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Abstract

Acute respiratory infections and diarrhoea globally identified as poising major threats to survival of children under the age of five. This is also true for India, where these two diseases have been the major causes behind infant mortality both in 1997 as well as 1998. Prevention as well as effective treatment of these diseases depend on a host of individual, household and community level behavioural factors. Our objective in this paper is to estimate the role played by such factors in determining the utilisation of formal health care to cure diarrhoea and certain respiratory illnesses plaguing young children. We have also simultaneously tried to explore the factors that explain why a child may be more prone towards contracting either of the above-mentioned two diseases. Our analysis is based on the National Family Health Survey (1998-99) data relating to 14 major Indian states. The major findings are Firstly, a woman with greater educational qualification and also higher decision-making power within the household exhibited greater willingness toward health care usage for her sick child. Secondly, formal health care is more likely to be sought for children whose mother are more aware of existing health care packages and the requisite symptoms of the diseases Thirdly, children who were reported to show signs of being severely ill, for each of the above mentioned diseases, are also the ones who have a significantly higher probability of being taken for treatment. Finally, not only the child's nutritional intake (after adjusting for age) but also that of the mother has a strong influence on the likelihood of the child contracting these diseases.

Keywords: *Autonomy, Bivariate Probit, Cough, Diarrhoea, Health Care, India, Nutrition, ORS, Sample Selection, Symptoms.*

JEL Codes: *J13, I18, I15 and I12*

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INTRODUCTION

The National Health policy of India emphasizes the Government's commitment to improve the health status of one of the most vulnerable groups of the society, i.e. the infants and young children. The national target is to reduce the infant mortality rate to below thirty by the year 2010[1]. Over the last two decades the health scenario in India have improved substantially, with infant mortality figures going down from 119 in 1981 to 70 in 2000. However, it is still far short of the desired target. To bridge this gap, one first needs to understand what ails the young? World wide, large percentage of children under the age of five has died of acute respiratory infections (nineteen percent) and diarrhoea (thirteen percent) in the year 2000.[2] This is also true for India where these two diseases along with measles and tetanus have been identified as the major causes behind infant mortality both in 1997 as well as 1998.[3] An in-depth analysis of these two diseases namely diarrhoea and acute respiratory illness becomes mandatory not only because of their high degree of fatality but also because they are not preventable by vaccinations.

Prevention as well as effective treatment of these diseases depends on a host of individual, household and community level behavioral factors. The objective of this paper is to estimate the role played by such factors in determining the utilisation of medical input to cure diarrhoea and certain respiratory illnesses plaguing young children. We have also simultaneously tried to explore the factors that explain why a child may be more prone towards contracting either of the above-mentioned two diseases. Our analysis is based on the survey data drawn from the National Family Health Survey (1998-99) for the fourteen major

[1] Annual Report of Ministry of Health and Family Welfare, Government of India, 2001-2002, Chapter 6, Pg.1.

[2] http://www.who.int/child-adolescent-health

[3] http://www.indiastat.com

states of India. Before presenting details on the methodology used, the results and the relevant policy implications, we have provided a brief review of the existing work done on the issues centering on child health.

LITERATURE REVIEW

Mosley et al. (1984) laid the foundation for analyzing the combination of different factors that influence child survival in developing countries. Their study distinguished between two sets of factors-the biological factors and the socio-economic factors. Medical research focus on how the former group of variables such as nutrition, environmental conditions, age, parity, personal illness control (preventive and curative medical inputs) directly contribute toward survival chances of infants. The social, cultural and economic conditions of a household promote or offset child health through their impact on these biological inputs. The study provided a framework for integrating these two sets of factors while analyzing health production by households. A vast literature has devoted itself to empirically analyzing these determinants of child health.[4] "Child Health" in these studies has been quantified mostly in terms of mortality rates or in anthropometrical units. A partial list of these studies, based primarily on developing countries, includes Bhargava (2003), Pal (1999), Pande (2000), Thomas et al. (1996), Duraisamy et al. (1995), Hill et al. (1995), Pattanaik (1995) and Schultz (1984).

Irrespective of how health status has been captured the following factors have emerged very clearly. Parental education, particularly mother's education has a very decisive role in terms of her child's health. Mother's education has a positive association with child's health because of a number of reasons. Firstly, education enhances the information

[4] A detailed literature review on determinants of child health status has been provided in Chapter 2 whereby the analysis under review was based on aggregate data. In this chapter we have also thrown light on the literature which models child health as a part of the household behavioural model using micro level data.

available to the mother by increasing her exposure to the outside world. Secondly, it strengthens her decision making power either by promoting financial independence or emotional independence or both. Finally, an educated mother typically faces lesser constraints in physical mobility and interaction with the outside world. Household's economic status was also found to have a significant impact on the well being of the child. However, the route through which the above-mentioned factors influence health has been largely left unexplained. Duraisamy et al. (1995) using primary data on rural Tamilnadu raised an interesting issue. Instead of looking into household's assets as a whole they analysed whether there is differential impact of parental asset holding. They found that assets if held by mothers had a greater beneficial impact on child health investment (captured by immunization) than the case where the father holds it. This stems from the fact that greater assets held by the mother gives her greater bargaining power within the household enabling her to take better care of her children. Apart from the social and economic structure of the child's family, the household's environment (captured largely in terms of drinking water and sanitation facilities) has also been hypothesized to have an impact on the health status of the child. However, consistent results were not obtained for the latter group of factors.

Apart from these variables, another group of factors that have received special attention in the existing literature includes, the birth order (parity) and the sex of the child. Birth order, apart from its biological implication, is also important in the context of child's health because it also captures the experience accumulated by the mother over successive births. Accumulated experience was envisaged to deter use of formal care and hence have a derogative impact. The gender of the child and its impact on her health has been a focus of large number of the above-mentioned studies. Particularly, in the context of India, the social and kinship structure encourage gender discrimination in favour of the male child. Under a patriarchal social system, it is the son who will

continue the family lineage and is expected to provide old age security. With exogamy in common practice, particularly in northern states of India, the daughters are married off to other households, sometimes located at a considerable distance from the maternal home and is often looked upon as a burden rather than an asset A large number of studies have analysed how preference for son can lead to discrimination in household's allocation of resources particularly food or even health inputs for e.g. preventive care for children (Duraisamy et al. (1995)). Griffiths (2002) provides a detailed review of the literature studying the existence of sex differential in children's nutritional outcome. However, a clear picture did not emerge. On one hand, several researchers have documented evidence in favour of gender discrimination resulting in daughters having an inferior health status than their male siblings. On the other hand, a number of studies have failed to find such discrimination against girls.

As mentioned earlier, a plethora of studies have focused on mortality figures or on indices measuring the nutritional status of the child ("height for age", "weight for height" etc.) to analyse the channels through which the socio-economic conditions and family composition influences the health of the child. However, to the best of our knowledge very few studies have looked into the child morbidity pattern and its determinants across the different households particularly based on India. Fewer still has attempted to analyse the factors that govern whether a household will seek formal care in the event that a child has contracted illness. In view of the threat caused by "diarrhoea" and "respiratory illness" not only in India but also world wide- an in depth analysis of these two diseases becomes very important. Few studies (Goldman et al. (2002), Duraisamy (2001), Krupnick et al. (1996), and CEBU team (1992)), drawing data from developing economies, have looked into the incidence of these two diseases and examined their determinants. Their findings show that occurrence and transmission of such diseases are largely affected by behavioural pattern and the environmental conditions

surrounding the household. For instance, findings by the CEBU team showed that improper feeding practices by the mother, contamination caused via water or exposure to faeces and excreta, overcrowded living conditions and smoke pollution significantly increase the chances of an infant contracting diarrhoea or cough, cold and fever.

However, the determinants differed according to the type of disease. Study based on Jakarta (Krupnick et al. (1996)) showed that defense mechanism of mother ('washing hands after using toilet') significantly reduces the chance of her child or herself getting diarrhoea. On the other hand, infrastructure for which households have to depend on the Government, for e.g. piped water supply was not a significant determinant of morbidity. The socio economic features such as mother's education and household income, unlike other studies, were found to have no impact on morbidity. It did however; significantly increase the likelihood of adoption of defensive mechanism. This was also partially reflected in Duraisamy (2001) who studied not only the morbidity differential but also the health seeking behaviour of the household based on micro level data from Indian States using NCAER Human Development Index survey conducted in 1994. In this case also mother's education was found to play no significant role in explaining morbidity differentials across different households. However primary, middle and secondary school educated mothers were found to have a higher likelihood of using either private or public care over informal (or no care) facilities.

