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Mother's Effective Literacy Status: Implications on Child Health

Surabhi Garg and Srijit Mishra

Indira Gandhi Institute of Development Research, Mumbai
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Email (corresponding author): surabhig@igidr.ac.in

Abstract

Mother's effective literacy status has instrumental importance in affecting child's health outcomes. This is not to dismiss the relevance of a father's literacy, but to posit a primitive that the father's literacy is by-and-large channelled through the mother. Having said that, the current analysis is an attempt to capture the impact of mother's effective literacy status (mother has the advantage of dual literacy – her own and that of the child's father, mother is literate but the child's father is illiterate, mother is proximate illiterate by being in proximity to the child's father who is literate, mother is secluded illiterate as neither she nor the child's father are literate) on child health outcomes. To begin with, we use Triplots to depict the percentage of children under 5 years of age with severity of anaemia, stunting, wasting and underweight for different effective literacy status of mother in India. Further, multinomial logit model is used to examine the effect of mother's effective literacy status on children below 5 years of age for rural and urban India. The results show that, compared to mother's secluded illiteracy, mother being proximate illiterate, literate alone or dual literate affect child health significantly for all the four health indicators in rural areas and for stunting and underweight in urban areas. Further, the effect of mother's dual literacy status is more pronounced than when literate alone, which is higher than when she is proximate illiterate. We further test for the differential effect of effective literacy status of mother with respect to the gender of the child and the level of education of the literate parent. It is also observed that that higher level of education of the literate parent is associated with lower log-odds of the child being unhealthy vis-à-vis healthy in both rural and urban areas.

Keywords: Proximate Illiteracy, Secluded Illiteracy, Child Health Outcomes, Anaemia, Stunting, Wasting, Underweight, India

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1. Introduction

Parents' education has instrumental importance in affecting child's health outcomes. Existing literature has studied that parents' education affects child health using various indicators of health such as child mortality (Desai and Alva, 1998; Maitra, 2003), use of institutional health care which in turn affects child's health status (Bhakta and Kumar, 2014), stunting (Alderman and Headey, 2017), child's vaccination and incidence of anaemia (Pal et, 2019). Though, the effect of mother's and father's education on child welfare may differ depending on whether the child is in the initial phase of her/his life (Pal et al, 2019) or an adolescent (Flouri and Buchanan, 2003). Studies show that generally mothers are more involved (Craig, 2006) and their education has larger effect than fathers' education on child's nutritional outcomes,[1] for India (Pal et al, 2019) as well as for other developing countries (Desai and Alva, 1998; Alderman and Headey, 2017).

Mothers are the primary care givers and more indulgent in childcare (Roopnarine, 2006). Studies by Cochrane et al (1982), Lee and Mason (2004), Chen and Li (2009), Nepal (2018) and Paul et al (2022) highlight the importance of maternal education in affecting health of children. Firstly, more educated mothers may have better health leading to better health of their children genetically. Secondly, more educated mothers have better knowledge about healthcare, nutrition and clean environment for their children; thereby improving the health of children (Chen and Li, 2009). Having acknowledged the importance of mother's education in affecting child health, we cannot dismiss the relevance of a father's education. A father with higher education may have better employment and income thereby reducing financial stress on the household and be more supportive or engaged in parenting and household responsibilities so that the mother can focus more on child health. Also, a literate father would improve his partner's knowledge and attitudes about child nutrition, vaccinations and encourage prenatal/postnatal care. Study by Teitler (2001) shows that while fathers' involvement may not directly improve childbirth outcomes but fathers "*can influence mothers to maintain or adopt healthy pregnancy behaviors"* which in turn may affect child health. We, therefore, posit a primitive that the father's literacy is by-and-large channelled through the mother.

There is a two-fold mechanism through which mother's potential capabilities may affect child health outcomes. The first mechanism involves the direct effect of a mother's education on child health. Yet the effect of mother's education on child health may not be independent of the education of the father. This leads us to the second mechanism wherein an illiterate mother may be affected by the education (literacy status)[2] of her spouse which may reflect in their child's health outcomes. The first mechanism has been extensively studied in literature with focus on the independent effect of literacy status of mother on child's health outcomes. Although, Pal et al (2019) tabulate the health status of children with change in education level

[1] Nutrition refers to providing a balanced diet to ensure good health and well-being of the individual. For this study, we will be using the terms 'Nutrition' and 'Health' interchangeably.
[2] Literacy is determined by the education level of the parent. Detailed description is given in section 5.

of a parent, keeping one parents' education constant. Yet, there is a case for empirical work to capture the second mechanism also.

The second mechanism is based on the concept of proximate illiteracy and secluded illiteracy, given by Basu and Foster (1998). In this context, proximate illiterate mother refers to an illiterate mother with a literate spouse in a household. This generates positive externalities from a literate father to an illiterate mother leading to higher effective literacy for the couple. On the other hand, secluded illiterate mother refers to an illiterate mother without a literate spouse. Hence, an illiterate mother with a literate spouse and an illiterate mother with an illiterate spouse will have different effective literacy status and may have distinct effect on child's health outcomes.

Section 2 dwells into literature on the concept and studies related to proximate illiteracy. Section 3 describes the conceptual framework. Section 4 discusses the data used in the analysis i.e. National Family Health Survey 2019-21 (NFHS-5). Section 5 gives the variables used. Section 6 explains the descriptive statistics. Section 7 elucidates the empirical methodology. Section 8 presents the regression results and finally, concluding remarks are in section 9.

2. Motivation and Literature

2.1. Proximate Illiteracy and Positive Externalities

Proximate illiteracy increases effective literacy of an illiterate member of a household because of the presence of a literate member. In other words, the illiterate members in a family may have instrumental benefits from their proximity to literate members even if they do not have the intrinsic advantage of being literate.[3] Empirical literature has illustrated the benefits from proximate illiteracy in a household set up (Basu et al, 2002; Iverson and Jones 2008) as well as for couples (Mishra and Mishra, 2004; Husain and Dutta, 2012).

There are different ways in which positive externality from the literate member may transfer to the illiterate member. This may be in the form of an illiterate attaining or expanding his/her "commonsense" through interaction with literate person (Basu et al, 2002), a literate reading for an illiterate person (Rogers and Herzog, 1966 and Basu et al, 2002), decision making by the literate on behalf of illiterate in the household and through the social networking of the literate peers (Sen and Dreze, 1995) which also benefits the household's illiterates.

Positive externality from literacy has been depicted through various measures in the literature. Proximate illiteracy in a family may lead to adoption of modern farming methods benefiting the illiterate (Green et al, 1985) and increase in productivity of the least educated in the household (Foster and Rosenzweig, 1996). Proximity to a literate person increases the bargaining power of the illiterate persons in the labour market (Benham, 1974 and Basu et al, 2002). Empirical study by Basu et al, 2000 shows that the earnings curve for secluded

[3] There can be instances when differences in intra-household literacy status may lead to adverse externalities on the illiterate or less literate members because of power dynamics that favour the literate members.

illiterate is lower than the earnings curve for proximate illiterate which is lower than the earnings curve for literate. Households with proximate illiterates also depict improved women and child health outcomes as compared to secluded illiterate households. Proximate illiterate wives have depicted better health outcomes such as lower episodes of asthma, tuberculosis, malaria (Mishra and Mishra, 2004) and higher use of contraception (Gubhaju, 2009; Husain and Dutta, 2012) as compared to secluded illiterate wives. Also, children with proximate illiterate parents have better health outcomes such as better height-for-age (Gibson, 2001), better weight-for-age and lower anaemia (Mishra and Mishra, 2004) compared to children with secluded illiterate parents.

2.2. Differential Effects of Proximate Illiteracy

The effect of externality may however be different for proximate illiterate male and proximate illiterate female. Studies show the literacy externalities to be stronger if generated by women (Strauss and Thomas 1995; Basu and Foster, 1998; Mishra and Mishra 2004) or if generated by men (Basu et al, 2002). However, Iverson and Jones, 2008 use econometric modelling to show that factors such as "social identity," "geographic location" and "sector of employment" tend to affect the literacy externalities created by a specific gender. Husain and Dutta (2012) have also acknowledged the presence of such factors in explaining the effect of proximity to a literate on the illiterate.

Externality effect is also "situation-specific" (Mishra, 2001). For example, illiterates may obtain information from radio, television among others, which matches their functionings with those of the literates. Mishra (2005) has pictographically illustrated differences in measures of literacy with respect to situations such as "rural-urban divide" and "social gap". Another interesting observation from the studies show that the level of education of the literate may (Caldwell, 1979 and Basu and Foster, 1998) or may not (Husain and Dutta, 2012) affect the strength of externality.

To summarize, studies have theoretically and empirically illustrated the importance of proximate illiteracy through various indicators. Yet, there is a case for further empirical work. Building on Mishra and Mishra (2004) study of one-to-one relationship between parents' literacy status and child health using NFHS-2, the current study extends that work in terms of updated data to more recent surveys and through a novel econometric application to examine the implications of effective literacy status of mother on child health in the Indian context. This study, while controlling for other factors, will also further scrutinize if the results vary with characteristics such as the gender of the child and education level of literate parents.

This analysis, therefore, aims to study the following research questions:

- Does effective literacy status of the mother affect child health significantly in case of India? Does this effect differ when the father's literacy status changes, keeping mother's literacy status constant?
- Does the effective literacy status of mother differ for boy and/or girl child?

- Does the effective literacy status of mother change with education level of the literate parent?

We now proceed to describing the conceptual framework, to study the concept of effective literacy and its application for this analysis.

3. Conceptual Framework

In this paper, we focus on the implications of effective literacy status of the mother on child health. Mother's effective literacy status incorporates the literacy status of both mother and father, taken together. Hence, the implication of effective literacy status on child health would incorporate the direct effect as well as the positive externalities from a literate father to an illiterate mother studied through their effect on child health outcomes. Hence, the principal variables of interest are the measures of effective literacy and child health outcomes.

Basu and Foster (1998) give a framework for the measurement of "effective literacy" which incorporates the externalities from a literate to an illiterate. They define a household with literates and illiterates. Further, they show how the presence of a literate person in a household generates positive externalities to illiterates in the household. This changes the effective literacy levels of proximate illiterates and therefore, the effective literacy profiles of the household as well as, of the society.

As mentioned earlier, our work focuses on the mother's literacy status. We therefore modify Basu and Foster (1998) measure with reference to the mother while taking into consideration the literacy status of the father also. A mother (M) or father (F) may be literate, proximate illiterate or secluded illiterate. For an individual parent, if being illiterate is 0 and being literate is 1 then being proximate illiterate refers to a positive externality $0 < \alpha < 1$ that an illiterate parent receives from a literate parent. Further, as Mishra (2001) indicates, the externality received by the illiterate mother from a literate father, α_M, will be different from the externality received by an illiterate father from a literate mother, α_F, that is $\alpha_M \neq \alpha_F$. The literacy status of a mother is $M_Z = 0,\ \alpha_M, 1$ and that of a father is $F_Z = 0,\ \alpha_F, 1$. From this, as indicated earlier, we posit that the mother's effective literacy status $M_Z^e = (M_Z, F_Z)$. It follows that:

$$M_Z^e = \begin{cases} (0,0) \text{ if both mother and father are secluded illiterates, S} \\ (\alpha_M, 1) \text{ if mother is proximate illiterate, } P \\ (1, \alpha_F) \text{ if only mother is literate, } L \\ (1,1) \text{ if dual literacy (both mother and father are literate), } D \end{cases}$$

Hence, there are four possible effective literacy status of the mother. As mentioned earlier, our analysis is based on the father's literacy being channeled through the mother. Therefore, we focus on the externality received by a proximate illiterate mother from a literate father, through implications on child health. The variables used for empirical analysis i.e. the effective literacy measures for mothers and other variables of interest are described in Section

5.[4] Appendix A1 represents the implications of effective literacy status of mothers and other controls on child health outcomes.[5] Now, we present in Section 4 the data source used for our analysis.

