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Household Demand for Health Care and Health Care Expenditure by Controlling Endogeneity Bias in Bangladesh

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Abstract

This paper uses the data of Household Income and Expenditure Survey 2005, a nationally representative sample of 10,080 households in Bangladesh from January, 2005 to December, 2005, to investigate the determinants of illness, choice of health care provider and household out-of-pocket health care expenditures. Three models were used in this paper- logistic model for illness, multinomial logistic model for provider choice and selection model for household health care expenditure. Endogeneity biases arising due to the selection of providers were controlled in the selection model. Our results of this study show that individual, household and environmental characteristics has substantial effects on illness, choice of health care providers as well as health care expenditures. The common perception is that the decision of whether and where to seek care and the amount of expenditure depends on how serious the illness is. Our results also show that illness is not the only factor involved in demand for health care. Other influences, such as individual, household and environmental characteristics, are found to determine the magnitude of expenditure incurred. These findings call for policy makers to either design new health policy or strengthen existing ones, taking into consideration various factors that are identified in this study in order to improve health care system in developing countries like Bangladesh.

Keywords: Choice of health care provider; Endogeneity bias; Health care expenditure; Selection model; Bangladesh

I. Introduction

Health is universally regarded as an important index of human development. Improvements in health would translate into higher incomes, higher economic growth, and accelerated declines of poverty. The importance of analysis of demand for health care and health care expenditure in the formulation of policies and strategies for the health sector can hardly be exaggerated. Appropriate strategies required for achieving any objectives of health care policy cannot be devised without adequate knowledge about the extent, determinants of demand for health care and health care expenditure at the household level. Analysis of demand for health care and health care expenditure are especially important in a poverty-stricken country like Bangladesh, which are constantly striving to concomitantly accomplish financial sustainability and universal coverage of health services as rapidly as possible. Health-care utilization is also interesting to study from an efficiency perspective, as health is the foundation of work productivity, education (the capacity to learn), and the capacity to grow physically and emotionally. At macro-economic level, good health in the population is a critical input into poverty reduction, economic growth, and long-term economic development (WHO, 2001). Analysis of demand for health care and health care expenditure is also crucial to designing financing strategies.

Without understanding the factors which play an important role in health care utilization, efforts to promote demand for health care will not offer a pragmatic solution. However, the process of determining whether or not to use health services is not straightforward enough to be analyzed because it may depend on multiple factors such as individual perception of illness, advice and influence of family, preference of particular health services, and weighing up the potential risk of illness and benefit of the service. Decisions are also likely to be affected by the purchasing power of the consumer, the price of the health services and the trade-offs between health care cost and other household expenditure. Households consider all of these factors when seeking health care (Jack, 1999).

Among these several factors, the price of the health care appeared as a major deterrent to many people who would like to use health services (Pokhrel et al., 2004; Pokhrel et al., 2005). In developing countries, expenditure incurred in households at the time of seeking treatment can be used as a proxy measure of the price of respective health care because of an insufficient prepayment scheme or lack of such a scheme in many developing countries (WHO, 2000). Thus, it is crucial to look into household health expenditure and conduct empirical studies on its determinants. Results from such studies can be applied to improve health care utilization.

Available studies on household health expenditure focus primarily on descriptive analysis, and very few multivariate household level analyses have been made. This might be due to data constraints, and available data cannot fulfill the criteria for achieving an unbiased estimation in econometric analysis. A Tobit model, which can estimate limited dependent variables, was used by some researchers to model health care expenditure (Mugisha et.al., 2002). However, Rous and Hotchkiss (2003) suggested that the Tobit model should be applied carefully in the case of health expenditure. Data on health expenditure are generally skewed and may include many zeros, so using the Tobit model may lead to biased parameter estimations.

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Since sample selection and endogeneity are other sources of potential bias that may arise due to restricted non-random sampling and unobserved variables, these needs to be controlled in the modeling of health care expenditure. In a study on household health expenditure in Nepal, the amount of health care expenditure, choice of providers and reporting illness were simultaneously determined. The researchers therefore developed a full-information maximum likelihood model to control endogeneity of sickness and provider choice (Rous and Hotchkiss, 2003). As an alternative, a study in Zambia validated the method to control endogeneity bias by generating selection terms for different providers and used each selection term as a regressor in ordinary least squares (OLS) estimation of health care expenditure for respective providers (Hjortsberg, 2003). However, analysis of reporting illness was not taken into account in this study, and possible linkage of reporting illness to health expenditure could not be presented. To our knowledge, apart from the study in Nepal, there is no other study in South-East Asia which has examined estimates of household health expenditure by controlling endogeneity bias arising due to the selection of providers. This is an area for further research, because in many countries in South-East Asia there is a scarcity of prepayment schemes resulting in a large share of out-of-pocket payment in national health account against high prevalence of poverty. On the other hand, health care utilization is low despite the burden of disease.