The other often cited socio economic variable i.e. income was found to play a significant role in both cases - on one hand, it reduced child morbidity on the other hand, it enhances use of private care. Like the study based on Jakarta, household's environment (although captured just by existence of separate kitchen) in this case also mattered more than community facilities such as availability of good roads or doctors in the village in determining the likelihood of children falling sick with

diarrhoea and/or cough. The latter, however, enhanced the probability that formal care (either public or private) will be sought for the sick child.

As mentioned earlier, the objective underlining this study is primarily to examine the factors that determine what kind of a health care facility a household chooses if its child has diarrhoea or respiratory diseases. We have simultaneously estimated the determinants explaining the morbidity differentials across children (less than three years in age) for the fourteen major States in India. To the best of our knowledge, the sole study based on rural Indian context, dealing with household's choice of health care for children with such morbidity pattern is that by Duraisamy (2001). The latter however concentrated on children belonging to the age group of 0 to 14 i.e. the infant, child and the young adolescent. However, it should be remembered that household's decision on choice of health care and also the morbidity pattern is not uniform across these different stages of childhood. For instance, threat imposed by diseases such as diarrhoea and ARI is considerably lower when a child enters into adolescence (age ten onwards) than in early stages of childhood. This is also corroborated by the results obtained by Duraisamy (2001). Probability of being ill and also the duration of illness / severity of illness were found to decrease with the age of the child implying that infants and the very young are most susceptible to these illnesses. Moreover, unlike the former we have also relied on separate analysis according to the kind of disease. This is important because the set, of exogenous variables that emerge as significant determinants differs across the two diseases (CEBU). The implication of this becomes important while formulating policies. Particularly if the policies are programme specific i.e. suggesting measures to target any particular disease. Our study departs from the previous literature in the following respects:

We have explored the relationship between the health care seeking pattern and the authority that the mother enjoys within her

family. Unlike previous studies, where mother's status was captured solely in terms of her education, in our case we have incorporated some direct measure of her autonomy within her household. By, autonomy we mean the rights she exercises regarding purchase of goods (including health inputs) and freedom to move beyond the boundaries of her home.

Instead of relying on educational qualification to capture her access to information, we have tried to ascertain the importance of imparting such health related information directly. The latter may include information on key health inputs used to treat the diseases (for instance ORS for diarrhoea), knowledge that will enable the mother to identify the relevant symptoms of the childhood ailments etc. Solutions of Oral Rehydration Salts (ORS), prepared by dissolving ready-made packets of the salt in water, forms an integral part of the therapy introduced worldwide in 1979 to treat diarrhoea. However, the National Family Health Survey (1998-99) reveals that more than a quarter of mothers of children less than three years age is unaware of existence of ORS. Moreover, although a majority of the mothers could recognize some signs of illness but a large section of them (almost two-thirds) could not identify two or more signs that could signal the need for medical treatment. In addition to this, unlike any of the earlier studies we have also examined whether the onus to secure formal health care varies according to the severity and complications encountered during illness.

One of the means through which higher income induces better health is by improving nourishment of the children (Duraisamy (2001)). Specifically programmes, such as IMCI (Integrated Management of Childhood Illnesses), ICDS (Integrated Child Development Services) have stressed amongst other things, the need to educate the mother on infant feeding practices to counter malnutrition and hence reduce morbidity, disability and mortality. When breast milk is not enough to meet the nutritional needs of the child, complementary food should be added to the diet. In fact WHO recommends that all infants should start receiving

food along with mother's milk from six months onwards till eighteen to twenty four months.[5] This is a vulnerable period when malnutrition sets in many infants thus lowering their immunity to diseases. Findings from the second round of NFHS show that complementary feeding is delayed for a majority of the Indian children. Only thirty two percent of children over the age of seven months eat solid and mushy food and the proportion continues to be less than half even for nine-month-old infants. Interestingly, children in this vulnerable age group of 6 to 23 months were found to be more likely than others to have ARI or Diarrhoea. We have tried to find the relationship between the child's feeding practices with its likelihood of contracting either of the two ailments. This aspect has not been explored in the previous studies based on India. Moreover, we have also looked into the impact of mother's nutritional intake with the health status of her child. It has been widely recognised that if the mother is under nourished then it is likely to have a dampening effect on the health of her child. As pointed out by Mosley et al. (1984), maternal diet and nutrition during pregnancy affect birth weight and, during lactation, influence the quantity and nutrient quality of breast milk. The latter is envisaged to influence the immunity of the child and hence her proreness toward infections. However, this relationship, between the mother's dietary intake and her child's health, has not been empirically tested in any of the previous mentioned studies.

Before proceeding further let me briefly summarise the important results. Firstly, a woman with greater educational qualification and also higher decision-making power within the household exhibited greater willingness toward health care usage for her sick child. Secondly, formal care is more likely to be sought for children whose mothers are more aware of existing health care packages and the requisite symptoms. Thirdly, not only the child's nutritional intake (after adjusting for age) but also that of the mother has a strong influence on the likelihood of the

[5] http://www.who.int/child-adolescent-health

child contracting these diseases. The remainder of the study is divided into the following sections. The next two sections present the economic rationale and econometric methodology employed to estimate the model of household demand for childcare. The next section presents the data, descriptive statistics and the explanatory variables. Then, the results are reported and the final section concludes the study.

ECONOMIC MODEL OF CHILD HEALTH AND DEMAND FOR CHILD HEALTH CARE

The theoretical foundation for analyzing child health and also demand for medical inputs as a part of the household decision making process was developed by Rosenzweig et al. (1983), Schultz (1984), Thomas et al. (1996). Such models start with the notion that the choices of the family members are guided by a common utility function (or common preferences)- an idea originally developed by Becker (1981). In the standard model, at any point in time, the household maximizes an inter temporally separable quasi concave utility function, which depends on the consumption of commodities and services bundle x, the leisure l, and health of each household members (off which the health of the child, in our case measured in terms of morbidity, is one dimension) represented by a vector. The household members thus chooses to solve the following problem:

$$\max_{x,l,\theta} u(x,l,\theta;A,Z) \tag{1}$$

where, A and Z, respectively, represent household and community characteristics, some of which are not observed. Allocation choices are made subject to the following budget constraint

$$px = w(T-l) + y \tag{2}$$

where, p is a vector of prices, w is a vector of wage rate of each household member, T is a vector of the maximum number of hours that

a household member can work and *y* is the sum total of the all family members non wage income.

Households are also constrained by the inherent biological health production function. This shows how the different factors combine to produce the health output of each member "*i*" of the family (in our study- the child). The former is represented by the following equation:

$$h_i = H_i(m, I, A, Z\mu_i) \quad (3)$$

where, *h* is the (ill)health status of the child, *m* is the vector of health related inputs that have a direct impact on the child's health outcome, for instance curative care, preventive measures etc. Note, this may include items in the commodity bundle *(x)* that not only enhances household's welfare directly but also indirectly through their impact on child health for instance nutritious diet. *I, A, Z* are individual (like age and sex), household (for example education, sanitation etc) and community characteristics that influences child's health outcome, and μ_i represents the unobservable individual, family and community characteristics that affect child's health.

The household's optimization of the common utility function subject to the budget constraint and the health production function yields the reduced form equation for "demand for child health inputs" and also "child health" in the form of equations (4) and (5) respectively as:

$$h_i = h(p, w, y, I, A, Z) \quad (4)$$

$$m = m(p, w, y, I, A, Z) \quad (5)$$

Depending on the availability of the data, one can estimate child health as a production function or as a reduced form demand equation or a mixture of both. Ideally, one would like to estimate the biological health production function. However, the problem stems from the endogenity of the health inputs *"m"*. For example, the initial biological endowment of each individual (child) is heterogeneous but unobserved by the

researcher (is a part of μ_i). On one hand, this genetic endowment will, of course, have an influence on the current health status of the child. On other hand, the mother has some information on the degree of frailty of her child and hence will choose the health inputs (like preventive care) for her accordingly. This violates the assumption of independence of "m" and "μ_i" in equation (3) and induces endogenity. Rosenzweig et al. (1983) provided the empirical framework required to estimate the full economic model outlined above. This was followed by other works (Schultz (1984); CEBU team (1992)) that relied on two-stage estimation procedures to control for this endogenity while estimating the parameters of the production function. Owing to dearth of requisite data, a majority of the literature, however modeled child health in terms of a reduced form demand equation (4). The problem with this is that several explanatory variables (for e.g. sanitation, toilet facilities) that are deemed to have an important effect on child survival cannot be estimated because in this framework household is choosing child health and such facilities simultaneously. Consequently, some studies (Duraisamy (2001), Krupnick et al. (1996)) have been compelled to include such potentially endogenous health inputs (and also demand function variables) while estimating child health outcomes. We have also adopted this approach because amongst other things, one of the issues which we would like to address is the role played by the mother's and child's nutrition on the likelihood of the child contracting the diseases. The full econometric methodology used by us is described in the subsequent section.

