of calorie intake over this period, with some of the most noticeable declines taking place in households with children aged 0 – 3. Although, there was a statistically significant increase in calorie intake from milk and milk products, the intake of protein and fat from milk and milk products has declined over this period, with the decline being proportionately larger for households with young children. Since infants rely on these items for their growth, this suggests a possible link between declining nutritional intake and poor health outcomes of children during this period.

JEL Classification: I12, C25, O12
Key Words: India, Weight-for-height, Height-for-age, Calorie intake, Expenditure patterns

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1. Introduction

Despite India's impressive economic growth, poor child nutrition outcomes continue to be significantly widespread. The World Bank notes that "South Asia...still has the highest rates and the largest numbers of undernourished children in the world", and adds that "the high economic growth experienced by South Asian countries has not made an impact on the nutritional status of South Asian children" (World Bank, 2011). UNDP (2007-2008) estimates show that 47% (51%) of all Indian children aged below 5 years were classified as being under-weight for age (under-height for age) between 1996 and 2005.

Poor nutrition has implications for a child's development, since a lack of adequate calories and nutrients to sustain normal growth puts children at a greater risk of being vulnerable to diseases and has adverse effects on their physical, cognitive and mental development (Barker, 1994). It is argued that eliminating malnutrition could cut child mortality by over 50%, and reduce the burden of disease by about 20% (see Murray and Lopez, 1997, Tomkins and Watson, 1989 and Pelletier, 1998). Poor nutrition also impacts negatively on children's future productivity (Strauss and Thomas, 1995).

In this paper we examine the link, if any, between the declining nutritional intake of Indian households and the lack of progress on child nutritional outcomes. We use information from the National Family and Health Survey (NFHS) and the National Sample Survey (NSS) datasets in a comprehensive analysis that focuses on both child anthropometric measures and consumption expenditure patterns. To the best of our knowledge, Deaton and Dreze (2009) is the only other study which uses both these datasets to analyse the links between nutrition, calorie intakes and food expenditure. However, their focus is not on any specific group, but rather on the big picture of generally poor nutritional outcomes in India. Our analysis on the other hand focuses on very young children: we examine the nutritional status of children aged 0 – 3 years, as well as the household expenditure and consumption patterns of households with children in this age group. It is important to consider this group from a policy perspective, as the impact of malnutrition at this age tends to persist into adulthood (Mc-Gregor-Grantham, 1995; Martorell and Habicht, 1986; Martorell, 1985).[1]

[1] Several recent studies have focused either on malnutrition among Indian children or on the declining nutritional intake in India (Lokshin *et al.* 2005, Gragnolati *et al.* 2005, Tarozzi and Mahajan, 2007 and, Pathak and Singh, 2011). However, there have been few attempts to draw a link between the two. This is primarily because of the unavailability of a nationally representative dataset that provides data on both child nutrition outcomes and household-level food consumption expenditures. For example, the NFHS datasets provide useful information on child anthropometric outcomes, but not on consumption expenditure patterns, while the NSS

Previous literature on child nutrition from India has found that inequalities have increased for vulnerable groups such as girls and individuals in the lower socio-economic groups (Gragnolati *et al.*, 2005, Lokshin *et al.,* 2005, Brennan *et al.,* 2004, and Tarozzi and Mahajan, 2007). For example, Tarozzi and Mahajan (2007) show that gender inequality in child nutrition increased substantially over the 1990's. There is also strong evidence of a decline in per capita calorie consumption in India over the last twenty years (Ray and Lancaster, 2005; Ray, 2007; Deaton and Dreze, 2009), which has resulted in an increase in the rate of undernourishment.

The trends observed in those two strands of the literature suggest that perhaps there is a nexus between the poor nutritional outcomes of young children on the one hand, and the calorie consumption of households. Our results show that while the height-for-age z-scores have improved for rural children less than 3 years of age between the years 1998 and 2006, the weight-for-height z-scores have worsened for these same children. Estimates from the NSS datasets show that over the same period, there has been a switch away from food to non-food consumption.[2] Additionally there has been a decline in the calorie intake and consumption expenditures on milk and milk-products, and this has affected households with young children (aged 0 – 3), relatively more than *other* households.

The rest of the paper is organised as follows. In section 2, we present the data and descriptive statistics for the variables used in the analysis. In section 3, we present results from our empirical analysis. The final conclusions and policy implications are presented in section 4.

2. Data and Descriptive Statistics

We use data from the nationally representative National Family and Health Survey (NFHS) and the National Sample Survey (NSS). The NFHS, conducted in 1998/1999 (NFHS II) and 2005/2006 (NFHS III), allow us to explore the trends in child nutrition during a period of rapid economic growth in India. However, in studying child nutrition, it is also important to consider calorie intake and food expenditures by households with young children.

datasets provide information on consumption expenditures, but not on child health. Even the consumption data provided in the NSS is not ideal for analysing expenditure patterns because, as in many other nationally representative surveys from India, data on consumption is not available separately for children. We use data from these two surveys to examine the contemporaneous movements in child nutritional outcomes (using the NFHS data set) and consumption patterns (using the NSS data set). However we are unable to argue causality.

[2] Our findings are consistent with those of Patnaik (2007), who finds that hunger and deprivation is increasing, especially in rural areas, and that people are purchasing fewer calories, particularly cereal calories, because of their inability to do otherwise.

Unfortunately, the NFHS data sets do not contain any information on household expenditure patterns or calorie intakes. In order to address this shortcoming, we use data from the 55th (1999/2000) and 61st (2004/2005) rounds of the NSS (NSS 55 and NSS 61 respectively) to examine calorie intakes at the household level.[3] The data used in this paper, therefore, come from parallel and independent surveys on child health and household expenditures that were conducted by different statistical agencies. However, they are both nationally representative. The NFHS II and the NSS 55th round, on the one hand, and NFHS III and the NSS 61st round on the other, were carried out over (almost) contemporaneous periods. This allows us to reconcile the results from NFHS with that from the NSS datasets, although we cannot infer any causality.

2.1 NFHS data

The NFHS are nationally representative and provide a 3-year retrospective collection of statistical records on maternal and child health practice and outcomes, along with demographic and economic information on the mothers, their children and other selected family members. Our estimating sample contains information on 27,411 children aged 0 – 3 years (15,104 children from NFHS II and 12,307 from NFHS III). The analysis is based on questions from the women's questionnaire, which in NFHS II was administered to every-married women aged 15 – 49 years and to all women aged 15 – 49 years in NFHS III.[4] The sample is restricted to children residing in rural areas of the major states of India.[5] Our key variables of interest are the two anthropometric measures of child nutrition: height-for-age and weight-for-height z-scores.

In an influential article, Waterlow *et al.* (1997) established that height-for-age and weight-for-height are good indicators of a child's nutritional status. A child's height-for-age is an indicator of his/her long-run nutritional status, reflecting the child's past nutritional experience, while a child's weight-for-height is regarded as an indicator of short-run or current nutritional status. We use the z-score method, with the reference population being the

[3] See Block and Webb (2009) and Osberg, Shao and Xu (2009) for recent evidence from Indonesia and China, respectively, on the link between spending patterns, especially food expenditure and child malnutrition.

[4] Having children out of wedlock is an extremely rare event in India and, indeed, all children in our sample are born to a married woman. It is therefore unlikely that this difference in sampling procedure affects our results.

[5] The states included in our analysis are: Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, West Bengal, Himachal Pradesh, Punjab and Uttar Pradesh.

commonly used US National Center for Health Statistics (NCHS) standard.[6] The z-scores have an important advantage over simple measures of height and weight in that they are less sensitive to changes at the extremes of the distribution of these variables. They also facilitate comparisons across measures that exhibit different variability in terms of units of measurement. Finally, the use of z-scores makes it possible to pool children of different ages and gender. A negative z-score indicates that the child's nutritional status is worse than the nutritional status of the average child in the reference population.

Descriptive statistics for key variables used in the analysis are presented in Table 1. Over the period 1998/99 – 2005/06, although the average height-for-age z-score of rural Indian children aged 0 – 3 years has improved from -1.94 to -1.59, it continues to remain significantly below the reference median. The weight-for-height z-scores, however, have worsened significantly during this period from -0.86 standard deviations in NFHS II to -1.08 standard deviations in NFHS III. Specifically, the proportion of children wasted (defined as weight-for-age z-score being < -2) has increased from 16% to 20% over the period under consideration, while the proportion of children stunted (defined as height-for-age z-score being < -2) has decreased from 49% to 40% over the same period.

In Figure 1 we present the non-parametric locally weighted regressions of the height-for-age and weight-for-height z-scores on the age of the child. As discussed above, both the height-for-age and the weight-for-height z-scores of Indian children are below those of the reference population. The curves in every case decline rapidly until 18 months of age and then stabilize around -2 for the height-for-age z-scores, and around -1 for the weight-for-height z-scores. Beyond 18 months, the relationship between a child's age and z-score is fairly non-monotonic, irrespective of the anthropometric measure considered. However, the extent of wasting is much less than the extent of stunting in the sample, and the extent of wasting also decreases for older children.

Next, we examine changes in the distribution of z-scores. In Figure 2, we present the kernel density estimates of the height-for-age and weight-for-height z-scores for children aged 0 – 3 years. Using the Kolmogorov-Smirnov test, we always reject the null hypothesis

[6] The z-score of child *i* is the difference between the observed value for the child *i* and the median value of the reference population, all divided by the standard deviation of the reference population. In this paper we consider two alternative measures: the height-for-age and the weight-for-height z-scores, which as noted reflect the long-term and short-term nutritional status of the children. A third measure is the weight-for-age z-score. However 95% of the variance in the weight-for-age z-score is explained by the variance in the height-for-age z-score and the variance in the weight-for-height z-score (Keller, 1983, cited in WHO, 1986), in our analysis we restrict ourselves to the height-for-age and the weight-for-height z-scores.

that the distributions are the same over the two survey rounds. The mass of the distribution for the height-for-age z-scores for the NFHS III dataset lies to the right of the NFHS II dataset, indicating substantial improvement in the long-term nutrition of children. With respect to the weight-for-height z-scores, the mass of the distribution for the NFHS III sample lies to the left of that for the NFHS II sample, indicating a worsening of the overall distribution.

In Figure 3 we present the difference in cumulative distribution functions for the two survey rounds. For a given value z of z-scores, letting F denote the cumulative distribution function while the subscript denotes the survey round, we compute the differences in distributions as $F_{III}(z) - F_{II}(z)$. Improvements are reflected as negative numbers. Figure 3 shows that while there has been an improvement in the height-for-age z-scores, this is not the case with the weight-for-height z-scores, supporting the results presented in Table 1 and Figure 2.

Turning to the descriptive statistics for the other key variables (Table 1), between 1998/1999 and 2005/2006, there have been large improvements in the educational attainment of both parents in our sample, particularly mothers. While the proportion of mothers with no schooling fell from 59% to 51% between the two periods, it continues to remain high. The proportion of fathers with no schooling decreased from 31% to 29%. There is also an improvement in the proportion of parents (both mothers and fathers) who have attained secondary schooling and above. In 1998/1999, 25% (51%) of the mothers (fathers) had education levels of at least secondary schooling. By 2005/2006, this figure has increased to 35% for mothers and 55% for fathers.

There is also evidence that the proportion of children in households belonging to the poorest wealth quintile has increased, while there has been a decrease in the proportion of children belonging to households in the higher wealth quintiles. Specifically, over the period 1998/99 to 2005/2006, the number of children born in rural households has declined in each of the wealth quintiles, except in the poorest wealth quintile where it has increased from 3.26 children in NFHS II to 3.48 in NFHS III. Amongst the wealthiest households, however, the average number of children has declined from 2.76 to 1.88 over this period.

There have been large improvements in maternal health awareness. For example, maternal knowledge of Oral Rehydration Salts (ORS), which is useful for treating diarrhoea, has increased from 61% to 71%.

Other factors such as maternal health status may also influence child nutritional outcomes. In particular, maternal iron deficiency (anaemia) increases the risk of pre-term labour, low birth weight, infant mortality, and predicts the likelihood of iron deficiency in infants after 4 months of age (Brabin *et al.* 2001). Maternal anaemia is classified as a severe public health problem in India by the World Health Organisation (WHO, 2008). In our sample, 18% of the mothers were in the moderately or severely anaemic category in 1998/1999, and this number increased to 19% in 2005/2006. Similarly, low maternal body-mass index (BMI) can influence child nutritional outcomes. Typically an individual with a BMI under 18 is regarded as being underweight and possibly malnourished. Around 41% of the mothers in our sample have a BMI below 18.5. The proportion of mothers with BMI below 16.5 and BMI in the range of 16.5 – 18.5, has remained stable over the two survey years.

Turning to child feeding practices, several results are noteworthy. First, we observe that the proportion of children that were breast-fed between 6 – 24 months has increased from 18 to 20 % between the two survey years. However, we see a decline in the proportion of children who were given milk and green vegetables in the 7 days prior to the survey.

2.2 NSS data

Can the patterns of anthropometric outcomes for Indian children aged 0 – 3, particularly the worsening of the short-run nutrition, be explained by changes in calorie inputs and consumption expenditures on food items by households with young children? To answer this, using data from the NSS, we describe the household expenditure patterns for a variety of food items, including both cereal and non-cereal items such as milk, milk products, protein and pulses, from the 55th and 61st rounds of India's National Sample Surveys. We also compare nutrient intake by households with and without children in the 0 – 3 years category.

The calorie intake from food items was obtained by using item specific calorie conversion figures provided by the FAO (2011), and from calorie conversion tables that are available in Gopalan *et al.* (1999). The latter provided the conversion factors of fat and protein that were used to calculate the intake of these nutrients from milk and milk products. Finally to compute the adult equivalent calorie intake, we have used the age and gender specific calorie requirements of the Indian Council of Medical Research (2011).

Table 2 presents the descriptive statistics for key variables in the two survey years. There does not appear to be a great deal of movement in most of the variables of interest. The exceptions are land holding and the proportion of workers employed in agriculture-related activities, both of which have declined sharply over the two survey years. The fall in

agriculture as a source of income over this period (see Bardhan, 2005), land fragmentation among siblings, and increased distress land sales are possibly some of the reasons for the decline in the size of land holding.[7] The poverty rate has remained stable at around 20% over the period.

In Table 3, we compare the expenditure patterns and nutrient intake of households with at least one child in the age category 0 – 3 years with that of households without a child in this age category (or *other* households). These comparisons could potentially provide important insights on the observed nutritional outcomes of children aged 0 – 3 years.

The presence of a young child reduces the mean household expenditure on rice, pulses, eggs, fish and meat, vegetables and fruit, items that are typically consumed by adults and older children. The differences in the expenditure figures on these food items between these two household types are highly significant. Moreover, contrary to expectations, this is also true for milk, a product consumed by young children, although the expenditure difference is not significant for milk in NSS 55.[8] From Table 3 we also observe that households with one or more children in the age group 0 – 3 years have lower calorie intakes and higher prevalence of undernourishment (POU) rates compared to the *other* households.[9] To obtain those figures, we adjust for the household's size and the age and gender- specific calorie requirements of individuals in the household.

Not only are households with young children spending less on food on an adult equivalent basis in both years, but also their situation worsened over the period 1999/2000 – 2004/2005. In particular, households with children aged 0 – 3 were not only observed to have lower expenditures on milk in NSS 61, compared to NSS 55; but the gap with other households has also widened with respect to milk expenditures, an important item in child consumption.

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[7] Note that the definition of land holding has changed between the 55th and the 61st rounds of the NSS. For the 55th Round, land holding refers to total land owned, whereas for the 61st round we are subtracting the land leased out from total land possessed, which may explain the drop in land holding across two rounds. However, even when we re-compute the size of land holdings using a consistent definition, we still observe a large drop in the mean land holding size. However, we do not believe that the issue is central to our analysis, and therefore do not to dwell on this any further.

[8] Lower intake of milk at household level adversely affects child nutrition in 2 ways: a direct effect due to the lower consumption of that item by the infant child and an indirect effect through the effect on her mother who in, most cases, is still breast feeding her infant child.

[9] POU rates refer to the fraction of people who are undernourished. The calculation of POU rates is based on the criterion of 'actual calories < required calories' (calculated using the ICMR data). They differ from the poverty rates.

Similarly, the difference in calorie intake between households with and without young children is highly significant in both survey rounds, and increases in size and significance between the two survey years. The difference in POU rates between households with children aged 0 – 3 and *other* households, is also statistically significant in NSS 61. Disaggregated calculations also show that at all levels of monthly per capita expenditure, households with young children have lower calorie intakes compared to *other* households (these results are not presented here but are available on request).

To summarize, although there was a decrease in calorie consumption across all households between the two NSS rounds, the decline was somewhat greater for households with young children (0 – 3 years) relative to households without any young children (or *other* households). This is a concern since this was a period of rapid economic growth in India, and could be indicative of increasing inequality and a worsening of living conditions in rural India. This decline in calorie intake is however not an inevitable consequence of economic growth, as Mishra and Ray (2009) have shown in the case of Vietnam where calorie consumption rose sharply during a comparable period in the late 1990s and the early part of this millennium. Young infants are particularly vulnerable to the adverse health effects of a declining nutrient intake since their households were both recording lower calorie intakes and were also experiencing larger proportionate declines.