II. Conceptual Framework

In the first step, we would like to understand which individual, household and environmental characteristics are important for illness. This reflects the felt need of the individual and may influence the decision on whether to seek health care, which type of health care to choose (Coreil, 1983), and how much money to spend. This is the entry point into demand for health care (Flessa, 2002). Overlook of factors influential to illness might lead to a piecemeal assessment of demand side factors on the use of health care.

In the second step, we explore the determinants of choice of health care providers since this is an important step toward improving the demand for health care. There are several studies on health seeking behavior in the developing world (Mugisha et.al., 2004). However, these failed to link the decision to seek health care to the behavior of the individual's illness and the resulting expenditure. We accepted the opinion of Maddala (1985) that the magnitude of health care expenditure depends on the choice of health care providers and is determined by providers and consumers alike.

In the third step, we would like to investigate factors affecting household health care expenditure. First, we assume that people who are treated with health care tend to be diagnosed correctly and receive appropriate treatment, and the resulting expenditure seems likely to reflect real costs for standard treatment. The second reason is that expenditure on health care has implications for the policy evaluation of currently implemented health financing and disease control programs.

This is followed by an analysis of the empirical data. The aim of this study was to investigate those factors determining the magnitude of household expenditure incurred on health care in Bangladesh, by controlling potential biases, and to examine whether these determinants also play important roles in illness and the choice of health care providers.

III. Data and Methodology

The data used in this analysis come from the Household Income and Expenditure Survey (HIES) which was administered by Bangladesh Bureau of Statistics (BBS) from January 2005 to December 2005 in Bangladesh. The HIES 2005 is the principal data source for estimating income, expenditure, consumption, income inequality and incidence of poverty in Bangladesh. A two stage stratified random sampling technique was followed in drawing sample for HIES 2005 under the framework of Integrated Multiple Sample (IMPS) design developed. The IMPS design consists of 1000 Primary Sampling Units (PSUs) throughout the country. There are 640 rural and 360 urban PSUs in the sample. Random selection was applied in both stages with each household having approximately the same probability of being chosen. The PSU is defined as contiguous two or more enumeration areas (EA). Each PSU comprises around 200 households proportional to the area population. In the first stage about one half, 504 in exact out of total 1000 IMPS PSUs, were drawn. These PSUs were selected from 16 different strata. There were 6 rural, 6 urban and 4 SMA strata. In the second stage, 20 households were selected from each of the rural PSUs and PSUs located in the municipal areas and SMAs. The survey included responses from 10,080 households and 49,969 individuals (BBS, 2007). On the other hand, the environmental module collected information on density of population, average temperature and average annual rainfall for the respective household member's area.

IV. Econometric Specification

Based on the conceptual framework developed, we used a set of dichotomous, polytomous and continuous choice models in this study.

First step: Illness

Since our focus was to have an unbiased estimate of household expenditure on health care in Bangladesh, we assumed that this expenditure was conditional upon the individual's illness. Thus, we were also interested in finding out the determinants of such illness and seeing whether the characteristics determining illness also influenced the household costs associated with health care provider. For this step, we used a discrete choice logit model since we had

only two outcomes. Probability of illness was written as a logit equation following Greene (2008).

$$p[Ill=1]=\frac{\exp(\alpha'v)}{1+\exp(\alpha'v)}$$

Where, $\alpha=$ a set of parameters to be estimated and $v=$ a set of predetermined variables. Goodness-of-fit was assessed using the Hosmer-Lemeshow test (Hosmer & Lemeshow, 2000). Since there were repeated observations belonging to the same households, we used the "cluster" option. This option specifies that the observations are independent across clusters (households), but are not necessarily independent within clusters (Stata, 2008).