ECONOMETRIC SPECIFICATION OF THE MODEL

The child health care use in this paper is analysed by using a two-stage process. Use of a particular form of health care, public, private or otherwise can be defined for those children having "diarrhoea" or "cough" in the two weeks prior to the survey. The child's (ill) health

status (h^*) is considered as a latent unobservable, which is determined by a set of socioeconomic factors i.e. x_j. Hence, the latent equation is:

$$h^* = x_j \beta_j + u_{1j} \quad (6)$$

However, if (ill) health crosses a certain thresh old level (assumed zero for simplicity), it manifests itself in terms of a certain morbidity ("diarrhoea" or "cough") which is observed and can be represented as a binomial variable (say h) that takes the value of one if child is sick with the respective ailment and is zero otherwise. That is,

$$h = 1 \; if \; h^* > 0 \; and \; h = 0 \; if \; h^* \leq 0 \quad (7)$$

Now, conditional on being sick, the willingness to seek healthcare for the child (s^*), is a latent unobserved variable, which is determined by a set of exogenous explanatory variables i.e.z_j. If this latent propensity (i.e. s^*) crosses a certain threshold level, then the mother is actually observed to seek care (either "*Coughcare*" or "*Diarrhoeacare*"). The latter can be represented by binomial variable (i.e. s) that is assigned the value of one if the mother has sought care for the particular disease under consideration and is zero otherwise.[6] Hence,

$$s^* \big| (h=1) = z_j \alpha_j + u_{2j} \; and \; s = 1 \; if \; s^* > 0 \; \& \; s = 0 \; if \; s^* \leq 0 \quad (8)$$

We assume that the error terms in the latent variable models (6) and (8), i.e. u_{1j} and u_{2j} are normal and estimate a bivariate probit model to allow for correlation (ρ) between the two random error terms. When ρ is not equal to zero, the standard probit model, used to determine the probability of seeking care[7] will yield biased estimates. Since, the current use of child health care facilities is only observed / selected for those mothers whose child is sick, we estimate a bivariate probit model with

[6] The economic rationale behind modeling demand for childcare is provided by equation (5).

[7] This aspect of sample selection has not been addressed in the existing literature while modeling the determinants of child health care usage.

sample selection using maximum likelihood method. This provides a consistent and asymptotically efficient estimate in this kind of framework.

The data and the variables used for determining the "probability of being sick" and "conditional probability of seeking care" is presented in the following section.

DATA AND EXPLANATORY VARIABLES

The analysis is based on the National Family Health Survey (1998-99) and is restricted to the fourteen major states in India (Andra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Madya Pradesh, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttra Pradesh and West Bengal). The study is based on the rural sample because data on availability of health and other infrastructure and community level programmes is available only for the villages. The survey collected data on the health conditions of the last two children born to ever-married women in the age group of 15 to 49. This included, amongst other issues, details on certain ailment afflicting the children and the kind of treatment sought for these diseases. Amongst 16,746 of the rural women who had affirmed that they had at least one birth during the last three years, 15,819 of the respondents confirmed that their (last born) child was alive at the time of the interview. The latter was asked whether their child had bouts of "*Diarrhoea*" or "*Cough*" in the two weeks preceding the day of the survey. Approximately, 20 percent of the children were reported to have diarrhoea while cough was more prevalent (around 35 percent). The disease rate was found to be different for the girls and boys. For both diarrhoea and cough, boys were found to have marginally higher incidence (53 and 55 respectively) than the girls.

National Family Health Survey (1998-99) provides details on not only whether the child had the above mentioned diseases but also where he/she has been taken for treatment. In our study, we have classified that child has received formal health treatment if the former has been

taken to either a public health facility such as government hospital, primary health care center, sub center, dispensary, mobile health clinic etc or to a qualified private (or NGO) health care provider & institution (clinics, nursing homes etc.). This excludes solicitation from unqualified personnel such as shopkeepers, pharmacist or from traditional practitioner like "vaidya", "hakim" etc. Although lower number of children were reported to have diarrhoea but slightly higher proportion of the mothers were found to seek formal health care when their child had diarrhoea as compared to those with cough. However, in both cases, around forty percent of the mothers did not seek any kind of modern health care for their sick child.

Both the risk of contracting either "*Diarrhoea*" or "*Cough*" and the probability that formal health care will be sought for the child depends on a set of individual characteristics of the child and his/her mother, other household and community features. Tables 1 and 2 give details on the method used to construct the variables of interest and their descriptive statistics. This section is subdivided into two sub-sections. In the first sub section, we have discussed the regresses used while modeling the demand for child health care. In the second subsection, we have briefly outlined the determinants of child morbidity.

Table 1: Variables and Description

VARIABLES	DESCRIPTION
Dependent Variables	
Coughcare	Dummy=1 if respondent seeks care when her child has cough
Cough	Dummy=1 if respondent reports that her child has cough
Diarrcare	Dummy=1 if respondent seeks care when her child has diarrhoea
Diarrhoea	Dummy=1 if respondent reports that her child has diarrhoea
Household Characteristics	
Numchld	Number of children currently living with the respondent
Size	Number of household members
Femhead	Dummy =1 if household head is female; 0 otherwise
Muslim	Dummy =1 if household head is Muslim (Reference group is Hindu); 0 otherwise
Religmisc	Dummy =1 if household head is Christian or Sikh or Buddhist or Jain or Jewish or Parsi or Others (Reference group is Hindu)
Caste1	Dummy =1 if household head is Scheduled Caste
Caste2	Dummy =1 if household head is Scheduled Tribe
Goodsnl	Dummy =1 if household owns any one of the non-luxury goods and any one of the luxury goods as well
Agriland	Dummy =1 if household owns any agricultural land
Toilet	Dummy =1 if household has a own flush toilet or own pit toilet
Ownwater	Dummy =1 if household has access to water piped into residence/yard/plot or handpump in residence/yard/plot or well in residence/yard/plot
Husbandedu	Husband's education in years
Husbunemploy	Dummy =1 if husband is not employed
Mother and Child Characteristics	
Femchld	Dummy =1 if child is female
Chldage	Age of the child
Childnutrigood	Dummy =1 if child has the highest nutritional intake
Respedu	Respondent's education in years

(Contd.. Table 1)

VARIABLES	DESCRIPTION
Respunemploy	Dummy =1 if respondent is not employed
Respage	Age of the respondent
Bord	Birth Order
Freedom	Index to freedom of movement
Decision	Index to decision making power
ORS	Dummy =1 if respondent has used ors, have heard of ors or was able to recognize the packet
Symptomsdiarr	Dummy =1 if respondent can recognize some signs of illness (diarrhoea)
Symptomscough	Dummy =1 if respondent can recognize some signs of illness (cough)
Sevcough	Dummy =1 if child takes short, rapid breaths during cough
Sevdiarrhoea	Dummy =1 if blood in the stools
Respnutrigood	Dummy =1 if respondent has the highest nutritional intake
Village Characteristics	
Railway	Distance to the nearest railway station
Comfacl	Dummy =1 if village has a community center or a community television
Pvthlthfacl	Dummy =1 if village has a private health facility including private doctors
Govhlthfacl	Dummy =1 if village has a government health facility
Statedum	State Dummies (base group is Kerala)
BIMARU	Dummy =1 for the states of Bihar, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh

Table 2: Descriptive Statistics of Variables

VARIABLE	OBSERVATIONS	MEAN	STD. DEV.
Household Characteristics			
Numchld	16746	2.556	1.587
Femhead	16746	0.057	0.232
Size	16746	7.764	3.952
Muslim	16735	0.110	0.312
Religmisc	16735	0.043	0.204
Caste1	16036	0.225	0.418
Caste2	16036	0.120	0.325
Goodsnl	16656	0.220	0.420
Agriland	16744	0.650	0.477
Toilet	16717	0.125	0.331
Ownwater	16671	0.306	0.461
Husbandedu	16703	5.483	4.857
Husbunemploy	16610	0.019	0.136
Individual Characteristics			
Femchld	16746	0.472	0.499
Chldage	15819	0.876	0.796
Childnutrigood	15690	0.070	0.255
Respedu	16739	2.536	3.913
Respunemply	16727	0.642	0.479
Respage	16746	25.139	5.553
Birthorder	16746	3.042	2.012
Freedom	16740	0.341	0.696
Decision	16708	0.711	0.752
ORS	16639	0.575	0.494
Symptomsdiarrhoea	16692	0.976	0.154
Symptomscough	16692	0.971	0.167
Sevcough	5515	0.591	0.492
Sevdiarrhoea	3093	0.150	0.357
Respnutrigood	16726	0.102	0.302
Village Characteristics			
Railways	16606	24.497	24.495
Comfacl	16704	0.286	0.452
Pvthlthfacl	16635	0.455	0.498
Govhlthfacl	15822	0.449	0.497
Dependent Variables			
Cough care	5531	0.597	0.491
Cough	15819	0.350	0.477
Diarrhoea care	3096	0.613	0.487
Diarrhoea	15819	0.196	0.397

Determinants of Utilisation of Child Health Care

Let us first discuss the determinants (i.e. z_j in equation 8) of the likelihood that formal health care will be sought ("*Diarrcare*" or "*Coughcare*") for the child.

The variables of primary interest, namely those capturing the role played by the mother's education level, her social status, her awareness of existing health conditions, inputs etc. are included as a part of the mothers and child's characteristics. As mentioned earlier, mother's education has been equivocally accepted as a primary determinant of child health (though not necessarily for health care usage). Apart from this feature, we have also incorporated certain other indicators of her status. This includes her work status and some direct measures of her autonomy within her household. The role played by the mother's occupational status is uncertain. On one hand, it might enhance her (bargaining) power within her household regarding any decisions pertaining to her own or her child's health and had a positive impact on seeking case. On the other hand, for an employed mother, her time for childcare (e.g. that needed to take her child to a doctor) competes with her income generating activities and other household work and have a negative impact on seeking case.

Moreover, in developing countries like ours, particularly in rural region, women from relatively well off family are restrained from taking employment. Hence, impact of mother's work status may partially be capturing the economic impact. This aspect has been controlled by including a measure of household's ownership of assets. Sociologists and demographers (Jeejebhoy (2001), Basu (1992)) have been critical of using just socioeconomic indicators, for e.g. her educational attainment, occupational status etc. to capture women's status within her household. In India, particularly, in rural regions, where extended or joint families are more common, a woman (even if she is financially independent) needs to take permission from her husband or other senior members of

her family (like mother-in-law or elder sister-in-law) before taking decisions pertaining to herself or her own child. Hence, sociologists have advocated direct measures of autonomy that captures her freedom to interact with people outside her household domain, her control over household resources and authority to take decisions on her own. Unlike any of the previous studies, we have taken this into consideration by using "*Freedom*" and "*Decision*", while modeling the utilisation of child health care.

The degree of women's autonomy was captured in two different areas: her decision-making power and freedom of movement. The NFHS questions the respondent on the following issues: Firstly, who decides on obtaining health care for herself? Secondly, who decides on purchasing jewellery or other major household items? Thirdly, is she allowed to set aside money for her own use? Three separate binary variables were created for each of the above-mentioned cases. For the first two cases, the corresponding dummy variable was assigned a value of one if the respondent was the sole decision maker. In the third case, the dummy took the value of one if the respondent replied in affirmative. The variable "*Decision*" (see Table 1) was composed by adding up these three binary variables and has a score from 0 to 3. The underlying assumption is that equal weights can be given to these household decisions.[8] The index of "*Freedom*" was generated in a similar fashion. The NFHS includes questions on whether the respondent requires permission to (a) go to the market or (b) to visit a friend. Two separate binary variables were created for each of (a) and (b) with a value of one assigned to those cases where the respondent did not require any permission. The variable "*Freedom*" (see Table 1) was created by adding up these two binary variables and has a score from 0 to 2. The

[8] The NFHS also enquires if the respondent has any authority regarding items cooked in the household. However, this component has not been used to construct the index of decision. It appears unreasonable to attach equal importance to this aspect vis-à-vis other aspects considered for constructing "Decision".

underlying assumption in this case also is that equal importance can be given to these indicators of freedom of movement.

We have also assessed the benefits of educating the mother on common childhood diseases and imparting information on health input required for treating them. Three binary variables namely, "*Symtomdiarr*", "*Symptomcough*", and "*Ors*" have been used for this purpose. National Family Health Survey (1998-99) cites a number of sickness conditions as symptoms of diarrhoea or coughs and sees whether the respondent is aware of these signs of illnesses. It also tests the mother's knowledge about oral rehydration salts -a vital input required to treat diarrhoea. Such information has been used to design the above-mentioned variables (see Table 1).

Our primary objective is to see whether mothers who are aware of these health conditions and issues are more prone toward seeking formal health care for their children. Seeking medical care is also closely associated with the degree of complications involved. To account for this, we have controlled for cases where the ailments have been severe. Hence, in case of diarrhoea, we have controlled for all those children whose mothers reported that there was blood in stools from others who did not have such severe diarrhoea. Similarly, for coughs, we have controlled for all those children whose mothers reported that the child faced difficulty in breathing with coughs (see "*Sevcough*" and "*Sevdiarrhoea*" in Table 1). Around twenty percent of the total children in our sample (fifty nine percent of those with cough) were reported to have acute respiratory problems accompanied with cough. Only three percent of the total children in our sample (fifteen percent of those with diarrhoea) were reported to have acute diarrhoea. However, for both diseases, slightly greater proportion of mothers (sixty four percent for cough and sixty seven percent for diarrhoea) was found to seek formal care if their children had the above-mentioned severities. Apart from

these, the gender of the child is the other individual characteristic that has been included.

The household characteristics include details on family composition captured by household size, sex of the head of the household, ethnic and religious backgrounds and the number of children, both boys and girls, who are living with the respondent. It is hypothesized, that everything else being equal, a mother with a greater number of children is less likely to seek formal childcare. This is because not only the time she can allocate is lower but also she has the advantage of falling back on her greater level of experience. Household's economic condition is captured by its ownership of certain assets, which has been classified as necessary, and luxury goods ("*Goodsnl*") and also in terms of possession of agricultural land. Unfortunately, the NFHS does not include questions on household's income or expenditure. However, it does provide data on household ownership of various items for example furniture, consumer durables, means of transportation etc. Previous studies have used different methods to assuage the level of household's prosperity on the basis of its ownership of such goods. We have adopted the methodology used by Pandey (2000) and have constructed a dummy variable namely "*Goodsnl*" (see Table 1) to capture household's economic status.[9] Although classification of the goods into "non-luxury" and "luxury" is discretionary but the descriptive statistics indicate that the division is not entirely unfounded. Around 75 percent of the household belonging to the rural sample was found to own at least one of the non-luxury items. However, only 22 percent of the households were found to have one of the luxury items as well. The other indicator used to reflect upon economic prosperity is the household's landholding status (see "*Agriland*" in Table 1).

[9] The goods chosen to be non-luxury are pressure cooker, clock, fan, bicycle, sewing machine, radio while luxury items included telephone, refrigerator, colour television, black & white television ,car and motorcycle.

The other household level variables include measures for father's characteristics. As pointed out by Mosley et al. (1984) father's education affects child health primarily through the income effect. Father's education has a direct association with his occupation and hence on the household income. However, it might also influence attitudes and hence his preferences over consumption of child care services. In our case, we have thus included both his level of education and his work status. Apart from these factors, we have also controlled for the overall infrastructure, development and scope for community level activities of the village. Hence, explanatory variables capturing distance to the nearest railway station, availability of health services (public and private separately) and personnel, availability of community center and/or community television set have been also included for the child health care utilisation model.

In addition to the variables discussed in the preceding sections, we have also included thirteen state dummies (Kerala is treated as the base state) to account for unobserved state specific effects.

Determinants of Child (ill) Health

Drawing from the existing literature we have hypothesized that the probability of the child contracting either "*Diarrhoea*" or "*Cough*" depends on a set of characteristics capturing its individual characteristics and those of his/her household particularly the parents. The explanatory variables (i.e. x_i in equation 6) included are birth-order of the child, child's age, age of the mother, parent's educational attainment, the religious and ethnic background of the family, household's economic status, and the environmental qualities captured by sanitation and drinking water facility. Note, there is considerable debate regarding the impact of piped water in terms of reduction of child morbidity.