3. Estimation methods and results

3.1 Methods

Using NFHS data, we estimated OLS models for weight-for-height and height-for-age z-scores for a pooled sample of children aged 0 – 3 years in the NFHS II and NFHS III data sets (Panel A). We also estimated a probit model of the likelihood of a child being stunted, defined as having a height-for-age z-score < -2, and being wasted, defined as having a height-for-age z-score < -2 (Panel B). The results for the key variables are presented in Table 4. The complete set of results are presented in Table A1.

In Table 5 we examine the robustness of the results to different specifications. First, rather than using a binary classification (stunted or not and wasted or not), following Kassouf and Senauer (1996) we categorize the nutritional status of children into four categories, namely: (1) Severely wasted/stunted: z-score is less than -3; (2) Moderately wasted/stunted: z-score lies in the interval (-3, -2); (3) Mildly wasted/stunted: z-score lies in the interval (-2, -1); (4) Normal: z-score > -1. Given that there is a natural ordering of these categories, the appropriate model to use in this case is the ordered probit model. Second, we present

estimates from a SUR system of regressions for the height-for-age and weight-for-height z-scores. This allows the errors in the two equations to be correlated, since they relate to the same child. As an additional (identifying) variable in the weight-for-height equation, we include a dummy variable taking the value of one if the child has had diarrhoea in the two weeks prior to the survey. Diarrhoea has been shown to have an impact on short-term nutrition but is not expected to influence a child's long-term nutrition, except in chronic cases. To obtain the standard errors adjusted for cluster at the mother level, 1000 bootstrap replications have been used.

All of the regressions control for an extensive set of individual, parental, household and community characteristics. They include the child's age in months, the number of male and female siblings, the child's birth-weight and birth-order, the age of the mother at birth, the highest educational attainment of the mother and the father, the mother's knowledge of and experience in using ORS, the wealth quintile of the household, whether the household has a television and a radio, whether the main source of drinking water is piped water, the religion and caste of the household, whether the mother is underweight, overweight or obese and the mother's anaemia status. To control for seasonal changes in food availability, we also include the month of measurement. Finally, a set of state dummy variables are included to control for any state specific policies that can have an effect on child nutritional outcomes (the reference category is that the child resides in Uttar Pradesh, the most populous state in India).

Similarly, in Table 6, using the pooled NSS datasets, we present: the OLS estimates of the budget shares for food, education and medical expenses, both institutional and non-institutional, (Panel A); the OLS estimates of the per adult equivalent monthly consumption (quantity consumed per household member) of rice, wheat, other cereals and pulses (Panel B); the OLS estimates of per adult equivalent consumption of milk, milk products, meat, vegetables and fruits (Panel C); and, the OLS estimates of per adult equivalent monthly calorie consumption (Panel D). As with the NFHS estimations, although the regressions control for an extensive set of household and community characteristics, for space considerations, we present only the estimated coefficients for our three variables of interest, namely: a dummy variable indicating whether the household has at least one child aged 0 – 3 years; a dummy variable for the NSS 61st round (year = 2004/2005) and, (iii) an interaction term – the dummy variable for Year 2004/2005 (NSS 61) interacted with a dummy variable indicating whether the household has at least one child in the 0 – 3 years age category. The full set of results are presented in Tables A5 – A10 for the different specifications.

Below we discuss the main findings of our analysis, focusing first on the NFHS datasets and then on the NSS datasets.

3.2. Anthropometric measures

The crucial variable of interest for our analysis is whether there has been any change in the nutritional status of children over the period 1998/1999 – 2005/2006. This time effect is captured using the NFHS III dummy variable in a pooled sample including both NFHS II and NFHS III. Even after controlling for a large number of observables that can potentially affect child nutritional outcomes, we observe that overall height-for-age z-scores are higher in 2005/2006, whereas the weight-for-age z-scores have significantly worsened in 2005/06. In other words, the dummy variable NFHS III is positive and statistically significant; whereas the NFHS III dummy is negative and statistically significant. More specifically, the average height-for-age z-score is 0.38 standard deviations higher in 2005/2006, while the average weight-for-height z-score is 0.21 standard deviations lower. Given that the average height-for-age z-score is -1.94 in 1998/1999, this amounts to an increase of 20% in average height-for-age z-scores over the relevant period, which cannot be accounted for by the control variables used in the model. On the other hand, given that the average weight-for-height z-score was -1.59 in 1998/1999, there has been a 20% worsening of the average weight-for-height z-score over the relevant period. The marginal effects from the probit regressions for stunting and wasting (Panel B) show that children are 11-percentage points less likely to be stunted in 2005/2006 but are 2-percentage points more likely to be wasted in 2005/2006, and the effect is statistically significant in both cases.

How do some of the other observables affect the height-for-age and weight-for-height z-scores? The full set of results presented in Table A1 in the appendix show that boys have higher height-for-age z-scores, but there is no statistically significant difference between boys and girls in terms of weight-for-height z-scores. In other words, while the long-term nutritional status of boys is better than girls, there is no gender difference in short-term nutritional outcomes. Not surprisingly, a child's birth-weight is negatively associated with both height-for-age and weight-for-height z-scores. While a child's birth order has no statistically significant influence on their weight-for-height, we note that relative to a first-born child, a child who is later born has a significantly lower height-for-age z-score. This is possibly indicative of sibling competition for scarce resources leading to poor long-term health or maternal depletion.

Several of the maternal characteristics are influential in child's anthropometric outcomes. Specifically, relative to having a mother with no education, having a mother

educated at primary, secondary and above levels of schooling, significantly improves height-for-age z-scores. Mother's secondary education similarly has a positive and significant influence on a child's weight-for-height z-score. Not surprisingly, household wealth significantly improves both weight-for-height and height-for-age z-scores. Relative to a child born in the richest wealth quintile, children from the other wealth quintiles have poorer anthropometric outcomes.

The nutritional outcomes of young children are likely to be closely linked to maternal health. We used the variables mother's BMI categories, and anaemia status among our explanatory variables, to account for the influence of maternal health on child nutrition. Our analysis shows that relative to having a mother with normal BMI, a child whose mother is severely underweight (BMI < 16.5) or underweight BMI $\in$ [16.5, 18.5], has lower weight-for-height and height-for-age z-scores. Similarly, having a mother with moderate or severe anaemia rather than being in the normal range, is negatively associated with child's weight-for-height and height-for-age z-scores.

The results are robust to alternative estimation methods. We note that the ordered probit and the SUR results presented in Table 5 are similar to the baseline results presented in Table 4. First, the ordered probit estimates (Panel A) show that, in terms of height-for-age z-scores, relative to 1998/1999, in 2005/2006 children are significantly more likely to be in the mildly stunted (1.8 percentage points) and in the normal category (9.2 percentage points) and significantly less likely to be in the severely and moderately stunted categories. On the other hand, in terms of weight-for-height z-scores, relative to 1998/1999, in 2005/2006 children are significantly more likely to belong to the severely (0.8 percentage points), moderately (2.6 percentage points) or mildly (2 percentage points) wasted categories and significantly less (5.5 percentage points) likely to belong to the normal weight category. Second, the SUR estimates presented in Panel B are almost identical to the corresponding OLS estimates of height-for-age and weight-for-height z-scores presented in Table 4.[10]

India is a heterogeneous country in terms of attitudes, food habits and in the overall standards of living. There is a fairly large literature that argues that the liberalisation process has not been uniform across the country (see for example, Basu and Maertens, 2007; Siggel, 2010). According to the World Bank (2006), the rural areas of some Indian states (such as

[10] The full set of results are presented in Tables A2 – A4. Keeping in mind space constraints we do not discuss these results.

Bihar and Orissa) possess levels of poverty and food insecurity comparable to the poorest nations in sub-Saharan Africa, whilst others (such as Punjab and Kerala) are similar to middle-income nations. Menon *et al* (2008) find that although India's overall rank on the Global Hunger Index (GHI) was 66 (a higher figure indicates poorer hunger index), there is substantial heterogeneity across the major states in India. For example, the GHI ranges from 34 for Punjab (placing it between Nicaragua and Ghana) to 82 for Madhya Pradesh (placing it between Chad and Ethiopia). Around 10 of the 17 individual Indian states ranked above the Indian average.

These findings are also consistent with our analysis, and the OLS estimates presented in Table A1 show a fair amount of geographical variation in nutritional outcomes among the Indian states. To explore this further, we compute OLS regressions for height-for-age z-score and weight-for-height z-score separately for each of the states included in our sample. The estimated coefficients (and the 95% confidence interval) of the NFHS III dummy, are presented in Figure 4. The largest improvements in both the height-for-age z-scores and the weight-for-height z-scores have occurred in the state of Haryana. Indeed there has been a significant improvement in the long-term health status of children in all the northern states (Madhya Pradesh, Rajasthan, Uttar Pradesh, Punjab, Haryana and Himachal Pradesh); considerably less so in the other states. To examine if the results, particularly the improvements in long-term nutrition (height-for-age z-scores), is driven by the performance in the 6 northern states, we re-estimated the OLS regressions for height-for-age and weight-for-height, excluding children who reside in these 6 northern states. The coefficient estimates from these regressions are presented in Table 5, Panel C. Notice that while still statistically significant, the coefficient estimate of the NFHS III dummy for the height-for-age z-score regression is lower (declining from 0.38 to 0.29). There is no big difference in the estimated coefficient of the NFHS III dummy in the weight-for-height z-score regression. Those results indicate that while most of the progress in terms of children's long term nutritional status has occurred in the northern states, the worsening of short term nutritional status does not follow any clear geographical pattern.

3.3. Expenditures and Nutritional Intakes

With the exception of the expenditure share on education, the dummy variable NSS 61 is negative and statistically significant for all the other items in Table 6 (Panel A). In other words, over the period, 1999/2000 to 2004/2005, there has been a switch away from food to non-food items such as education. This is possibly a reflection of the Engel effect as overall

incomes have risen during this period and the argument is supported by the sign and significance of the coefficient estimates of the food items in panels B and C, which show that there has been a significant decline in the consumption of all the food items considered in our analysis.

Consistent with the descriptive statistics presented in Table 2, the decline between the 55th and the 61st rounds of the NSS is fairly uniform across all the food items. In the context of our analysis, a significant finding for Table 6 (Panels B and C) is that milk, milk products and fruits, which are important consumption items for young children declined significantly. These declines were of comparable magnitude to rice, which figures more prominently in adults' consumption.

The results presented in Table 6 (Panel D) confirm that there has been a significant decline in calorie consumption between the two NSS rounds. The insignificance of the interaction coefficient, however, suggests that the decline is similar for households with children aged 0 – 3 to that experienced by *other* households.

The overall picture that emerges from Tables 3 and 6 is one of a decline in consumption of all the principal food items that may potentially explain the decline in calorie intake during this period. This decline may provide a possible explanation for the poor nutritional outcomes of children during this period. The decline in consumption of food items has both a direct and indirect effect, both adverse, on the nutritional status of young children. The direct effect works through the lower consumption of non-solid food items such as milk and milk products that are consumed by the infant children. The indirect effect works through the worsening nutritional status of mothers with young children due to their lower consumption of rice and other solid food items. Recall that using NFHS data, we have already observed that there is a close link between maternal health and child nutrition (see Table A1).

To explore the last point further, in Table 7 we present the per adult equivalent intake of calorie, protein and fat from milk and milk products in the two NSS survey rounds, for households with children aged 0 – 3 years and *other* households. The results in Table 7 were obtained by using the nutrient value of milk and milk products in terms of their calorie, using information on protein and fat content provided in Gopalan *et al* (1999).

While there has been a slight increase in the calorie intake from these 2 food items, there has been a decline in the protein and fat intake from these two items. Table 7A provides statistical confirmation of this by reporting the magnitude and *p*-values of the differences in calorie, fat and protein intake (per adult equivalent) between NSS round 55 and 61. Table 7A

reports these figures separately for households with at least one child in the 0 – 3 year age category, and *other* households. It is significant that the decline in fat and protein intake of households with children aged 0 – 3 is of a larger magnitude than that for *other* households. More importantly from Table 7A, we observe that while the decline in protein and fat intake from milk is not statistically significant, the corresponding decline in the intake of these nutrients obtained from milk products is significant for both groups of households. There is evidence that milk and milk products contain essential micronutrients, and are an important source of protein and minerals (Henriksen, 2009). Furthermore, Black *et al* (2002) find that in growing children, long-term avoidance of cow milk is associated with smaller stature and poor bone health.

Table 7B and 7C provide the state-wise changes in calorie, fat and protein intake over this period. While Table 7B reports the figures for households with children aged 0 – 3, Table 7C reports the corresponding figures for *other* households. There are some interesting differences between the Indian states both in the magnitude of the changes and in their statistical significance, though there is no systematic pattern across the different states.

Further insight into this link is provided in Table 8, where we present the results from a SUR model for calorie, protein and fat intake from milk (Panel A) and milk products (Panel B). The statistical significance of the coefficient estimate for the NSS 61 dummy variable, confirms that with the exception of calorie intake from milk products, there has been a decline in the intake of all three nutrients from both items over this period. With regard to the calorie intake from milk products, the significantly negative coefficient estimate of the interaction term between the time-trend and the dummy for households with children aged 0 – 3 shows that for such households there was a decline in calorie intake from milk products as well. This suggests that the decline in consumption of milk products is a potentially important key factor explaining the worsening of short-term nutritional status of children, especially, if one recalls from Table 3, that there was a 30% reduction in the consumption of milk products over the period between the two NSS rounds.

4. Conclusion

It is now widely acknowledged that while the Indian economy grew at a rapid pace in the last decade or so, this is not reflected in the short-term nutritional outcomes of Indian children. Nearly all the available statistics show that nutrition intakes are declining and that Indian children are among some of the most malnourished in the world. What is really worrying is

that this has occurred against a backdrop of high economic growth rates in the Indian economy.

The paradox is heightened by the fact that, in recent years the weight-for-height and height-for-age z-scores have moved in opposite directions. Over the period 1998/1999 to 2005/2006, coinciding with a period of what has been termed the *second-generation economic reforms*, height-for-age z-scores have improved. However, this gain in long-term nutrition has been associated with a significant decline in weight-for-height z-scores, indicating a decline in short-run nutrition. This might not necessarily be a problem as the short-term losses can be easily reversed. Unfortunately, the available datasets cannot tell us whether this decline in weight-for-height is indeed a short-run phenomenon, or whether it is the harbinger of what is to come. After all, persistent adverse short-run effects will ultimately accumulate and have long-term effects.

Two other caveats are worth mentioning. First, since our analysis relies on expenditure data, we acknowledge that it is likely that there is an underestimation of consumption, particularly in households that do not rely on the market for food consumption. However, lack of data availability prevents us from conducting any quantity-based analysis. Second, while we are able to identify a contemporaneous co-movement of declining child nutrition and declining nutritional intake, with the data at hand, we cannot identify any form of causality.

By identifying the co-movement of declining nutritional intake for both adults and children and the lack of progress in improving nutritional outcomes of children, our analysis has opened the door to directed/targeted policies that might be used to address this problem. Previous studies have simply reported the "puzzle", but not explained it. In studying the child nutritional issues in a comprehensive manner involving two different data sets covering very similar periods, we have tried to nudge the literature forward. We have not demonstrated that this link is a causal one. However, the key result of our analysis that the decline in the consumption of milk and milk products and in overall calorie intake especially in households with children aged below 3 years is of considerable significance. It points to the role of policy initiatives that can stem the decline in nutritional intake, and hence lead to advances in child health. Such initiatives need to target households with infants or, perhaps, to nip the problem in the bud, those with expectant mothers. The Vietnamese experience of impressive performance in improving child nutrition outcomes and nutritional intake against a background of economic performance not dissimilar to India's (see Mishra and Ray, 2009), holds several policy lessons for India. The programs documented in Hop (2003) in the

Vietnam context as having successes in achieving higher nutrition and reducing malnutrition are worth emulating in India. This is clearly a topic of policy importance and merits further research.

