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Abstract

In this paper we identify the multiple channels by which parental education affects child health status. These can be summarised as follows: (a) parental education directly improves child health status; (b) amongst all those who utilised institutional health care facilities children of educated parents have a better health status; (c) educated mothers are more likely to utilise institutional health care whether or not such facilities are available within their village; and (d) educated parents are more likely to utilise health care centre that is available in a village, compared to uneducated parents. Our results show that merely expanding the supply of health care facilities will not help to increase the pace of reduction in child mortality rates and improve child health status. Utilization of existing health care services too should expand and here women's education plays a positive role. Hence, the government has to pay attention to increase education level of adults, women in particular, along with the expansion of health care coverage.

Keywords: Child health status, Health care services, Parental education, Child care, Ordered Probit Model.

JEL Code: **I11; I12; I18**

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1 Introduction

Historically, public policy in India since Independence has laid stress on expanding the provision of health care facilities and increasing the number of health workers per 1000 people (Sen, 2012). The emphasis till 2005 was to expand the supply side factors, especially physical provision of health care facilities. Over time, there has been a shift in the focus of public policy away from provisioning of physical health care infrastructure to provision of integrated and comprehensive health care (Goel, 2007). A policy milestone is the National Rural Health Mission (NRHM) implemented in 2005 to strengthen the public health care system in rural areas. Two major programmes under the NRHM that focused on maternal and child care are (a) Reproductive and Child Health Programme (RCH) that gives special attention to the reduction of infant mortality rate, maternal mortality rate and total fertility rate, and (b) Janani Suraksha Yojana (JSY) that focuses on increasing institutional deliveries. Alongside, the ASHA (Accredited Social Health Activist), AWW (Anganwadi Worker) and ANM (Auxiliary Nurse Midwives) workers were trained to provide additional support to strengthen the quality of antenatal and postnatal care to increase in actual utilization.

These policy initiatives no doubt have had a positive impact on the health outcomes in the country. India has managed to reduce infant mortality rate (IMR) from 129 deaths per 1,000 live births in 1971 to 53 in 2008 (Government of India, 2010). The under-five mortality rate (U5MR) declined to 59 in 2010 (The Planning Commission, 2011). Nevertheless, "India had the highest number of under-five deaths in the world in 2014, with 1.4 million children dying before

reaching their fifth birthday" (UN, 2014). The progress in reducing the proportion of underweight children, U5MR and IMR is far below what is required to achieve the Millennium Goal by 2015. Not surprisingly, India is classified as off-track in terms of IMR, U5MR and maternal mortality rate (ESCAP-ADB-UNDP, 2013).

Expanding the supply of health care facilities, no doubt, is an important pre-requisite for improving health outcomes in the country. However, it is only a necessary condition and by no means sufficient. Existing literature has pointed out several socio-economic factors in determining child mortality rates. Parental education in particular is identified as a crucial determinant in this regard (Mosley and Chen, 1984; Ross and Mirowsky, 2011). Mosley and Chen (1984) have also suggested that a variety of health care practises play an important role in influencing the health of a child. Other studies have shown that socio-economic factors such as the income / wealth of the households, mother's work status, household size, their religion / caste, residence type, gender of the household head, birth order, age at first marriage, fertility rate, etc. are also important determinants of health status of children (Chalasani, 2010; Muldoon et al., 2011; NIMS, ICMR and UNICEF, 2012).

One aspect common to all these studies is that they do not consider the utilization of health care services in their empirical models. That is, there is an implicit assumption that supply of health care facilities, and not demand, is the constraining factor that retards the progress in health status. The empirical fact, however, is that utilisation of the existing health care facilities has been far from total. As per the National Family Health Survey (NFHS) (2005-06) data, only about 51 per cent pregnant women received three or more antenatal care check-ups and only 37 per cent women received post natal care within 48 hours (Government of India, 2010). About 32 per cent of the households in 2005-06 did not make use of any health care facilities available in their

village / neighbouring village. In such a situation, ignoring utilization would result in misspecification error in the estimated model.

A preliminary analysis of National Family Health Survey (NFHS) data suggests that there is no one-to-one correspondence between parental education and utilization of health care facilities though the utilization rate is higher amongst households where at least one of the parents has completed primary education (Table I). The data also shows that child mortality rates for relevant age groups are significantly lower for those households who have utilised available facilities irrespective of the parental education level. More interestingly, amongst the households that utilised health facilities, survival rates are higher (94 per cent) amongst households where parents have completed primary education compared to those where parents are uneducated (90 per cent). These data patterns suggest that parental education not only has a direct effect on child health status as posited in the literature, but also has an indirect effect via the utilization of health facilities, which has not attracted much attention.

[Table I should be inserted here]

We explore the multiple channels by which parental education affects child health status in this paper. Specifically, we test four hypotheses here. (i) Utilization of health facilities along with parental education and other control factors play a significant role in determining the health status of children; (ii) Parental education enhances the impact of utilisation of health care facilities on health status of children; (iii) Educated parents are more likely to avail health care facilities, irrespective of whether such facilities are available within their village or not; and (iv) educated parents are more likely to utilise health care centre that is available in a village, compared to uneducated parents. Towards this, we develop two empirical models using data from the three rounds of NFHS.

First, we develop an ordered-probit model wherein the health status of children is captured through an indicator variable with six categories ordered from very good to very bad health condition based on their survival status and body mass index. We relate the probability of a child falling in one of these six categories to parent's education status, utilization of health facilities, an interaction term between these two variables and other control factors that have been stressed in the literature. The control factors include access to safe drinking water, sanitation facilities, child-care practises, and household's socio-economic and demographic characteristics.

Second, we develop a set of probit models to study the factors that influence the decision of a household to utilise two health facilities that are critical for maternal and child health, viz., institutional place of delivery and antenatal care. The key variables of interest here are parental education, availability of health care services and their interaction term. Existing literature shows that availability (Das et al., 2001), parents' education (Govindasamy and Ramesh, 1997) and several other socio-economic factors (Khan et al., 1994; Barlow and Diop, 1995; Regmi and Manandhar, 1997; Sugathan et al., 2001) have significant impact on the utilization. Many of the control variables used in the first model are also used here. In addition, the interaction term between availability and parental education examines whether educated parents are more likely to utilise health care centre that is available in a village, compared to uneducated parents.