4. Data

National Family Health Survey (NFHS) is a large-scale, multi-round survey conducted in a representative sample of households throughout India. The current paper uses fifth round of the survey in 2019-21, hereafter NFHS-5, which has been conducted under the aegis of Ministry of Health and Family Welfare (MoHFW), Government of India (GoI) with the International Institute for Population Sciences (IIPS) as the nodal agency and with technical support from the Demographic and Health Surveys (DHS) Program.

The data for NFHS-5 has been collected using two-stage stratified random sampling. It provides data on household's availability of toilet facility, vehicle, television, and fridge, among others; education of household members, health and nutrition information of women and children for rural and urban areas in 707 districts of 28 states and 7 union territories of India. NFHS-5 comprises of four questionnaires providing information on household, woman, man and biomarker for 6,36,699 households, 7,24,115 women and 1,01,839 men.

In this paper, data from the Household member file and the Child file of NFHS-5 (from woman questionnaire) has been used. The child information is obtained from the Child file. Further, parents from Child file are matched to the Household member file to obtain the parents' information. The variables of interest required for our analysis have been discussed in the next section.

5. Variables

The dependent variables and other variables of interest are given below.

5.1. Dependent Variable: Health Outcomes

Health outcomes of children are based on the indicators of nutritional status. NFHS gives anthropometric data on the age, height and weight of children and further evaluates nutritional indices of the children from this data. These nutritional indicators are stunting wasting, and underweight. "Stunting, based on a child's height and age, is a measure of chronic nutritional deficiency. Wasting, based on a child's weight and height, is a measure of acute nutritional deficiency. Underweight, based on weight and age, is a composite measure of both acute and chronic statuses." Low level of iron is also an important measure of nutrition deficiency. Iron deficiency is associated with anaemia globally. We use anaemia,

[4] Couples and parents of a child (below 5 years of age) would be used interchangeably from now onwards.
[5] Described in section 5.

stunting, wasting and underweight as the four measures of nutritional/health indicators for children under five years of age for our analysis.[6]

5.2. Variables of Interest: Control Variables

The principal explanatory variable is the effective literacy status of mother. NFHS-5 India report defines literates as "Respondents who have completed standard nine or higher are assumed to be literate. All other respondents were given a sentence to read, and they were considered to be literate if they could read all or part of the sentence." The information for adults is available on "years of education completed" for 1,42,867 spouses but on "reading a sentence" is available for a small sample size. Hence, in this paper, a person who has completed standard nine or higher parent is considered as literate. We create four dummy variables to capture the effective literacy status of the mother. This along with other controls is described in Appendix A2.

The important variables under study are *S, P, L* and *D*.[7] These variables are proxies for effective literacy measures. *S* denotes secluded illiteracy of the mother with both mother and father being illiterate, *P* denotes proximate illiteracy of mother with mother being illiterate and father being literate, *L* denotes only literate mother with mother being literate and father being illiterate, and *D* denotes dual literacy status of mother or parents with both mother and father being literate. We study the association between these effective literacy statuses of mother and child health in the subsequent sections. First, we give one-to-one association between effective literacy status of mother and different nutritional deprivation measures (anaemia, stunting, wasting and underweight) of their children. We then give the empirical methodology to study the association between effective literacy measures and health status, while including other controls.

6. Descriptive Statistics

6.1. Literacy Status of the Mother

The sample comprises of women and men in the age group of 15-49 years with living children. The education information for parents (couples) is available for 1,42,867 observations, of which 1,10,229 belong to rural areas and 32,638 belong to urban areas.

Table 1 shows the effective literacy status of mothers in rural and urban areas. Here, proximate and secluded illiteracy is defined with respect to the spouses only. Parents' literacy is higher in urban areas as compared to rural areas. Also, the percentage of literate fathers is higher than literate mothers in both the areas. However, this difference is trivial for urban

[6] Study of health/nutrition of this age group has been important since children's major brain development occurs during initial 5 years of life.

[7] *S, P, L* and *D* denote proxies for effective literacy measures i.e. each measure represents the literacy status of both the parents taken together. Hence, *P* being proximate illiterate mother represents illiterate mother and literate father. Likewise, *L* represents literate mother and illiterate father.

areas. Percentage of proximate illiterate mothers, *P*, is higher than percentage of only literate mothers, *L*, in both rural and urban areas. Further, percentage of *P* is higher in rural areas as compared to urban areas but percentage of *L* is higher in urban areas as compared to rural areas. Also, the percentage of secluded illiterate mothers, *S*, is much higher in rural as compared to urban areas.

Table 1: Effective Literacy Status of Mothers in Rural and Urban Areas (in %)

Region	RURAL			URBAN		
Mother's Literacy	Father's Literacy			Father's Literacy		
	Illiterate	Literate	Total	Illiterate	Literate	Total
Illiterate	38.3 (S)	17.0 (P)	55.3	21.9 (S)	12.1 (P)	33.9
Literate	9.7 (L)	35.0 (D)	44.7	10.5 (L)	55.6 (D)	66.1
Total	48.0	52.0	100.0	32.3	67.7	100.0

Note: Secluded illiterate mothers (both wife and husband being illiterate), proximate illiterate mother (mother being illiterate and father being literate), only literate mother (mother being literate and father being illiterate), dual literacy (both mother and father are literate).

It is observed that there is a substantive difference in literacy status of mothers and fathers across rural and urban areas. We now study the nutritional status of children with respect to their mothers' effective literacy for rural and urban areas separately.

6.2. Nutritional Status of the Children

The sample comprises of children aged 0-59 months i.e. children less than 5 years of age. This data set comprises of 2,24,218 children of which 1,78,334 belong to rural areas and 45,884 belong to urban areas. The measures of nutritional status of the children used for analysis are anaemia, stunting, wasting and underweight.

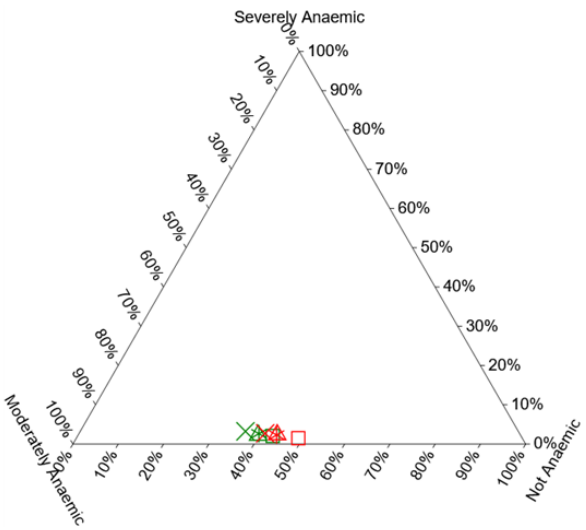


Figure 1a: Anaemia

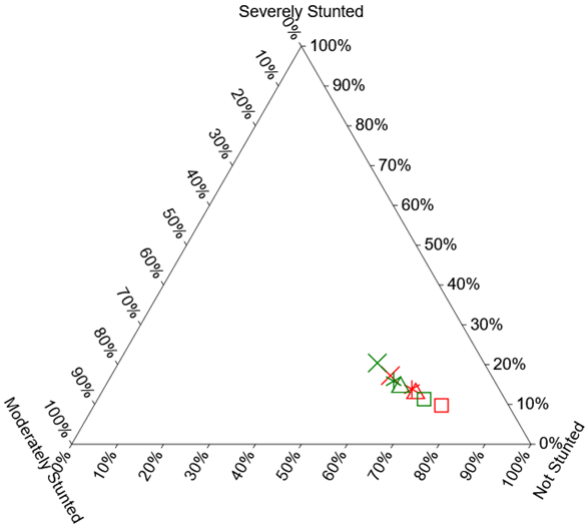


Figure 1b: Stunting

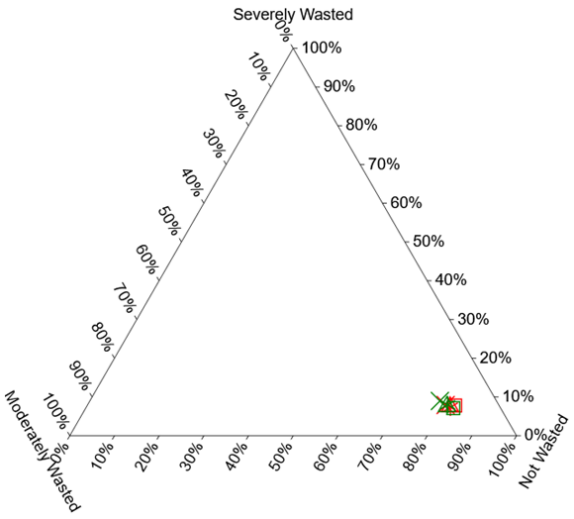


Figure 1c: Wasting

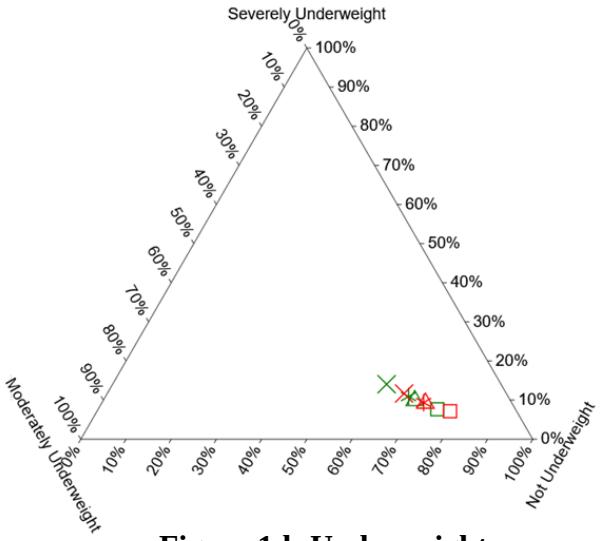


Figure 1d: Underweight

Note: The legend description for all the health indicators is as follows. Cross (×) denotes secluded illiterate mothers, Asterisk (∗) denotes proximate illiterate mothers, Triangle (△) denotes only literate mothers, Square (□) denotes dual literacy. Further, green legends depict rural areas, and the red legends depict urban areas.

We use triplots,[8] a two-dimensional pictographic representation of three dimensions (no deprivation, moderate deprivation, and severe deprivation that together add up to 100 percent) to show the nutrition status of children. In other words, the triplots in Figures 1a-1d depict percentage of children with different levels of deprivation (severe, moderate and none) for four types of nutritional deprivation (anaemia, stunting, wasting and underweight, respectively) for different effective literacy status of parents, in rural and urban areas.

Figures 1a-1d show that the cross sign is above and to the left of asterisk, triangle and square for rural and urban areas.[9] This means that households with secluded illiterate mothers (both mother and father being illiterate) when compared to households with proximate illiterate mother, only literate mother and dual literacy, have a higher percentage of children with moderate and severe nutritional deprivation for anaemia, stunting, wasting and underweight. Also, square sign is below and to the right of cross, asterisk and triangle for rural and urban areas i.e. households with dual literacy have the highest percentage of children with no nutritional deprivation compared to when either or both the parents are illiterate.

Asterisk is above and to the left of triangle for anaemia, stunting and underweight in rural and urban areas. This means that households with proximate illiterate mothers (illiterate mother and literate father) when compared to households with only literate mothers (literate mother and illiterate father) have a higher percentage of children with moderate and severe

[8] *"Triplot makes use of equilateral triangle where sum of perpendiculars drawn from the three bases to any point within the triangle adds up to a constant that can be normalized to unity*" (Mishra, 2005). Detailed pictographic description of a point on the Triplot is given in Appendix A4.

[9] The percentage of children with respect to the effective literacy status of mothers (used for the construction of triplot) is given in Table A7 in the Appendix.

nutritional deprivation for anaemia, stunting, and underweight in rural and urban areas. However, for wasting in urban areas, households with proximate illiterate mothers when compared to households with only literate mothers have a lower percentage of children with moderate and severe nutritional deprivation.