Table 1: Sample means for key variables used in the analysis (NFHS II and NFHS III)

	NFHSII (1998)	NFHS III (2005)
Sample size	15118	12307
Height-for-age	-1.939	-1.585
Weight-for-height	-0.863	-1.084
Height-for-age <-3	0.259	0.179
Height-for-age from -3 to -2	0.229	0.223
Height-for-age from -2 to -1	0.239	0.263
Height-for-age from -1	0.273	0.335
Height-for-age <-3	0.032	0.035
Weight-for-height from -3 to -2	0.134	0.157
Weight-for-height from -2 to -1	0.318	0.370
Weight-for-height from -1 to	0.516	0.438
Male	0.524	0.521
Age of child: 0-6	0.210	0.171
Age of child: 7-12	0.158	0.169
Age of child: 13-18	0.196	0.173
Age of child: 19-24	0.133	0.153
Age of child: 25-29	0.186	0.175
Age of child: 30-36	0.117	0.160
Number of sisters	0.751	0.739
Number of brothers	0.641	0.610
Birth weight low	0.253	0.224
Birth order=1	0.272	0.293
Birth order=2	0.252	0.274
Birth order=3	0.184	0.172
Birth order=4	0.292	0.261
Age of mother at birth: 19	0.229	0.197
Age of mother at birth: 20-24	0.399	0.423
Age of mother at birth: 25-29	0.238	0.243
Age of mother at birth: 30-34	0.094	0.093
Age of mother at birth: 35 or higher	0.040	0.043
Mothers education no education	0.591	0.506
Mothers education primary schooling	0.157	0.149
Mothers education secondary or higher	0.252	0.345
Mother is wife of the household head	0.492	0.486
Fathers education no education	0.312	0.290
Fathers education primary schooling	0.180	0.159
Fathers education secondary or higher	0.508	0.550
Know ORS	0.609	0.712
Use ORS	0.062	0.055
Wealth quintile: poorest	0.258	0.294
Wealth quintile: poor	0.248	0.249
Wealth quintile: middle	0.232	0.210
Wealth quintile: rich	0.184	0.164
Wealth quintile: richest	0.078	0.083
Household has radio	0.339	0.255
Household has television	0.232	0.306
Household has access to pipe water	0.094	0.104
Hindu	0.841	0.810
Other caste	0.665	0.635
Andhra Pradesh	0.045	0.030
Assam	0.034	0.047
Bihar	0.126	0.112
Gujarat	0.041	0.041
Haryana	0.044	0.043
Himachal Pradesh	0.039	0.032

Karnataka	0.047	0.047
Kerala	0.029	0.030
Madhya Pradesh	0.109	0.121
Maharashtra	0.043	0.039
Orissa	0.068	0.055
Rajasthan	0.123	0.062
Tamil Nadu	0.043	0.034
Uttar Pradesh	0.129	0.211
West Bengal	0.045	0.059
Punjab	0.036	0.037
Child was breastfeed for 6 to 24 month	0.181	0.202
Child was given: water	0.747	0.828
Child was given: milk	0.419	0.407
Child was given: green vegetable	0.254	0.232
Child was given: fruit	0.163	0.221
Onset of breastfeeding: 1h or less	0.150	0.218
Onset of breastfeeding: 1h to 1 day	0.229	0.268
Onset of breastfeeding: more than 1 day	0.611	0.381
At least 1 household member smokes	0.539	0.215
Mothers BMI: <16.5	0.101	0.104
Mothers BMI: 16.5 to 18.5	0.312	0.311
Mothers BMI: 18.5 to 25	0.560	0.542
Mothers BMI: 25 to 30	0.023	0.036
Mothers BMI: >30	0.003	0.006
Mothers anaemia level: mild	0.157	0.414
Mothers anaemia level: moderate	0.165	0.186
Mothers anaemia level: severe	0.017	0.017
Mothers anaemia level: missing	0.045	0.012
Diarrhoea	0.198	0.127

Table 2: Descriptive statistics for key variables used in the analysis (NSS 55th and NSS 61st rounds)

	NSS 55	NSS 61
Sample Size	61,904	66,682
Hinduism	0.842	0.835
Islam	0.100	0.103
Christianity	0.022	0.022
Sikhism	0.028	0.031
Jainism	0.001	0.001
Buddhism	0.005	0.006
Household Type: Non-Agricultural	0.149	0.233
Household Type: Agriculture Labour	0.286	0.165
Household Type: Other Labour	0.074	0.112
Household Type: Self Employed in Agriculture	0.373	0.340
Scheduled Tribe (ST)	0.105	0.099
Scheduled Caste (SC)	0.192	0.192
Other Backward Classes (OBC)	0.374	0.413
Years of Schooling Household Head	4.092	3.529
Male Household Head	0.551	0.555
Age of Household Head	45.575	46.280
Marital Status	0.86	0.87
Household Size	5.296	5.109
Household Size per adult equivalent	4.17	(2.624) 4.05
Land Holding (in hectare)	3.909	1.752
Per Capita Expenditure (in Rs.)	558.982	675.423
Expenditure per adult equivalent (in Rs.)	700.747	842.249
Household having at least one child aged 0 – 3	0.278	0.251
Poverty Rate	0.20	0.18
Andhra Pradesh	0.083	0.082
Assam	0.055	0.050
Bihar	0.117	0.101
Gujarat	0.040	0.034
Haryana	0.018	0.025
Karnataka	0.044	0.043
Kerala	0.042	0.049
Madhya Pradesh	0.082	0.087
Maharashtra	0.065	0.075
Orissa	0.054	0.057
Rajasthan	0.052	0.053
Tamil Nadu	0.066	0.061
West Bengal	0.072	0.075
Himachal Pradesh	0.026	0.032
Punjab	0.034	0.036

Table 3: Differences in food expenditures between households with and without a child aged 0 – 3 years.

	55th Round			61st Round		
	Households with Children Aged 0 - 3	**Other Households**	**p-value of diff.**	**Households with Children Aged 0 - 3**	**Other Households**	**p-value of diff.**
Per adult equivalent consumption of						
Rice (kg/month)	8.139	9.332	0.000	7.699	8.904	0.000
Wheat (kg/month)	6.313	5.249	0.000	5.657	4.863	0.000
Other Cereals (kg/month)	2.009	2.005	0.957	1.911	1.807	0.000
Pulses (kg/month)	1.091	1.173	0.039	0.929	1.017	0.000
Milk (kg/month)	7.776	8.026	0.445	7.194	7.952	0.000
Milk Products (kg/month)	0.909	1.055	0.286	0.646	0.688	0.614
Egg, Fish, Meat (kg/month)	0.987	1.192	0.000	0.899	1.124	0.000
Vegetables (kg/month)	7.255	7.576	0.000	6.634	7.045	0.000
Fresh Fruits (kg/month)	1.846	2.428	0.000	1.630	2.187	0.000
Calorie (kcal/day)	2092.6	2163.7	0.013	2002.5	2097.3	0.000
POU rates	0.89	0.86	0.378	0.91	0.89	0.001
Poverty rates	0.31	0.18	0.000	0.30	0.17	0.000
Household size	6.9	4.7	0.000	6.8	4.5	0.000
Household size (as adult equivalent)	5.1	3.8	0.000	4.9	3.7	0.000

Notes:

POU rates are the fraction of people who are undernourished.

Calculation of POU rates is based on the criterion of 'actual calories < required calories'.

P-values refer to p-values of mean comparison t-test between households with at least one child aged 0 – 3 and those households without any child in that age group.

Table 4: Regressions for z-scores, Stunting and Wasting

Panel A (OLS)	**Height-for-age z-score**	**Weight-for-height z-score**
NFHS III (Year = 2005-06)	0.378***	-0.206***
	(0.022)	(0.017)
Panel B (Probit)	**Stunting**	**Wasting**
NFHS III (Year = 2005-06)	-0.107***	0.017***
	(0.008)	(0.006)
Observations	27425	27507

Notes:
Stunting is defined as having a height-for-age z-score < -2; Wasting is defined as having a weight-for-height z-score < -2.
Figures in parenthesis are standard errors clustered at the mother level.
*** p<0.01, ** p<0.05, * p<0.1
Regressions control for a full set of individual, parental and household characteristics. Full set of results are presented in Table A1 in the Appendix.

Table 5: Robustness of results to alternative estimation methods

			Height-for-age z-score	Weight-for-height z-score
Panel A: Ordered Probit Estimates				
NFHS III (Year = 2005-2006)	Coefficient Estimate		0.278***	-0.141***
			(0.017)	(0.017)
	Marginal Effects	Severely Stunted/Wasted	-0.074***	0.009***
			(0.005)	(0.001)
		Moderately Stunted/Wasted	-0.036***	0.026***
			(0.002)	(0.003)
		Mildly Stunted/Wasted	0.018***	0.021***
			(0.001)	(0.003)
		Normal	0.092***	-0.056***
			(0.006)	(0.007)
Panel B: SUR Estimates				
NFHS III (Year = 2005-2006)			0.378***	-0.208***
			(0.023)	(0.018)
Panel C: OLS Regressions Excluding the 6 northern states				
NFHS III (Year = 2005-2006)			0.292***	-0.184***
			(0.031)	(0.025)

Notes:
Figures in parenthesis are standard errors clustered at the mother level.
*** p<0.01, ** p<0.05, * p<0.1
Regressions control for a full set of individual, parental and household characteristics. Full set of results are presented in Supplementary Appendix.

Table 6: Pooled OLS Regressions: Expenditure and Inputs

Panel A: Expenditure Shares (4 major categories)				
	Food	**Education**	**Medical- Institutional**	**Medical- Non institutional**
Household having at least one child aged 0 – 3	-0.009*** (0.001)	-0.010*** (0.000)	0.005*** (0.000)	0.012*** (0.001)
NSS 61st Round (Year = 2005-06)	-0.021*** (0.001)	0.013*** (0.000)	-0.008*** (0.000)	-0.003*** (0.001)
Household having at least one child aged 0 – 3 × NSS 61st Round	0.004** (0.001)	-0.005 (0.001)	0.002** (0.001)	-0.001 (0.001)

Panel B: Per Adult Equivalent Consumption of Cereals				
	Rice (kg/month)	**Wheat (kg/month)**	**Other Cereals (kg/month)**	**Pulses (kg/month)**
Household having at least one child aged 0 – 3	0.18*** (0.04)	0.34*** (0.04)	0.05 (0.03)	0.09** (0.03)
NSS 61st Round (Year = 2005-2006)	-0.53*** (0.03)	-0.69*** (0.03)	-0.22*** (0.04)	-0.26*** (0.03)
Household having at least one child aged 0 – 3 × NSS 61st Round	-0.01 (0.06)	-0.30*** (0.05)	0.13** (0.06)	-0.003 (0.03)

Panel C: Per Adult Equivalent Consumption of Milk, Milk Products, Meat, Vegetables and Fruits					
	Milk (kg/month)	**Milk Products (kg/month)**	**Egg, Fish and Meat (kg/month)**	**Vegetables (kg/month)**	**Fresh Fruits (kg/month)**
Household having at least one child aged 0 – 3	1.48*** (0.54)	0.13 (0.11)	0.12*** (0.04)	0.52*** (0.07)	0.18** (0.07)
NSS 61st Round (Year = 2005-2006)	-0.67*** (0.10)	-0.39*** (0.11)	-0.23*** (0.03)	-0.94*** (0.06)	-0.40*** (0.03)
Household having at least one child aged 0 – 3 × NSS 61st Round	-0.48 (0.50)	0.12 (0.18)	0.004 (0.05)	-0.07 (0.09)	0.07 (0.07)

Panel D: Per Adult Equivalent Calorie Consumption (Kcal/Month)	
Household having at least one child aged 0 – 3	2163.0*** (746.4)
NSS 61st Round (Year = 2005-2006)	-4452.0*** (662.3)
Household having at least one child aged 0 – 3 × NSS 61st Round	-689.6 (1045.0)

Notes:
Figures in parenthesis are robust standard errors.
*** p<0.01, ** p<0.05, * p<0.1
Regressions control for a full set of individual, parental and household characteristics. Full set of results are presented in Table A1 in the Appendix.

Table 7: Per adult equivalent intake of Calorie, Protein and Fat from Milk and Milk Product

	55th Round		61st Round	
	Households with children aged 0 - 3	**Other Households**	**Households with children aged 0 - 3**	**Other Households**
Milk				
Calorie (in Kcals)	143.01	199.16	145.95	204.08
Protein (in kgs)	0.29	0.30	0.26	0.29
Fat (in kgs)	0.50	0.51	0.46	0.51
Milk Products				
Calorie (in Kcals)	159.52	215.08	166.97	230.07
Protein (in kgs)	0.76	0.79	0.71	0.78
Fat (in kgs)	0.82	0.85	0.76	0.84

Table 7A: Differences in per adult equivalent intake of Calorie, Protein and Fat from Milk and Milk Product from 55th to 61st Round

	Households with children aged 0 - 3	**p-value of diff.**	**Other Households**	**p-value of diff.**
Milk				
Calorie (in Kcals)	2.94	0.000	4.93	0.000
Protein (in kgs)	-0.03	0.229	-0.01	0.303
Fat (in kgs)	-0.04	0.229	0.00	0.303
Milk Products				
Calorie (in Kcals)	7.46	0.004	14.99	0.000
Protein (in kgs)	-0.05	0.050	-0.01	0.000
Fat (in kgs)	-0.06	0.050	-0.01	0.000

Table 7B: State Wise Differences in per adult equivalent intake of Calorie, Protein and Fat from Milk and Milk Product from 55th to 61st Round in Households with 0-3 years Children

States	*Milk*						*Milk Products*					
	Calorie (in Kcals)	**p-value of diff.**	*Protein (in kgs)*	**p-value of diff**	*Fat (in kgs)*	**p-value of diff**	*Calorie (in Kcals)*	**p-value of diff.**	*Protein (in kgs)*	**p-value of diff**	*Fat (in kgs)*	**p-value of diff**
Andhra Pradesh	5.86	0.064	0.00	0.666	-0.01	0.666	-18.11	0.127	-0.01	0.348	-0.01	0.348
Assam	9.66	0.019	0.02	0.000	0.04	0.000	24.06	0.073	0.06	0.365	0.06	0.365
Bihar	5.86	0.024	-0.13	0.403	-0.22	0.403	-1.67	0.819	-0.33	0.021	-0.35	0.021
Gujarat	-1.01	0.775	-0.02	0.434	-0.03	0.434	-14.77	0.112	-0.04	0.051	-0.05	0.051
Haryana	1.16	0.790	-0.09	0.041	-0.16	0.041	0.17	0.984	-0.24	0.332	-0.26	0.332
Himachal Pradesh	-0.77	0.875	0.05	0.024	0.09	0.024	-2.64	0.893	0.13	0.137	0.14	0.137
Karnataka	-2.24	0.568	-0.01	0.056	-0.03	0.056	-19.60	0.072	-0.04	0.000	-0.04	0.000
Kerala	10.44	0.018	-0.01	0.436	-0.01	0.436	66.35	0.001	-0.02	0.112	-0.02	0.112
Madhya Pradesh	1.48	0.574	-0.01	0.392	-0.01	0.392	2.21	0.746	-0.02	0.313	-0.02	0.313
Maharashtra	-0.52	0.859	0.01	0.442	0.01	0.442	21.19	0.114	0.01	0.566	0.02	0.566
Orissa	0.78	0.882	0.00	0.866	0.00	0.866	-5.26	0.740	0.00	0.124	0.00	0.124
Punjab	1.99	0.653	-0.06	0.142	-0.11	0.142	23.72	0.083	-0.17	0.029	-0.18	0.029
Rajasthan	2.55	0.340	-0.03	0.150	-0.04	0.150	8.78	0.169	-0.07	0.058	-0.07	0.058
Tamil Nadu	5.53	0.176	0.01	0.559	-0.01	0.559	-15.35	0.369	0.01	0.003	0.01	0.003
Uttar Pradesh	2.71	0.096	0.00	0.841	0.00	0.841	6.95	0.206	0.00	0.337	0.00	0.337
West Bengal	1.75	0.629	-0.02	0.010	-0.03	0.010	-0.24	0.983	-0.04	0.193	-0.04	0.193

Table 7C: State Wise Differences in per adult equivalent intake of Calorie, Protein and Fat from Milk and Milk Product from 55th to 61st Round in Other Households

States	*Milk*						*Milk Products*					
	Calorie (in Kcals)	**p-value of diff.**	*Protein (in kgs)*	**p-value of diff**	*Fat (in kgs)*	**p-value of diff**	*Calorie (in Kcals)*	**p-value of diff.**	*Protein (in kgs)*	**p-value of diff**	*Fat (in kgs)*	**p-value of diff**
Andhra Pradesh	7.82	0.036	0.01	0.164	0.01	0.164	4.59	0.714	0.02	0.532	0.02	0.532
Assam	1.07	0.717	0.01	0.012	0.01	0.012	47.00	0.000	0.02	0.180	0.02	0.180
Bihar	-1.09	0.747	0.02	0.000	0.04	0.000	-11.80	0.203	0.05	0.000	0.06	0.000
Gujarat	4.70	0.390	-0.02	0.050	-0.03	0.050	-1.42	0.894	-0.04	0.001	-0.04	0.001
Haryana	6.27	0.288	-0.04	0.125	-0.08	0.125	28.76	0.009	-0.12	0.351	-0.13	0.351
Himachal Pradesh	-10.58	0.103	0.05	0.003	0.09	0.003	48.90	0.010	0.14	0.404	0.15	0.404
Karnataka	14.42	0.002	-0.02	0.000	-0.03	0.000	12.50	0.315	-0.05	0.157	-0.05	0.157
Kerala	18.34	0.000	-0.01	0.298	-0.01	0.298	61.10	0.000	-0.02	0.020	-0.02	0.020
Madhya Pradesh	-0.05	0.989	-0.01	0.130	-0.02	0.130	4.36	0.601	-0.03	0.560	-0.03	0.560
Maharashtra	4.66	0.241	0.00	0.984	0.00	0.984	13.54	0.271	0.00	0.074	0.00	0.074
Orissa	0.23	0.961	0.00	0.824	0.00	0.824	-5.47	0.688	0.00	0.107	0.00	0.107
Punjab	0.41	0.921	-0.01	0.435	-0.02	0.435	22.15	0.063	-0.04	0.000	-0.04	0.000
Rajasthan	6.02	0.195	-0.03	0.038	-0.05	0.038	13.17	0.151	-0.08	0.000	-0.09	0.000
Tamil Nadu	15.99	0.000	-0.02	0.051	-0.03	0.051	9.38	0.518	-0.04	0.000	-0.04	0.000
Uttar Pradesh	2.73	0.382	-0.01	0.449	-0.01	0.449	14.74	0.102	-0.02	0.253	-0.02	0.253
West Bengal	10.93	0.002	-0.02	0.000	-0.04	0.000	7.24	0.543	-0.06	0.226	-0.06	0.226

Table 8: SUR Estimates

Panel A: Per Adult Equivalent Intake of Calorie, Protein and Fat from Milk			
	Calorie (kcal/month)	**Protein (kg/month)**	**Fat (kg/month)**
Household having at least one child aged 0 – 3	2.955***	0.056***	0.096***
	(0.908)	(0.0094)	(0.016)
NSS 61st Round (Year = 2005-2006)	-4.269***	-0.025***	-0.044***
	(0.692)	(0.007)	(0.012)
Household having at least one child aged 0 – 3 × NSS 61st Round	-1.230	-0.018	-0.031
	(1.263)	(0.013)	(0.023)
Panel B: Per Adult Equivalent Intake of Calorie, Protein and Fat from Milk Products			
	Calorie (kcal/month)	**Protein (kg/month)**	**Fat (kg/month)**
Household having at least one child aged 0 – 3	7.850***	0.147***	0.158***
	(2.674)	(0.025)	(0.027)
NSS 61st Round (Year = 2005-2006)	-1.145	-0.067***	-0.072***
	(2.232)	(0.019)	(0.020)
Household having at least one child aged 0 – 3 × NSS 61st Round	-7.613*	-0.048	-0.051
	(3.893)	(0.035)	(0.037)

Notes:

i) Figures in parenthesis are robust standard errors.
ii) ***, **,* indicate significance at 1%, 5% and 10% level respectively.
iii) Regressions control for a full set of individual, parental and household characteristics. Full set of results available on request.