The rest of the paper is organised as follows: In the next section we describe the data used in this study, and provide some descriptive statistics on child health status, parents' education, and other control variables of interest here. In Section 3 we examine the factors determining child health status. Here, we first describe how child health status is measured, then describe the specification of our model and report the estimation results. In Section 4, we describe the specification of our

model of utilization of health facilities and discuss the estimation results. Finally, in Section 5 we provide some concluding remarks and discuss the policy implications of our findings.

2 The Sample

We use NFHS data for the analysis. It is a large scale, multi-round survey for a representative sample throughout India. The survey was conducted in three rounds in 1992-93, 1998-99 and 2005-06, respectively. The primary objective of NFHS is to collect national-level and state-level data on health and demographics for evaluating population and family welfare programmes and strategies. The sample design followed in each NFHS is uniform, systematic and stratified sample of households with two stages sampling in rural areas and three stages sampling in urban areas.

In each round, the survey consists of two questionnaires, viz., a household questionnaire and a woman's questionnaire. The household questionnaire collects information on all residents of a sample household including all visitors who slept in the household the night before the interview. Basic characteristics of each person were interviewed including age, gender, education, occupation, relationship with head of the household, marital status etc. Data on sources of drinking and non-drinking water, sanitation facilities and asset related variables; like irrigated & non-irrigated land, type of house, cattle, vehicle etc. were also collected.

The household questionnaire was then used to shortlist those women who were eligible to respond for the woman's questionnaire. The eligibility criterion has changed since the second round. Ever married women aged 13-49 years were selected in the first round whereas the age limit was changed to 15-49 in second and third rounds. 89,777 eligible women were interviewed in the first round, whereas 131,596 and 92,318 in the second and third rounds, respectively. The

woman's questionnaire was designed to collect data on their background, reproduction, contraception, health of children, fertility preferences, husband's background, height, weight and also information on utilization of available health facilities both in public and private sector.

Additionally, village level surveys were conducted in the first and second rounds to collect data on availability of both government and private health facilities like hospital, sub-centre, public health centre, mobile health unit and private health care units.

In this study we use data on children born between 4-5 years before each NFHS survey. We chose the range 4–5 years so that we have at least 4 years of time period to classify the children according to their survival and health status. The final dataset contains 14127, 7129 and 25675 children from the three NHFS rounds, respectively.

Table II presents the descriptive statistics of the variables of interest, viz., child survival and health status and other covariates. It can be seen that the survival rate has increased from 86% in 1992-93 to 92.97% in 2005-06 whereas mortality rates of different age groups are declining over time. Specifically, the first month after the child was born is the most crucial life span for survival as a significant percentage of children died before 1 month of age. In the pooled dataset, 2574 children out of the total 46931 children died before 1 month of age. Critically, of these 2574 children we observe that only 27% of them were born in a health centre and 37% had received antenatal care.

[Table II should be inserted here]

In general, only 25% households availed both antenatal care and delivered in a health centre in 1992-93, and this has increased only marginally to 28% in 2005-06. The percentage of

households that accessed at least one facility has increased from 61% to 68% over these years. In other words about 32% of households did not avail any of these facilities in 2005-06.

Percentage of parents who have completed primary education has increased from 61% in 1992-93 to 72% in 2005-06. In this dataset, households are mostly male headed, more than 70% belong to Hindu religion and more than 25 % of total households are from scheduled castes (SC) and scheduled tribes (ST) in each round. Only 25% households in the sample have access to safe drinking water whereas 33% households have sanitation facilities in their own residence. About 67% households have electricity in 2005-06 up from 52% in 1992-93. About 50% of total households have either television or radio which may be considered as sources of information about the use of contraceptives and child care practises. Here about 15% households own a motorised vehicle (car, motorcycle or tractor) which may increase their ability to cover longer distance in order to access health care services in or outside the village. Age at first marriage was about 17 years whereas total fertility rate (given as total children ever born) remains high with more than 3 children on average. About 52% children in the sample are male.

3 Factors Determining Health Status of Children

We have defined the health status of children (CHS) in six categories which are ordered from very good to very bad health condition (1, 2, …, 6) on the basis of their survival status and body mass index (BMI). The health status of a child is 1 if the child is alive with normal BMI, 2 if the child is alive with above normal BMI, 3 if the child is alive with less than normal BMI or malnourished, 4 if the child died between 1-5 years of age, 5 if the child died between 1-12 months of age and 6 if the child died before 1 months of age. Here BMI is calculated as $(Weigh\ in\ kg)/(Height\ in\ m)^2$.

Normal BMI in the medical literature is usually given as a range varies across gender and age. WHO (2006) has constructed the BMI-for-age standard utilizing longitudinal data of height and weight of children from upper socioeconomic strata who do not experience any environmental constraints. The study was undertaken with a multi-country dataset including India and these BMI standards are widely used for assessing health status of children. Khadilkar et al. (2009) have done a similar exercise exclusively for India but based on a smaller sample size. To eliminate the small sample bias in Khadilkar et al. (2009), recently Marwaha et al. (2011) have presented the growth chart of affluent school children aged 3-18 years, covering four major regions of India. To the best of our knowledge these BMI estimates are the most recent ones available based on data exclusively from India. Marwaha et al. (2011) recommend that 75th percentile values from their survey be taken as the upper limit for deciding if a child has normal or above normal BMI. They, however, do not make any recommendation with regard to the lower limit for normal BMI. Hence, we follow the general practise of using the 5th percentile as the lower limit for BMI. We use the 5th to 75th percentile range of BMI separately for girls and boys across different ages from Marwaha et al. (2011), given in Table III below, to classify children according to their health status. Thus, for example, the health status of a 3-year old boy will be 1 if he has BMI between 12.86 and 15.72; 2 if his BMI is greater than 15.72 and 3 if less than 12.86. Similarly, for girls and boys of various ages.

[Table III should be inserted here]

As the dependent variable (CHS) is defined in an ordered scale 1-6 where 1 represents best and 6 implies worst health status, we use ordered probit model to estimate the health status of children. We consider six dimensions of explanatory factors that may affect health status of a child:

utilization of health care facilities, parental education, water & sanitation facilities, willingness, complications & care, affordability and other social & demographic characteristics.