It is observed that the space between legends is more pronounced for stunting and underweight followed by anaemia and then wasting. Hence, we use Minkowski distance to determine the closeness of distance between several data points. This helps us in enhancing comparison between two particular legends on the triplot. Table A8 in the Appendix, shows that Minkowski distance between points depicting dual literacy and proximate illiterate mother is higher than the distance between dual literacy and only literate mother for all the health indicators except for anaemia and wasting in rural areas and wasting in urban areas. Also, Minkowski distance between proximate illiterate mothers/ only literate mothers and secluded illiterate mothers is higher for stunting and underweight than anaemia and wasting, in both rural and urban areas. The distances are generally higher in rural compared to urban areas. Also, the distance between only literate mothers and secluded illiterate mothers is higher compared to the distance between proximate illiterate mother and secluded illiterate mothers except for anaemia in rural areas and wasting in urban areas.

It is also observed that the Minkowski distance is the lowest between proximate illiterate mother and only literate mother as compared to the distance between proximate illiterate mother and secluded illiterate mothers, and distance between only literate mother and secluded illiterate mothers. Distance between proximate illiterate mother and only literate mother is the highest for stunting, followed by underweight, followed by wasting and anaemia.

These triplots depict that there are differences in percentage of deprivation of child's health condition with respect to the effective literacy status of mothers. Given these differences from a one-to one association, we now describe the empirical methodology in the next section which would incorporate more variables to lead us to a multivariate analysis. This would help us in observing the behaviour between mothers' effective literacy status and child's health condition, while controlling for other factors.

7. Empirical Methodology

This section gives the model to study the association between mothers' effective literacy status and child's health/nutrition indicators i.e. anaemia, stunting, wasting and underweight, while controlling for other variables,[10] as discussed in the conceptual framework. The methodology proposed for the following analysis is Multinomial Logit Model,[11] (as used by

[10] Mentioned in section 5.2.

[11] We tried using the Proportional Odds Logistic Regression Model but the data set under consideration did not satisfy the proportional odds assumption.

Pal et al, 2019).[12] This model is used since the dependent variable i.e. each of the health indicators is a categorical variable with more than two responses. Also, the health category in which a child falls is a function of the attributes of the child. Hence, the explanatory variables i.e. the attributes of a child are constant across the categories of health indicators.[13]

The probability for each category of health indicators is given as:

$$Prob\ (Y_i = j|x_i) = \frac{e^{\beta'_j x_i}}{\sum_{k=1}^{3} e^{\beta'_k x_i}};\quad \text{j = 1, 2, 3} \tag{1}$$

A set of probabilities is obtained for J=3 categories of each health indicator. We assume the categories to be as j = 1 being severe nutritional deprivation, j = 2 being moderate nutritional deprivation and j = 3 being no nutritional deprivation. Since the sum of probabilities should be one, hence probability for one category can be determined once we obtain probabilities for the other two categories.

A logit model gives log-odds of occurrence of a category as a linear function of explanatory variables. Odds refer to the ratio of probability of being in a category w.r.t. probability of being in another category. In case of multinomial logit model, if there are J categories, then one category (also termed as the baseline category) can be used as a denominator in calculating J-1 non-redundant odds. Baseline category is chosen for ease of interpretation (Anderson and Rutkowski, 2008). Therefore, one of the βs is normalized to 0 to remove the indeterminacy in the model (Greene, 2002).

Here, we consider category j = 3 as the reference category such that $\beta_3 = 0$

Hence, $$Prob\ (Y_i = 3|x_i) = \frac{1}{1+\sum_{k=1}^{2} e^{\beta'_k x_i}} \quad \text{for } j = 3 \tag{2}$$

$$Prob\ (Y_i = j|x_i) = \frac{e^{\beta'_j x_i}}{1+\sum_{k=1}^{2} e^{\beta'_k x_i}} \quad \text{for } j = 1, 2 \tag{3}$$

Since there are three categories; we may compute 2 log-odds ratio as

$$ln\ [\frac{q_{ij}}{q_{ik}}] = x'_i(\beta_j - \beta_k) \tag{4}$$

$$ln\ [\frac{q_{ij}}{q_{ik}}] = x'_i\beta_j \text{ if } k = 3 \tag{5}$$

Multinomial Logit Model is based on the assumption of independence of irrelevant alternatives, as depicted in equation (4). This means that the relative probabilities of one

[12] Pal et al, (2019) use a logistic regression to study the effect of parents' literacy status on child health outcomes. We however are considering three categories for each of our health indicators and hence use multinomial logistic regression.

[13] Health indicators are anaemia, stunting, wasting and underweight. Categories of health indicators are severe, moderate and none. Hence, there are a total of 3 categories for each health indicator.

category with respect to the other is not affected by the third category for an individual.

Given the relevance of this model, we would now give the results from Multinomial Logit Regression in the next section.

8. Regression Results

8.1. Regression Results

The regression equation is given as:

$$ln\left[\frac{q(y=j|x)}{q(y=3|x)}\right] = \beta_{0j} + \beta_{1j}P + \beta_{2j}L + \beta_{3j}D + \beta_{4j}Covid + \beta_{5j}P * Covid + \beta_{6j}L * Covid + \beta_{7j}D * Covid + \beta_{8j}Wealth + \beta_{9j}WealthSquared + \beta_{10j}Age + \beta_{11j}Girl\ Child + \beta_{12j}Siblings + \beta_{13j}Religion + \beta_{14j}Caste$$

The coefficients for *P*, *L* and *D* only; from Tables A9, A10 and A11 in the Appendix have been consolidated in Table 2 below for ease. Since there are three categories of health indicators, the multinomial logit regression gives log-odds (or coefficients) for 2 categories. One set of coefficients belongs to category 1 and the other set of coefficients belongs to category 2. Category 1 gives the log-odds of child being severely nutritionally deprived versus non-nutritionally deprived and category 2 gives the log-odds of child being moderately nutritionally deprived versus non-nutritionally deprived.[14]

Also, the absolute value of significant coefficients of *D* (vis-à-vis *S*) is higher than *L* (vis-à-vis *S*) which in turn is higher than *P* (vis-à-vis *S*) for rural and urban areas.[15] This means that dual literacy lowers the log of odds of the child being undernutrition by the maximum amount followed by the case when only the mother is literate followed by the case of proximate illiterate mother. Our results fall in line with the work of Caldwell (1979), Mensch et al. (1986), Gibson (2001) and Iversen and Jones (2008) who show that maternal literacy has a higher influence than paternal literacy on child health.[16]

We further examine if effect of an illiterate mother or a literate mother differs on child health outcome if the literacy status of the father changes. This is observed through the asterisk on *P* and hash on *D*. While the asterisk on *P* depicts statistically significant effect of *P* on child health outcomes vis-à-vis *S*, hash depicts statistically significant effect of *D* on child health

[14] This means Category 1 gives the log-odds of child being severely anaemic versus not anaemic, severely stunted versus not stunted, severely wasted versus not wasted and severely underweight versus not underweight. Category 2 gives the log-odds of child being moderately anaemic versus not anaemic, moderately stunted versus non stunted, moderately wasted versus not wasted and moderately underweight versus not underweight.

[15] Minkowski distance between points representing *L* and *S* is generally higher than distance between points representing *P* and *S* for almost all the health indicators.

[16] According to Gibson (2001) and Iversen and Jones (2008), proximate illiteracy effect from literate mother is higher than from literate father if the variable of interest *"measures some aspect of home production"* such as child's health.

outcomes vis-à-vis *L*.[17] The results show significant effect of *P* on all the four child health outcomes in rural areas (except for stunting and wasting under Category-2) and for stunting and underweight in urban areas. Also, the coefficients of *D* are significantly different from coefficients of *L* for anaemia, stunting and underweight in rural areas and urban areas (under Category-2 only). Under Category-1 of urban areas, coefficients of *D* are significantly different from coefficients of *L* for anaemia, stunting and wasting. This means that the effect of *P* is significantly higher as compared to the effect of *S* and the effect of *D* is significantly higher as compared to the effect of *L* in lowering the log of odds of the child being undernutrition, for the mentioned categories. This implies that father's literacy plays an important role in affecting child health outcomes, given the mother's literacy status.

Table 2: Coefficients of *P, L* and *D* from Regression of Children's Health Indicators on Parents' Effective Literacy Status for India

Overall				
Variables	**Anaemia**	**Stunting**	**Wasting**	**Underweight**
Category-1 (Severe versus None)				
P	-0.279***	-0.219***	-0.073**	-0.206***
L	-0.324***	-0.363***	-0.156***	-0.340***
D	-0.602***(###)	-0.515***(###)	-0.123***	-0.494***(###)
Category-2 (Moderate versus None)				
P	-0.086***	-0.058***	-0.059**	-0.123***
L	-0.075***	-0.147***	-0.070**	-0.182***
D	-0.207***(###)	-0.306***(###)	-0.075***	-0.317***(###)
Rural				
Category-1 (Severe versus None)				
P	-0.267***	-0.202***	-0.075**	-0.189***
L	-0.322***	-0.320***	-0.151***	-0.313***
D	-0.479***(##)	-0.438***(###)	-0.157***	-0.461***(###)
Category-2 (Moderate versus None)				
P	-0.071***	-0.029	-0.045	-0.104***
L	-0.034	-0.107***	-0.047	-0.150***
D	-0.132***(###)	-0.219***(###)	-0.041	-0.254***(###)
Urban				
Category-1 (Severe versus None)				
P	-0.217	-0.163**	0.025	-0.129*
L	-0.101	-0.321***	-0.057	-0.209**
D	-0.657***(###)	-0.450***(#)	0.089 (#)	-0.283***
Category-2 (Moderate versus None)				
P	-0.074	-0.123**	-0.081	-0.117**
L	-0.097**	-0.180***	-0.099	-0.154**
D	-0.240***(###)	-0.337***(###)	-0.097*	-0.259***(#)

Coefficients significant at ***: 1% l.o.s., **: 5% l.o.s., *: 10% l.o.s.

Hash depicts significant difference between coefficients of *L* and *D* for a specific category such that ###: 1% l.o.s., ##: 5% l.o.s., #: 10% l.o.s.

[17] Under *P* and *S*, the mother is illiterate, but the literacy status of the father is different. Under *D* and *L*, the mother is literate, but the literacy status of the father is different.

The absolute value of coefficients of *P, L* and *D* are higher under category 1 as compared to the coefficients of *P, L* and *D* respectively under category 2 in both rural and urban areas. This means that if either or both the parents are literate as compared to being illiterate, the effect of parent's effective literacy status on child health is higher for severely nutritionally deprived versus non nutritionally deprived compared to moderately nutritionally deprived versus non-nutritionally deprived children. This result reiterates the work of Alderman and Headey (2017) for developing countries who show that the effect of parental education on child's nutrition is higher when there is "*higher burdens of undernutrition*".

Uptil now, we have not considered the children who are over-wasted or over-weight, in our analysis. We now club the children who are over-wasted with severely-wasted and club over-weight with severely-underweight children in one category. These two categories are clubbed since both over-wasted and over-weight depicts deterioration in health condition as much as severely-wasted and severely-underweight respectively.[18] The results are given in Table A12 in the appendix. The coefficients of *P, L* and *D* for wasting and underweight are slightly different but hold the same sign and almost similar significance as the coefficients of *P, L* and *D* for wasting and underweight in Table 2.

To sum up, dual literacy status of mother or parents, only literate mother and proximate illiterate mother have significantly positive association with better child health outcomes as compared to secluded illiterate mother. While the proximate illiteracy measures are statistically significant for almost all the health indicators in rural areas, they are statistically significant for majorly stunting and underweight in urban areas. Also, the effect of dual literacy status of mother is comparatively better than only literate mother and the effect of proximate illiterate mother is comparatively better than secluded illiterate mother on child health outcomes. We now extend this basic model to incorporate other controls in studying the differential effects of *P, L* and *D* on child's health.