As pointed out by Krupnick et al. (1996), based on their sample in Jakarta, households receiving piped water, often report very frequent interruptions (this is also not unlikely in India, particularly rural region).

This necessitates storage of water that might lead to contamination due to unhygienic storage condition. The other way pipe water can get contaminated is because the pipes used to transmit the water-specially in developing countries is often in bad condition due to poor maintenance. This causes contamination by nearby water table reaching into the corroded pipes. In the absence of data on the quality of water at source or the stored water we cannot account for these aspects. In our case, we have not differentiated across households on the basis of whether it has access to pipe water alone. Instead, we have controlled for those households who do not have to rely on any shared water source, whatever be their own source of drinking water - private hand pump, well or piped water (see "*Ownwater*" in Table 1) in their own residence yard or plot.

We have emphasized on examining the role played by both the mother's and the child's dietary intake on his/her health status after controlling for the household economic prosperity. 13,609 respondents (81.27 percent) said that they still breast feed their child. This factor along with the fact that around 74 percent of children were less than one year old indicates that mother's milk serves as an important nutrient of the child. Hence nutritional status of the mother can become important determinant of the child's health. NFHS (1998-99) provides information on whether the respondent takes each of these items namely milk, pulses, green leafy vegetables, vegetables, fruits, eggs and other non vegetarian items. Accordingly "*Respnutrigood*" was defined for those mothers who affirmed that they take four to seven of these items on a per day basis. The reason behind this is that less than ten percent of the respondents confirmed that this many nutritious food items form a part of their daily diet. Admittedly, this kind of classification is arbitrary but as

pointed out by Mosley et al. (1984) "recall history of the diet … may be particularly useful in analyzing relative levels of nutrient intake."[10]

The child's nutritional status has been captured in a similar way. NFHS (1998-99) provides information on how often the child is given the following items during the last seven days: powdered milk, any other milk other than breast milk, any other liquid, green leafy vegetables, fruits, any other solid or mushy food. Accordingly, "*Childnutrigood*" has been created to indicate good dietary intake and includes respondents (around 7 percent) who provides at least 4 to 6 of all these items to their child everyday. Since child's feeding practices also depend on his/her age, an interaction dummy quantifying the cross effect between the child's age (variable is "*Chldage*") and "*Childnutrigood*" has also been incorporated as a determinant of "*Diarrhoea*" and "*Cough*". The results are presented in the following section.

RESULTS OF THE MAXIMUM LIKELIHOOD ESTIMATES

In this section, we present the bivariate probit estimates of "*Coughcare*" and "*Diarrcare*" after selecting the children who had either "*Cough*" or "*Diarrhoea*". The results from the separate regression (for each disease) are presented in Table 3 and Table 4 respectively. Table 5 show the marginal effects in probability of seeking care. For all cases, the correlation coefficient (ρ) between the two sets of unobserved characteristics for the joint determination of "*Coughcare*" with "*Cough*" and "*Diarrcare*" with "*Diarrhoea*" is significant and positive. This justifies the use of bivariate probit models. First, we will present the results of the "selection equations" i.e. the probit equations estimated (separately for "*Cough*" and "*Diarrhoea*") to compute the likelihood of the child contracting these illnesses. Secondly, we will present the determinants

[10] Mosley W. and C. Chen (1984) in "An Analytical Framework for the Study of Child Survival in Developing Countries", *Population and Development Review*, Supplement 10, Pg. 33.

of seeking formal health care ("*Coughcare*" and "*Diarrcare*" separately) conditional on the child contracting the respective illnesses.

Table 3: Heckman Probit Estimates for Seeking Child Health Care for Cough

Variables	**Coefficient**	**Std. Error**	**P > | z |**	**Coefficient**	**Std. Error**	**P > | z |**
Dependent variable = seek care for "cough"						
Individual Characteristics						
	Model 1.1			Model 1.2		
Femchld	-0.124	0.046	0.008	-0.119	0.031	0.000
Respedu	0.015	0.007	0.029	0.014	0.005	0.008
Respunemply	0.042	0.032	0.197	N.I.	N.I.	N.I.
Freedom	-0.016	0.022	0.472	N.I.	N.I.	N.I.
Decision	0.046	0.025	0.064	0.041	0.019	0.031
Symptomscough	0.365	0.142	0.010	0.331	0.104	0.001
Sevcough	0.268	0.079	0.001	0.252	0.042	0.000
Household Characteristics						
Numchld	-0.036	0.011	0.001	-0.038	0.009	0.000
Size	0.000	0.004	0.965	N.I.	N.I.	N.I.
Femhead	0.015	0.068	0.825	N.I.	N.I.	N.I.
Muslim	0.065	0.055	0.243	N.I.	N.I.	N.I.
Religmisc	-0.104	0.098	0.288	N.I.	N.I.	N.I.
Caste1	0.044	0.040	0.270	0.057	0.034	0.092
Caste2	-0.076	0.060	0.202	N.I.	N.I.	N.I.
Goodsnl	0.115	0.052	0.026	0.111	0.043	0.009
Agriland	-0.034	0.034	0.319	N.I.	N.I.	N.I.
Husbandedu	0.007	0.005	0.161	0.006	0.004	0.104
Husbunemploy	-0.179	0.117	0.125	-0.169	0.094	0.073
Village Characteristics						
Railways	-0.001	0.001	0.155	-0.001	0.001	0.025
Comfacl	0.048	0.039	0.213	N.I.	N.I.	N.I.
Pvthlthfacl	-0.019	0.031	0.544	-0.009	0.028	0.739
Govhlthfacl	0.057	0.034	0.098	0.060	0.029	0.039
Constant	-0.946	0.224	0.000	-0.928	0.155	0.000

(Contd.. Table 3)

Variables	Coefficient	Std. Error	P > | z |	Coefficient	Std. Error	P > | z |
Dependent variable =Child has "cough"						
Individual Characteristics						
Birthorder	0.007	0.008	0.327	N.I.	N.I.	N.I.
Respage	-0.010	0.003	0.001	-0.007	0.002	0.000
Respedu	0.002	0.003	0.572	0.001	0.003	0.703
Respnutrigood	-0.054	0.032	0.088	-0.065	0.030	0.032
Childnutrigood	0.094	0.100	0.348	N.I.	N.I.	N.I.
Chldage	0.006	0.013	0.647	N.I.	N.I.	N.I.
Chldage* Childnutrigood	-0.125	0.061	0.039	-0.071	0.022	0.001
Household Characteristics						
Goodsnl	0.029	0.028	0.289	0.024	0.026	0.348
Agriland	-0.024	0.021	0.250	N.I.	N.I.	N.I.
Toilet	0.009	0.036	0.795	N.I.	N.I.	N.I.
Ownwater	-0.014	0.029	0.627	N.I.	N.I.	N.I.
Muslim	0.058	0.035	0.100	N.I.	N.I.	N.I.
Religmisc	-0.028	0.054	0.598	N.I.	N.I.	N.I.
Caste1	0.060	0.024	0.013	0.052	0.022	0.019
Caste2	0.045	0.030	0.138	N.I.	N.I.	N.I.
Femhead	-0.019	0.041	0.645	N.I.	N.I.	N.I.
Husbandedu	-0.003	0.002	0.271	-0.004	0.002	0.122
Constant	-0.171	0.086	0.046	-0.188	0.075	0.012
Rho (ρ)	0.812	0.211	…	0.854	0.079	…
X^2 (ρ=0)	3.35	Prob > X^2 = 0.067		18.79	Prob > X^2 =0.000	
Log-likelihood	-11979.85			-12082.32		
Observations	14434			14543		

Note: Std. Error is adjusted for clustering at the household level. N.I. stands for not included in the estimation after the results obtained from the Wald test.