The NFHS data gives information on the utilization of several health facilities such as place of delivery, antenatal care, postnatal care, nutritional intake during the pregnancy, immunization, polio, ORS intake by a child that suffered from diarrhoea and other health care practises during pregnancy and after the delivery. Amongst these, only two variables, viz., place of delivery (POD) and antenatal care (AC) are finally used in the model because (i) they are crucial for determining child health status and survival rate (Mosley and Chen, 1984); and (ii) information on these two variables are available for all three rounds of NFHS for all selected children irrespective of their survival status. Information on the utilization of all the other health care facilities is available only for children that have survived. It may be noted that the information on both antenatal care and place of delivery is specific to the particular child in the sample irrespective of whether or not the child survived. Thus, for instance, if a child in the sample is (say) 3-years old, the data is on whether its mother utilised AC / POD for this child.

Finally, based on the place of delivery (institutional or not) and use of antenatal care, three indicator variables Availed both facilities (ABF), Availed either one of the facilities (AEF) and Availed at least one of the facilities (AHF) are created as follows:

Use of health facilities (POD, AC)	**Availed both facilities (ABF)**	**Availed either one of the facilities (AEF)**	**Availed at least one of the facilities (AHF)**
Yes, Yes	= 1	= 0	= 1
Yes, No	= 0	= 1	= 1
No, Yes	= 0	= 1	= 1
No, No	= 0	= 0	= 0

Mother's and father's education are measured in years of formal education completed and parents' education (PE) is taken as a dummy variable which is coded as 1 if the child's mother or

father completed primary education. Additionally, interaction between uneducated parents and AHF is considered as an important determinant to understand whether the impact of accessing those facilities gets hampered due to lack of education of their parents. Actual impact of utilizing those facilities on child's health status is hypothesised as conditional on the education level of their parents. In other words, the hypothesis tests whether educated parents can handle the child care practises in a better way which plays an additional role to determine actual impact of availing those services.

Along with these above mentioned variables we have incorporated several control variables in the model to estimate their actual impact. For instance, source of safe drinking water and access to sanitation facilities are considered as important determinants of child health status in existing literature (Muldoon et al., 2011). Here source of drinking water is assumed to be safe if the household uses piped water from public tap or in own residence or ground water from hand pump in the yard or in public location. Regarding sanitation two variables are considered; one, whether the household has access to a flush or pit toilet facility in their own residence or to a public / share toilet facility; and two, if the household has a flush or pit toilet in their own residence.

NFHS collects information on willingness of having the child which is defined as wanted pregnancy. Then caesarean deliveries are taken as a proxy to capture the complication during the pregnancy, if any. The breastfeeding practise is a crucial variable for child health (Engle et al., 1997) which is calculated as months of breastfeeding divided by age of the child in months. This variable captures the care practises of mother for her child.

Asset index is considered as a control variable to reflect the affordability of the household for both health care services and nutritional intake necessary during and after the pregnancy. The

asset index is constructed by applying principal component analysis (PCA) using the following assets and housing characteristics: type of flooring, material of exterior walls, type of roofing, cooking fuel, number of household members per sleeping room, ownership of a mattress, a pressure cooker, a chair, a cot/bed, a table, an electric fan, a radio/transistor, television, a sewing machine, a mobile telephone, any other telephone, a computer, a refrigerator, a watch or clock, a bicycle, a motorcycle or scooter, an animal-drawn cart, livestock, a car, a water pump, a thresher, a tractor and irrigated & non-irrigated land. But, inclusion and definition of variables in each round vary depending on the availability of data and nature of existing variables. To make them comparable, the asset index is normalised as

$$\text{Normalised Asset Index (NAI)} = \frac{\text{Actual Value} - \text{minimum value}}{\text{Maximum} - \text{Minimum Value}} * 100$$

Among other socio-economic factors; radio/television, vehicle, electricity, religion, caste, adult child ratio, birth order of the child, rural, age at first marriage, age at first birth, total children ever born, gender and relation of the head of the household are taken as other control variables which may have impact on the health condition of each child. The variable radio/television is taken as a source of information on child health care practises whereas vehicle is considered as a proxy for households' ability to reach to a health care centres. Here adult child ratio is calculated as total number of adult members (above 15 years of age) in the household divided by the total number of children including those who died before 5 years of age. The adult child ratio indicates total number of adult members available in the household per child to take care of.

In addition to the above explanatory variables that have been stressed in the literature, we have also considered the type of cooking fuel (smoking and non-smoking) used by the household. Parikh and Laxmi (2000) suggest that cooking fuels especially firewood and animal dung cakes

that generate smoke are a source of indoor air pollution, which has an adverse impact on health of household members including children. We include the type of cooking fuel as an explanatory variable to test if indoor air pollution is a significant factor affecting health status of children, an aspect that has not attracted much attention in the empirical literature.

As mentioned earlier, we estimate an ordered probit model to test the impact of parental education and utilization of health facilities on child health status and how the impact of such utilization is conditional on their parental education. The model can be written as,

$$CHS^{*} = \alpha_1 + \alpha_2 PE + \alpha_3 \text{ABF} + \alpha_4 \text{AEF} + \alpha_5 \text{AHF} * \text{PE} + \gamma X + \varepsilon \quad \ldots\ldots\ldots (1)$$

where, CHS^{*} is a latent variable, which is observed in discrete form through the following mechanism (Greene and Hensher; 2008):

$$\text{CHS}_\text{i} = \text{k if } \partial_{k-1} \leq CHS_i^{*} < \partial_k \; for \; k = 1,2 \ldots, 6; \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$i = 1, \ldots, N; \; \partial_0 = -\infty \; ; \; \partial_J = \infty$$

In equation 1, it is assumed that the error term ε is normally distributed with an expected value of zero and variance of unity whereas X is a vector of control variables which are assumed to be strictly uncorrelated with the error term, ε; and $\gamma$is a vector of coefficients of included control variables. The ∂'s are unknown threshold parameters which are estimated along with the α's. These threshold parameters can be used to estimate different observed values of CHS and the ∂'s can be interpreted as intercepts of the estimated model.