Figure 1: Lowess Plots of HAZ and WHZ by year

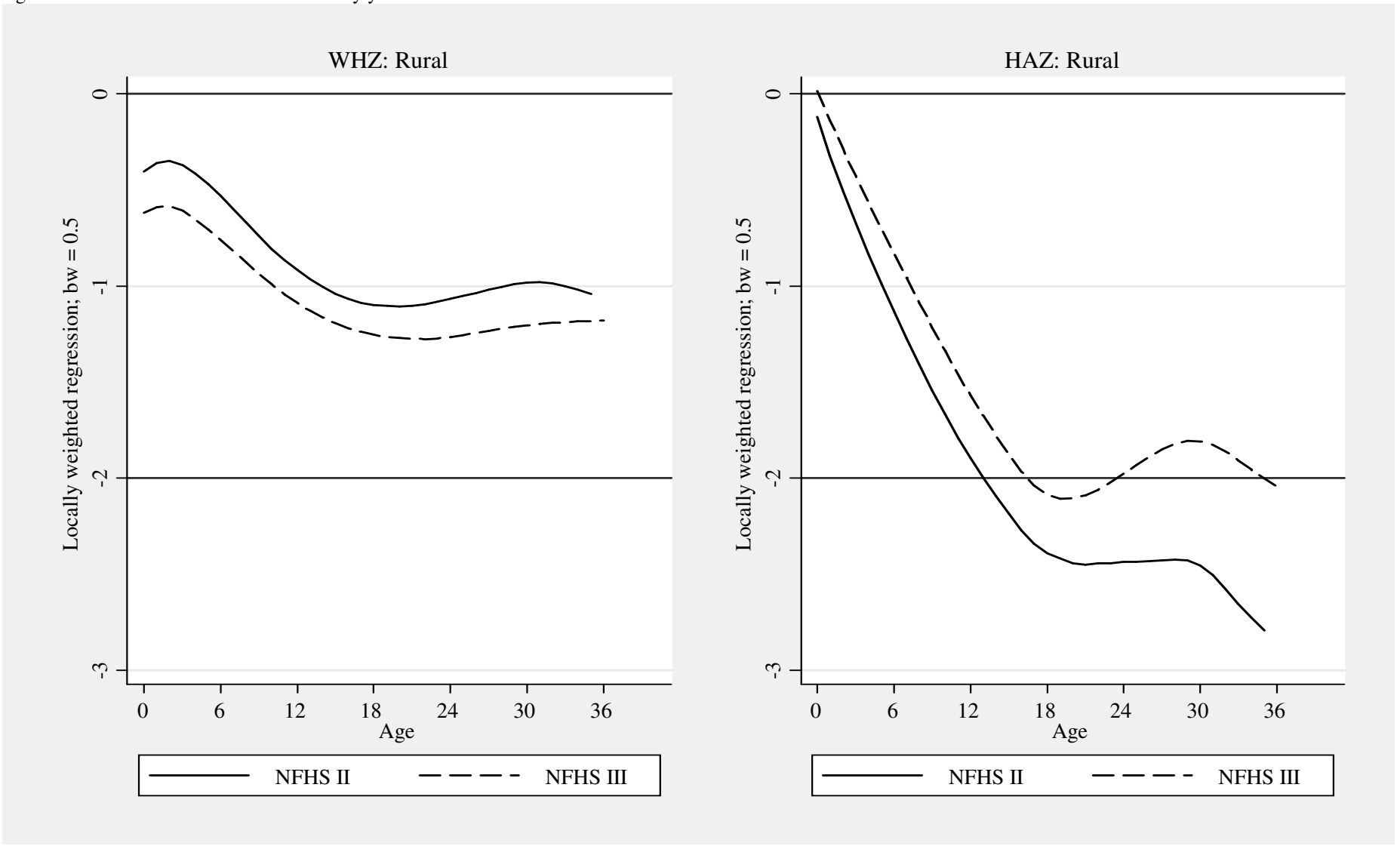
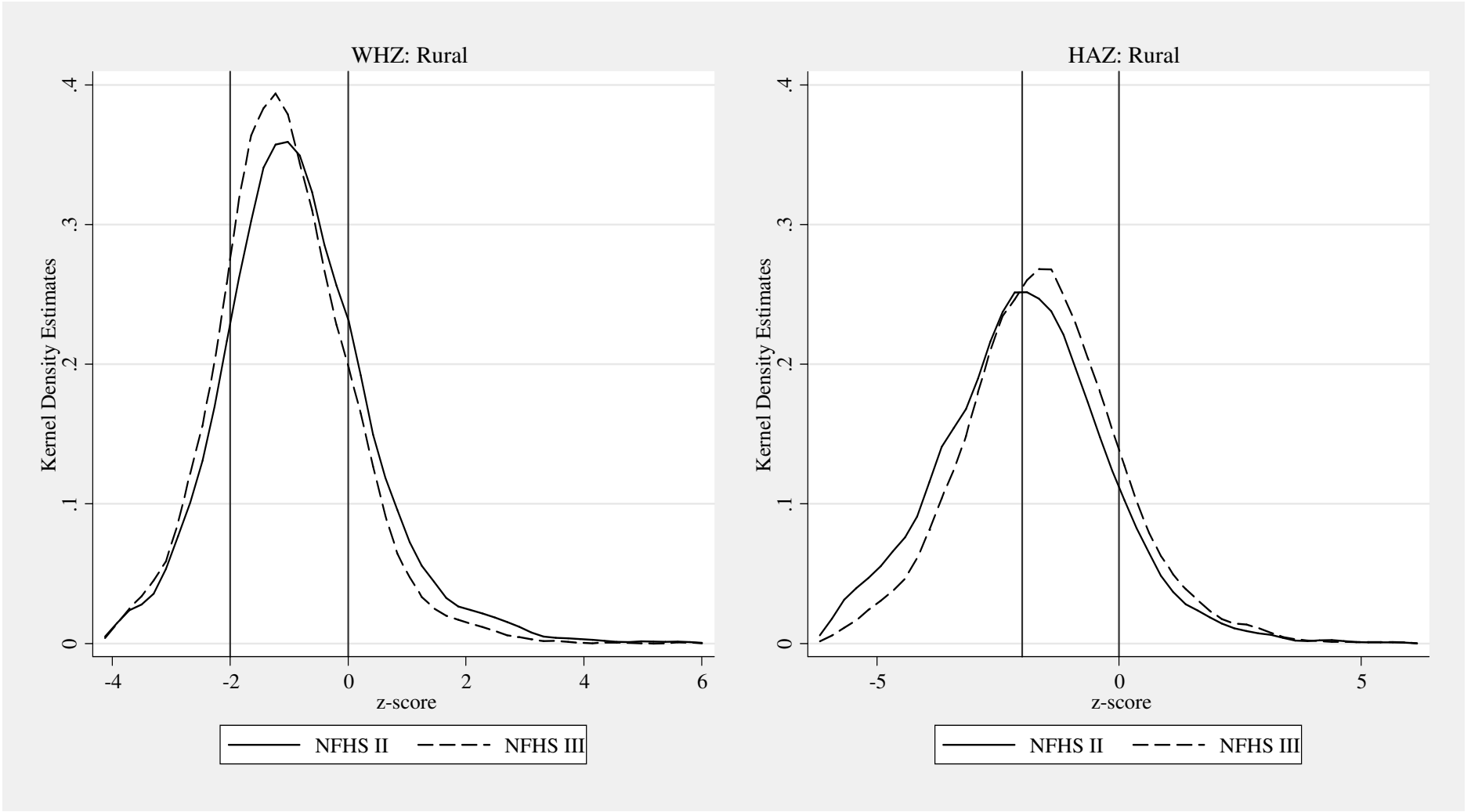


Figure 2: Kernel Density Estimates of HAZ and WHZ by year



Notes: Kolmogrov-Smirnov test p-values:
HAZ: Combined K-S 0.0534; p-value = 0.0000
WHZ: Combined K-S 0.0739; p-value = 0.0000

Figure 3: Difference in cdf of HAZ and WHZ. Improvements are denoted by negative numbers

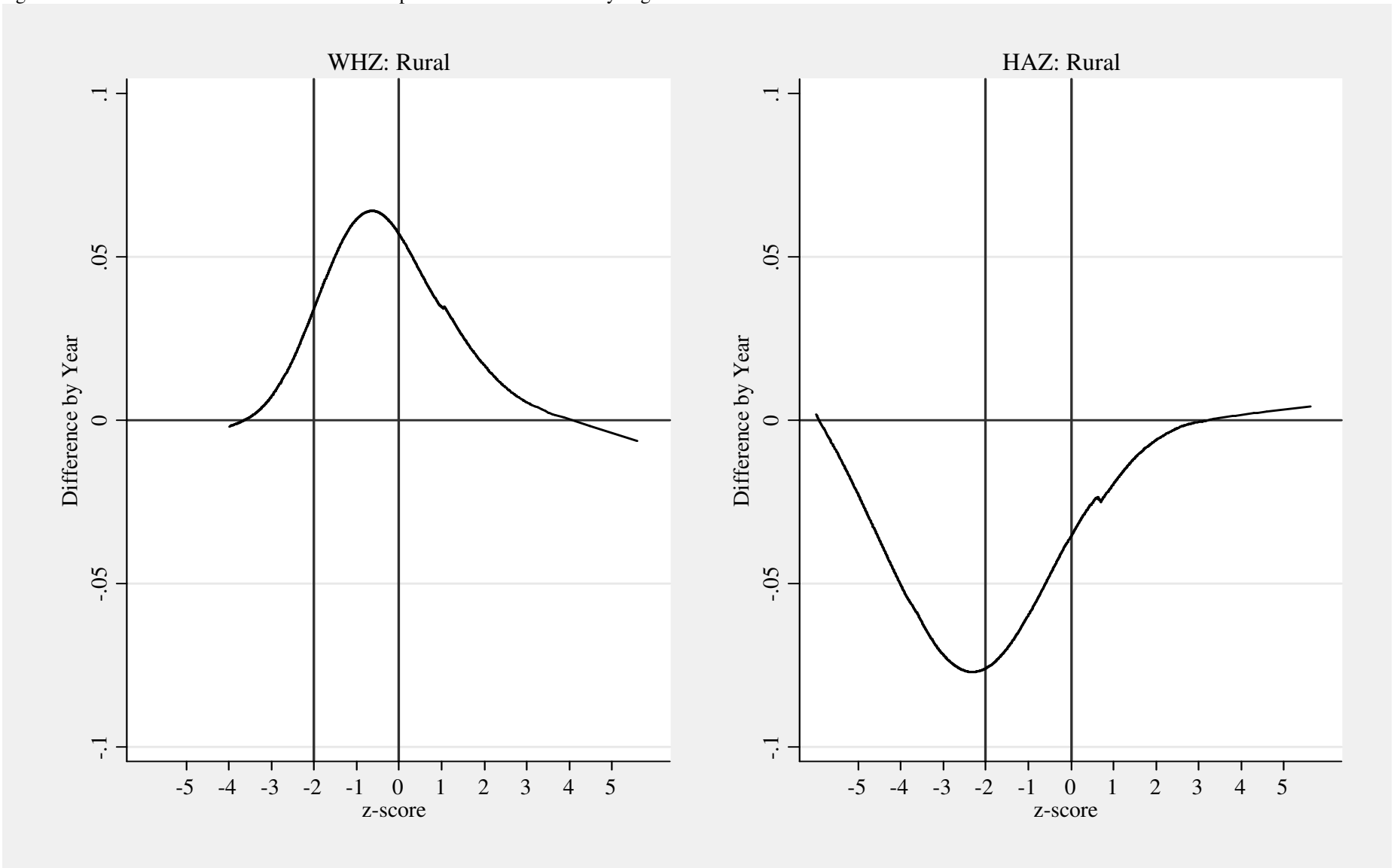
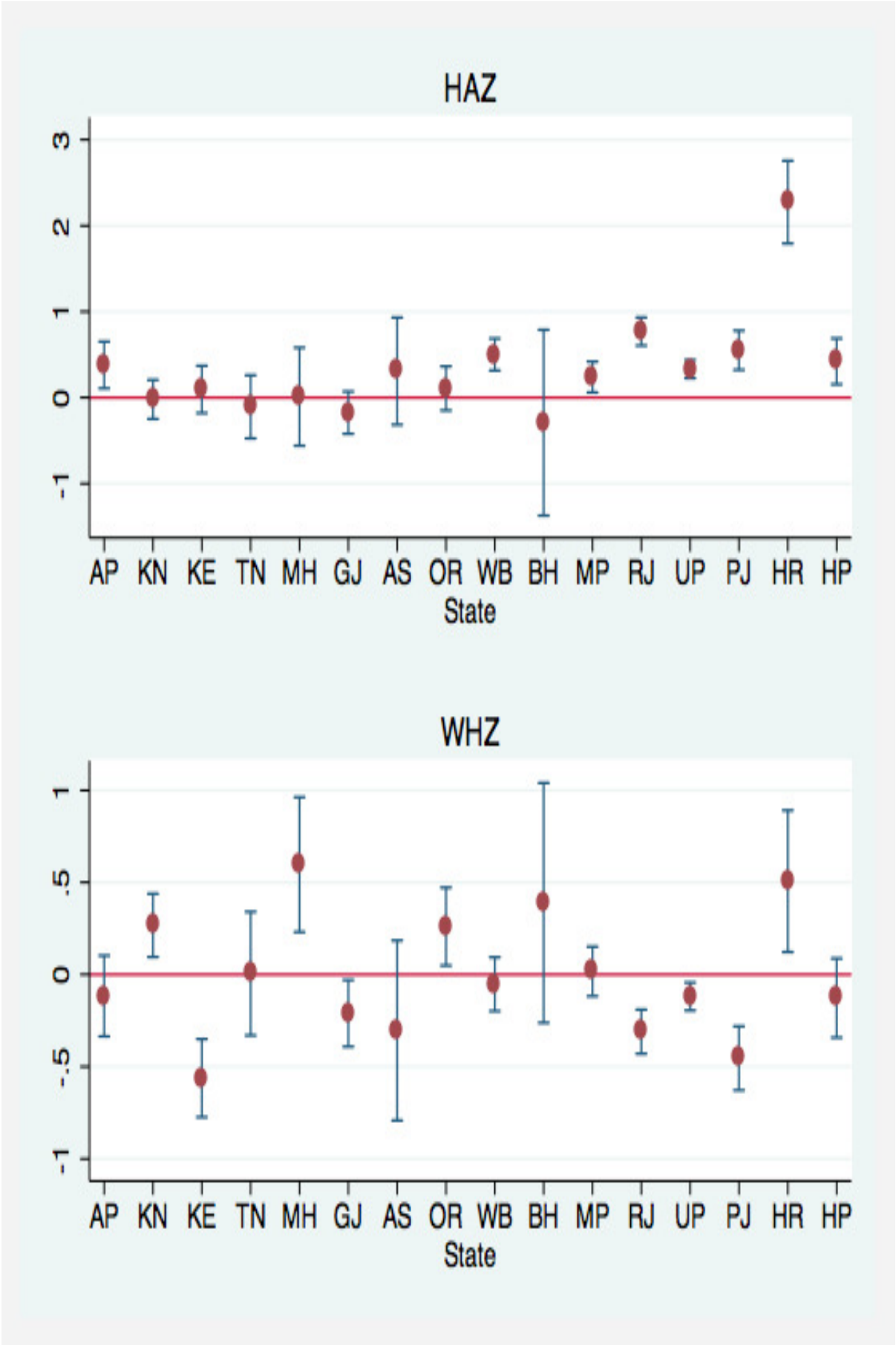