Table 4: Heckman Probit Estimates for Seeking Child Health Care for Diarrhoea

Variables	Coefficient	Std. Error	P > | z |	Coefficient	Std. Error	P > | z |
Dependent variable = seek care for "diarrhoea"						
Individual Characteristics						
	Model 2.1			Model 2.2		
Femchld	-0.049	0.034	0.153	-0.045	0.033	0.164
Respedu	0.006	0.007	0.414	N.I.	N.I.	N.I.
Respunemply	0.003	0.039	0.942	N.I.	N.I.	N.I.
Freedom	-0.034	0.028	0.220	N.I.	N.I.	N.I.
Decision	0.015	0.024	0.518	N.I.	N.I.	N.I.
ORS	0.273	0.056	0.000	0.268	0.050	0.000
Symptomsdiarrhoea	0.339	0.157	0.031	0.331	0.149	0.026
Sevdiarrhoea	0.153	0.056	0.007	0.141	0.052	0.006
Household Characteristics						
Numchld	-0.018	0.012	0.131	-0.018	0.011	0.118
Size	0.003	0.005	0.564	N.I.	N.I.	N.I.
Femhead	0.188	0.094	0.047	0.167	0.088	0.059
Muslim	0.138	0.072	0.055	0.132	0.068	0.054
Religmisc	-0.203	0.130	0.118	N.I.	N.I.	N.I.
Caste1	0.102	0.047	0.031	0.088	0.043	0.041
Caste2	-0.051	0.060	0.396	N.I.	N.I.	N.I.
Goodsnl	0.132	0.057	0.021	0.148	0.053	0.005
Agriland	0.060	0.044	0.170	N.I.	N.I.	N.I.
Husbandedu	0.000	0.005	0.967	0.004	0.004	0.396
Husbunemploy	-0.250	0.130	0.054	-0.230	0.123	0.061
Village Characteristics						
Railways	-0.001	0.001	0.074	-0.001	0.001	0.035
Comfacl	0.020	0.042	0.625	N.I.	N.I.	N.I.
Pvthlthfacl	-0.065	0.038	0.090	-0.056	0.036	0.116
Govhlthfacl	0.101	0.042	0.015	0.096	0.038	0.011
Constant	-1.641	0.279	0.000	-1.652	0.244	0.000
Dependent variable =Child has "diarrhoea"						
Individual Characteristics						
Birthorder	0.017	0.009	0.059	0.017	0.009	0.048
Respage	-0.009	0.003	0.004	-0.009	0.003	0.003
Respedu	0.004	0.004	0.288	N.I.	N.I.	N.I.
Respnutrigood	-0.109	0.041	0.008	-0.099	0.040	0.012
Childnutrigood	0.110	0.097	0.260	N.I.	N.I.	N.I.
Chldage	-0.050	0.013	0.000	-0.050	0.013	0.000
Chldage* Childnutrigood	-0.205	0.067	0.002	-0.141	0.030	0.000

(Contd.. Table 4)

Variables	Coefficient	Std. Error	P > | z |	Coefficient	Std. Error	P > | z |
Household Characteristics						
Goodsnl	0.023	0.032	0.475	0.019	0.031	0.534
Agriland	0.014	0.025	0.592	N.I.	N.I.	N.I.
Toilet	-0.047	0.041	0.245	N.I.	N.I.	N.I.
Ownwater	0.012	0.029	0.683	N.I.	N.I.	N.I.
Muslim	0.103	0.044	0.018	0.097	0.042	0.022
Religmisc	-0.078	0.075	0.303	N.I.	N.I.	N.I.
Caste1	0.057	0.029	0.047	0.048	0.027	0.073
Caste2	0.003	0.037	0.942	N.I.	N.I.	N.I.
Femhead	-0.020	0.051	0.695	-0.018	0.051	0.726
Husbandedu	-0.008	0.003	0.007	-0.006	0.003	0.028
Constant	-1.018	0.116	0.000	-1.036	0.111	0.000
Rho (ρ)	0.832	0.086	…	0.854	0.065	…
X^2 (ρ=0)	18.34	Prob > X^2 = 0.000		28.01	Prob > X^2 = 0.000	
Log-likelihood	-8513.392			-8590.805		
Observations	14631			14737		

Note: Std. Error is adjusted for clustering at the household level. N.I. stands for not included in the estimation after the results obtained from the Wald test.

Table 5: Marginal Effects On Probability Of Seeking Care (Selectivity Corrected)

VARIABLES (X)	d (Pr.(Coughcare=1)) / dX	d (Pr.(Diarr care=1) / dX
Femchld*	-0.039	-0.016
Respedu	0.004	…
Decision	0.013	…
ORS*	…	0.093
Symptomsdiarrhoea*	…	0.114
Sevdiarrhoea*	…	0.049
Symptomcough*	0.104	…
Sevcough*	0.080	…
Caste1*	0.018	0.030
Goodsnl*	0.034	0.049
Husbandedu	0.002	0.001
Husbunemploy*	-0.053	-0.079
Govfacility*	0.019	0.033
	Pr. (Coughcare=1)=0.247	Pr. (Diarrcare=1)=0.295

* Marginal effect if for discrete change of dummy variable from 0 to 1

Model 1.1 in Table 3 is the full model including all of the explanatory variables used to obtain the maximum likelihood estimates for the regressions (discussed in details in previous section) where child had cough. In Model 1.2, we have retained all those variables that were significant (in at least one of the two jointly determined probit equations) with exception made only in the case of availability of private health facility. The likelihood ratio test (Chi-square is 19.73 with nineteen degrees of freedom) is strongly in favour of dropping these variables. As seen from Model 1.2 in Table 3 this does not cause any change in the sign or significance of the other variables.

Similarly, Model 2.1 in Table 4 is the full model including all of the explanatory variables used to obtain the maximum likelihood estimates for the regressions where child had diarrhoea. In Model 2.2, we have once again retained all those variables that were significant (in at least one of the two jointly determined probit equations) with exception made only for availability of private health facility. The likelihood ratio test (Chi-square is 11.57 with sixteen degrees of freedom) is strongly in favour of dropping these variables. Comparing the results of Model 2.1 and Model 2.2 in Table 4, for diarrhoea, show that this does not cause any change in the sign or significance of the other variables. The estimates are discussed under the following two subsections:

Estimates of Determinants of Child (ill) Health

Let us begin by briefly discussing the results on the determinants of child contracting cough or diarrhoea (see in Table 3 where dependant variable is child has "*Cough*" and in Table 4 where dependant variable is child has "*Diarrhoea*").

Effect of Nutritional Variables

One of our objectives was to find the association between the nutritional intake of both mother and child on the health status of the child. Results from Table 3 (Model 1.1 and 1.2) and Table 4 (Model 2.1 and 2.2) show

that the nutritional variables exert a strong impact even after controlling the household's economic status and environment. The probability of a child having "*Cough*" or "*Diarrhoea*" is significantly lower for all those children whose mother's were found to consume a good and healthy diet on a daily basis (see "*Respnutrigood*"). The nutritional intake of the child per se, captured by "*Childnutrigood*, was found to be insignificant. However, as discussed earlier, a child's feeding pattern is closely related to age for e.g. solid and mushy food is introduced only after six months. This was the rational behind introducing an interaction term between child's age and her nutritional status. This has a significant negative impact on the likelihood of the child falling sick with cough as well as also on the probability of child contracting diarrhoea. It is worthwhile to note that the economic status of the household, captured by its ownership of both luxury and non-luxury items, has no significant impact on the child's health outcome. This is contrary to many of the previous mentioned studies. One plausible explanation is that the route through which economic capability enhances health of child is by increasing endowment particularly nutrition of both child and lactating mother. Since, the latter aspects are explicitly controlled in our study this reduces the importance of the asset variable ("*Goodsnl*") perse.

Other Results

Let us turn to some of the other important finding which are briefly summarized below:

- The explanatory variables, included to control for parity, for instance mother's age, birth order, have a significant impact on the likelihood of child having these ailments. The probability of contracting cough and also that of having diarrhoea was lower for children born to older women. On the other hand, chances of falling sick with diarrhoea was significantly higher if the child belongs to a higher birth order. This matches with the results obtained in the previously mentioned literature. Also, an inverse relationship can be established between the child's morbidity status and his or her age.

The probability of having diarrhoea is significantly lower for children who belong to comparatively higher age group (see "*Chldage*" in models 2.1 and 2.2 in Table 4.)

- The ethnic and also religious background of the child plays an important role. For both forms of diseases, "*Cough*" and "*Diarrhoea*", children belonging to households headed by a schedule caste, had a greater risk of contracting these diseases. In rural India, generally, backward caste families are also economically backward (although this aspect has been partially accounted for by incorporating "*Goodsnl*"). They might also be compelled to reside in the outskirts of the village thus reducing their accessibility and also the awareness of existing health facilities. This is a plausible explanation behind higher incidence of diseases amongst children who are of scheduled caste origin. In addition to this if the household head is a Muslim then this significantly increases the chances of having diarrhoea.