Note that equation 1 is unlikely to suffer from potential endogeneity between a child suffering from any illness and utilisation of health facilities since we have included only antenatal care and the place of delivery, which are for the mother. Since we are using independently pooled cross section data where each survey represents a random sample from the population, this rules out

correlation in the error term within and between each survey's observations (Wooldridge, 2012). Alternative models are estimated with different combination of control variables to test the robustness of the results. Time effects are included in each model to incorporate the change in relation in each round. The concordant ratio, likelihood ratio test, Score test and Wald test statistics are mentioned to show overall performance of each model. The final model is selected by backward selection procedure after dropping the insignificant variables, and is reported in Table IV.

[Table IV should be inserted here]

The results suggest that mother's education plays an important role in determining health status of their child (Hobcraft et al., 1984; Mosley and Chen, 1984; Hobcraft, 1993; Chalasani, 2010; Ross and Mirowsky, 2011; NIMS, ICMR and UNICEF, 2012). The probability of having a healthy child increases significantly by around 0.006 points with an increase in years of mother's education. In addition, the result confirms a significant positive impact of utilization of health care services on the child health status. Here availing both antenatal care and institutional delivery services significantly increases the survival rate of a child with normal BMI by 0.297 which is more than those who have availed only one facility (0.238). But these effects get dampened somewhat in 2005-06 by 0.159 and 0.132, respectively, as captured by interaction terms between ABF, AEF and dummy variable for NFHS 2005-06.

The coefficient of the interaction term between uneducated parents and the utilization of health care turns out significant at -0.062. This suggests that among those who availed health care facilities, children of less educated parents have lower probability of being healthy than those with educated parents. Thus actual impact of utilization of such health facilities gets weakened due to lack of education of their parents as was seen earlier in the data reported in Table I. This

may be due to the fact that an increase in education generates an improvement in health knowledge (Altindag et al., 2011) which results a better choice of health inputs and child care practises; and this contributes an additional positive influence on the health status of their children (Govindasamy and Ramesh, 1997).

The result suggests that a flush or pit toilet facility in own residence and access to safe drinking water have positive impact on the health status of child. It has been tested that access to shared or public toilets does not improve child health status significantly (not given in the table). Alternative models are estimated with and without water and sanitation and we have noticed that the coefficients of mother's education, accessing health facility and their interaction have not changed significantly after inclusion of water and sanitation, although they have significant impact on the health status. Thus water and sanitation have independently explained the health status of children which is not explained by rest of the explanatory variables.

Three other crucial variables are included in the final model viz., wanted pregnancy, caesarean and breastfeeding practise. The covariate "wanted pregnancy" captured the willingness to have the child which has a positive and significant impact on the health status. The "caesarean" is taken as a proxy of any kind of complications during the pregnancy or delivery of the child which may have a negative impact on the health status or the survival status of the child. Here we get significant and negative coefficient as expected. In the literature, breastfeeding practise is considered to be one of the most important factors for health of a child. Here breastfeeding practise is calculated as month of breastfeeding divided by the age of the child in months. Notably breastfeeding practise is turn out to be the most important among included covariates. The probability of a healthy child with normal BMI increases significantly with breastfeeding practises by 0.483.

Asset index is taken as proxy for consumption pattern and affordability of health services of the households. But the index is not significant in the model. Instead we have considered different asset related variables separately like vehicle, livestock, land, house type, electricity, television and radio. Here electricity and type of house are turn out to be significant and have positive impact on the health status of children.

Among other social and demographic variables; children from scheduled tribe (ST) and scheduled caste (SC) families are doing badly than other communities. Furthermore, age of mother at first marriage, adult child ratio and households headed by parents have positive impact whereas male headed household has negative impact on child health status.

In the process of model selection, the type of cooking fuel (smoking and non-smoking) used in the household turned out significant when considered alone, but become insignificant after inclusion of other explanatory variables. Hence, it does not appear in the final model reported here.

4 Modelling Utilization of Health Facilities

After establishing the importance of utilization of health care services in determining child health status, we now turn to the question of determinants of the utilization of health care services. This exercise is done with the pooled data from first two rounds of NFHS because third round does not include the village level survey. The village level survey includes variables related to availability of health facilities and other infrastructure like school, roads and electricity in a village. Without this information it is not possible to construct the variable "availability of services" for the NFHS third round.

The model for utilization of health care that we develop here tests whether availability of health care services has significant impact on actual utilization of antenatal care and institutional delivery after controlling the impact of other important socio-economic and demographic factors. An ordered probit model is used here.

The outcome (dependent) variable, utilization of health facilities (UHF) takes value 1 if the delivery took place in a public or private health care centre by trained personnel and the child has received antenatal care; 2 if the respondent (mother) availed either one of these facilities; and 3 otherwise. Note that the dependent variable here is not exactly the same as ABF, AEF and AHF used earlier, but corresponds closely to these three variables.

Among relevant covariates, parental education and availability of health facility are considered as the focus point of our study. Here availability is captured with two separate variables as public health facility (PUBHF) and private health facility (PRIHF). The PUBHF is coded as 1 if the village has any kind of government health facility and 0 otherwise. Similarly, PRIHF captures the presence of private health facilities; and availability of health care centre (AHC) is taken as 1 if at least one kind of health facilities is present in the region. In addition, the interaction terms between the presence of such facilities (AHC) and parental education (PE) are incorporated to test whether education encourages more to avail those facilities in a region where the facility is already present. More specifically, the significance of the coefficient explains whether parental education can influence the impact of supply side factors on the utilization of the utilities. The list of control variables used in this model is same as equation 1, excluding breastfeeding practises, sanitation and water sources, to capture the impact of other socio-demographic factors which may affect the actual utilization of available resources.

The model for utilization of health facilities (UHF) is specified as;

$$UHF^{*} = \beta_1 + \beta_2 PE + \beta_3 \text{PUBHF} + \beta_4 \text{PRIHF} + \beta_5 \text{AHC} * \text{PE} + \delta Z + \epsilon \ldots\ldots\ldots (3)$$

The UHF^{*} is a latent variable which is observed in discrete form through the following mechanism;

$$\text{UHF} = \text{j if } \mu_{j-1} \leq UHF_i^{*} < \mu_j \; for \; j = 1,2,3; \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$$i = 1, \ldots, N; \; \mu_0 = -\infty \; ; \; \mu_J = \infty$$

In equation 3, the error term ϵ is assumed to be normally distributed with an expected value of zero and variance of unity whereas Z is a vector of control variables which are strictly assumed to be uncorrelated with the error term, ϵ; and δ is a vector of coefficients of included control variables. Here AHC $*$ PE is the interaction term between AHC and PE.[4]

Table V shows total number of women who had received antenatal care and availed institutional delivery by trained personnel against availability of health care facilities in a public or private health centre. More than 25% households did not utilise any health facilities in spite of the fact that health care centres were available in the village.