8.2. Extensions of the Model

8.2.1 Gender of the Child

In the previous section, we show that *P, L* and *D* have a significant effect (vis-à-vis *S*) on child health indicators. Results from baseline regression also show that the coefficient for the variable *Girl Child* is significant in rural and urban areas for stunting, wasting and underweight. Gibson (2001) mentions about the importance of gender composition of children in affecting child health indicator. It may be noted that parents may discriminate between sons and daughters (Pal et al, 2019) depending on differential benefits from them such as sons being able to retain parents' land and perform their last rites among others (Gibson, 2001).

Here, we go a step further to see if *P, L* and *D* differentiate between the child health of a son and daughter. Hence, we incorporate interaction of *Girl Child* with effective literacy

[18] This is done only for theoretical purpose.

indicators in the basic regression equation.

Now, the regression equation becomes:[19]

$$ln\left[\frac{q(y=j|x)}{q(y=3|x)}\right] = \beta_{0j} + \beta_{1j}P + \beta_{2j}L + \beta_{3j}D + \beta_{4j}P * Girl\ Child + \beta_{5j}L * Girl\ Child + \beta_{6j}D * Girl\ Child + \beta_{7j}P * Covid + \beta_{8j}L * Covid + \beta_{9j}D * Covid + \beta_{10j}Girl\ Child + \beta_{11j}Covid + \beta_{12j}Wealth + \beta_{13j}WealthSquared + \beta_{14j}Age + \beta_{15j}Siblings + \beta_{16j}Religion + \beta_{17j}Caste$$

where j = 1, 2

Table 3 shows only the statistically significant coefficients of β_{4j} and β_{5j}, taken from the regression Table A13 and Table A14.

Table 3: Statistically Significant Coefficients from Regression of Health Indicators on Parents' Effective Literacy Status with Gender Interactions

Variables	Stunting	Wasting	Underweight
Category-1 (Severe versus None)			
P * Girl Child	0.179*(Urban)	-0.110*(Rural)	-0.128**(Rural)
D * Girl Child	-0.071*(Rural)		-0.123***(Rural)
Category-2 (Moderate versus None)			
P * Girl Child			-0.066*(Rural) 0.171*(Urban)
D * Girl Child	-0.056*(Rural)		-0.087***(Rural)

The above results show that the coefficient of *P*Girl Child* is positive in urban areas for Stunting (Category-1) and for Underweight (Category-2). In rural areas, the coefficient of *P*Girl Child* is negative for Wasting and Underweight (Category-1) and for Stunting (Category-2). This means that the log-odds of the child being severely stunted vis-à-vis not-stunted and moderately underweight vis-à-vis not-underweight is relatively higher in girls than boys for *P* compared to *S* in urban areas. However, the log-odds of the child being severely wasted (or severely/moderately underweight) vis-à-vis not wasted (or not underweight) is relatively lower in girls than boys for *P* as compared to *S* in rural areas. Further, the coefficient of *D*Girl Child* is negative for stunting and underweight children in rural areas.

To summarize, when only the mother is literate among the spouses, there is no statistically significant difference in the effect on the health of boy and girl child. However, when the mother is proximate illiterate, girl child has relatively lower log-odds of being unhealthy vis-à-vis healthy compared to the boy child in rural areas and girl child has relatively higher log-odds of being unhealthy vis-à-vis healthy compared to the boy child in urban areas. Also, when both the parents are literate, there is no statistically significant difference in the effect

[19] The description of coefficients of interest is given in Appendix A5.

on the health of boy and girl child in urban areas but in rural areas, girl child has relatively lower log-odds of being stunted (or underweight) vis-à-vis not-stunted (or not-underweight) compared to the boy child.

8.2.2. Literacy Level of the Parents

Another interesting extension of the basic model takes into account the level of education of literate mother for *L*,[20] and literate father for *P*.[21] According to Husain and Dutta (2012),; the education level of the partner may affect the extent of externality generated and hence the results. We therefore consider education level of the literate spouse by modifying *P* and *L* to incorporate the education level of father (literate spouse) and education level of mother (literate spouse) respectively.

Now, the regression equation becomes:[22]

$$ln\left[\frac{q(y=j|x)}{q(y=3|x)}\right] = \beta_{0j} + \beta_{1j}P\_FSec + \beta_{2j}P\_FSenSec + \beta_{3j}P\_FGrad + \beta_{4j}P\_FAbGrad + \beta_{5j}L\_MSec + \beta_{6j}L\_MSenSec + \beta_{7j}L\_MGrad + \beta_{8j}L\_MAbGrad + \beta_{9j}D + \beta_{10j}P\_FSec * Covid + \beta_{11j}P\_FSenSec * Covid + \beta_{12j}P\_FGrad * Covid + \beta_{13j}P\_FAbGrad * Covid + \beta_{14j}L\_MSec * Covid + \beta_{15j}L\_MSenSec * Covid + \beta_{16j}L\_MGrad * Covid + \beta_{17j}L\_MAbGrad * Covid + \beta_{18j}D * Covid + \beta_{19j}Wealth + \beta_{20j}WealthSquared + \beta_{21j}Age + \beta_{22j}Girl\ Child + \beta_{23j}Siblings + \beta_{24j}Religion + \beta_{25j}Caste$$

where j = 1, 2

Table 4 shows the statistically significant coefficients of $\beta_{1j}, \beta_{2j}, \beta_{3j,}\ \beta_{4j}, \beta_{5j}, \beta_{6j}, \beta_{7j}$ and β_{8j}, taken from the regression Table A15 and Table A16.

The results show that higher numbers of dummies are significant for each of the health indicators in rural areas. However, most of dummies are significant for stunting and underweight in urban areas. It is observed that the absolute value of coefficients is higher with higher education level of the literate mother and literate father in both rural and urban areas. This means that, as the level of education of the literate parent increases, the log-odds of the child being unhealthy vis-à-vis healthy fall by a larger amount.

[20] As discussed previously, a parent is defined as literate if he/she has completed more than equal to 9 years of education. Hence, the level of education for a literate parent would be secondary (9-10 years of education), senior secondary (11-12 years of education), graduate (13-16 years of education) and above graduate (17 years and above of education).

[21] We refrain from considering the education level of mother and father in case of *D* to avoid confusion due to too many independent variables.

[22] The description of coefficients of interest is given in Appendix A6.

Table 4: Statistically Significant Results from Regression of Health Indicators on Parents' Effective Literacy Status with Differences in the Education Level of the Literate Parents

Variables	Anaemia	Stunting	Wasting	Under-weight	Anaemia	Stunting	Wasting	Under-weight
	Rural				Urban			
Category-1 (Severe versus None)								
P_FSec	-0.263***	-0.177***		-0.133***				
P_FSenSec		-0.243***	-0.150**	-0.282***		-0.388***		
P_FGrad	-0.836***	-0.242***	-0.192*	-0.380***		-0.508***	-0.512*	-0.375*
P_FAbGrad		-0.617***				-1.036**		
L_Msec	-0.224***	-0.326***	-0.124**	-0.286***		-0.226***		
L_MSenSec	-0.606***	-0.330***	-0.234**	-0.374***	-0.786**	-0.560***		-0.362**
L_MGrad	-0.828**	-0.404***		-0.382**		-0.564**		-0.505*
L_MAbGrad				-1.142*				
Category-2 (Moderate versus None)								
P_FSec	-0.083***			-0.066**	-0.088*			
P_FSenSec				-0.178***		-0.249**	-0.326**	-0.216*
P_FGrad				-0.198***		-0.261*		-0.272*
P_FAbGrad	-0.373***				0.546*	-1.096**		-0.702*
L_Msec		-0.106***		-0.161***	-0.095*	-0.136*		-0.137*
L_MSenSec	-0.111**	-0.115*	-0.149*	-0.102*				-0.219**
L_MGrad				-0.296**		-0.450**		

9. Summary and Conclusion

The Sustainable Development Goal (SDG) 3.2 of the United Nations aims to *"end preventable deaths of newborns and children under 5 years of age"*. This can be achieved by ensuring adequate nutrition and improving health outcomes of children. While supply of health care is a necessary condition, parents' education plays a crucial role in improving child health outcomes (Bhakta and Kumar, 2014). In this paper, we have used multinomial logit model to show that proximate illiterate, only literate and dual literate mothers affect child health significantly compared to secluded illiterate mothers. The results also show that the absolute value of coefficients for measure of dual literacy is higher than coefficients of only literate mother which is higher than coefficients of proximate illiterate mother for all the health indicators. This result corroborates from literature (Mishra and Mishra, 2004). Also, the effect of measure of dual literacy on child health is statistically different from measure of only literate mother for anaemia, stunting and underweight.

We observe rural-urban difference in terms of the effect on child's health indicators. The results show that in rural areas, keeping other variables constant, the log-odds of a child being (severely or moderately) unhealthy vis-a-vis healthy are lower for proximate illiterate

mothers as compared to the secluded illiterate mothers, for all the four health indicators. However, in urban areas, ceteris paribus, the proximate illiterate mothers is observed to have statistically significant positive effect on child's health for majorly stunting and underweight only, as compared to the secluded illiterate mothers. This rural-urban differentiation may be due to better access to informative sources of health education in urban areas for secluded illiterate mothers and not just proximity to a literate spouse, which may be responsible for better child health.

We further incorporate child gender interaction terms with the effective literacy variables in the basic regression equation to study if the effect of effective literacy status of mothers differs for sons and daughters. The results show that in urban areas, for proximate illiterate mothers, not much difference is observed in the effect on health of boy and girl child except for the girls having higher log-odds of being severely stunted (moderately underweight) as compared to not stunted (not underweight), compared to boys. However, in urban areas, for dual literate and proximate illiterate mothers, girls have lower log-odds of being unhealthy vis-à-vis healthy than boys. At the same time, if only mother is literate among the two spouses, there is no difference in terms of any statistically significant difference in the effect on health of girl and boy child.

We also consider the literacy dummies with respect to the level of education of the literate parent to find the extent of effect associated with the education level of the literate parent. It is observed that higher level of education of the literate parent is associated with lower log-odds of the child being unhealthy vis-à-vis healthy.

This essay makes two contributions to the literature. Firstly, we contextualize mothers' education in terms of their effective literacy status i.e. dual literacy, only literate mother, proximate illiterate mother and secluded illiterate mother to study the association between effective literacy status of mothers and severity of health condition of their children using econometric modelling. Secondly, we study if the results vary with gender of the child and level of education of the literate parent.