Figure 4: Estimated effect for the NFHS III dummy for the different states



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Supplementary Appendix

Table A1: Regressions for z-scores, Stunting and Wasting

	Height-for-age z-score		Weight-for-height z-score		Stunted Probit		Wasted Probit	
	Coefficient	SE	Coefficient	SE	Marginal Effect	SE	Marginal Effect	SE
Male	0.030*	(0.018)	0.002	(0.014)	-0.017***	(0.006)	0.009**	(0.005)
Age of child: 7-12	-0.873***	(0.032)	-0.370***	(0.027)	0.269***	(0.012)	0.084***	(0.010)
Age of child: 13-18	-1.578***	(0.032)	-0.623***	(0.026)	0.466***	(0.009)	0.151***	(0.011)
Age of child: 19-24	-2.017***	(0.034)	-0.734***	(0.027)	0.528***	(0.008)	0.165***	(0.012)
Age of child: 25-29	-1.556***	(0.035)	-0.630***	(0.026)	0.441***	(0.010)	0.076***	(0.011)
Age of child: 30-36	-1.911***	(0.038)	-0.640***	(0.027)	0.496***	(0.009)	0.085***	(0.012)
Number of sisters	-0.030*	(0.017)	-0.005	(0.012)	0.011*	(0.006)	0.001	(0.004)
Number of brothers	-0.032*	(0.018)	-0.013	(0.013)	0.005	(0.006)	0.001	(0.004)
Birth weight low	-0.246***	(0.021)	-0.194***	(0.016)	0.073***	(0.008)	0.058***	(0.006)
Birth order=2	-0.048*	(0.028)	-0.025	(0.022)	0.025**	(0.010)	0.012	(0.007)
Birth order=3	-0.085**	(0.040)	-0.009	(0.030)	0.047***	(0.014)	-0.002	(0.010)
Birth order 4 and Higher	-0.157***	(0.053)	-0.011	(0.039)	0.063***	(0.019)	0.009	(0.013)
Age of mother at birth: 20-24	0.180***	(0.026)	-0.021	(0.021)	-0.068***	(0.009)	0.001	(0.007)
Age of mother at birth: 25-29	0.262***	(0.033)	-0.047*	(0.025)	-0.087***	(0.012)	0.007	(0.008)
Age of mother at birth: 30-34	0.284***	(0.043)	-0.061*	(0.033)	-0.090***	(0.015)	0.009	(0.011)
Age of mother at birth: 35 or higher	0.289***	(0.059)	-0.116***	(0.043)	-0.106***	(0.018)	0.012	(0.014)
Mother's education primary schooling	0.069**	(0.027)	-0.000	(0.021)	-0.019*	(0.010)	0.001	(0.007)
Mother's education secondary or higher	0.186***	(0.027)	0.082***	(0.021)	-0.075***	(0.010)	-0.009	(0.007)
Mother is wife of the household head	-0.001	(0.020)	-0.025	(0.015)	0.001	(0.007)	0.003	(0.005)
Father's education primary schooling	0.038	(0.029)	-0.032	(0.021)	-0.020*	(0.010)	-0.002	(0.007)
Father's education secondary or higher	0.089***	(0.026)	0.019	(0.019)	-0.036***	(0.009)	-0.009	(0.006)
Know ORS	0.062***	(0.021)	-0.034**	(0.016)	-0.018**	(0.007)	-0.004	(0.005)
Use ORS	-0.097**	(0.038)	-0.007	(0.033)	0.031**	(0.014)	0.008	(0.011)
Wealth quintile: lowest	-0.548***	(0.053)	-0.251***	(0.041)	0.196***	(0.020)	0.073***	(0.016)
Wealth quintile: second	-0.459***	(0.049)	-0.229***	(0.039)	0.175***	(0.019)	0.060***	(0.015)
Wealth quintile: middle	-0.380***	(0.044)	-0.163***	(0.035)	0.138***	(0.018)	0.048***	(0.014)
Wealth quintile: fourth	-0.272***	(0.038)	-0.107***	(0.031)	0.102***	(0.016)	0.030**	(0.012)
Has radio	0.016	(0.021)	-0.009	(0.017)	-0.007	(0.008)	0.000	(0.006)
Has television	0.012	(0.027)	-0.018	(0.021)	0.002	(0.010)	-0.005	(0.007)
Has access to pipe water	0.021	(0.032)	0.014	(0.025)	-0.012	(0.012)	-0.009	(0.009)
Hindu	0.037	(0.027)	-0.004	(0.021)	-0.013	(0.010)	-0.000	(0.007)
Other caste	0.078***	(0.020)	0.031**	(0.015)	-0.025***	(0.007)	-0.012**	(0.005)

Andhra Pradesh	0.416***	(0.051)	-0.007	(0.039)	-0.119***	(0.018)	0.001	(0.015)
Assam	0.267***	(0.062)	0.417***	(0.050)	-0.078***	(0.019)	-0.028**	(0.013)
Bihar	0.124***	(0.038)	-0.209***	(0.029)	-0.034***	(0.013)	0.085***	(0.011)
Gujarat	0.105**	(0.052)	-0.135***	(0.039)	-0.027	(0.018)	0.092***	(0.017)
Haryana	-0.037	(0.048)	0.220***	(0.039)	0.016	(0.018)	-0.031**	(0.013)
Himachal Pradesh	0.107*	(0.062)	-0.089*	(0.049)	-0.023	(0.023)	0.034*	(0.018)
Karnataka	0.401***	(0.055)	-0.076*	(0.043)	-0.093***	(0.019)	0.021	(0.014)
Kerala	0.453***	(0.065)	-0.143***	(0.051)	-0.156***	(0.024)	0.022	(0.019)
Madhya Pradesh	0.167***	(0.037)	-0.276***	(0.027)	-0.046***	(0.013)	0.089***	(0.011)
Maharashtra	0.266***	(0.049)	-0.239***	(0.038)	-0.054***	(0.019)	0.063***	(0.016)
Orissa	0.394***	(0.044)	-0.158***	(0.035)	-0.099***	(0.016)	0.050***	(0.014)
Rajasthan	0.195***	(0.039)	-0.100***	(0.028)	-0.058***	(0.013)	0.042***	(0.011)
Tamil Nadu	0.639***	(0.057)	-0.135***	(0.047)	-0.184***	(0.019)	0.050***	(0.017)
West Bengal	0.491***	(0.045)	-0.084**	(0.035)	-0.156***	(0.015)	0.031**	(0.014)
Punjab	0.181***	(0.056)	0.177***	(0.043)	-0.056***	(0.021)	-0.009	(0.016)
Month of measurement: February	-0.032	(0.029)	0.011	(0.022)	0.007	(0.010)	0.023***	(0.008)
Month of measurement: March	0.065*	(0.035)	-0.110***	(0.027)	-0.029**	(0.012)	0.049***	(0.010)
Month of measurement: April	0.194***	(0.039)	-0.273***	(0.030)	-0.069***	(0.014)	0.088***	(0.012)
Month of measurement: May	0.118***	(0.037)	-0.232***	(0.029)	-0.048***	(0.013)	0.098***	(0.012)
Month of measurement: June	0.084**	(0.043)	-0.208***	(0.033)	-0.009	(0.015)	0.099***	(0.013)
Month of measurement: July	0.136*	(0.070)	-0.120**	(0.057)	-0.032	(0.025)	0.116***	(0.023)
Month of measurement: August	-0.070	(0.162)	0.195	(0.150)	0.047	(0.058)	0.117**	(0.051)
Month of measurement: September	0.046	(0.690)	1.437**	(0.696)	-0.009	(0.139)	0.149	(0.131)
Month of measurement: November	0.138	(0.089)	-0.297***	(0.064)	-0.073**	(0.032)	-0.021	(0.026)
Month of measurement: December	0.022	(0.031)	-0.110***	(0.023)	-0.023**	(0.011)	0.006	(0.009)
Child was breastfeed for 6 to 24 month	0.288***	(0.029)	0.087***	(0.020)	-0.069***	(0.010)	-0.023***	(0.007)
Child was given: water	-0.029	(0.026)	-0.005	(0.021)	0.001	(0.010)	-0.000	(0.007)
Child was given: milk	0.008	(0.020)	-0.002	(0.016)	-0.007	(0.007)	-0.003	(0.005)
Child was given: green vegetable	0.134***	(0.024)	-0.045***	(0.017)	-0.022***	(0.008)	0.009	(0.006)
Child was given: fruit	0.103***	(0.025)	0.046**	(0.018)	-0.034***	(0.009)	-0.025***	(0.006)
Onset of breastfeeding: 1h or less	-0.100**	(0.046)	-0.033	(0.032)	0.024	(0.016)	0.007	(0.012)
Onset of breastfeeding: 1h to 1 day	-0.073*	(0.044)	-0.085***	(0.030)	0.013	(0.015)	0.009	(0.011)
Onset of breastfeeding: more than 1 day	-0.057	(0.043)	-0.096***	(0.029)	0.008	(0.015)	0.012	(0.011)
At least 1 household member smoke	-0.096***	(0.020)	0.037**	(0.016)	0.029***	(0.007)	-0.013***	(0.005)
Mother's BMI: <16.5	-0.128***	(0.030)	-0.394***	(0.023)	0.038***	(0.011)	0.105***	(0.009)
Mother's BMI: 16.5 to 18.5	-0.098***	(0.020)	-0.208***	(0.015)	0.025***	(0.007)	0.036***	(0.005)
Mother's BMI: 25 to 30	0.047	(0.051)	0.163***	(0.043)	-0.023	(0.021)	-0.041***	(0.014)

Mother's BMI: >30	0.212	(0.144)	0.303***	(0.104)	-0.101**	(0.050)	-0.077**	(0.031)
Mother's anaemia level: mild	-0.063***	(0.023)	-0.015	(0.017)	0.017**	(0.008)	-0.001	(0.006)
Mother's anaemia level: moderate	-0.158***	(0.026)	-0.055***	(0.020)	0.048***	(0.009)	0.003	(0.006)
Mother's anaemia level: severe	-0.219***	(0.070)	-0.195***	(0.051)	0.045*	(0.025)	0.040**	(0.019)
Mother's anaemia level: missing	-0.110*	(0.056)	0.111**	(0.045)	0.048**	(0.020)	-0.015	(0.013)
Diarrhoea in last 7 days			-0.072***	(0.021)			0.005	(0.007)
NFHS III (Year 2005-2006)	0.378***	(0.022)	-0.206***	(0.017)	-0.107***	(0.008)	0.017***	(0.006)
Constant	-0.705***	(0.087)	0.248***	(0.066)				
Observations	27,425		27,499		27,425		27,499	
R-squared	0.235		0.127					

Table A2: Ordered Probit estimations: Height-for-Age

	Severely Stunted		Moderately Stunted		Mildly Stunted		Normal	
	Coefficient	**SE**	**Coefficient**	**SE**	**Coefficient**	**SE**	**Coefficient**	**SE**
Male	-0.009***	(0.004)	-0.004***	(0.002)	0.002***	(0.001)	0.012***	(0.004)
Age of child: 7-12	0.215***	(0.009)	0.049***	(0.002)	-0.078***	(0.004)	-0.187***	(0.006)
Age of child: 13-18	0.412***	(0.009)	0.037***	(0.003)	-0.156***	(0.004)	-0.293***	(0.005)
Age of child: 19-24	0.525***	(0.009)	-0.009**	(0.004)	-0.203***	(0.004)	-0.313***	(0.005)
Age of child: 25-29	0.392***	(0.010)	0.039***	(0.003)	-0.149***	(0.005)	-0.282***	(0.005)
Age of child: 30-36	0.490***	(0.010)	0.000	(0.004)	-0.191***	(0.005)	-0.299***	(0.005)
Number of sisters	0.008**	(0.003)	0.004**	(0.002)	-0.002**	(0.001)	-0.010**	(0.004)
Number of brothers	0.006*	(0.004)	0.003*	(0.002)	-0.002*	(0.001)	-0.008*	(0.004)
Birth weight low	0.054***	(0.005)	0.022***	(0.002)	-0.015***	(0.002)	-0.061***	(0.005)
Birth order=2	0.011*	(0.006)	0.005*	(0.003)	-0.003*	(0.002)	-0.013*	(0.007)
Birth order=3	0.022***	(0.008)	0.010***	(0.004)	-0.006**	(0.002)	-0.026***	(0.010)
Birth order=4	0.033***	(0.011)	0.015***	(0.005)	-0.009***	(0.003)	-0.039***	(0.013)
Age of mother at birth: 20-24	-0.037***	(0.005)	-0.018***	(0.003)	0.009***	(0.001)	0.046***	(0.007)
Age of mother at birth: 25-29	-0.050***	(0.006)	-0.027***	(0.004)	0.011***	(0.001)	0.066***	(0.009)
Age of mother at birth: 30-34	-0.053***	(0.007)	-0.030***	(0.005)	0.009***	(0.001)	0.074***	(0.012)
Age of mother at birth: 35 or	-0.049***	(0.010)	-0.028***	(0.007)	0.009***	(0.001)	0.069***	(0.016)
Mothers education primary	-0.013**	(0.005)	-0.006**	(0.003)	0.003**	(0.001)	0.016**	(0.007)
Mothers education secondary	-0.045***	(0.005)	-0.023***	(0.003)	0.010***	(0.001)	0.058***	(0.007)
Mother is wife of the	-0.000	(0.004)	-0.000	(0.002)	0.000	(0.001)	0.000	(0.005)
Fathers education primary	-0.010*	(0.006)	-0.005*	(0.003)	0.002*	(0.001)	0.013*	(0.007)
Fathers education secondary	-0.021***	(0.005)	-0.010***	(0.002)	0.005***	(0.001)	0.025***	(0.006)
Know ORS	-0.013***	(0.004)	-0.006***	(0.002)	0.003***	(0.001)	0.015***	(0.005)
Use ORS	0.021**	(0.008)	0.009***	(0.003)	-0.006**	(0.002)	-0.024***	(0.009)
Wealth quintile: lowest	0.127***	(0.013)	0.046***	(0.003)	-0.040***	(0.005)	-0.133***	(0.012)
Wealth quintile: second	0.109***	(0.012)	0.040***	(0.003)	-0.034***	(0.004)	-0.115***	(0.011)
Wealth quintile: middle	0.091***	(0.011)	0.034***	(0.003)	-0.028***	(0.004)	-0.097***	(0.010)
Wealth quintile: fourth	0.062***	(0.009)	0.025***	(0.003)	-0.019***	(0.003)	-0.068***	(0.009)
Has radio	-0.006	(0.004)	-0.003	(0.002)	0.001	(0.001)	0.007	(0.005)
Has television	-0.000	(0.006)	-0.000	(0.003)	0.000	(0.001)	0.000	(0.007)
Has access to pipe water	-0.010	(0.007)	-0.005	(0.003)	0.002	(0.002)	0.013	(0.008)
Hindu	-0.006	(0.006)	-0.003	(0.003)	0.002	(0.001)	0.007	(0.007)
Other caste	-0.017***	(0.004)	-0.008***	(0.002)	0.004***	(0.001)	0.021***	(0.005)
Andhra Pradesh	-0.073***	(0.008)	-0.046***	(0.006)	0.009***	(0.001)	0.111***	(0.015)
Assam	-0.045***	(0.010)	-0.025***	(0.007)	0.008***	(0.001)	0.062***	(0.016)