[Table V should be inserted here]

The estimated models for utilization of health services are given in Table VI. As preceding section has pointed out the importance of antenatal care and place of delivery as important determinants of health status of a child, three separate models are estimated to have a thorough understanding about the determining factors of accessing these health facilities in India. The first model applied ordered probit model with time effects on the variable "availed services" which is defined as a combination of antenatal care and delivery place (categorised as both, one & none).

[4] Note that the relationships in the two models taken together resemble somewhat a recursive simultaneous equations system. Simultaneity bias, however, may not be an issue here due to the recursive structure.

Second and third model have given special attention to each services separately applying binary probit model.

[Table VI should be inserted here]

Here, availability of both private and public health care facilities (PRIHF and PUBHF) have positive impact on utilization of resources. But second and third model clarifies the fact that the PRIHF has greater impact on the probability of availing institutional delivery service whereas PUBHF is more important to increase the probability of availing antenatal care. This may be due to the (actual/perceived) poor quality of services provided by the public health care centres. Mother's education (MEY) has a positive impact on the probability of accessing those facilities (Govindasamy and Ramesh, 1997) by around 0.07.

The interaction between availability of health care (AHC) and MEY is significant for first two models. That is, when a particular region has at least one of these health facilities, the probability of actual utilization of these services increases significantly with mother's education level. But father's education does not play any significant role in determining the actual utilization of these services. That is why the model considers only mother's education instead of parents' education. If we observe the results of second and third models; the interaction term between AHC and MEY is significant for antenatal care but not for place of delivery. Thus the impact of provisioning health care centre on availing institutional delivery services in a health centre is constant for all children irrespective of the education level of their mother whereas the probability of receiving antenatal care is conditional on mother's education in an area with health care facilities (Figure 1).

[Figure 1 should be inserted here]

Asset index captures the affordability of each household which has a significant positive impact on the utilization of health facilities (0.014) but the level of impact declines by 0.01 in 1998-99 (captured by the interaction term between AHC and round2) due to increase in total coverage of health care facilities by public sector.

Several other control variables are included in the model. Here awareness / access to information on maternal and child health practise (captured by TV/Radio), electricity, physical accessibility / mobility (motorised vehicle), adult child ratio and age of mother at first marriage have positive impact on the probability of accessing available facilities whereas socio-demographic factors like birth order, male headed family, backward castes (SC and ST), Hindu and Muslim households reduce the probability of utilizing the available heath facilities. Children from rural areas have lower probability as compared to urban areas.

5 Conclusions and Policy Implications

In this paper we explored the multiple channels by which parental education affects child health status. We developed two empirical models using data from the three rounds of NFHS and tested four hypotheses, viz., (i) Utilization of health facilities along with parental education and other control factors play a significant role in determining the health status of children; (ii) Parental education enhances the impact of utilisation of health care facilities on health status of children; (iii) Educated parents are more likely to avail health care facilities, irrespective of whether such facilities are available within their village or not; and (iv) educated parents are more likely to utilise health care centre that is available in a village, compared to uneducated parents.

First, we developed an ordered-probit model to assess the impact of utilization of health care facilities and parental education on the health status of children after controlling other

determining factors. The health status is defined in six categories which are ordered from very good to very bad health conditions on the basis of their survival status and body mass index (BMI). Here we consider six dimensions of factors which affect health status of a child: utilization of health care facilities, parental education, water & sanitation facilities, willingness, complications & care, affordability and other social & demographic characteristics. In addition the interaction between parental education and utilization of health care is incorporated in the model to examine whether lack of education among parents affects the actual impact of the utilization.

The results show that both utilization of these services and mother's education improve the health status of a child. Probability of having a healthy child increases significantly if they availed both antenatal care and institutional delivery services as compared to only one service. But the significance of the interaction term confirms that lack of education among parents dampens the impact of the utilization of available facilities on the health of a child. In other words, educated parents appear to be better placed at managing child care practises, which offers them an additional edge over uneducated parents who availed those facilities. Among others determining factors, having toilet facility in own residence and access to safe drinking water play significant role in improving the health status whereas households from SC and ST are doing badly than other communities. Furthermore, age of mother at first marriage, adult child ratio and households headed by parents have positive impact whereas male headed household has negative impact on child health status.

In the second part of our analysis, we develop a set of probit models to study the factors that influence the decision of a household to utilise two health facilities that are critical for maternal and child health, viz., institutional place of delivery and antenatal care. The key variables of

interest here are parental education, availability of health care services and their interaction term, along with other control variables many of which appear in the model for child health status.

The models for utilization of the two health care facilities (antenatal care and institutional delivery) confirm that additional provision of health care facilities leads to significant increase in utilization of both these facilities. The results also show that mere provision of more health care services alone will not help to reduce the mortality rates of children at the rate required to achieve acceptable levels of child health status. The model reveals the fact that, schooling affects health seeking behaviour among women which leads to greater utilization of institutional benefits in a region where the facilities are present. Here, father's education does not have any significant impact on the probability of utilization. Thus, female education must be enhanced to increase the utilization of antenatal care at a faster rate. In addition asset of the household, awareness (captured by TV/Radio), electricity, accessibility (motorised vehicle), adult child ratio and age of mother at first marriage have positive impact on the probability of accessing available facilities whereas other socio-demographic factors like birth order, male headed family, backward castes (SC and ST), Hindu and Muslim households affect negatively. Children from rural areas have lower probability as compared to urban areas.

The two models put together bring out the multiple channels through which parental education, especially mother's education, affects the survival and health status of children. These can be summarised as follows: (a) parental education directly improves child health status; (b) amongst all those who utilised institutional health care facilities children of educated parents have a better health status; (c) educated mothers are more likely to utilise institutional health care whether or not such facilities are available within their village; and (d) educated parents are more likely to

utilise health care services in a village where the health care centre is available, compared to uneducated parents.