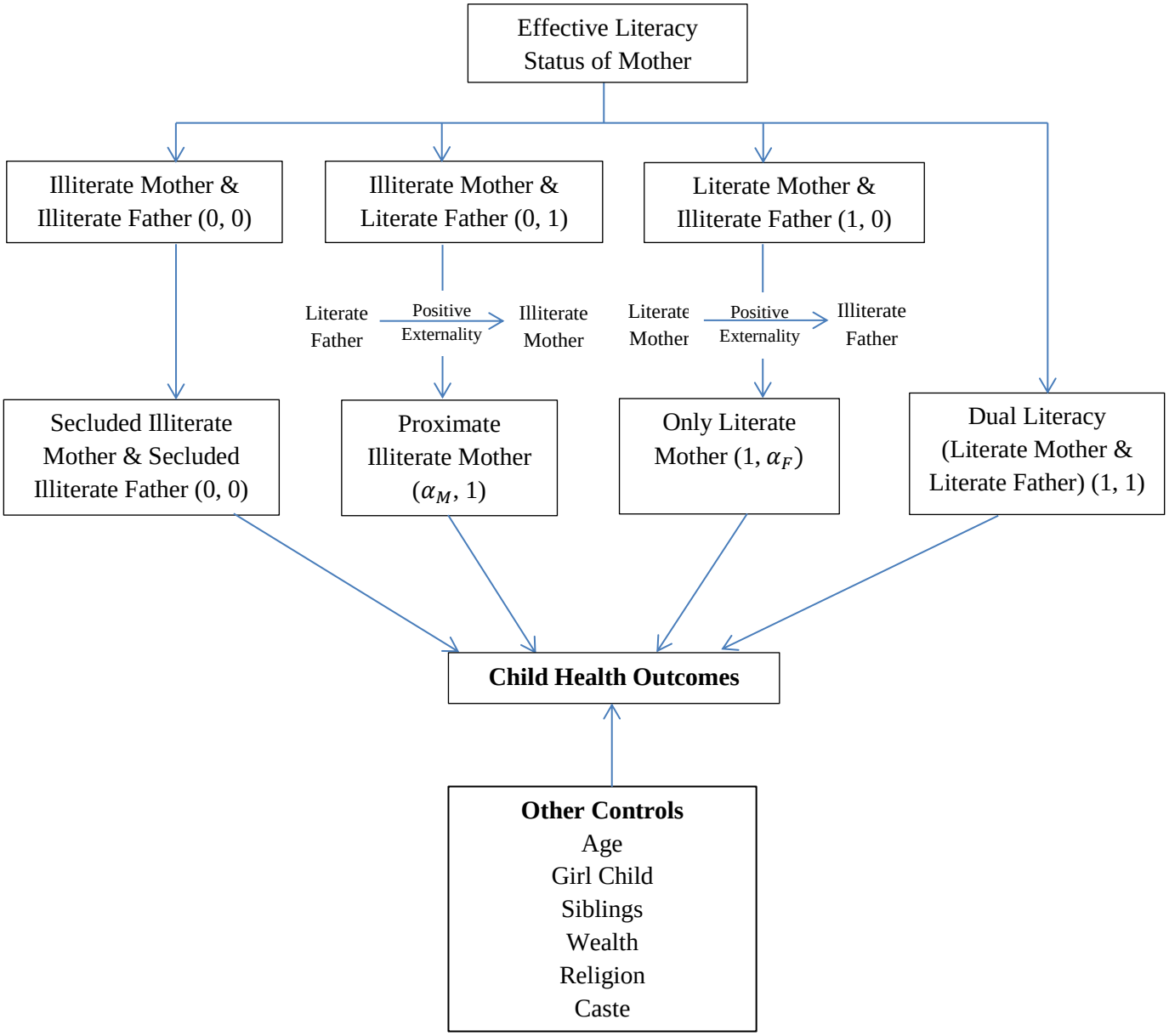
This analysis leads us to important policy implications. In the short run, the government may focus on improving awareness of parents in rural areas about child health through radio, television and other local communication channels. This may improve health outcomes for children even when both the parents are illiterate in rural areas. Having said that, literacy and higher level of education is definitely important in both rural and urban to ensure better child health outcomes in the long run. While education attainment is important, higher focus on education of women is required since it not only leads to better health outcomes for their children as compared to proximate illiterate mother, but also lesser chances of difference in terms of the effect of their literacy on health outcomes of boy and girl child.

One area of future research could be the study of effects of effective literacy status of mothers for different states of India. Another interesting extension of this analysis could be the study of two components of proximate illiteracy effect i.e. the instrumental versus retaining power dynamics. Instrumental refers to a literate person's willingness to share information with

illiterate spouse to improve the welfare of the child. Retaining power dynamics refers to reluctance of the literate member to share information with illiterate spouse, thereby constraining the improvement in child health. The instrumental effect may overpower retaining power dynamics or vice-versa, depending on socio-cultural factors, behavioural factors, wealth constraints, outcome variable under study, and gender of the literate member among others. However, given our data set, it may be difficult to split the two effects. The study of these components may be easier through primary survey which may be an interesting topic for future research.

Appendix

A1: Types of Effective Literacy Status of Mother and Implications on Child Health



A2: Variable Names and Description

Variable Name		Description
Dependent Variables #		
Anaemia	*Severe*	Dummy variable equals 1 if child is severely anaemic, and 0 otherwise
	Moderate	Dummy variable equals 1 if child is moderately anaemic, and 0 otherwise
	Not Anaemic	Dummy variable equals 1 if child is not anaemic, and 0 otherwise
Stunting	*Severe*	Dummy variable equals 1 if child is severely stunted, and 0 otherwise
	Moderate	Dummy variable equals 1 if child is moderately stunted, and 0 otherwise
	Not Stunted	Dummy variable equals 1 if child is not stunted, and 0 otherwise
Wasting	*Severe*	Dummy variable equals 1 if child is severely wasted, and 0 otherwise
	Moderate	Dummy variable equals 1 if child is moderately wasted, and 0 otherwise
	Not Wasted	Dummy variable equals 1 if child is not wasted, and 0 otherwise
Underweight	*Severe*	Dummy variable equals 1 if child is severely underweight, and 0 otherwise
	Moderate	Dummy variable equals 1 if child is moderately underweight, and 0 otherwise
	Not Underweight	Dummy variable equals 1 if child is not underweight, and 0 otherwise
Explanatory Variables		
MELS**	*S*	Dummy variable equals 1 if both mother and father are illiterate, and 0 otherwise
	P	Dummy variable equals 1 if mother is illiterate and father is literate, and 0 otherwise
	L	Dummy variable equals 1 if mother is literate and father is illiterate, and 0 otherwise
	D	Dummy variable equals 1 if both mother and father are literate, and 0 otherwise
Wealth Index (Rural/Urban) ⁂		Wealth Index of the Household; number
Age		Age of the child; in months
Girl Child		Dummy variable, equals 1 if child is female, and 0 otherwise
Siblings		Total siblings of the child; number
Religion	*Hindu*	Dummy variable equals 1 if religion of household is Hinduism, and 0 otherwise
	Muslim	Dummy variable equals 1 if religion of household is Islam, and 0 otherwise
	Christian	Dummy variable equals 1 if religion of household is Christianity, and 0 otherwise
	Others	Dummy variable equals 1 if religion of household is Others, and 0 otherwise
Caste †	*General*	Dummy variable equals 1 if caste of household is General, and 0 otherwise
	OBC	Dummy variable equals 1 if caste of household is OBC, and 0 otherwise
	SC	Dummy variable equals 1 if caste of household is SC, and 0 otherwise
	ST	Dummy variable equals 1 if caste of household is ST, and 0 otherwise
Covid‡		Dummy variable equals 1 if date of survey is after 24.03. 2020, and 0 otherwise

Detailed description of these variables is given in A3.

* Mother or father is defined as literate if (s)he has completed more than or equal to 9 years of education.

⁑ MELS denotes mother's effective literacy status where S is secluded illiteracy, P is proximate illiteracy, L is only mother literate and D is both mother and father are literate.

⁂ Wealth index is given in quintiles, adjusted at state level and for rural and urban areas. For ease of analysis, Wealth Index and Wealth Index-squared will be considered as continuous variables.

† OBC, SC and ST denote Other Backward Classes, Scheduled Castes and Scheduled Tribes, respectively.

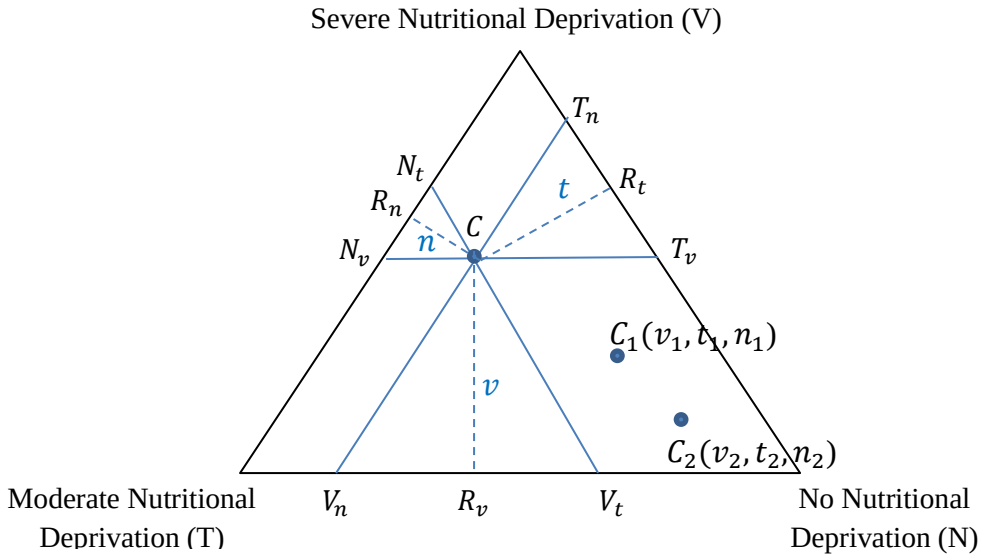
‡ We also have explanatory variables which are interaction terms of Covid Dummy with mother's effective literacy status.

A3: Description of Nutritional Status associated with Health Indicators

Nutritional Status	Description (as given in the Guide to DHS statistics)
Not-Anaemic	Number of children whose haemoglobin count is not less than 11 grams per decilitre (g/dl)
*Moderately Anaemic**	Number of children whose haemoglobin count is between 7.0 and 10.9 grams per decilitre (g/dl)
Severely Anaemic	Number of children whose haemoglobin count is less than 7.0 grams per decilitre(g/dl)
Not-Stunted	Number of children whose height-for-age z-score is not below minus 2 (-2.0) standard deviations (SD) above the mean on the WHO Child Growth Standards (hc70 > -200)
Moderately Stunted	Number of children whose height-for-age z-score is below minus 2 (-2.0) standard deviations (SD) below the mean on the WHO Child Growth Standards (hc70 < -200)
Severely Stunted	Number of children whose height-for-age z-score is below minus 3 (-3.0) standard deviations (SD) below the mean on the WHO Child Growth Standards (hc70 < -300)
Not-Wasted	Number of children whose weight-for-height z-score is between minus 2 (-2.0) and plus 2 (+2.0) standard deviations (SD) above the mean on the WHO Child Growth Standards (hc72 > -200 & hc72 < 200)
Moderately Wasted	Number of children whose weight-for-height z-score is below minus 2 (-2.0) standard deviations (SD) below the mean on the WHO Child Growth Standards (hc72 < -200)
Severely Wasted	Number of children whose weight-for-height z-score is below minus 3 (-3.0) standard deviations (SD) below the mean on the WHO Child Growth Standards (hc72 < -300)
Over-wasted	Number of children whose weight-for-height z-score is above plus 2 (+2.0) standard deviations (SD) above the mean on the WHO Child Growth Standards (hc72 > 200 & hc72 < 9990)
Not-Underweight	Number of children whose weight-for-age z-score is between minus 2 (-2.0) and plus 2 (+2) standard deviations (SD) above the mean on the WHO Child Growth Standards (hc71 > -200 & hc71 < 200)
Moderately Underweight	Number of children whose weight-for-age z-score is below minus 2 (-2.0) standard deviations (SD) below the mean on the WHO Child Growth Standards (hc71 < -200)
Severely Underweight	Number of children whose weight-for-age z-score is below minus 3 (-3.0) standard deviations (SD) below the mean on the WHO Child Growth Standards (hc71 < -300)
Overweight	Number of children whose weight-for-age z-score is above plus 2 (+2.0) standard deviations (SD) above the mean on the WHO Child Growth Standards (hc71 > 200 & hc71 < 9990)

*: This combines both moderately anaemic and mildly anaemic in a single category.

A4: Pictographic description of a point on the Triplot



VTN is an equilateral triangle. Here, point C gives the proportion of severe (v), moderate (t) and no deprivation (n) children such that $v + t + n = 1$.

N_vT_v line parallel to TN, CR_v line perpendicular to TN.
V_tN_t line parallel to NV, CR_t line perpendicular to NV.
T_nV_n line parallel to VT, CR_n line perpendicular to VT.

Therefore, $CR_v = v$, $CR_t = t$ and $CR_n = n$.

Hence, if point C is closer to vertex V, then it is associated with higher severely nutrition deprived children and less moderately nutrition deprived and less non nutrition deprived children. This holds true for the other two vertices as well.