Bihar	-0.025***	(0.007)	-0.013***	(0.004)	0.006***	(0.001)	0.032***	(0.010)
Gujarat	-0.012	(0.010)	-0.006	(0.005)	0.003	(0.002)	0.015	(0.013)
Haryana	-0.002	(0.010)	-0.001	(0.005)	0.000	(0.002)	0.002	(0.012)
Himachal Pradesh	-0.023*	(0.012)	-0.012*	(0.007)	0.005**	(0.002)	0.030*	(0.016)
Karnataka	-0.073***	(0.009)	-0.046***	(0.007)	0.009***	(0.001)	0.110***	(0.016)
Kerala	-0.083***	(0.010)	-0.055***	(0.009)	0.007***	(0.002)	0.130***	(0.020)
Madhya Pradesh	-0.032***	(0.007)	-0.017***	(0.004)	0.007***	(0.001)	0.042***	(0.010)
Maharashtra	-0.045***	(0.009)	-0.025***	(0.006)	0.008***	(0.001)	0.062***	(0.014)
Orissa	-0.072***	(0.007)	-0.045***	(0.006)	0.009***	(0.001)	0.108***	(0.013)
Rajasthan	-0.040***	(0.007)	-0.021***	(0.004)	0.008***	(0.001)	0.053***	(0.010)
Tamil Nadu	-0.105***	(0.007)	-0.076***	(0.008)	0.002	(0.003)	0.179***	(0.018)
West Bengal	-0.090***	(0.007)	-0.061***	(0.006)	0.007***	(0.002)	0.144***	(0.014)
Punjab	-0.043***	(0.010)	-0.024***	(0.007)	0.008***	(0.001)	0.059***	(0.016)
Month of measurement:	0.006	(0.006)	0.003	(0.003)	-0.002	(0.002)	-0.008	(0.007)
Month of measurement:	-0.013*	(0.007)	-0.006*	(0.003)	0.003**	(0.002)	0.016*	(0.009)
Month of measurement: April	-0.043***	(0.007)	-0.024***	(0.004)	0.008***	(0.001)	0.059***	(0.011)
Month of measurement: May	-0.022***	(0.007)	-0.011***	(0.004)	0.005***	(0.001)	0.029***	(0.010)
Month of measurement: June	-0.007	(0.009)	-0.003	(0.004)	0.002	(0.002)	0.009	(0.011)
Month of measurement: July	-0.012	(0.013)	-0.006	(0.007)	0.003	(0.003)	0.015	(0.018)
Month of measurement:	0.034	(0.039)	0.014	(0.014)	-0.010	(0.013)	-0.038	(0.040)
Month of measurement:	0.042	(0.124)	0.016	(0.039)	-0.013	(0.042)	-0.046	(0.121)
Month of measurement:	-0.036**	(0.016)	-0.020*	(0.010)	0.007***	(0.002)	0.049**	(0.024)
Month of measurement:	-0.009	(0.006)	-0.004	(0.003)	0.002	(0.001)	0.011	(0.008)
Child was breastfeed for 6 to	-0.047***	(0.005)	-0.025***	(0.003)	0.010***	(0.001)	0.062***	(0.007)
Child was given: water	0.004	(0.005)	0.002	(0.003)	-0.001	(0.001)	-0.005	(0.007)
Child was given: milk	-0.003	(0.004)	-0.002	(0.002)	0.001	(0.001)	0.004	(0.005)
Child was given: green	-0.017***	(0.005)	-0.009***	(0.002)	0.004***	(0.001)	0.022***	(0.006)
Child was given: fruit	-0.020***	(0.005)	-0.010***	(0.003)	0.005***	(0.001)	0.025***	(0.006)
Onset of breastfeeding: 1h or	0.014	(0.009)	0.006	(0.004)	-0.004	(0.003)	-0.017	(0.011)
Onset of breastfeeding: 1h to 1	0.008	(0.009)	0.004	(0.004)	-0.002	(0.002)	-0.010	(0.011)
Onset of breastfeeding: more	0.008	(0.008)	0.004	(0.004)	-0.002	(0.002)	-0.010	(0.010)
At least 1 household member	0.020***	(0.004)	0.009***	(0.002)	-0.005***	(0.001)	-0.024***	(0.005)
Mothers BMI: <16.5	0.026***	(0.007)	0.011***	(0.003)	-0.007***	(0.002)	-0.030***	(0.007)
Mothers BMI: 16.5 to 18.5	0.018***	(0.004)	0.008***	(0.002)	-0.005***	(0.001)	-0.021***	(0.005)
Mothers BMI: 25 to 30	-0.019*	(0.011)	-0.010	(0.006)	0.004**	(0.002)	0.025	(0.015)
Mothers BMI: >30	-0.041	(0.026)	-0.023	(0.017)	0.008***	(0.003)	0.057	(0.041)
Mothers anaemia: mild	0.013***	(0.005)	0.006***	(0.002)	-0.004***	(0.001)	-0.016***	(0.006)
Mothers anaemia: moderate	0.035***	(0.006)	0.015***	(0.002)	-0.010***	(0.002)	-0.040***	(0.006)
Mothers anaemia: severe	0.049***	(0.016)	0.019***	(0.005)	-0.015***	(0.006)	-0.053***	(0.015)

Mothers anaemia: missing	0.029**	(0.013)	0.012***	(0.005)	-0.008**	(0.004)	-0.033**	(0.013)
Year: 2005	-0.074***	(0.005)	-0.036***	(0.002)	0.018***	(0.001)	0.092***	(0.006)
Observations							27,425	

Note: we report marginal effects and standard errors are in parentheses.

Table A3: Ordered Probit: Weight-for-Height

	Severely Wasted		Moderately Wasted		Mildly Wasted		Normal	
	Coefficient	**SE**	**Coefficient**	**SE**	**Coefficient**	**SE**	**Coefficient**	**SE**
Male	-0.001	(0.001)	-0.002	(0.003)	-0.001	(0.002)	0.004	(0.006)
Age of child: 7-12	0.027***	(0.003)	0.071***	(0.006)	0.042***	(0.003)	-0.140***	(0.010)
Age of child: 13-18	0.053***	(0.003)	0.121***	(0.006)	0.056***	(0.002)	-0.230***	(0.010)
Age of child: 19-24	0.065***	(0.004)	0.137***	(0.006)	0.051***	(0.002)	-0.254***	(0.010)
Age of child: 25-29	0.043***	(0.003)	0.103***	(0.006)	0.053***	(0.002)	-0.199***	(0.010)
Age of child: 30-36	0.045***	(0.004)	0.105***	(0.006)	0.049***	(0.002)	-0.199***	(0.010)
Number of sisters	0.001	(0.001)	0.002	(0.002)	0.002	(0.002)	-0.004	(0.005)
Number of brothers	0.001	(0.001)	0.004	(0.002)	0.003	(0.002)	-0.008	(0.005)
Birth weight low	0.013***	(0.001)	0.038***	(0.003)	0.028***	(0.002)	-0.078***	(0.006)
Birth order=2	0.002*	(0.001)	0.007*	(0.004)	0.006*	(0.003)	-0.015*	(0.009)
Birth order=3	0.000	(0.002)	0.000	(0.006)	0.000	(0.005)	-0.000	(0.012)
Birth order=4	0.001	(0.002)	0.002	(0.007)	0.002	(0.006)	-0.005	(0.016)
Age of mother at birth: 20-24	0.001	(0.001)	0.002	(0.004)	0.002	(0.003)	-0.005	(0.008)
Age of mother at birth: 25-29	0.001	(0.002)	0.004	(0.005)	0.004	(0.004)	-0.010	(0.010)
Age of mother at birth: 30-34	0.002	(0.002)	0.006	(0.006)	0.005	(0.005)	-0.012	(0.013)
Age of mother at birth: 35 or	0.006**	(0.003)	0.018**	(0.008)	0.013**	(0.006)	-0.037**	(0.017)
Mothers education primary	0.001	(0.001)	0.002	(0.004)	0.002	(0.003)	-0.005	(0.008)
Mothers education secondary	-0.004***	(0.001)	-0.013***	(0.004)	-0.011***	(0.004)	0.027***	(0.009)
Mother is wife of the	0.001	(0.001)	0.003	(0.003)	0.003	(0.002)	-0.007	(0.006)
Fathers education primary	0.000	(0.001)	0.001	(0.004)	0.001	(0.003)	-0.003	(0.009)
Fathers education secondary or	-0.002	(0.001)	-0.006	(0.004)	-0.005	(0.003)	0.012	(0.008)
Know ORS	0.001	(0.001)	0.002	(0.003)	0.002	(0.003)	-0.005	(0.006)
Use ORS	0.001	(0.002)	0.004	(0.006)	0.003	(0.005)	-0.008	(0.013)
Wealth quintile: lowest	0.017***	(0.003)	0.048***	(0.008)	0.035***	(0.005)	-0.100***	(0.017)
Wealth quintile: second	0.014***	(0.003)	0.041***	(0.008)	0.030***	(0.005)	-0.085***	(0.016)
Wealth quintile: middle	0.010***	(0.003)	0.030***	(0.007)	0.022***	(0.005)	-0.062***	(0.015)
Wealth quintile: fourth	0.007***	(0.002)	0.021***	(0.006)	0.016***	(0.004)	-0.044***	(0.013)
Has radio	0.000	(0.001)	0.000	(0.003)	0.000	(0.003)	-0.001	(0.007)
Has television	-0.000	(0.001)	-0.001	(0.004)	-0.001	(0.003)	0.003	(0.009)
Has access to pipe water	-0.001	(0.002)	-0.004	(0.005)	-0.003	(0.004)	0.008	(0.010)
Hindu	-0.000	(0.001)	-0.000	(0.004)	-0.000	(0.003)	0.000	(0.008)
Other caste	-0.003***	(0.001)	-0.009***	(0.003)	-0.008***	(0.002)	0.020***	(0.006)
Andhra Pradesh	0.001	(0.003)	0.002	(0.008)	0.002	(0.006)	-0.004	(0.017)
Assam	-0.010***	(0.002)	-0.033***	(0.007)	-0.033***	(0.009)	0.076***	(0.018)

Bihar	0.019***	(0.003)	0.050***	(0.006)	0.032***	(0.003)	-0.101***	(0.011)
Gujarat	0.015***	(0.003)	0.040***	(0.008)	0.026***	(0.004)	-0.080***	(0.015)
Haryana	-0.009***	(0.002)	-0.031***	(0.007)	-0.031***	(0.008)	0.071***	(0.016)
Himachal Pradesh	0.006*	(0.004)	0.018*	(0.010)	0.014**	(0.006)	-0.038*	(0.020)
Karnataka	0.005*	(0.003)	0.015*	(0.008)	0.012**	(0.006)	-0.032*	(0.017)
Kerala	0.009**	(0.004)	0.025**	(0.010)	0.018***	(0.006)	-0.051**	(0.020)
Madhya Pradesh	0.022***	(0.003)	0.057***	(0.006)	0.035***	(0.003)	-0.113***	(0.011)
Maharashtra	0.017***	(0.004)	0.046***	(0.008)	0.029***	(0.004)	-0.092***	(0.015)
Orissa	0.010***	(0.003)	0.029***	(0.007)	0.020***	(0.004)	-0.059***	(0.014)
Rajasthan	0.008***	(0.002)	0.023***	(0.006)	0.017***	(0.004)	-0.047***	(0.012)
Tamil Nadu	0.013***	(0.004)	0.035***	(0.009)	0.024***	(0.005)	-0.072***	(0.018)
West Bengal	0.007***	(0.003)	0.021***	(0.007)	0.016***	(0.005)	-0.044***	(0.014)
Punjab	-0.009***	(0.002)	-0.030***	(0.008)	-0.029***	(0.009)	0.068***	(0.019)
Month of measurement:	0.001	(0.001)	0.004	(0.004)	0.003	(0.003)	-0.008	(0.009)
Month of measurement: March	0.011***	(0.002)	0.031***	(0.005)	0.022***	(0.003)	-0.064***	(0.010)
Month of measurement: April	0.023***	(0.003)	0.059***	(0.006)	0.035***	(0.003)	-0.117***	(0.011)
Month of measurement: May	0.023***	(0.003)	0.060***	(0.006)	0.036***	(0.003)	-0.119***	(0.011)
Month of measurement: June	0.021***	(0.003)	0.055***	(0.007)	0.034***	(0.003)	-0.109***	(0.012)
Month of measurement: July	0.019***	(0.005)	0.051***	(0.011)	0.030***	(0.004)	-0.101***	(0.021)
Month of measurement:	0.002	(0.009)	0.006	(0.026)	0.005	(0.020)	-0.014	(0.056)
Month of measurement:	-0.001	(0.026)	-0.004	(0.082)	-0.003	(0.072)	0.009	(0.179)
Month of measurement:	0.009*	(0.006)	0.026*	(0.014)	0.018**	(0.008)	-0.053*	(0.028)
Month of measurement:	0.004**	(0.002)	0.011**	(0.005)	0.009**	(0.004)	-0.024**	(0.010)
Child was breastfeed for 6 to	-0.006***	(0.001)	-0.018***	(0.004)	-0.016***	(0.004)	0.040***	(0.008)
Child was given: water	0.001	(0.001)	0.004	(0.004)	0.004	(0.003)	-0.010	(0.008)
Child was given: milk	0.000	(0.001)	0.001	(0.003)	0.001	(0.002)	-0.002	(0.006)
Child was given: green	0.002**	(0.001)	0.007**	(0.003)	0.006**	(0.003)	-0.015**	(0.007)
Child was given: fruit	-0.004***	(0.001)	-0.013***	(0.003)	-0.011***	(0.003)	0.028***	(0.008)
Onset of breastfeeding: 1h or	0.002	(0.002)	0.007	(0.006)	0.006	(0.005)	-0.016	(0.013)
Onset of breastfeeding: 1h to 1	0.005**	(0.002)	0.014**	(0.006)	0.011**	(0.005)	-0.030**	(0.013)
Onset of breastfeeding: more	0.005***	(0.002)	0.015***	(0.006)	0.013***	(0.005)	-0.033***	(0.012)
At least 1 household member	-0.002**	(0.001)	-0.006**	(0.003)	-0.005**	(0.002)	0.013**	(0.006)
Mothers BMI: <16.5	0.030***	(0.002)	0.076***	(0.005)	0.041***	(0.002)	-0.147***	(0.008)
Mothers BMI: 16.5 to 18.5	0.011***	(0.001)	0.033***	(0.003)	0.025***	(0.002)	-0.069***	(0.006)
Mothers BMI: 25 to 30	-0.010***	(0.002)	-0.034***	(0.007)	-0.035***	(0.009)	0.078***	(0.019)
Mothers BMI: >30	-0.013***	(0.004)	-0.048***	(0.017)	-0.055**	(0.025)	0.116**	(0.046)
Mothers anaemia: mild	0.001	(0.001)	0.002	(0.003)	0.002	(0.003)	-0.004	(0.007)
Mothers anaemia: moderate	0.002*	(0.001)	0.007*	(0.004)	0.005*	(0.003)	-0.014*	(0.008)
Mothers anaemia: severe	0.011***	(0.004)	0.031***	(0.011)	0.021***	(0.006)	-0.063***	(0.020)

Mothers anaemia: missing	-0.004	(0.002)	-0.012	(0.008)	-0.011	(0.008)	0.027	(0.018)
Diarrhoea	0.003**	(0.001)	0.010**	(0.004)	0.008***	(0.003)	-0.022***	(0.008)
Year: 2005	0.009***	(0.001)	0.026***	(0.003)	0.021***	(0.003)	-0.056***	(0.007)
Observations	27,507		27,507		27,507		27,507	

Note: we report marginal effects and standard errors are in parentheses.