These results imply that to increase the pace of reduction in child mortality rates and improve child health status it is not enough to merely expand the supply of health care facilities. Utilization of existing health care services too should expand and here women's education plays a positive role. Hence, the government has to pay attention to increase education level of adults, women in particular, along with the expansion of health care coverage. Awareness of the importance of availing health care facilities and health care practises has to be created among the uneducated parents who did not complete primary educations.

For instance, policies and programmes should be initiated to encourage women for availing antenatal care and delivery services. The Janani Suraksha Yojana (JSY) implemented in 2005 under the National Rural Health Mission by modifying the National Maternity Benefit Scheme (NMBS) is one such example. Under this scheme, institutional delivery is promoted among poor pregnant women by financial assistance of Rs.500 per birth up to two children for those women who have attained 19 years of age and belong to BPL families. After the intervention, percentage of institutional delivery has increased significantly across states but still considerably less than 100% level (UNFPA, 2009). Hence this kind of programme has to be implemented extensively across states.

But the results of the study are conditional on certain limitations of the data. First of all, NFHS does not provide data on household expenditure and nutritional intake for all three rounds. Thus we have constructed asset index by considering all asset related items of each household to capture the capability of the particular household to spend on food and health. Second, child health status depends on several health care practises other than antenatal care and institutional

delivery. Notably, postnatal cares like vaccination for polio, DPT and measles, health care practises if the child has diarrhoea, fever or pneumonia, and food consumption of both mother and child may have significant role in determining health status of the child. But information on these variables in the NFHS does not cover all the children in the target group for this study, and hence these variables could not be included here. And third, we had to rely on data comprising first and second rounds of the NFHS to estimate the model for utilization of health services as data on availability of health care services were not collected in the third round. Nevertheless the study has done several checks for robustness of each model to conclude the findings.

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References

Altindag D, Cannonier C, Mocan N. 2011. The impact of education on health knowledge. *Economics of Education Review* 30(5): 792-812.

Barlow R, Diop F. 1995. Increasing the utilization of cost-effective health services through changes in demand. *Health Policy and Planning* 10(3): 284–295.

Chalasani S. 2010. The Changing Relationship between Household Wealth and Child Survival in India. *Demographic and Health Surveys Working Paper. Demographic and Health Research* 69. Available at http://pdf.usaid.gov/pdf_docs/PNADT375.pdf.

Das N P, Mishra V K, Saha P K. 2001. *Does Community Access Affect the Use of Health and Family Welfare Services in Rural India?* National Family Health Survey Subject Reports 18. Mumbai, India, and Honolulu, U.S.A.: International Institute for Population Sciences, Mumbai, and East-West Centre, Honolulu.

Engle P L, Menon P, Haddad L. 1997. *Care and Nutrition: Concepts and Measurement*. Washington, DC: International Food Policy Research Institute. Geneva and New York: WHO and UNICEF.

ESCAP-ADB-UNDP. 2012-13. *Asia-Pacific Aspirations: Perspectives for a Post-2015 Development Agenda*. Asia-Pacific Regional MDGs Report 2012/13.

Goel S. 2007. From Bhore Committee to National Rural Health Mission: A Critical Review. *The Internet Journal of Health* 7(1).

Government of India. 2010. *Annual Report to the People on Health, Ministry of Health and Family Welfare*. September, 2010.

Govindasamy P, Ramesh B M. 1997. *Maternal Education and the Utilization of Maternal and Child Health Services in India*. National Family Health Survey Subject Report 5. Mumbai: International Institute for Population Sciences; Calverton, Maryland: Macro International, Demographic and Health Surveys (DHS).

Greene W H, Hensher D A. 2008. Modeling ordered choices: A primer and recent developments. *Department of Economics (Leonard N. Stern School of Business, New York University) working Paper* 08-26.

Hobcraft J. 1993. Women's education, child welfare and child survival: a review of the evidence. *Health Transition Review* 3(2).

Hobcraft J N, McDonald J W, Rutstein S O. 1984. Socioeconomic factors in infant and child mortality: a cross-national comparison. *Population Studies* 38(2): 193-223.

Khadilkar V V, Khadilkar A V, Cole T J, Sayyad M J. 2009. Cross-sectional growth curves for height, weight and body mass index for affluent Indian children, 2007. *Indian Pediatrics* 46: 477–89.

Khan Z, Soomro G Y, Soomro S. 1994. Mother's education and utilization of health care services in Pakistan. *Pakistan Development Review* 33(4.2): 1155–66.

Marwaha R K, Tandon N, Ganie M A, Kanwar R, Shivaprasad C, Sabharwal A, Bhadra K, Narang A. 2011. Nationwide reference data for height, weight and body mass index of Indian schoolchildren. *The National Medical Journal of India* 24(5).

Mosley W H, Chen L C. 1984. An analytical framework for the study of child survival in developing countries. *Population and Development Review* 10: 25-45.

Muldoon K A, Galway L P, Nakajima M, Kanters S, Hogg R S. 2011. Health system determinants of infant, child and maternal mortality: A cross-sectional study of UN member countries. *Global Health* 7: 42.

NIMS, ICMR and UNICEF. 2012. *Infant and Child Mortality in India: Levels, Trends and Determinants*. National Institute of Medical Statistics (NIMS), Indian Council of Medical Research (ICMR) and UNICEF India.

Parikh J, Laxmi V. 2000. Biofuels, Pollution and Health Linkages: A Survey of Rural Tamilnadu. *Economic and Political Weekly* XXXV: 47.

Planning Commission, Government of India. Data and Statistics, 2011. Available at: http://planningcommission.gov.in/data/datatable/index.php?data=datatab.

Regmi G P, Manandhar M. 1997. *Patterns and determinants of health care utilization. Insights on Family Health Issues in Nepal*. Kathmandu: Family Health Division, Department of Health Services, Ministry of Health, Nepal, and Calverton, Maryland: Demographic and Health Surveys (DHS), Macro International 27–48.

Ross C E, Mirowsky J. 2011. The interaction of personal and parental education on health. *Social Science & Medicine* 72: 591-599.