Minkowski Distance:

Let $C_1(v_1, t_1, n_1)$ and $C_2(v_2, t_2, n_2)$ represent two points on the triplot, then

Minkowski Distance between C_1 and C_2 = $[(v_1 - v_2)^2 + (t_1 - t_2)^2 + (n_1 - n_2)^2]^{1/2}$

A5: Regression Equation (along with description of variables) with interaction of *Girl Child* with effective literacy indicators in the basic regression equation

$$ln\left[\frac{q(y=j|x)}{q(y=3|x)}\right] = \beta_{0j} + \beta_{1j}P + \beta_{2j}L + \beta_{3j}D + \beta_{4j}P * Girl\ Child\ + \beta_{5j}L * Girl\ Child + \beta_{6j}D * Girl\ Child\ + \beta_{7j}P * Covid\ + \beta_{8j}L * Covid + \beta_{9j}D * Covid + \beta_{10j}Girl\ Child + \beta_{11j}Covid\ + \beta_{12j}Wealth + \beta_{13j}WealthSquared + \beta_{14j}Age + \beta_{15j}Siblings + \beta_{16j}Religion + \beta_{17j}Caste$$

where j = 1, 2

Here, β_{4j} = Difference between the log-odds ratio comparing *P* versus *S* in girls and the log-odds ratio comparing *P* versus *S* in boys when the child belongs to category j vis-à-vis category 3.

β_{5j} = Difference between the log-odds ratio comparing *L* versus *S* in girls and the log-odds ratio comparing *L* versus *S* in boys when the child belongs to category j vis-à-vis category 3.

A6: Regression Equation (along with description of variables) which incorporates the education level of literate father and education level of literate mother

$$ln\left[\frac{q(y=j|x)}{q(y=3|x)}\right] = \beta_{0j} + \beta_{1j}P\_FSec + \beta_{2j}P\_FSenSec + \beta_{3j}P\_FGrad + \beta_{4j}P\_FAbGrad + \beta_{5j}L\_MSec + \beta_{6j}L\_MSenSec + \beta_{7j}L\_MGrad + \beta_{8j}L\_MAbGrad + \beta_{9j}D + \beta_{10j}P\_FSec * Covid + \beta_{11j}P\_FSenSec * Covid + \beta_{12j}P\_FGrad * Covid + \beta_{13j}P\_FAbGrad * Covid + \beta_{14j}L\_MSec * Covid + \beta_{15j}L\_MSenSec * Covid + \beta_{16j}L\_MGrad * Covid + \beta_{17j}L\_MAbGrad * Covid + \beta_{18j}D * Covid + \beta_{19j}Wealth + \beta_{20j}WealthSquared + \beta_{21j}Age + \beta_{22j}Girl\ Child + \beta_{23j}Siblings + \beta_{24j}Religion + \beta_{25j}Caste$$

where j = 1, 2

Here, P_FSec = Dummy variable, equals 1 if father is secondary level educated and mother is illiterate, and 0 otherwise

$P\_FSenSec$ = Dummy variable, equals 1 if father is senior secondary level educated and mother is illiterate, and 0 otherwise

P_FGrad = Dummy variable, equals 1 if father is graduation level educated and mother is illiterate, and 0 otherwise

$P\_FAbGrad$ = Dummy variable, equals 1 if father is above graduation level educated and mother is illiterate, and 0 otherwise

L_MSec = Dummy variable, equals 1 if mother is secondary level educated and father is illiterate, and 0 otherwise

$L\_MSenSec$ = Dummy variable, equals 1 if mother is senior secondary level educated and father is illiterate, and 0 otherwise

L_MGrad = Dummy variable, equals 1 if mother is graduation level educated and father is illiterate, and 0 otherwise

$L\_MAbGrad$ = Dummy variable, equals 1 if mother is above graduation level educated and father is illiterate, and 0 otherwise

Hence, β_{1j} = Log-odds ratio comparing *P* versus *S* when father is secondary level educated for child in category j vis-à-vis category 3.

β_{2j} = Log-odds ratio comparing *P* versus *S* when father is senior secondary level educated for child in category j vis-à-vis category 3.

β_{3j} = Log-odds ratio comparing *P* versus *S* when father is graduation level educated for child in category j vis-à-vis category 3.

β_{4j} = Log-odds ratio comparing *P* versus *S* when father is above graduation level educated for child in category j vis-à-vis category 3.

β_{5j} = Log-odds ratio comparing *L* versus *S* when mother is secondary level educated for child in category j vis-à-vis category 3.

β_{6j} = Log-odds ratio comparing *L* versus *S* when mother is senior secondary level educated for child in category j vis-à-vis category 3.

β_{7j} = Log-odds ratio comparing *L* versus *S* when mother is graduation level educated for child in category j vis-à-vis category 3.

β_{8j} = Log-odds ratio comparing *L* versus *S* when mother is above graduation level educated for child in category j vis-à-vis category 3.

Tables

Table A7: Percentage of Children with respect to the Effective Literacy Status of Mothers (Used for the construction of Triplot)

Rural/Urban	Severely Anaemic	Moderately Anaemic	Not Anaemic	Severely Stunted	Moderately Stunted	Not Stunted	Severely Wasted	Moderately Wasted	Not Wasted	Severely Underweight	Moderately Underweight	Not Underweight
Rural												
Secluded Illiterate Mother	3.24	60.27	36.49	20.44	23.23	56.34	8.98	12.66	78.36	14.03	25.33	60.64
Proximate Illiterate Mother	2.63	57.6	39.76	15.85	21.97	62.18	7.98	11.41	80.61	10.91	22.03	67.07
Only Literate Mother	2.25	57.97	39.78	14.33	21.23	64.45	7.53	11.81	80.66	9.87	21.17	68.96
Dual Literacy	2.07	54.83	43.09	11.33	17.61	71.06	7.12	10.59	82.3	7.66	17.29	75.05
Urban												
Secluded Illiterate Mother	2.7	56.17	41.12	17.24	21.97	60.79	7.92	11.91	80.17	11.66	22.64	65.7
Proximate Illiterate Mother	2.3	53.85	43.85	13.85	19	67.15	7.34	11.13	81.53	9.37	19.46	71.17
Only Literate Mother	2.38	53.69	43.93	12.75	18.73	68.53	7.44	11.13	81.43	9.22	19.15	71.63
Dual Literacy	1.5	49.46	49.04	9.76	14.61	75.63	7.79	9.84	82.37	7.16	14.73	78.11

Table A8: Minkowski Distance between various points on the Triplot

Two points on the triplot	Anaemia	Stunting	Wasting	Underweight
		Rural		
Proximate Illiterate Mother & Secluded Illiterate Mother (∗, x)	4.265	7.534	2.761	7.872
Only Literate Mother & Secluded Illiterate Mother (Δ, x)	4.135	10.349	2.849	10.190
Proximate Illiterate Mother & Only Literate Mother (∗, Δ)	0.531	2.830	0.604	2.322
Dual Literacy & Proximate Illiterate Mother (□,∗)	4.37	10.88	2.07	9.83
Dual Literacy & Only Literate Mother (□, Δ)	4.57	8.11	2.08	7.55
		Urban		
Proximate Illiterate Mother & Secluded Illiterate Mother (∗, x)	3.605	7.795	1.672	6.729
Only Literate Mother & Secluded Illiterate Mother (Δ, x)	3.762	9.517	1.558	7.301
Proximate Illiterate Mother & Only Literate Mother (∗, Δ)	0.196	1.785	0.141	0.575
Dual Literacy & Proximate Illiterate Mother (□,∗)	6.84	10.39	1.60	8.68
Dual Literacy & Only Literate Mother (□, Δ)	6.69	8.74	1.63	8.11

Table A9: Coefficients from Regression of Children's Health Indicators on Parents' Effective Literacy Status for India

	Overall			
Variables	**Anaemia**	**Stunting**	**Wasting**	**Underweight**
Category-1 (Severe versus None)				
P	-0.279***	-0.219***	-0.073**	-0.206***
L	-0.324***	-0.363***	-0.156***	-0.340***
D	-0.602*** (###)	-0.515***(###)	-0.123***	-0.494***(###)
Covid	-0.480***	-0.140***	-0.305***	-0.161***
*P*Covid*	0.111	0.016	-0.055	-0.018
*L*Covid*	-0.018	0.036	-0.002	0.059
*D*Covid*	0.228***	-0.049	-0.075	-0.001
Wealth	-0.119**	-0.174***	-0.063*	-0.173***
Wealth-Squared	0.004	-0.000	-0.001	-0.003
Age	0.000	-0.000	-0.017***	-0.002***
Girl Child	-0.008	-0.178***	-0.127***	-0.184***
Siblings	0.190***	0.163***	-0.077***	0.094***
Religion (Base-Hindu)				
Muslim	-0.140***	0.026	0.223***	0.073***
Christian	-1.006***	-0.194***	-0.505***	-0.882***
Others	0.150**	-0.147***	-0.363***	-0.469***
Caste (Base- General)				
OBC	-0.164***	0.206***	0.083***	0.203***
SC	0.092*	0.317***	0.088***	0.251***
ST	0.191***	0.272***	0.294***	0.368***
Constant	-2.112***	-0.859***	-1.456***	-1.128***
Category-2 (Moderate versus None)				
P	-0.086***	-0.058***	-0.059**	-0.123***
L	-0.075***	-0.147***	-0.070**	-0.182***
D	-0.207*** (###)	-0.306***(###)	-0.075***	-0.317***(###)
Covid	-0.151***	0.009	-0.114***	-0.011
*P*Covid*	0.038	-0.079**	-0.055	-0.077**
*L*Covid*	-0.003	0.021	0.026	-0.028
*D*Covid*	0.070***	-0.073**	-0.130***	-0.156***
Wealth	-0.169***	-0.019	-0.091***	-0.086***
Wealth-Squared	0.018***	-0.015***	0.001`	-0.009**
Age	-0.003***	0.012***	-0.009***	0.008***
Girl Child	0.011	-0.067***	-0.092***	-0.105***
Siblings	0.092***	0.126***	-0.043***	0.084***
Religion (Base-Hindu)				
Muslim	-0.155***	-0.043**	0.037	-0.041**
Christian	-0.869***	-0.116***	-0.545***	-0.583***
Others	-0.125***	-0.216***	-0.353***	-0.444***
Caste (Base- General)				
OBC	-0.051***	0.196***	0.164***	0.222***
SC	0.066***	0.269***	0.135***	0.273***
ST	0.246***	0.177***	0.255***	0.243***
Constant	0.858***	-1.371***	-1.387***	-1.073***
Prob > chi2	0.000	0.000	0.000	0.000
Number of Observations	174,999	168,681	158,528	170,208

Table A10: Coefficients from Regression of Children's Health Indicators on Parents' Effective Literacy Status for Rural India