Table A4: SUR estimates for height-for-age and weight-for-height z-scores

	Height-for-age z-score		Weight-for-height z-	
	Coefficient	**SE**	**Coefficient**	**SE**
Male	0.030*	(0.018)	0.002	(0.014)
Age of child: 7-12	-0.874***	(0.031)	-0.370***	(0.026)
Age of child: 13-18	-1.577***	(0.032)	-0.622***	(0.026)
Age of child: 19-24	-2.018***	(0.034)	-0.737***	(0.027)
Age of child: 25-29	-1.557***	(0.034)	-0.632***	(0.025)
Age of child: 30-36	-1.911***	(0.037)	-0.641***	(0.027)
Number of sisters	-0.030*	(0.017)	-0.005	(0.012)
Number of brothers	-0.032*	(0.019)	-0.013	(0.013)
Birth weight low	-0.247***	(0.021)	-0.194***	(0.016)
Birth order=2	-0.047*	(0.028)	-0.025	(0.022)
Birth order=3	-0.084**	(0.038)	-0.011	(0.031)
Birth order=4	-0.156***	(0.053)	-0.012	(0.039)
Age of mother at birth: 20-24	0.179***	(0.026)	-0.022	(0.020)
Age of mother at birth: 25-29	0.261***	(0.033)	-0.046*	(0.025)
Age of mother at birth: 30-34	0.283***	(0.044)	-0.060*	(0.032)
Age of mother at birth: 35 or higher	0.287***	(0.058)	-0.119***	(0.044)
Mothers education primary schooling	0.070**	(0.027)	-0.000	(0.020)
Mothers education secondary or higher	0.187***	(0.028)	0.082***	(0.021)
Mother is wife of the household head	-0.001	(0.020)	-0.025*	(0.015)
Fathers education primary schooling	0.037	(0.029)	-0.030	(0.021)
Fathers education secondary or higher	0.089***	(0.026)	0.019	(0.019)
Know ORS	0.062***	(0.021)	-0.035**	(0.016)
Use ORS	-0.097***	(0.038)	0.005	(0.034)
Wealth quintile: lowest	-0.548***	(0.052)	-0.247***	(0.041)
Wealth quintile: second	-0.459***	(0.047)	-0.226***	(0.038)
Wealth quintile: middle	-0.380***	(0.043)	-0.161***	(0.035)
Wealth quintile: fourth	-0.272***	(0.037)	-0.105***	(0.032)
Has radio	0.017	(0.021)	-0.009	(0.016)
Has television	0.011	(0.027)	-0.017	(0.021)
Has access to pipe water	0.022	(0.032)	0.015	(0.026)
Hindu	0.037	(0.028)	-0.005	(0.020)
Other caste	0.078***	(0.021)	0.031*	(0.016)
Andhra Pradesh	0.416***	(0.052)	-0.004	(0.039)
Assam	0.267***	(0.064)	0.417***	(0.051)
Bihar	0.125***	(0.037)	-0.209***	(0.029)
Gujarat	0.104**	(0.051)	-0.124***	(0.039)
Haryana	-0.037	(0.048)	0.220***	(0.039)
Himachal Pradesh	0.107*	(0.061)	-0.088*	(0.048)
Karnataka	0.402***	(0.055)	-0.074*	(0.044)
Kerala	0.454***	(0.067)	-0.147***	(0.051)
Madhya Pradesh	0.167***	(0.037)	-0.277***	(0.027)
Maharashtra	0.267***	(0.048)	-0.239***	(0.039)
Orissa	0.395***	(0.046)	-0.158***	(0.037)
Rajasthan	0.195***	(0.038)	-0.099***	(0.028)
Tamil Nadu	0.640***	(0.058)	-0.135***	(0.047)
West Bengal	0.491***	(0.045)	-0.085**	(0.034)
Punjab	0.182***	(0.054)	0.177***	(0.043)
Month of measurement: February	-0.032	(0.030)	0.010	(0.022)
Month of measurement: March	0.065*	(0.036)	-0.109***	(0.026)
Month of measurement: April	0.193***	(0.039)	-0.272***	(0.031)
Month of measurement: May	0.117***	(0.037)	-0.231***	(0.029)
Month of measurement: June	0.084**	(0.043)	-0.208***	(0.035)
Month of measurement: July	0.135*	(0.072)	-0.120**	(0.059)
Month of measurement: August	-0.071	(0.157)	0.196	(0.152)
Month of measurement: September	0.043	(0.748)	1.435**	(0.727)
Month of measurement: November	0.138	(0.092)	-0.288***	(0.063)

Month of measurement: December	0.023	(0.030)	-0.108***	(0.023)
Child was breastfeed for 6 to 24 month	0.290***	(0.028)	0.087***	(0.020)
Child was given: water	-0.028	(0.026)	-0.003	(0.021)
Child was given: milk	0.009	(0.021)	-0.003	(0.016)
Child was given: green vegetable	0.134***	(0.024)	-0.047***	(0.018)
Child was given: fruit	0.104***	(0.025)	0.049***	(0.018)
Onset of breastfeeding: 1h or less	-0.100**	(0.047)	-0.033	(0.032)
Onset of breastfeeding: 1h to 1 day	-0.073*	(0.044)	-0.085***	(0.030)
Onset of breastfeeding: more than 1 day	-0.057	(0.044)	-0.096***	(0.029)
At least 1 household member smoke	-0.096***	(0.021)	0.038**	(0.016)
Mothers BMI: <16.5	-0.127***	(0.030)	-0.394***	(0.022)
Mothers BMI: 16.5 to 18.5	-0.098***	(0.020)	-0.209***	(0.015)
Mothers BMI: 25 to 30	0.047	(0.051)	0.162***	(0.044)
Mothers BMI: >30	0.212	(0.142)	0.311***	(0.106)
Mothers anaemia level: mild	-0.063***	(0.023)	-0.016	(0.018)
Mothers anaemia level: moderate	-0.159***	(0.025)	-0.056***	(0.019)
Mothers anaemia level: severe	-0.219***	(0.072)	-0.196***	(0.054)
Mothers anaemia level: missing	-0.109*	(0.056)	0.104**	(0.045)
Year: 2005	0.378***	(0.023)	-0.208***	(0.018)
Diarrhoea			-0.089***	(0.020)
Constant	-0.705***	(0.088)	0.249***	(0.068)
Observations	27.417		27.417	
R-squared	0.235		0.127	

Table A5: OLS Regressions for Expenditure Shares

Variables	Food	Education	Medical Institutional	Medical-Non-institutional
Religion Dummies				
Hinduism	-0.001	0.001	-0.001	-0.001
	(0.006)	(0.002)	(0.003)	(0.003)
Islam	0.005	-0.005**	-0.001	-0.001
	(0.006)	(0.002)	(0.003)	(0.003)
Christianity	0.005	0.000	-0.001	-0.001
	(0.006)	(0.003)	(0.003)	(0.003)
Sikhism	0.013**	0.000	-0.001	-0.001
	(0.006)	(0.003)	(0.003)	(0.003)
Jainism	-0.004	-0.001***	0.005	0.005
	(0.010)	(0.004)	(0.005)	(0.005)
Buddhism	-0.008	0.004	-0.005	-0.005
	(0.007)	(0.003)	(0.004)	(0.004)
Household Type Dummies				
Non-Agricultural	0.010***	-0.006***	0.003***	0.002**
	(0.001)	(0.000)	(0.001)	(0.001)
Agriculture Labour	0.004	-0.006***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
Other Labour	-0.002	-0.007***	0.007***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
Self Employed in Agriculture	0.020***	-0.005***	0.002***	0.000
	(0.001)	(0.000)	(0.001)	(0.001)
Social Group Dummies				
Scheduled Tribe (ST)	-0.010***	-0.003***	0.004***	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Scheduled Caste (SC)	-0.011***	-0.003***	0.004***	0.007***
	(0.001)	(0.000)	(0.001)	(0.001)
Other Backward Classes (OBC)	-0.004***	-0.002***	0.003***	0.004***
	(0.001)	(0.03)	(0.001)	(0.001)
Household Head Characteristics				
Education	-0.001***	0.001***	-0.001***	-0.001***
	(0.000)	(0.00)	(0.000)	(0.000)
Sex	-0.001***	-0.008***	0.001***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
Age	0.000	0.001***	0.000	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Marital Status	-0.004***	0.004***	0.000	0.004***
	(0.001)	(0.000)	(0.001)	(0.001)
Other Household Characteristics				
Household Size	-0.001***	0.002***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Land Holding	0.000	0.001**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Per Capita Expenditure	-0.104***	0.013***	0.027***	0.032***
	(0.001)	(0.000)	(0.000)	(0.001)
Other Dummies				
Household having at least one child aged 0 – 3	-0.009***	-0.010***	0.005***	0.012***
	(0.001)	(0.000)	(0.000)	(0.001)
NSS 61st Round (Year = 2005-06)	-0.021***	0.013***	-0.008***	-0.003***
	(0.001)	(0.000)	(0.000)	(0.001)
Household having at least one child aged 0 – 3 × NSS 61st Round	0.004**	-0.005	0.002**	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Regional Dummies				

Andhra Pradesh	0.021***	-0.012***	0.002**	-0.015***
	(0.001)	(0.001)	(0.001)	(0.001)
Assam	0.089***	-0.015***	-0.004***	-0.039***
	(0.002)	(0.001)	(0.001)	(0.001)
Bihar	0.059***	-0.010***	-0.002***	-0.022***
	(0.001)	(0.001)	(0.001)	(0.001)
Gujarat	0.048***	-0.018***	-0.001	-0.030***
	(0.002)	(0.001)	(0.001)	(0.001)
Haryana	0.018***	0.009***	-0.006***	-0.023***
	(0.002)	(0.001)	(0.001)	(0.001)
Karnataka	0.015***	-0.015***	-0.001	-0.028***
	(0.002)	(0.001)	(0.001)	(0.001)
Kerala	0.024***	-0.004***	0.002**	-0.017***
	(0.002)	(0.001)	(0.001)	(0.001)
Madhya Pradesh	-0.012***	-0.010***	0.002***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)
Maharashtra	-0.009***	-0.014***	0.006***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)
Orissa	0.046***	-0.006***	0.006***	-0.010***
	(0.002)	(0.001)	(0.001)	(0.001)
Rajasthan	0.023***	-0.011***	-0.005***	-0.027***
	(0.002)	(0.001)	(0.001)	(0.001)
Tamil Nadu	0.023***	-0.009***	0.001***	-0.024***
	(0.002)	(0.001)	(0.001)	(0.001)
West Bengal	0.062***	0.001***	-0.003***	-0.017***
	(0.001)	(0.001)	(0.001)	(0.001)
Himachal Pradesh	0.025***	-0.002**	-0.006***	-0.028***
	(0.002)	(0.001)	(0.001)	(0.001)
Punjab	-0.015***	0.002	-0.010***	-0.014***
	(0.003)	(0.001)	(0.001)	(0.002)
Constant	1.252***	-0.053***	-0.162***	-0.157***
	(0.008)	(0.003)	(0.004)	(0.005)
Observations	95013	95013	95013	95013
R-squared	0.3116	0.1382	0.0594	0.0708

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Table A6: OLS Regressions for per adult equivalent consumption of cereals

Variables	Rice (kg/month)	Wheat (kg/month)	Other Cereals (kg/month)	Pulses (kg/month)
Religion Dummies				
Hinduism	-1.861***	0.772***	1.175***	0.106***
	(0.389)	(0.169)	(0.113)	(0.0265)
Islam	-1.707***	0.733***	0.953***	0.0958***
	(0.391)	(0.173)	(0.141)	(0.0307)
Christianity	-1.452***	0.590***	0.685***	0.00101
	(0.409)	(0.175)	(0.124)	(0.0295)
Sikhism	-2.531***	2.508***	0.452***	0.0747*
	(0.388)	(0.310)	(0.125)	(0.0432)
Jainism	-3.144***	1.429***	-0.0836	-0.174***
	(0.490)	(0.420)	(0.314)	(0.0555)
Buddhism	-1.864***	1.192***	1.510***	0.233***
	(0.430)	(0.235)	(0.259)	(0.0430)
Household Type Dummies				
Non-Agricultural	0.267***	0.0948**	0.136	0.0148
	(0.0516)	(0.0457)	(0.0939)	(0.0134)
Agriculture Labour	0.716***	0.175***	0.242***	0.0108
	(0.0579)	(0.0481)	(0.0400)	(0.0178)
Other Labour	0.304***	0.0649	0.134***	0.0208
	(0.0603)	(0.0565)	(0.0449)	(0.0427)
Self Employed in Agriculture	0.485***	0.229***	0.338***	0.0858***
	(0.0473)	(0.0444)	(0.0291)	(0.0153)
Social Group Dummies				
Scheduled Tribe (ST)	1.769***	-1.773***	0.876***	0.0493***
	(0.0605)	(0.0490)	(0.0727)	(0.0114)
Scheduled Caste (SC)	0.575***	0.197***	-0.105*	0.0262
	(0.0429)	(0.0462)	(0.0540)	(0.0220)
Other Backward Classes (OBC)	0.490***	0.0575*	-0.0967**	0.0238
	(0.0340)	(0.0322)	(0.0455)	(0.0245)
Household Head Characteristics				
Education	-0.0814***	-0.0252***	-0.0773***	-0.00518
	(0.00568)	(0.00519)	(0.00435)	(0.00552)
Sex	-0.893***	-0.0627	0.0689*	-0.105***
	(0.0600)	(0.0581)	(0.0390)	(0.0205)
Age	0.0228***	0.00815***	0.000271	0.00273***
	(0.00118)	(0.00109)	(0.00120)	(0.000454)
Marital Status	0.149***	-0.0538	0.0712*	-0.0175
	(0.0520)	(0.0538)	(0.0376)	(0.0234)
Other Household Characteristics				
Household Size per adult equivalent	-0.156***	-0.0448***	0.00364	-0.0368***
	(0.00872)	(0.00743)	(0.00724)	(0.00334)
Land Holding	0.000803	0.00197***	0.00165***	0.000204
	(0.000877)	(0.000740)	(0.000516)	(0.000205)
Per Capita Expenditure	1.647***	1.718***	0.118***	0.693***

	(0.0534)	(0.0485)	(0.0388)	(0.0226)
Other Dummies				
Household having at least one child aged 0 – 3	0.180***	0.342***	0.0488	0.0896**
	(0.0443)	(0.0419)	(0.0396)	(0.0355)
NSS 61st Round (Year = 2005-06)	-0.531***	-0.691***	-0.221***	-0.258***
	(0.0334)	(0.0307)	(0.0489)	(0.0312)
Household having at least one child aged 0 – 3 × NSS 61st Round	-0.00819	-0.303***	0.125**	-0.00348
	(0.0586)	(0.0554)	(0.0577)	(0.0351)
Regional Dummies				
Andhra Pradesh	8.826***	-10.95***	0.591***	-0.443***
	(0.0603)	(0.0431)	(0.0356)	(0.0675)
Assam	9.462***	-10.17***	-0.00805	-0.628***
	(0.0574)	(0.0449)	(0.262)	(0.0510)
Bihar	4.697***	-4.450***	0.392***	-0.273***
	(0.0548)	(0.0520)	(0.0253)	(0.0602)
Gujarat	-3.577***	-6.373***	5.098***	-0.315***
	(0.0467)	(0.0646)	(0.0706)	(0.0617)
Haryana	-5.001***	0.592***	-0.00934	-0.509***
	(0.0487)	(0.0937)	(0.0461)	(0.166)
Karnataka	1.180***	-10.17***	5.791***	-0.194***
	(0.0671)	(0.0454)	(0.0637)	(0.0643)
Kerala	4.621***	-11.22***	0.174***	-0.950***
	(0.0770)	(0.0559)	(0.0291)	(0.0595)
Madhya Pradesh	1.671***	-3.004***	0.691***	-0.124**
	(0.0858)	(0.0790)	(0.0396)	(0.0601)
Maharashtra	-1.778***	-6.594***	4.983***	-0.134**
	(0.0578)	(0.0579)	(0.0572)	(0.0558)
Orissa	11.16***	-9.662***	0.307***	-0.563***
	(0.0713)	(0.0463)	(0.0290)	(0.0565)
Rajasthan	-5.731***	0.891***	4.313***	-0.674***
	(0.0381)	(0.107)	(0.0892)	(0.0701)
Tamil Nadu	7.180***	-11.13***	0.241***	-0.339***
	(0.0672)	(0.0456)	(0.0283)	(0.0663)
West Bengal	9.157***	-9.899***	0.519***	-0.814***
	(0.0683)	(0.0473)	(0.0292)	(0.0481)
Himachal Pradesh	-0.810***	-3.666***	1.961***	0.0964*
	(0.0627)	(0.0761)	(0.0645)	(0.0583)
Punjab	-4.882***	-1.323***	0.179***	-0.382***
	(0.0658)	(0.221)	(0.0556)	(0.0612)
Constant	-2.740***	-0.122	-1.231***	-2.805***
	(0.544)	(0.340)	(0.212)	(0.108)
Observations	112,699	112,699	112,699	112,699
R-squared	0.561	0.561	0.121	0.019

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A7: OLS Regressions for per adult equivalent consumption of milk, meat, vegetables and fruits