Sen G. 2012. Universal Health Coverage in India. *Economic & Political Weekly* XLVII: 08.

Sugathan K S, Mishra V, Retherford R D. 2001. *Promoting Institutional Deliveries in Rural India: The Role of Antenatal-Care Services*. National Family Health Survey Subject Reports 20, December 2001, International Institute for Population Sciences.

UN. 2014. *The Millennium Development Goals Report, 2014*. United Nations, Available at http://www.un.org/millenniumgoals/2014%20MDG%20report/MDG%202014%20English%20web.pdf.

UNFPA. 2009. *Concurrent Assessment of Janani Suraksha Yojana (JSY) Scheme in Selected States of India, 2008*. http://nrhm.gov.in/images/pdf/media/publication/concurrent-assessment-of-jsy/jsy_study_unfpa.pdf.

WHO. 2006. Assessment of differences in linear growth among populations in the WHO Multicentre Growth Reference Study. Multicentre Growth Reference Study Group. *Acta Paediatr Suppl* 450: 56–65.

Wooldridge J M. 2012. *Introductory Econometrics: A Modern Approach 5th edition*. SouthWestern .

Tables

Table I: Distribution of age-wise mortality rates by utilization of health facility and parents' education

Utilization of Health Facility	Parents Education (Completed Primary)	Mortality Rate (Below 1month)	Mortality Rate (1-12month)	Mortality Rate (1-5Years)	Survival Rate
No (34%)	No (52%)	8%	5%	3%	84%
	Yes (27%)	7%	4%	2%	87%
Yes (66%)	No (48%)	6%	3%	2%	90%
	Yes (73%)	4%	1%	1%	94%

Source: Authors' estimates using NFHS data (Rounds 1, 2 & 3)

Note: Table reports NFHS data pooled over the three Rounds, and refers to children born between 4-5 years before each NFHS survey.

Amongst the households that utilised health facilities, survival rates are higher amongst households where parents have completed primary education compared to those where parents are uneducated

Table II: Descriptive statistics

Variables	1992-93	1998-99	2005-06	Pooled
Health Outcomes				
Survival Rate	86.20%	91.32%	92.97%	90.68%
Mortality Rate (1-5 years)	2.07%	1.07%	0.99%	1.33%
Mortality Rate (1-12 months)	4.11%	2.76%	1.55%	2.51%
Mortality Rate (0-1 months)	7.62%	4.85%	4.48%	5.48%
Utilization of Health care facilities				
Availed both facilities	25%	30%	28%	27%
Availed antenatal care only	35%	34%	26%	30%
Availed institutional delivery only	2%	3%	14%	8%
Availed no service	39%	34%	32%	34%
Parents' Education				
Parents completed primary education (%)	61%	87%	72%	71%
Mother education in years (Mean)	2.97	3.55	4.76	4.04
Father education in years (Mean)	5.75	10.45	6.89	7.11
Water & sanitation				
Safe drinking water	33%	36%	25%	29%
Sanitation facility in own residence	26%	27%	33%	30%
Willingness, complications & care				
Wanted pregnancy	78%	82%	80%	80%
Caesarean	12%	7%	10%	10%
Months breastfeeding	18.82	19.76	19.94	19.58
Breastfeeding practice	0.61	0.74	0.55	0.60
Affordability				
Normalised asset index	7.91	29.91	37.87	27.64
Other social & demographic factors				
Radio / TV	46%	51%	56%	52%
Electricity	52%	62%	67%	62%
Bicycle	42%	48%	45%	44%
Motorcycle	9%	11%	17%	14%
Car	1%	2%	3%	2%
Motorised vehicle	10%	12%	18%	14%
Hindu	76%	78%	70%	73%
Muslim	14%	13%	16%	15%
SC	13%	19%	18%	17%
ST	12%	12%	16%	14%
Number of household members	7.80	7.50	6.69	7.15
Relation to household head (parents)	57%	56%	62%	60%
Sex household head (Male)	93%	94%	90%	91%
Age of Household head	43.55	43.30	42.21	42.78
Total children ever born	3.49	3.21	3.23	3.31
Age Mother at 1st birth	19.14	19.02	19.78	19.47
Marital status married	98%	99%	98%	98%
Age at first marriage	17.15	17.15	17.26	17.21
Gender of the child (Male)	52%	52%	52%	52%
Birth order	2.99	2.89	2.70	2.82

Source: Authors' estimates using NFHS data (Rounds 1, 2 & 3)

Note: Data consists of children born between 4-5 years before each NFHS survey.

Table III: Gender specific and age wise normal BMI ranges for children

Gender	Age (years)	Lower	Upper
Boys	3	12.86	15.72
	4	12.9	16.12
	5	12.93	16.5
Girls	3	12.37	15.63
	4	12.51	16.11
	5	12.62	16.57

Source: MARWAHA, et al. (2011)

Note: Lower and upper limits are BMI values at 5th and 75th percentile BMI values of children from upper socio economic strata

Table IV: The estimated models for health status of children using ordered probit model

Variable	Model
Intercept1	-0.691***
Intercept2	0.023
Intercept3	0.392***
Intercept4	0.483***
Intercept5	0.697***
Mother education in years (MEY)	0.006***
Availed both facilities (ABF)	0.297***
Availed either one facilities (AEF)	0.238***
Availed health facilities (AHF) × Parents not educated	-0.062***
ABF × Round3	-0.159***
AEF × Round3	-0.132***
Safe drinking water	0.032**
Sanitation in own house	0.024*
Wanted pregnancy	0.029**
Caesarean	-0.130***
Breastfeeding practise	0.483***
Pucca / semi-pucca house[1]	0.052***
Electricity	0.046***
SC	-0.047***
ST	-0.136***
Adult child ratio	0.030***
Relation to household head (parents)	0.081***
Household head (male)	-0.055***
Marital status (married)	0.131***
Age at first marriage	0.005***
Round 2005-06	0.416***
Round 1998-99	-0.056***
No. of Obs.	46931
Likelihood Ratio Test	2750.99***
Score Test	2739.69***
Wald Test	2687.29***

Source: Authors' estimates using NFHS data (Rounds 1, 2 & 3 pooled)

Notes: Data consists of children born between 4-5 years before each NFHS survey

Round3 is a dummy variable takes value 1 for NFHS 2005-06 and 0 otherwise.