The odds ratios (OR) can be written as follows:

$$OR=\frac{P}{1-P}=\frac{\Pr(Ill=1|v)}{\Pr(Ill=0|v)}=\exp(\alpha'v)$$

It ranges from 0 when $\Pr(Ill=1|v)=0$ to ∞ when $\Pr(Ill=1|v)=1$.

The marginal effect is captured as a discrete probability variation following a change from 0 to 1 for an independent variable, assuming that all other independent variables are constant. In that case, other independent variables are evaluated at the sample mean($\bar{v}$). For a binary independent variable b, the expression of the slope is calculated as:

$$\frac{\Delta\Pr(y=1|\bar{v})}{\Delta b_i}=\Pr(Ill=1|\bar{v},b_i=1)-\Pr(Ill=1|\bar{v},b_i=0)$$

Second step: Choice of providers

For this step, we used a Multinomial Logit Model (MNL) where there are more than dichotomous choices. The aims of this step are two folds: on the one hand to derive the selection term for choosing health care in order to obtain an unbiased estimate on resulting expenditure, and on the other hand to find out whether the factors determining the choice of health care also influence household expenditure incurred. The probability of choice of providers was specified as follows (Greene, 2008). The model for determining z is

$$P_{ij}=p(z_i=j)=\frac{\exp(\alpha_j'v_i)}{1+\sum_{j=0}^{J}\exp(\alpha_j'v_i)}$$

Where, $z_i=j$ indicated the individual "i" choosing the provider "j", j=0, 1,2,3 or 4, where j=0 is no care or self medication, 1= government care, 2=private care, 3=traditional healer and 4=salesman of a pharmacy. $\alpha_j=$ a set of parameters to be estimated, $v_i=$ a set of explanatory variables.

Since we want to understand the factors that determine the source of external care, we combined self-medication with no care and treated them as a reference group. Some individuals reported illness more than once belonging to the same households. We again used the cluster option to control repeated observations included in the model. The Hausman specification test was applied in order to test the "independence of the irrelevant alternatives" (IIA) assumption. Under the IIA assumption, we would expect no systematic change in coefficients if we excluded one of the outcomes from the model (Stata, 2008).

Third step: Magnitude of household health care expenditure

To model health expenditure on health care, a selectivity correction was needed because individuals would self-select health care. We used a method developed by Lee (1983) as applied in a recent work from Zambia (Hjortsberg, 2003). The multinomial logit model assumes independence between odds ratios of the different alternatives. The regression equation for health care expenditure is (the observation subscript i is dropped for convenience),

$$\begin{aligned}y_j&=\beta'x_i+(\rho_j\sigma_j)\phi[H_j(\alpha_j'v_i)]/\Phi[H_j(\alpha_j'v_i)]+\eta_j\\&=\beta'x_i+(\rho_j\sigma_j)\lambda_j+\eta_j\\&=\beta'x_i+\theta_j\lambda_j+\eta_j\end{aligned}$$

where $H_j=\Phi^{-1}(P_j)$, $\lambda_j=\phi(H_j)/\Phi(H_j)$ and y_j (health care expenditure), the dependent variable, is observed only when jth category is chosen, β is a vector of unknown parameters, x_i is a vector of explanatory variables, η_j are residuals, ρ is the correlation coefficient and σ is the variance. The functions $\phi(.)$ and $\Phi(.)$ are the probability density function and the cumulative density function of the standard normal distribution respectively. The two-step estimation technique is in step one to estimate the multinomial logit model by maximum likelihood. Select those observations for which z takes the value in question. For these observations compute λ_j. In step two obtain consistent estimates of β and θ_j by least square regression of y_j on x and λ_j. For derivation of the model see (Lee, 1983 p. 511).

The heterogeneity was controlled for, which we did by applying the Huber/White/sandwich estimator for variance (Stata, 2008). Here we also used cluster options. The idea was to treat the observed health care expenditure as independent across households but not necessarily independent within household (Stata, 2008).

V. Variables and Their Measurements

Both dependent and independent variables and their measurements are summarized in Table 1. Independent variables are categorized into seven groups: individual characteristics, illness condition, health facility characteristics, household characteristics, environmental characteristics, economic status and selection term. Some variables are explained in more details for clarity.