- Educational attainment of the child's father has a significant negative impact on the child's morbidity status. Even, after controlling the economic status, an additional year of education acquired by the father significantly reduces the likelihood of child having diarrhoea and also (under a one tailed test) the likelihood of having cough.

- None of the variables designed to capture the environment and sanitation facilities of the household (see "*Ownwater*" and "*Toilet*") have any impact on either of the two diseases. In the face of irregularities in supply often encountered with pipe water, particularly in summers, it is necessary to know the quality of stored water. This was not possible because of absence of data. Similarly, we could not control for the environment surrounding the household for e.g. the nature of waste disposal system in the neighbourhood etc. Dearth of data on these characteristics prevent us from assessing the over all environmental impact.

Determinants of Utilisation of Formal Health Care for Child

Selecting the children with cough, we consider the determinants of seeking formal health care for cough (see in Table 3 where dependant variable is "*Coughcare*"). Similarly, selecting the children with diarrhoea we have analysed the determinants of seeking formal health care for diarrhoea (see in Table 4 where dependant variable is "*Diarrcare*"). An important consideration is to ascertain the influence exerted by the mother's education, status within her family and awareness of health condition on the demand for child health care. We begin this section by discussing the impact of these factors on the demand for health care when child has cough and diarrhoea respectively.

Effect of Variables Capturing the Mother's Status

Traditionally, education, occupation etc. are used to measure the status a woman enjoys in her social circle. Amongst these, education has been indisputably found to improve child's health status. From our analysis, it is apparent that this also holds in case of demand for curative health care for the child. Even after controlling for other measures of women status and mother's awareness of certain health conditions etc., education per se was found to significantly increase the probability of seeking curative care for cough (see "*Respedu*" in Table 3 for "*Coughcare*"). Note, the positive sign also holds for "*Diarrcare*" but is not significant (see "*Respedu*" in Table 4 for "*Diarrcare*").

However, no such association was found between the occupational status of the mother and the preferences for health care (see "*Respunemploy*" when the dependant variable is "*Coughcare*" and "*Diarrcare*" in Models 1.1 and 1.2 in Table 3 and Models 2.1 and 2.2 in Table 4 respectively). This is because the relationship between a woman's occupational status and her willingness to seek care for the child can work both in positive and negative direction. On one hand, an employed mother has greater financial independence and hence may

have a greater say in matters relating to her child for e.g. whether to seek formal care or not. On the other hand, an employed mother has less time to allocate for her child and this can have a dampening impact.

Finally, let us turn our attention to the role played by direct measures of the mother's autonomy. Even after accounting for the mother's educational attainment and work status, probability of seeking care was found to be significantly higher for women who had greater autonomy in terms of making decisions on her own and control over household resources. This is evident from the significant positive coefficient of "*Decision*" in Models 1.1 and 1.2 in Table 3 i.e. for "*Coughcare*". Unfortunately, no such significant association could be obtained between the women's decision-making power and the demand for curative care for diarrhoea i.e. "*Diarrcare*".

Role Played by Informational and Severity Variables

Instead of relying on the mother's educational qualification to assess her access to information we have introduced variables, separately for each form of ailment, to explicitly capture her awareness of her child's health condition and the existing health packages. We will now examine the impact of these variables on the type of health care sought for the sick child.

The mother's degree of health awareness was measured in terms of her ability to recognize the symptoms of the requisite illnesses (represented by "*Symptomscough*" and "*Symptomsdiarrhoea*" respectively). In addition to this, for diarrhoea we have also controlled for her knowledge on oral rehydration salts-an essential input used world wide to treat diarrhoea. The underlying hypothesis is that mother's who are better informed (either because of prior experience or from external sources) on these health related issues are also more aware of the risks involved with these childhood diseases. Hence, they are more prone towards seeking formal health care for their sick child. This also gets

reflected from the positive significant effect of "*Symptomscough*" on "*Coughcare*" (see Model 1.1 and 1.2 in Table 3) and the positive significant impact of "*Symptomsdiarrhoea*" on "*Diarrcare*" (see Model 2.1 and 2.2 in Table 4). In other words, probability of seeking care was higher for those children whose mothers were able to recognize the symptoms of the respective illnesses. A similar association was also found between "*Ors*" and "*Diarrcare*". Children whose mothers' had prior knowledge about oral rehydration salts also had a significantly higher likelihood of receiving curative health care.

The propensity to seek treatment is obviously related to the degree of severity of the disease. Accordingly, "*Sevcough*" and "*Sevdiarrhoea*" has been incorporated to see whether there is any significant difference in preferences with variation in the level of complications encountered for cough and diarrhoea respectively. Note, the severity of each illness is not computed on the basis of observation made by any trained personnel. These variables are constructed from the response of the respondent to the structured question (see the section on explanatory variables for the design of "*Sevcough*" and "*Sevdiarrhoea*"). Consequently, the latter will depend not only on the actual nature of the diseases but also the mother's ability to comprehend the requisite complications. The probability of seeking care for cough is significantly higher for all those children who were reported to have such complications (coefficient "*Sevcough*" is positive significant in case of "*Coughcare*" in Table 3). Similarly, likelihood of seeking formal care for diarrhoea significantly increases with severity of diarrhoea (coefficient "*Sevdiarrhoea*" is positive significant in case of "*Diarrcare*" in Table 4).

Gender Effect

A vast body of literature have analysed the determinants of child health and nutritional outcomes in terms of households demand for child health. These studies have explained the discrepancy in the health of the boy and girl child in terms of differences in household's preferences. This is

directly captured in our case where the allocation of resources for seeking treatment is found to be significantly different for the two sexes. For both cough and diarrhoea, probability of seeking care for the sick child is significantly lower if the child is female as compared to when he is male (see "*Femchld*" in Table 3 and Table 4).

Impact of Father's Status

As pointed out earlier, the educational effect of the father can stem from two sources. Firstly, educated father's most probably has better jobs and hence yield higher income to the families. Secondly, the beneficial impact can arise out of changed preferences. In this case, even after controlling for the occupational status and assets owned by the household, probability of seeking care increases with the educational qualification of the father. This is evident from the positive significant (under a one tailed test) of "*Husbandedu*"on "*Coughcare*" (see Model 1.1 and 1.2 in Table 3). No such impact was however found on the willingness to seek care if child has diarrhoea.

If the father is unemployed then there is a lower likelihood of formal health care being sought in the event of cough or diarrhoea than otherwise (see "*Husbandunemploy*" in Table 3 for "*Coughcare*" and Table 4 for "*Diarrcare*").

Role Played by Health Infrastructure Availability

Does health service availability have a significant effect on the demand for curative health care conditional on the child having cough or diarrhoea? Table 3 and Table 4 present the regression estimates separately for cough and diarrhoea. Availability of Government health facility is found to enhance the utilisation of care for both forms of ailment. The coefficient of "*Govhlthfacl*" is positive and significant for both "*Coughcare*" (see Models 1.1 and 1.2 in Table 3) and "*Diarrcare*" (see Models 2.1 and 2.2 in Table 4). Conflicting result was however obtained for private health facility. The coefficient of "*Pvthlthfacl*" is

negative but not significant for "*Coughcare*" and also for "*Diarrcare*" (Model 2.1 being the only exception). A possible reason behind this maybe as follows: formal private health facilities are sparsely located in economically backward regions. Without adequate controls for the overall economic prosperity of the region (for e.g. income distribution) the coefficient of "*Pvthlthfacl*" is actually reflecting the impact of the economic backwardness on utilisation. In this context we would like to draw attention to another important aspect. In developing countries, usually there is considerable difference in what is supposed to be available and what is actually available in public health facilities. Failure to incorporate this divergence can lead to misleading calculation of the returns to public investment in health. Estimates by Thomas et al. (1996) revealed that the magnitude of impact of several public health inputs is lowered and even loses in significance if the actual health personnel and infrastructure characteristics is replaced with what is supposed to be available. This factor could not be addressed in our study because of dearth in data.

Other Results

Some of the other important findings are enlisted below:

- The family composition exerts an important influence. The effects however differ across the diseases. Family composition is captured in terms of the number of children currently residing with the respondent, family size, sex of the head of the household. Amongst them, number of children affects both "*Coughcare*" and "*Diarrcare*" in a similar way. The probability of seeking care for cough significantly decreases with increase in number of children (see "*Numchld*"in Table 3 for "*Coughcare*"). This is also true for "*Diarrcare*" but under a one tailed test (see "*Numchld*"in Table 4 for "*Diarrcare*"). The estimated coefficient confirms our conjecture that a mother with greater number of children will have a tendency to rely on her own gathered experience rather than seek formal health services for her sick child. The other variable in this category, which

had some impact, was "*Femhead*". The probability of seeking care conditional on the child having diarrhoea is higher for households headed by a female member (see "*Femhead*" in Table 4 for "*Diarrcare*").