Variables	Milk (kg/month)	Milk Products (kg/month)	Egg, Fish and Meat (kg/month)	Vegetables (kg/month)	Fruits (kg/month)
Religion Dummies					
Hinduism	-1.376**	0.199	-0.0307	-0.100	-0.131
	(0.624)	(0.162)	(0.117)	(0.286)	(0.281)
Islam	-2.883***	0.0790	0.369***	-0.285	0.0535
	(0.594)	(0.177)	(0.120)	(0.301)	(0.300)
Christianity	-1.950***	0.122	0.399***	-0.236	0.663**
	(0.617)	(0.169)	(0.128)	(0.315)	(0.311)
Sikhism	1.877**	0.415**	-0.0541	-0.00513	-0.264
	(0.790)	(0.208)	(0.329)	(0.324)	(0.301)
Jainism	-1.438*	-0.197	-0.347	-1.357***	-0.168
	(0.816)	(0.310)	(0.492)	(0.426)	(0.318)
Buddhism	-1.471**	-0.0800	-0.105	-0.661**	-0.0588
	(0.645)	(0.224)	(0.134)	(0.330)	(0.298)
Household Type Dummies					
Non-Agricultural	-0.692	-0.230	0.00113	-0.0621	0.139*
	(0.549)	(0.149)	(0.0627)	(0.0891)	(0.0710)
Agriculture Labour	-0.595	0.184	-0.0440	0.137	0.0442
	(0.782)	(0.226)	(0.0726)	(0.101)	(0.0517)
Other Labour	-1.595**	0.0499	-0.125*	-0.157	-0.0297
	(0.635)	(0.166)	(0.0662)	(0.114)	(0.114)
Self Employed in Agriculture	1.534***	-0.147	-0.00962	0.00255	0.173***
	(0.504)	(0.186)	(0.0603)	(0.0793)	(0.0402)
Social Group Dummies					
Scheduled Tribe	-1.976***	-0.340***	0.180***	-0.0476	-0.0501
	(0.0931)	(0.115)	(0.0308)	(0.0787)	(0.0500)
Scheduled Caste	-1.520***	0.0859	0.135***	0.00802	0.0486
	(0.451)	(0.117)	(0.0470)	(0.0728)	(0.0804)
Other Backward Classes (OBC)	-0.839***	0.221*	0.0904***	0.0464	0.00277
	(0.113)	(0.121)	(0.0347)	(0.0638)	(0.0383)
Household Head Characteristics					
Education	0.000882	-0.0384**	-0.0120***	-0.0345***	0.0140***
	(0.0538)	(0.0164)	(0.00393)	(0.0105)	(0.00541)
Sex	-1.373	-0.394	-0.132	-0.577***	-0.469***
	(1.015)	(0.252)	(0.0871)	(0.0995)	(0.151)
Age	0.0104	0.00867	-2.34e-05	0.0136***	0.00415***
	(0.0101)	(0.00555)	(0.00124)	(0.00212)	(0.000963)
Marital Status	0.580	-0.201*	-0.0693	-0.395***	0.109
	(0.557)	(0.119)	(0.102)	(0.102)	(0.0767)
Other Household Characteristics					
Household Size per	-0.334***	-0.0794**	-0.0404***	-0.374***	-0.0955***

adult equivalent	(0.0337)	(0.0318)	(0.00685)	(0.0156)	(0.00850)
Land Holding	0.00449	0.00306*	-0.000810***	0.000819	0.000450
	(0.00349)	(0.00156)	(0.000207)	(0.00129)	(0.000970)
Per Capita	6.752***	0.482***	0.964***	3.381***	1.884***
Expenditure	(0.171)	(0.135)	(0.0291)	(0.0925)	(0.0427)
Other Dummies					
Household having at	1.486***	0.133	0.123***	0.526***	0.184**
least one child aged	(0.540)	(0.111)	(0.0457)	(0.0734)	(0.0719)
NSS 61st Round	-0.677***	-0.399***	-0.234***	-0.949***	-0.406***
(Year = 2005-06)	(0.106)	(0.110)	(0.0329)	(0.0600)	(0.0396)
Household having at	-0.485	0.121	-0.00422	-0.0710	0.0750
least one child aged	(0.504)	(0.180)	(0.0567)	(0.0985)	(0.0718)
Regional Dummies					
Andhra Pradesh	-3.531***	0.474**	0.0655	-3.605***	-0.0486
	(0.0971)	(0.238)	(0.0732)	(0.0928)	(0.0599)
Assam	-5.734***	0.245*	0.581***	0.212*	-0.386***
	(0.114)	(0.137)	(0.0671)	(0.110)	(0.0768)
Bihar	-1.048	0.169	0.0296	1.533***	-0.00652
	(0.899)	(0.103)	(0.0466)	(0.0966)	(0.0575)
Gujarat	-1.336***	1.442***	-0.223***	-2.992***	-0.605***
	(0.144)	(0.143)	(0.0528)	(0.110)	(0.0741)
Haryana	8.292***	0.443	0.159	-3.305***	-0.770***
	(0.331)	(0.331)	(0.273)	(0.108)	(0.0624)
Karnataka	-3.325***	0.395	0.217***	-3.976***	1.475***
	(0.109)	(0.249)	(0.0529)	(0.101)	(0.0679)
Kerala	-6.517***	-0.517***	2.060***	-5.780***	6.828***
	(0.135)	(0.184)	(0.0729)	(0.139)	(0.121)
Madhya Pradesh	-1.932***	0.242	-0.0585	-2.075***	-0.0733
	(0.138)	(0.285)	(0.0503)	(0.114)	(0.0584)
Maharashtra	-4.215***	0.142	-0.00625	-3.959***	-0.0512
	(0.150)	(0.242)	(0.0976)	(0.173)	(0.0551)
Orissa	-5.007***	-0.125	0.225***	1.171***	0.0783
	(0.139)	(0.194)	(0.0566)	(0.160)	(0.0569)
Rajasthan	4.707***	0.431***	-0.328***	-4.085***	-0.415***
	(0.185)	(0.123)	(0.0500)	(0.105)	(0.157)
Tamil Nadu	-3.715***	-0.248*	0.0994	-4.200***	1.443***
	(0.130)	(0.139)	(0.0901)	(0.0953)	(0.0743)
West Bengal	-5.040***	-0.249**	0.828***	1.778***	-0.334***
	(0.111)	(0.115)	(0.0589)	(0.133)	(0.0814)
Himachal Pradesh	1.535***	-0.296**	-0.428***	-4.610***	-1.015***
	(0.265)	(0.143)	(0.0607)	(0.101)	(0.0697)
Punjab	3.422***	-0.00454	-0.436	-2.037***	-0.831***
	(0.484)	(0.141)	(0.271)	(0.145)	(0.0871)
Constant	-30.04***	-1.937*	-4.955***	-9.785***	-9.734***
	(1.029)	(1.122)	(0.274)	(0.647)	(0.420)
Observations	83,163	15,946	44,370	83,113	65,195
R-squared	0.059	0.016	0.087	0.142	0.244

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A8: OLS Regressions for per adult equivalent calorie consumption

Variables	Calorie (kcal/month)
Religion Dummies	
Hinduism	1,146
	(5,832)
Islam	2,208
	(5,879)
Christianity	389.9
	(5,984)
Sikhism	1,123
	(6,321)
Jainism	178.7
	(6,870)
Buddhism	1,146
	(5,832)
Household Type Dummies	
Non-Agricultural	312.9
	(744.0)
Agriculture Labour	5,289***
	(1,045)
Other Labour	889.0
	(989.1)
Self Employed in Agriculture	4,960***
	(703.2)
Social Group Dummies	
Scheduled Tribe (ST)	6,425***
	(973.2)
Scheduled Caste (SC)	2,439***
	(785.9)
Other Backward Classes (OBC)	2,932***
	(709.1)
Household Head Characteristics	
Education	-886.8***
	(110.5)
Sex	-2,221**
	(1,124)
Age	109.1***
	(21.89)
Marital Status	-607.5
	(1,096)
Other Household Characteristics	
Household Size per adult equivalent	-605.5**
	(244.1)

Land Holding	14.70
	(16.02)
Per Capita Expenditure	18,501***
	(1,468)
Other Dummies	
Household having at least one child aged 0 – 3	2,163***
	(746.4)
NSS 61st Round (Year = 2005-06)	-4,452***
	(662.3)
Household having at least one child aged 0 – 3 × NSS 61st Round	-689.6
	(1,045)
Regional Dummies	
Andhra Pradesh	-2,519*
	(1,526)
Assam	-2,194*
	(1,276)
Bihar	1,915
	(1,416)
Gujarat	-17,703***
	(1,517)
Haryana	-18,561***
	(2,068)
Karnataka	-11,163***
	(1,955)
Kerala	-24,980***
	(1,736)
Madhya Pradesh	-7,441***
	(1,441)
Maharashtra	-12,320***
	(1,317)
Orissa	6,932***
	(1,417)
Rajasthan	-4,914***
	(1,580)
Tamil Nadu	-11,669***
	(1,640)
West Bengal	-4,499***
	(1,280)
Himachal Pradesh	-10,786***
	(1,624)
Punjab	-18,542***
	(2,519)
Constant	-51,978***
	(11,670)
Observations	6,705
R-squared	0.238

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A9: SUR Regressions for per adult equivalent intake of calorie, protein and fat from milk

Variables	Calorie (kcal/month)	Protein (Kg/month)	Fat (kg/month)
Religion Dummies			
Hinduism	13.30**	-0.0516	-0.0887
	(6.469)	(0.0671)	(0.115)
Islam	17.10***	-0.108	-0.186
	(6.546)	(0.0679)	(0.117)
Christianity	22.00***	-0.0731	-0.126
	(6.846)	(0.0711)	(0.122)
Sikhism	1.624	0.0704	0.121
	(6.870)	(0.0713)	(0.123)
Jainism	9.138	-0.0539	-0.0928
	(9.647)	(0.100)	(0.172)
Buddhism	17.54**	-0.0552	-0.0949
	(7.649)	(0.0794)	(0.137)
Household Type Dummies			
Non-Agricultural	-24.50***	-0.0260**	-0.0446**
	(1.071)	(0.0111)	(0.0191)
Agriculture Labour	-20.06***	-0.0223*	-0.0384*
	(1.172)	(0.0122)	(0.0209)
Other Labour	-24.64***	-0.0598***	-0.103***
	(1.367)	(0.0142)	(0.0244)
Self Employed in Agriculture	-25.13***	0.0575***	0.0989***
	(0.942)	(0.00977)	(0.0168)
Social Group Dummies			
Scheduled Tribe (ST)	0.523	-0.0741***	-0.127***
	(1.238)	(0.0128)	(0.0221)
Scheduled Caste (SC)	2.376**	-0.0570***	-0.0981***
	(0.946)	(0.00982)	(0.0169)
Other Backward Classes (OBC)	0.455	-0.0314***	-0.0541***
	(0.715)	(0.00742)	(0.0128)
Household Head Characteristics			
Education	-2.014***	3.31e-05	5.69e-05
	(0.113)	(0.00117)	(0.00201)
Sex	-48.81***	-0.0515***	-0.0886***
	(1.217)	(0.0126)	(0.0217)
Age	0.970***	0.000389	0.000670
	(0.0232)	(0.000241)	(0.000414)
Marital Status	-54.33***	0.0218**	0.0374**
	(1.064)	(0.0110)	(0.0190)
Other Household Characteristics			
Household Size per adult equivalent	-36.54***	-0.0125***	-0.0215***
	(0.151)	(0.00157)	(0.00270)

Land Holding	0.0403	0.000168	0.000289
	(0.0248)	(0.000258)	(0.000444)
Per Capita Expenditure	27.86***	0.253***	0.436***
	(0.699)	(0.00726)	(0.0125)
Other Dummies			
Household having at least one child aged 0 – 3	2.955***	0.0557***	0.0959***
	(0.908)	(0.00943)	(0.0162)
NSS 61st Round (Year = 2005-06)	-4.269***	-0.0254***	-0.0437***
	(0.692)	(0.00719)	(0.0124)
Household having at least one child aged 0 – 3 × NSS 61st Round	-1.230	-0.0182	-0.0313
	(1.263)	(0.0131)	(0.0226)
Regional Dummies			
Andhra Pradesh	-0.425	-0.132***	-0.228***
	(1.224)	(0.0127)	(0.0219)
Assam	-23.35***	-0.215***	-0.370***
	(1.624)	(0.0169)	(0.0290)
Bihar	-0.385	-0.0393***	-0.0676***
	(1.207)	(0.0125)	(0.0215)
Gujarat	-1.860	-0.0501***	-0.0862***
	(1.470)	(0.0153)	(0.0262)
Haryana	-19.76***	0.311***	0.535***
	(1.851)	(0.0192)	(0.0330)
Karnataka	-9.033***	-0.125***	-0.214***
	(1.430)	(0.0148)	(0.0255)
Kerala	-47.08***	-0.244***	-0.420***
	(1.762)	(0.0183)	(0.0315)
Madhya Pradesh	4.170***	-0.0725***	-0.125***
	(1.244)	(0.0129)	(0.0222)
Maharashtra	-3.108**	-0.158***	-0.272***
	(1.264)	(0.0131)	(0.0226)
Orissa	-12.79***	-0.188***	-0.323***
	(2.021)	(0.0210)	(0.0361)
Rajasthan	-1.424	0.177***	0.304***
	(1.281)	(0.0133)	(0.0229)
Tamil Nadu	-12.60***	-0.139***	-0.240***
	(1.462)	(0.0152)	(0.0261)
West Bengal	-15.62***	-0.189***	-0.325***
	(1.502)	(0.0156)	(0.0268)
Himachal Pradesh	-15.22***	0.0575***	0.0990***
	(1.648)	(0.0171)	(0.0294)
Punjab	-15.05***	0.128***	0.221***
	(2.414)	(0.0251)	(0.0431)
Constant	235.5***	-1.126***	-1.938***
	(8.091)	(0.0840)	(0.144)
Observations	83,163	83,163	83,163
R-squared	0.562	0.059	0.059

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A10: SUR Regressions for per adult equivalent intake of calorie, protein and fat from milk products

Variables	Calorie (kcal/month)	Protein (Kg/month)	Fat (kg/month)
Religion Dummies			
Hinduism	33.29	-0.136	-0.146
	(22.15)	(0.177)	(0.190)
Islam	36.53	-0.285	-0.306
	(22.40)	(0.179)	(0.192)
Christianity	38.45	-0.193	-0.207
	(23.53)	(0.188)	(0.201)
Sikhism	50.98**	0.186	0.199
	(23.59)	(0.188)	(0.202)
Jainism	41.09	-0.142	-0.152
	(26.73)	(0.264)	(0.283)
Buddhism	33.73	-0.146	-0.156
	(26.13)	(0.210)	(0.224)
Household Type Dummies			
Non-Agricultural	-22.29***	-0.0685**	-0.0734**
	(2.979)	(0.0293)	(0.0314)
Agriculture Labour	-12.88***	-0.0589*	-0.0631*
	(3.899)	(0.0321)	(0.0344)
Other Labour	-21.21***	-0.158***	-0.169***
	(4.254)	(0.0375)	(0.0401)
Self Employed in Agriculture	-19.42***	0.152***	0.163***
	(2.668)	(0.0258)	(0.0276)
Social Group Dummies			
Scheduled Tribe (ST)	-4.094	-0.196***	-0.209***
	(4.029)	(0.0339)	(0.0363)
Scheduled Caste (SC)	-1.200	-0.151***	-0.161***
	(3.049)	(0.0259)	(0.0278)
Other Backward Classes (OBC)	1.642	-0.0830***	-0.0889***
	(2.157)	(0.0196)	(0.0210)
Household Head Characteristics			
Education	-1.607***	8.73e-05	9.35e-05
	(0.334)	(0.00309)	(0.00331)
Sex	-41.32***	-0.136***	-0.146***
	(3.787)	(0.0334)	(0.0357)
Age	0.602***	0.00103	0.00110
	(0.0723)	(0.000636)	(0.000680)
Marital Status	-49.10***	0.0575**	0.0615**
	(3.335)	(0.0292)	(0.0312)
Other Household Characteristics			
Household Size per adult equivalent	-33.57***	-0.0330***	-0.0354***

	(0.448)	(0.00414)	(0.00443)
Land Holding	0.182**	0.000444	0.000476
	(0.0727)	(0.000681)	(0.000729)
Per Capita Expenditure	58.57***	0.668***	0.716***
	(2.064)	(0.0192)	(0.0205)
Other Dummies			
Household having at least one child aged 0 – 3	7.850***	0.147***	0.158***
	(2.674)	(0.0249)	(0.0267)
NSS 61st Round (Year = 2005-06)	-1.145	-0.0670***	-0.0717***
	(2.232)	(0.0190)	(0.0203)
Household having at least one child aged 0 – 3 × NSS 61st Round	-7.613*	-0.0480	-0.0514
	(3.893)	(0.0346)	(0.0371)
Regional Dummies			
Andhra Pradesh	-12.05**	-0.350***	-0.374***
	(5.453)	(0.0335)	(0.0359)
Assam	0.891	-0.568***	-0.608***
	(4.965)	(0.0445)	(0.0476)
Bihar	13.46***	-0.104***	-0.111***
	(4.089)	(0.0331)	(0.0354)
Gujarat	31.49***	-0.132***	-0.142***
	(3.693)	(0.0403)	(0.0431)
Haryana	-24.62***	0.821***	0.879***
	(4.739)	(0.0507)	(0.0543)
Karnataka	-9.562*	-0.329***	-0.352***
	(5.362)	(0.0392)	(0.0420)
Kerala	-24.66***	-0.645***	-0.691***
	(5.534)	(0.0483)	(0.0517)
Madhya Pradesh	1.286	-0.191***	-0.205***
	(3.839)	(0.0341)	(0.0365)
Maharashtra	16.50***	-0.417***	-0.447***
	(4.626)	(0.0346)	(0.0371)
Orissa	-5.248	-0.496***	-0.531***
	(6.138)	(0.0554)	(0.0593)
Rajasthan	-3.571	0.466***	0.499***
	(3.714)	(0.0351)	(0.0376)
Tamil Nadu	-18.38***	-0.368***	-0.394***
	(5.915)	(0.0401)	(0.0429)
West Bengal	-3.236	-0.499***	-0.534***
	(4.563)	(0.0412)	(0.0441)
Himachal Pradesh	4.261	0.152***	0.163***
	(5.091)	(0.0452)	(0.0483)
Punjab	-42.72***	0.339***	0.363***
	(8.164)	(0.0661)	(0.0708)
Constant	10.33	-2.974***	-3.184***
	(26.82)	(0.222)	(0.237)
Observations	83,163	83,163	83,163
R-squared	0.428	0.059	0.059

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1