	Rural			
Variables	**Anaemia**	**Stunting**	**Wasting**	**Underweight**
Category-1 (Severe versus None)				
P	-0.267***	-0.202***	-0.075**	-0.189***
L	-0.322***	-0.320***	-0.151***	-0.313***
D	-0.479***(##)	-0.438***(###)	-0.157***	-0.461***(###)
Covid	-0.503***	-0.149***	-0.326***	-0.194***
*P*Covid*	0.136	0.032	-0.022	-0.019
*L*Covid*	-0.094	0.025	-0.018	0.065
*D*Covid*	0.220**	-0.068	-0.073	0.009
Wealth	-0.134**	-0.158***	-0.086**	-0.189***
Wealth-Squared	0.004	-0.007	0.001	-0.004
Age	-0.001	0.001	-0.018***	-0.002***
Girl Child	0.004	-0.177***	-0.140***	-0.187***
Siblings	0.192***	0.153***	-0.071***	0.087***
Religion (Base-Hindu)				
Muslim	0.010	0.044	0.168***	0.017
Christian	-1.050***	-0.187***	-0.519***	-0.912***
Others	0.084	-0.162***	-0.348***	-0.501***
Caste (Base- General)				
OBC	-0.207***	0.240***	0.130***	0.255***
SC	0.019	0.338***	0.128***	0.293***
ST	0.130**	0.244***	0.343***	0.378***
Constant	-1.960***	-0.845***	-1.403***	-1.059***
Category-2 (Moderate versus None)				
P	-0.071***	-0.029	-0.045	-0.104***
L	-0.034	-0.107***	-0.047	-0.150***
D	-0.132***(###)	-0.219***(###)	-0.041	-0.254***(###)
Covid	-0.143***	0.022	-0.097***	0.001
*P*Covid*	0.035	-0.085**	-0.083	-0.092**
*L*Covid*	-0.022	0.045	0.026	-0.031
*D*Covid*	0.043	-0.082**	-0.154***	-0.163***
Wealth	-0.186***	0.025	-0.111***	-0.070***
Wealth-Squared	0.018***	-0.026***	0.003	-0.015***
Age	-0.003***	0.013***	-0.009***	0.009***
Girl Child	0.010	-0.065***	-0.094***	-0.102***
Siblings	0.084***	0.112***	-0.042***	0.075***
Religion (Base-Hindu)				
Muslim	-0.053***	-0.028	0.005	-0.049**
Christian	-0.857***	-0.082***	-0.514***	-0.566***
Others	-0.129***	-0.245***	-0.395***	-0.471***
Caste (Base- General)				
OBC	-0.048***	0.184***	0.169***	0.232***
SC	0.056***	0.245***	0.139***	0.275***
ST	0.248***	0.117***	0.242***	0.212***
Constant	0.920***	-1.372***	-1.336***	-1.054***
Prob > chi2	0.000	0.000	0.000	0.000
Number of Observations	138,176	133,179	125,421	134509

Table A11: Coefficients from Regression of Children's Health Indicators Parents' Effective Literacy Status for Urban India

	Urban			
Variables	**Anaemia**	**Stunting**	**Wasting**	**Underweight**
Category-1 (Severe versus None)				
P	-0.217	-0.163**	0.025	-0.129*
L	-0.101	-0.321***	-0.057	-0.209**
D	-0.657***(###)	-0.450***(#)	0.089 (#)	-0.283***
Covid	-0.250*	-0.015	-0.224**	0.061
*P*Covid*	-0.117	-0.173	-0.278	-0.092
*L*Covid*	0.045	0.008	0.014	-0.068
*D*Covid*	0.084	-0.122	-0.136	-0.189**
Wealth	-0.121	-0.354***	-0.059	-0.249***
Wealth-Squared	0.003	0.034***	0.004	0.016
Age	0.008***	-0.003***	-0.015***	-0.002**
Girl Child	-0.074	-0.180***	-0.075*	-0.169***
Siblings	0.083	0.142***	-0.110***	0.070**
Religion (Base-Hindu)				
Muslim	-0.413***	0.138***	0.410***	0.361***
Christian	-0.591***	-0.109	-0.295***	-0.514***
Others	0.546***	0.018	-0.412***	-0.205*
Caste (Base- General)				
OBC	-0.075	0.058	-0.021	0.015
SC	0.276**	0.199***	0.028	0.099
ST	0.071	0.174**	-0.072	0.010
Constant	-2.636***	-0.799***	-1.705***	-1.353***
Category-2 (Moderate versus None)				
P	-0.074	-0.123**	-0.081	-0.117**
L	-0.097**	-0.180***	-0.099	-0.154**
D	-0.240***(###)	-0.337***(###)	-0.097*	-0.259***(#)
Covid	-0.177***	0.008	-0.227***	-0.043
*P*Covid*	0.030	-0.108	0.104	-0.040
*L*Covid*	0.069	-0.076	0.077	-0.007
*D*Covid*	0.134**	-0.100	-0.015	-0.161**
Wealth	-0.147***	-0.270***	-0.059	-0.254***
Wealth-Squared	0.013**	0.026***	-0.002	0.019**
Age	-0.001	0.011***	-0.008***	0.007***
Girl Child	0.016	-0.080***	-0.089**	-0.118***
Siblings	0.085***	0.129***	-0.067**	0.062**
Religion (Base-Hindu)				
Muslim	-0.288***	0.034	0.160***	0.111***
Christian	-0.784***	-0.228***	-0.658***	-0.568***
Others	-0.062	-0.013	-0.123	-0.237***
Caste (Base- General)				
OBC	-0.072***	0.183***	0.134***	0.147***
SC	0.072**	0.270***	0.103*	0.205***
ST	-0.056	0.183***	0.175**	0.086
Constant	0.706***	-1.201***	-1.511***	-0.999***
Prob > chi2	0.000	0.000	0.000	0.000
Number of Observations	36,823	35,502	33107	35,699

Table A12: Coefficients from Regression of Children's Health Indicators on Parents' Effective Literacy Status for India (clubbing over-wasted with severely-wasted and over-weight with severely-underweight children)

	Rural		Urban	
Variables	**Wasting**	**Underweight**	**Wasting**	**Underweight**
Category-1 (Severe versus None)				
P	-0.019	-0.163***	0.087	-0.102
L	-0.133***	-0.311***	-0.040	-0.177**
D	-0.091***	-0.393***(##)	0.139**(##)	-0.206***
Covid	-0.341***	-0.205***	-0.206***	0.046
*P*Covid*	-0.031	-0.059	-0.241*	-0.089
*L*Covid*	0.071	0.051	0.018	-0.118
*D*Covid*	-0.012	-0.008	-0.072	-0.154*
Wealth	-0.058*	-0.199***	-0.025	-0.223***
Wealth-Squared	0.003	0.002	0.005	0.017
Age	-0.021***	-0.004***	-0.015***	-0.004***
Girl Child	-0.120***	-0.156***	-0.074**	-0.148***
Siblings	-0.090***	0.060***	-0.133***	0.040
Religion (Base-Hindu)				
Muslim	0.232***	0.066**	0.336***	0.340***
Christian	-0.265***	-0.772***	-0.034	-0.311***
Others	-0.001	-0.348***	-0.008	-0.086
Caste (Base- General)				
OBC	0.009	0.190***	-0.087**	-0.065
SC	0.043	0.233***	-0.057	0.016
ST	0.292***	0.345***	0.047	-0.007
Constant	-1.022***	-0.920***	-1.344***	-1.208***
Category-2 (Moderate versus None)				
P	-0.044	-0.104***	-0.083	-0.117**
L	-0.049	-0.151***	-0.099	-0.153**
D	-0.041	-0.252***(###)	-0.096*	-0.259***(#)
Covid	-0.096***	0.001	-0.228***	-0.044
*P*Covid*	-0.084	-0.093**	0.107	-0.040
*L*Covid*	0.029	-0.031	0.078	-0.008
*D*Covid*	-0.152***	-0.163***	-0.015	-0.161**
Wealth	-0.110***	-0.069***	-0.059	-0.252***
Wealth-Squared	0.003	-0.015***	-0.002	0.018**
Age	-0.009***	0.009***	-0.007***	0.007***
Girl Child	-0.094***	-0.101***	-0.088**	-0.117***
Siblings	-0.043***	0.075***	-0.066**	0.062**
Religion (Base-Hindu)				
Muslim	0.005	-0.048**	0.159***	0.110***
Christian	-0.515***	-0.563***	-0.656***	-0.567***
Others	-0.394***	-0.468***	-0.123	-0.236***
Caste (Base- General)				
OBC	0.169***	0.231***	0.133***	0.146***
SC	0.138***	0.274***	0.101*	0.205***
ST	0.243***	0.212***	0.176**	0.088
Constant	-1.340***	-1.055***	-1.518***	-1.002***
Prob > chi2	0.000	0.000	0.000	0.000
Number of Observations	130,395	136,003	34,693	36,284

Table A13: Coefficients from Regression of Children's Health Indicators on Parents' Effective Literacy Status with Gender Interactions for Rural India

	Rural			
Variables	**Anaemia**	**Stunting**	**Wasting**	**Underweight**
Category-1 (Severe versus None)				
P	-0.296***	-0.216***	-0.024	-0.131***
L	-0.378**	-0.296***	-0.127**	-0.302***
D	-0.446***	-0.407***	-0.125***	-0.404***
P Girl Child*	0.060	0.030	-0.110*	-0.128**
L Girl Child*	0.113	-0.052	-0.051	-0.021
D Girl Child*	-0.070	-0.071*	-0.069	-0.123***
*P*Covid*	0.136	0.032	-0.022	-0.019
*L*Covid*	-0.092	0.024	-0.018	0.066
*D*Covid*	0.220**	-0.068	-0.073	0.009
Girl Child	0.002	-0.158***	-0.097***	-0.130***
Covid	-0.503***	-0.149***	-0.326***	-0.194***
Wealth	-0.134**	-0.157***	-0.086**	-0.188***
Wealth-Squared	0.004	-0.007	0.001	-0.005
Age	-0.001	0.001	-0.018***	-0.002***
Siblings	0.192***	0.153***	-0.071***	0.087***
Religion (Base-Hindu)				
Muslim	0.010	0.044	0.168***	0.017
Christian	-1.049***	-0.187***	-0.519***	-0.912***
Others	0.083	-0.162***	-0.348***	-0.501***
Caste (Base- General)				
OBC	-0.207***	0.240***	0.130***	0.255***
SC	0.018	0.339***	0.128***	0.293***
ST	0.129**	0.245***	0.343***	0.378***
Constant	-1.958***	-0.855***	-1.424***	-1.087***
Category-2 (Moderate versus None)				
P	-0.080***	0.002	-0.029	-0.072**
L	-0.043	-0.086**	-0.059	-0.124***
D	-0.136***	-0.192***	-0.038	-0.212***
P Girl Child*	0.019	-0.065	-0.034	-0.066*
L Girl Child*	0.017	-0.044	0.024	-0.055
D Girl Child*	0.008	-0.056*	-0.006	-0.087***
*P*Covid*	0.035	-0.084**	-0.083	-0.092**
*L*Covid*	-0.022	0.044	0.026	-0.032
*D*Covid*	0.043	-0.082**	-0.154***	-0.163***
Girl Child	0.002	-0.031	-0.088***	-0.059***
Covid	-0.143***	0.022	-0.096***	0.001
Wealth	-0.186***	0.025	-0.111***	-0.070***
Wealth-Squared	0.018***	-0.026***	0.003	-0.015***
Age	-0.003***	0.013***	-0.009***	0.010***
Siblings	0.084***	0.112***	-0.042***	0.075***
Religion (Base-Hindu)				
Muslim	-0.053***	-0.028	0.005	-0.049**
Christian	-0.857***	-0.082***	-0.514***	-0.566***
Others	-0.129***	-0.245***	-0.395***	-0.471***
Caste (Base- General)				
OBC	-0.049***	0.184***	0.169***	0.233***
SC	0.056***	0.245***	0.139***	0.275***
ST	0.249***	0.117***	0.242***	0.212***
Constant	0.924***	-1.389***	-1.339***	-1.076***
Prob > chi2	0.000	0.000	0.000	0.000
Number of obs	138,176	133,179	125,421	134,509

Table A14: Coefficients from Regression of Children's Health Indicators on Parents' Effective Literacy Status with Gender Interactions for Urban India