- The religious and ethnic background of the child also governs the demand for curative care. As seen from Model 1.2 in Table 3, children belonging to Schedule Caste household have a higher probability of being treated by formal health institutions or personnel in case of cough. This matches with the result obtained earlier. Note, children belonging to this caste are also the ones who are more susceptible to have this disease. In this case also, the religious background have no impact on "*Coughcare*". A similar pattern was also established for "*Diarrcare*". The utilisation of curative care for diarrhoea is significantly higher if the head of the household is Muslim or Schedule Caste. As before, this also matches with the fact that children belonging to these households are also more prone towards contracting diarrhoea

- The negative and significant coefficient of "*Railways*" for both "*Coughcare*" and "*Diarrcare*" tells us that the probability of seeking care for either diarrhoea or cough significantly reduces with increase in distance to railway station[11]. Note, this variable is not only an indicator of the infrastructure development in the village but also captures the accessibility of health facilities.

- Finally, there is some regional variation in demand for child care as reflected from the coefficient of the state dummies incorporated to control for the state effects (the results are not reported in Table 3 and Table 4). The base state has been chosen as Kerala because of the considerably better performance of this state vis-à-vis all other Indian states in social spheres. The results are discussed on the basis of Model 1.2 of Table 3 and 2.2 of Table 4 because the

[11] Only for Model 1.1 in Table 3 (for coughcare) it is negative and significant under one tail.

likelihood ratio tests are in favour of selecting these models. The effect is more pronounced for "*Coughcare*" as compared to "*Diarrcare*". In case of the former the coefficient of all the state dummies is negative and all are significant except for Andhra Pradesh, Haryana, Maharashtra and Madhya Pradesh. However, the results obtained are quite different for "*Diarrcare*". Relative to a child residing in Kerala, the probability of seeking formal treatment for diarrhoea is significantly lower if the child is residing in West Bengal and significantly higher if residing in Haryana and Maharashtra. There is no significant difference in seeking treatment for diarrhoea between Kerala and the other states.

Marginal Effect for Selective Explanatory Variables

We have computed the (selectivity corrected) marginal effects to compare the magnitude of impact of these factors on the willingness to seek formal health care. Table 5 presents the marginal effect of changes in various significant variables on the probability to seek care for cough or diarrhoea. In case of both, seeking care for cough and diarrhoea, we have calculated the marginal effects on the basis of Model 1.2 (Table 3) and Model 2.2 (Table 4). This follows from the likelihood ratio test mentioned earlier. The results are reported for some selective variables.

Looking at marginal effects for "*Coughcare*" let us begin by discussing the relative importance of the parental characteristics. An additional year of education of the mother increases the demand for formal treatment, if child has cough, by 0.4 percentage points. In other words if the mother is educated from primary to secondary level (an addition of ten years) the probability of seeking care increases by forty percentage points. Comparatively, the impact of the "*Decision*" is lot lower at 1.3 percentage points. The impact of father's educational attainment is positive and significant but is lower than that of the mother by two percentage points. However, this difference is not significant. We have performed the likelihood ratio test to determine whether there

is any significant differential impact of mother's education on the use of health care for her child relative to that of her spouse. The null hypothesis of equality of educational impact of the parents could not be rejected (the associated chi square with one degree of freedom is 1.23 and the p-value is 0.268). The other parental feature i.e. father's occupational status had a high impact. Children whose father is unemployed have around five-percentage lower probability of being taken for treatment than others. We also see that if the child is female then she has 3.9 percent lower chances of being taken for formal health treatment if she has cough as compared to when it is a male child.

Turning to the informational and severity variables we find that their impact are of relatively higher magnitude as compared to those, which captures the basic parental features. The probability of seeking formal treatment increases by 10.4 percentage points if the mother is aware of the symptoms of the cough and by eight percent if she comprehends that the disease has taken severe proportions. Compared to the most of the above-mentioned factors the magnitude of impact of government health facility was quite low. Availability of the former increases the likelihood of securing formal health care for cough by only 1.9 percent. However, the weak relationship between public health facility and child health is well documented in the literature (Thomas et al.(1996)). Public policies are often geared toward meeting the health need of economically or socially backward regions with limited demand for such modern facilities. This selective placement of health facilities produces and causes the coefficient to be biased downwards. Although we acknowledge this problem but we were unable to correct for it because of lack of appropriate data.

The marginal effects derived from the "*Diarrcare*" regression yield a similar picture. The probability of a child receiving curative treatment for diarrhoea is around 1.6 percent lower if the child is female as compared to a male child. The magnitude of impact of the

informational and severity variables is quite large (in fact the highest). The probability of seeking care for diarrhoea increases by 11.4 percent if the mother is aware of the symptoms of diarrhoea and by 9.3 percent if she is familiar with oral rehydration salt. Children who were reported to have severe diarrhoea had a 4.9 percent higher chance of being taken for formal curative health care. Surprisingly, although none of the basic feature of the respondent was found to be significant, the father's characteristics play an important role. An additional year of educational attainment of the father increased the probability of seeking care for diarrhoea by 0.1 percent and being unemployed lowered this probability by a substantial 7.9 percentage points. Once again the impact of public health facility is quite low. Availability of this facility enhances the demand for health care in this case by only 3.3 percent (though lot higher than that for "*Coughcare*"). This is because of problems cited earlier.

CONCLUSION

Using the second round of National Family Health Survey of 1998-99, we have examined the reasons behind the low use of formal curative health facilities for children across rural India. Unlike any of the prior studies we have used the bivariate probit selection models to jointly determine the risks of child contracting cough and diarrhoea and the demand for curative health care for children afflicted with the requisite illnesses.

A significant association was found between the diet of both mother and child on the health status of the child. The probability of a child having cough or diarrhoea is significantly lower for all those children whose mother's were found to consume a good and healthy diet on a daily basis. It is worthwhile to note that the former result holds true even after we have explicitly controlled for the household's economic status and environment. Similarly, feeding pattern of the child (after adjusting for age) plays a crucial role with good diet significantly lowering the

child's chances of contracting such diseases. This reiterates the need for adopting a holistic approach towards improving the health status of the child. Policies (as embodied in the Integrated Child Development Service) designed to educate the mother to look after the nutritional needs of the child is needed to reduce child malnutrition and hence build up the latter's capability to develop immunity against common child hood diseases. In addition to this it is also important to teach the mother (particularly lactating women) about her own appropriate dietary intake, which is necessary for not only her own health but also for her child.

One of our primary objectives was to examine how the choice of treatment of the sick child is influenced by the autonomy enjoyed by the mother, her awareness of health conditions (in terms of ability to recognize symptoms and vital health inputs) and the nature of complication encountered in the respective diseases. The probability of seeking formal care for the child in the event of cough was found to be significantly higher for children whose mothers' exercised a higher decision making power over the household's resources. However, more than the autonomy, education and occupational stature of the mother, it is her awareness regarding important health issues which plays a major role. For both diseases i.e. cough and diarrhoea the likelihood of seeking curative care was significantly higher if the mother was aware of the requisite symptoms. In addition to this, for diarrhoea we were also able to capture the mother's familiarity with oral rehydration salts used worldwide to treat this disease. A similar kind of impact was found to exist for this variable.

Fortunately, children with severe cough or diarrhoea (as reported by the mother) had higher chances of being taken for treatment to a formal health institution or personnel. This emphasizes the importance of teaching parents on appropriate care for sick children and also educating them to recognize symptoms of common ailments that need medical attention. Particular care should be taken to address the health

needs of the vulnerable group. The latter category includes children, particularly female child, who are socially and economically backward. For both cough and diarrhoea, probability of seeking care for the sick child is significantly lower if the child is female, if the father is unemployed and if the head of the household is a scheduled caste. So far as impact of available health infrastructure is concerned, surprisingly it is the government health facility that was found to significantly enhance the demand for curative health care for the sick child. No such relationship was however established between health care usage and availability of private health facility. However, a better notion is to determine the impact of health facilities after controlling for its quality. This we could not pursue in our analysis because of absence of requisite data. These issues are left for future research.

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