***, ** and * represent 1%, 5% and 10% significant levels for a two-tail test.

"×" refers to interaction terms between two variables

[1] Pucca house refers to dwellings that are entirely built of stone, brick, cement, concrete or timber whereas for semi-pucca house, only floor and walls are made of these materials.

Both mother's education and utilization of health care services plays an important role in determining health status of their child but the interaction term suggests that among those who availed health care facilities, children of less educated parents have lower probability of being healthy than those with educated parents.

Table V: Availability vs. utilization of health facilities

		Availed facilities				% of children did not utilise any facilities
	Availability	Both	One	None	Total	
1992-93	PHC+Sub centre+Hospital	2,869	2,724	2,055	7,648	**27**
	PHC+Sub centre+Hospital+ Other Govt. health facilities	3,159	3,761	3,315	10,235	**32**
	Private health centre	2,761	2,506	1,914	7,181	**27**
1998-99	PHC+Sub centre+Hospital	1,690	1,496	1,104	4,290	**26**
	PHC+Sub centre+Hospital+ Other Govt. health facilities	1,868	1,955	1,549	5,372	**29**
	Private health centre	1,702	1,634	1,279	4,615	**28**

Source: Authors' estimates using NFHS data (Rounds 1 & 2 pooled)

Note: Data consists of children born between 4-5 years before each NFHS survey

Significant percentage of households did not utilise antenatal care and institutional delivery facilities although facilities were available in the village

Table VI: Estimated models for the utilization of health facilities using probit model

Variables	Utilization of health facilities	Antenatal care	Place of delivery (health centre)
Intercept	-1.742*** -0.421***	-0.632***	-1.458***
Public health facility (PUBHF)	0.179***	0.192***	0.132***
Private health facility (PRIHF)	0.172***	0.118***	0.258***
PRIHF X Round2	-0.110***	-0.064	-0.219***
Mother education in years (MEY)	0.075***	0.070***	0.077***
MEY × Round2	-0.001	0.002	-0.012**
Availability of health care (AHC) × MEY	0.013**	0.022***	0.005
Normalised asset index	0.014***	0.020***	0.008***
Normalised asset index × Round2	-0.010***	-0.018***	-0.005**
Radio/TV	0.097***	0.101***	0.083***
Electricity	0.318***	0.352***	0.234***
Motorised vehicle	0.091***	0.06	0.110***
Hindu	-0.167***	-0.125***	-0.218***
Muslim	-0.188***	-0.171***	-0.213***
SC	-0.089***	-0.011	-0.199***
ST	-0.228***	-0.146***	-0.372***
Adult child ratio	0.046***	0.033***	0.053***
Relation to household head (parents)	0.246***	0.240***	0.232***
Sex household head (male)	-0.366***	-0.303***	-0.402***
Age of household head	0.003***	0.003***	0.002**
Age of mother at first marriage	0.042***	0.033***	0.047***
Birth order	-0.086***	-0.076***	-0.096***
Round2	0.169***	0.142***	0.316***
Rural	-0.348***	-0.181***	-0.461***
No. of Obs.	21256	21256	21256
Concordant Ratio	79.5	79.1	84.5
Likelihood Ratio Test	9863.6***	6002.8***	7356.1***
Score Test	8079.6***	5020.3***	6942.6***
Wald Test	8263.8***	4327.6***	5532.8***

Source: Authors' estimates using NFHS data
(Rounds 1, 2 & 3 pooled)

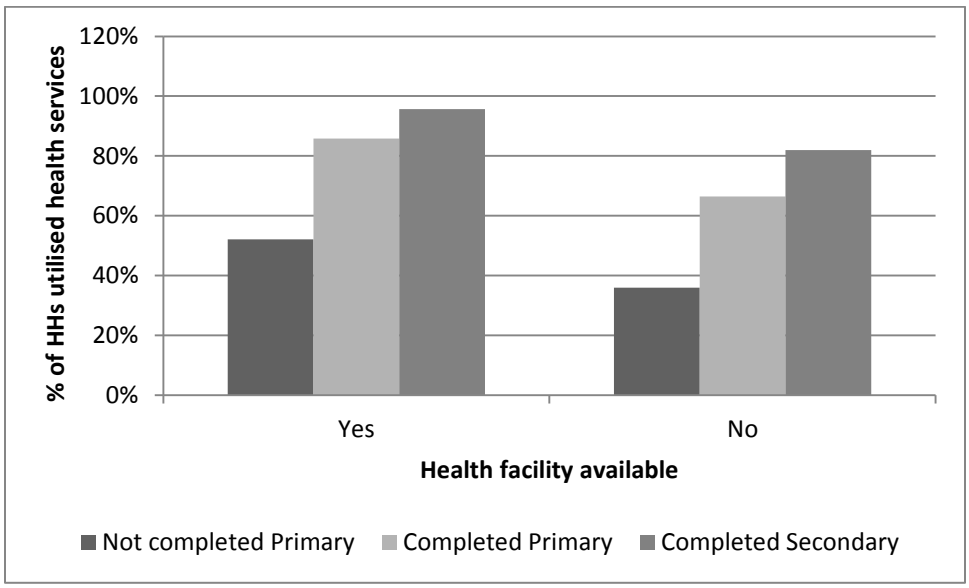
Notes: Data consists of children born between 4-5 years before each NFHS survey

Round2 is a dummy variable takes value 1 for NFHS 1998-99 and 0 otherwise.

***, ** and * represent 1%, 5% and 10% significant levels for a two-tail test.
"X" refers to interaction terms between two variables

Mother's education, availability of health care services and their interaction are significant determinants of utilisation of health care services after controlling other socio-economic variables. Interaction term implies, in a region with at least one of these health facilities, the probability of actual utilization of these services increases significantly with mother's education level

Figure 1: Utilization of health care services by availability and mother's education



Source: Authors' estimates using NFHS data (Rounds 1 & 2 pooled)

Note: Figure shows NFHS data pooled over the three Rounds, and refers to children born between 4-5 years before each NFHS survey.

Educated parents are more likely to utilise health care services in a village where the health care centre is available, compared to uneducated parents