	Urban			
Variables	**Anaemia**	**Stunting**	**Wasting**	**Underweight**
Category-1 (Severe versus None)				
P	-0.233	-0.247***	-0.039	-0.165*
L	-0.045	-0.335***	0.019	-0.133
D	-0.713***	-0.449***	0.091	-0.269***
P Girl Child*	0.034	0.179*	0.130	0.073
L Girl Child*	-0.119	0.029	-0.166	-0.168
D Girl Child*	0.121	-0.003	-0.005	-0.031
*P*Covid*	-0.117	-0.171	-0.278	-0.092
*L*Covid*	0.043	0.008	0.010	-0.071
*D*Covid*	0.085	-0.122	-0.136	-0.189**
Girl Child	-0.114	-0.204***	-0.071	-0.145**
Covid	-0.250*	-0.015	-0.224**	0.061
Wealth	-0.121	-0.353***	-0.057	-0.248***
Wealth-Squared	0.003	0.033***	0.004	0.016
Age	0.008***	-0.003***	-0.015***	-0.002**
Siblings	0.083	0.141***	-0.110***	0.070**
Religion (Base-Hindu)				
Muslim	-0.413***	0.138***	0.410***	0.361***
Christian	-0.592***	-0.108	-0.294***	-0.514***
Others	0.546***	0.019	-0.411***	-0.206*
Caste (Base- General)				
OBC	-0.075	0.058	-0.021	0.015
SC	0.277**	0.198***	0.028	0.099*
ST	0.071	0.174**	-0.072	0.011
Constant	-2.619***	-0.789***	-1.709***	-1.364***
Category-2 (Moderate versus None)				
P	-0.102*	-0.175**	-0.073	-0.200***
L	-0.076	-0.209***	-0.173*	-0.160**
D	-0.249***	-0.296***	-0.090	-0.263***
P Girl Child*	0.057	0.106	-0.018	0.171*
L Girl Child*	-0.042	0.057	0.149	0.013
D Girl Child*	0.019	-0.087	-0.016	0.006
*P*Covid*	0.030	-0.106	0.104	-0.038
*L*Covid*	0.068	-0.074	0.081	-0.007
*D*Covid*	0.134**	-0.101	-0.015	-0.161**
Girl Child	0.003	-0.059	-0.095	-0.145***
Covid	-0.177***	0.008	-0.227***	-0.044
Wealth	-0.147***	-0.269***	-0.060	-0.252***
Wealth-Squared	0.013**	0.026***	-0.002	0.018**
Age	-0.001	0.011***	-0.008***	0.007***
Siblings	0.085***	0.128***	-0.067**	0.062**
Religion (Base-Hindu)				
Muslim	-0.288***	0.034	0.160***	0.111***
Christian	-0.784***	-0.227***	-0.658***	-0.570***
Others	-0.062	-0.014	-0.124	-0.237***
Caste (Base- General)				
OBC	-0.072***	0.183***	0.134***	0.147***
SC	0.072**	0.269***	0.102*	0.205***
ST	-0.056	0.183***	0.174**	0.086
Constant	0.712***	-1.211***	-1.507***	-0.987***
Prob > chi2	0.000	0.000	0.000	0.000
Number of obs	36,823	35,502	33,107	35,699

Table A15: Coefficients from Regression of Children's Health Indicators on Parents' Effective Literacy Status with differences in the Education Level of the Literate Parents for Rural India

	Rural			
Variables	**Anaemia**	**Stunting**	**Wasting**	**Underweight**
Category-1 (Severe versus None)				
P_FSec	-0.263***	-0.177***	-0.034	-0.133***
P_FSenSec	-0.084	-0.243***	-0.150**	-0.282***
P_FGrad	-0.836***	-0.242***	-0.192*	-0.380***
P_FAbGrad	-0.680	-0.617***	-0.246	-0.258
L_MSec	-0.224***	-0.326***	-0.124**	-0.286***
L_MSenSec	-0.606***	-0.330***	-0.234**	-0.374***
L_MGrad	-0.828**	-0.404***	-0.271	-0.382**
L_MAbGrad	0.542	-0.172	-0.808	-1.142*
D	-0.479***	-0.440***	-0.163***	-0.464***
*P_FSec*Covid*	0.023	0.020	-0.021	-0.043
*P_FSenSec*Covid*	0.292	0.118	0.023	0.061
*P_FGrad*Covid*	0.679**	-0.027	-0.135	0.025
*P_FAbGrad*Covid*	-0.168	-0.324	-0.164	-0.566
*L_MSec*Covid*	-0.101	0.059	-0.106	0.087
*L_MSenSec*Covid*	0.140	0.061	0.103	0.056
*L_MGrad*Covid*	0.535	-0.254	0.072	-0.316
*L_MAbGrad*Covid*	-14.590	-1.146	0.637	0.811
*D*Covid*	0.227**	-0.067	-0.075	0.007
Covid	-0.510***	-0.149***	-0.323***	-0.191***
Wealth	-0.136**	-0.157***	-0.084**	-0.187***
Wealth-Squared	0.004	-0.007	0.001	-0.004
Age	-0.001	0.001	-0.018***	-0.002***
Girl Child	0.004	-0.178***	-0.141***	-0.187***
Siblings	0.193***	0.153***	-0.071***	0.087***
Religion (Base-Hindu)				
Muslim	0.008	0.044	0.167***	0.016
Christian	-1.050***	-0.187***	-0.520***	-0.913***
Others	0.078	-0.164***	-0.349***	-0.503***
Caste (Base- General)				
OBC	-0.205***	0.240***	0.130***	0.256***
SC	0.020	0.338***	0.128***	0.293***
ST	0.131**	0.244***	0.343***	0.378***
Constant	-1.960***	-0.847***	-1.407***	-1.065***

continued

Category-2 (Moderate versus None)				
P_FSec	-0.083***	-0.044	-0.036	-0.066**
P_FSenSec	-0.031	-0.038	-0.088	-0.178***
P_FGrad	-0.035	0.087	-0.046	-0.198***
P_FAbGrad	-0.373***	0.027	0.060	-0.165
L_MSec	-0.003	-0.106***	-0.031	-0.161***
L_MSenSec	-0.111**	-0.115*	-0.149*	-0.102*
L_MGrad	-0.110	-0.082	0.095	-0.296**
L_MAbGrad	0.112	0.200	-0.760	-0.242
D	-0.133***	-0.218***	-0.044	-0.257***
*P_FSec*Covid*	0.042	-0.064	-0.053	-0.100**
*P_FSenSec*Covid*	0.062	0.027	-0.133	0.002
*P_FGrad*Covid*	-0.126	-0.429***	-0.115	-0.189*
*P_FAbGrad*Covid*	0.491**	-0.542*	-0.510	-0.503
*L_MSec*Covid*	-0.007	0.127**	0.025	0.014
*L_MSenSec*Covid*	0.055	-0.062	0.040	-0.114
*L_MGrad*Covid*	-0.158	-0.383**	0.042	-0.136
*L_MAbGrad*Covid*	-1.089**	-0.626	0.510	-0.235
*D*Covid*	0.043	-0.084**	-0.153***	-0.163***
Covid	-0.144***	0.024	-0.097***	0.001
Wealth	-0.187***	0.025	-0.110***	-0.069***
Wealth-Squared	0.018***	-0.026***	0.003	-0.014***
Age	-0.003***	0.013***	-0.009***	0.009***
Girl Child	0.010	-0.064***	-0.093***	-0.102***
Siblings	0.084***	0.112***	-0.042***	0.075***
Religion (Base-Hindu)				
Muslim	-0.053***	-0.027	0.004	-0.050**
Christian	-0.857***	-0.080***	-0.516***	-0.566***
Others	-0.131***	-0.247***	-0.394***	-0.474***
Caste (Base- General)				
OBC	-0.048***	0.184***	0.169***	0.233***
SC	0.056***	0.245***	0.139***	0.275***
ST	0.248***	0.116***	0.242***	0.211***
Constant	0.920***	-1.374***	-1.338***	-1.057***
Prob > chi2	0.000	0.000	0.000	0.000
Number of Obs	138,176	133,179	125,421	134,509

Table A16: Coefficients from Regression of Children's Health Indicators on Parents' Effective Literacy Status with differences in the Education Level of the Literate Parents for Urban India

	Urban			
Variables	**Anaemia**	**Stunting**	**Wasting**	**Underweight**
Category-1 (Severe versus None)				
P_FSec	-0.246	-0.036	0.077	-0.073
P_FSenSec	-0.041	-0.388***	0.065	-0.128
P_FGrad	-0.340	-0.508***	-0.512*	-0.375*
P_FAbGrad	-0.194	-1.036**	-0.048	-0.822
L_MSec	0.112	-0.226***	-0.015	-0.110
L_MSenSec	-0.786**	-0.560***	-0.137	-0.362**
L_MGrad	-0.009	-0.564**	-0.254	-0.505*
L_MAbGrad	-13.305	-0.673	0.059	0.183
D	-0.649***	-0.461***	0.082	-0.284***
*P_FSec*Covid*	-0.438	-0.217	-0.323	-0.008
*P_FSenSec*Covid*	-0.005	-0.150	-0.251	-0.743**
*P_FGrad*Covid*	0.949	0.065	-0.249	0.330
*P_FAbGrad*Covid*	-12.929	-12.660	-0.171	-12.746
*L_MSec*Covid*	0.085	0.021	-0.020	-0.063
*L_MSenSec*Covid*	-0.569	0.024	0.032	-0.146
*L_MGrad*Covid*	0.045	-0.176	-0.300	-0.292
*L_MAbGrad*Covid*	13.438	-0.278	0.171	-0.471
*D*Covid*	0.070	-0.131	-0.150	-0.205**
Covid	-0.237	-0.008	-0.211**	0.076
Wealth	-0.112	-0.339***	-0.052	-0.240***
Wealth-Squared	0.001	0.032***	0.004	0.015
Age	0.008***	-0.003***	-0.015***	-0.002**
Girl Child	-0.073	-0.181***	-0.076*	-0.169***
Siblings	0.082	0.138***	-0.111***	0.070**
Religion (Base-Hindu)				
Muslim	-0.413***	0.131***	0.406***	0.356***
Christian	-0.597***	-0.104	-0.293***	-0.511***
Others	0.546***	0.016	-0.412***	-0.208*
Caste (Base- General)				
OBC	-0.075	0.059	-0.018	0.016
SC	0.277**	0.195***	0.027	0.096
ST	0.069	0.174**	-0.072	0.009
Constant	-2.662***	-0.811***	-1.711***	-1.367***

continued

Category-2 (Moderate versus None)				
P_FSec	-0.088*	-0.038	-0.012	-0.053
P_FSenSec	-0.046	-0.249**	-0.326**	-0.216*
P_FGrad	-0.081	-0.261*	-0.039	-0.272*
P_FAbGrad	0.546*	-1.096**	-0.235	-0.702*
L_MSec	-0.095*	-0.136*	-0.106	-0.137*
L_MSenSec	0.013	-0.154	-0.125	-0.219**
L_MGrad	-0.195	-0.450**	0.160	-0.181
L_MAbGrad	-0.021	-0.715	-0.769	-0.008
D	-0.232***	-0.340***	-0.096*	-0.264***
*P_FSec*Covid*	-0.019	-0.098	0.103	-0.046
*P_FSenSec*Covid*	0.274*	-0.121	0.314	-0.087
*P_FGrad*Covid*	-0.123	-0.468	-0.182	0.017
*P_FAbGrad*Covid*	-0.558	0.752	-13.239	-0.786
*L_MSec*Covid*	0.128	-0.097	0.206	0.022
*L_MSenSec*Covid*	0.026	-0.275	-0.021	-0.180
*L_MGrad*Covid*	-0.102	0.202	-0.152	0.014
*L_MAbGrad*Covid*	-0.563	0.391	-0.414	-0.853
*D*Covid*	0.128**	-0.110	-0.011	-0.173**
Covid	-0.171***	0.018	-0.231***	-0.032
Wealth	-0.152***	-0.262***	-0.056	-0.247***
Wealth-Squared	0.014**	0.025***	-0.002	0.018**
Age	-0.001	0.011***	-0.008***	0.007***
Girl Child	0.017	-0.082***	-0.089**	-0.119***
Siblings	0.085***	0.127***	-0.068**	0.061**
Religion (Base-Hindu)				
Muslim	-0.286***	0.028	0.160***	0.107***
Christian	-0.782***	-0.225***	-0.658***	-0.566***
Others	-0.062	-0.017	-0.126	-0.240***
Caste (Base- General)				
OBC	-0.072***	0.185***	0.132***	0.147***
SC	0.072**	0.269***	0.101*	0.203***
ST	-0.058	0.185***	0.175**	0.085
Constant	0.703***	-1.211***	-1.516***	-1.004***
Prob > chi2	0.000	0.000	0.000	0.000
Number of Obs	36,823	35,502	33,107	35,699

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