Table. 1. Use of the variables and their measurements

Variables	Measurement
1. Dependent variables	
Illness	Illness (yes=1, otherwise=0)
Provider	Choice of provider (0=no care or self medication, 1=government health care, 2=private health care, 3=traditional healer, 4=salesman of a pharmacy)
LogCostT	Total expenditure incurred for health care (logarithmic)
2. Independent variables	
(a) Individual characteristics	
Age	Individual's age (year)
Agesq	Square of individual's age
Adult	Being adult ≥ 15 years (yes=1, otherwise=0)
Gender	Gender of respondents (male=1, female=0)
Education	Education of respondents (1=no education, 2=primary, 2=secondary, 3=higher education)
Marital_s	Have ever been married (yes=1, otherwise=0)
Head	Being household head (yes=1, otherwise=0)
(b) Illness condition	
Chronic	Suffering chronic illness in the last 12 months (yes=1, otherwise=0)
Ch_ill_d	Duration of chronic illness more than one month (yes=1, otherwise=0)
Disease	Reported disease (1= diarrhea, 2=communicable, 3=non-communicable, 4=injury, 5=other's disease)
(c) Health facility characteristics	
Travel_pro	Travel to the provider by engine facility vehicle (yes=1, otherwise=0)
Wait_tp	Wait at provider to be examined more than 30 minutes (yes=1, otherwise=0)
Reacht_pro	Reach at provider more than 30 minutes (yes=1, otherwise=0)
Spend_tp	Provider spend enough time to examine (yes=1, otherwise=0)
(d) Household characteristics	
Head_f	Gender of household head (female=1, male=0)
H_size	Household size
Roof_d	Good roof (roof is made of concrete, metal or brick=1, otherwise=0)
Wall_d	Good wall (wall is made of brick or cement or C.I. Sheet/wood=1, otherwise=0)
Toilet_d	Having sanitary or pacca latrine (yes=1, otherwise=0)
Sd_water	Source of drinking supply or tube well water (yes=1, otherwise=0)
S_kitchen	Dwelling posses a separate kitchen (yes=1, otherwise=0)
S_dining	Dwelling posses a separate dining (yes=1, otherwise=0)
Electricity	Having electricity connection (yes=1, otherwise=0)
(e) Economic status	
Log_exp	Household monthly expenditure (logarithmic)
(f) Geographical characteristics	
Area	Area (rural=1, others=0)
D_pop	Density of population
Ave_tem	Average temperature (^{o}c)
Ann_rain	Annual rainfall (mm)
(g) Lamda	Selection term for choice of health care providers in Bangladesh

For each individual in the sample, information was collected on illness condition within the prior period of one month. For young children, 5 years of age or younger, this information was collected from the mother, or another knowledgeable adult in the household. If an illness was reported during the month prior to the survey, the individual was asked about the type of illness or injury, etc. Information was also collected on expenditure on the first, second and third consultations, including expenditures on medicine and travel associated with the consultation. The dependent variable used in the health care expenditure equation is the sum of the consultation and travel costs of the first consultation after the illness or symptom was recognized. The reported morbidity was coded using the ICD_{10} classification and then transferred to the respective Global Burden of Disease (GBD) classification in order to obtain an international comparison. We considered household expenditure as a better proxy for household reported income. A log transformation of household expenditure was used to capture possible non-linearities between the determinants of expenditure.

VI. Results

This section describes the descriptive and estimation results of these equations that presented in economic specification section. As described above, the dependent variables that were modeled are illness, the choice of health care provider, and health care expenditures.

General characteristics of respondents and households

Among the 48,969 respondents in the household survey, about 11.5% of the sample were below 5 years of age and 36.5% of sample below 15 years. The working age group (15–60 years) made up about 57.8% of the study sample. The mean age of the sampled was 25.54±19.2 (SD) years where urban sample mean was 25.73±18.46(SD) and rural sample mean was 25.43±19.56(SD). Male respondents comprised 50.53% of the study sample. There was a very low literacy rate in our sample; only 3.23±4.05 (SD) years mean educated person were included. Households had on average 4.86±2.07 (SD) members. The mean monthly household expenditure amounted to 6092.21 TK. (Note: 1US$=TK 70 approximately).

Table. 2. Logistic regression of the determinants of an illness in the month prior to the survey. ®No education=reference group

Variable	Coefficients	Robust Std. Err.	Odds Ratio	Marginal Effects (%)
Individual characteristics				
Age	-.0686345	.0040277***	.9336679	-.97344
Agesq	.0007977	.0000428***	1.000798	.01131
Gender	-.1313135	.0300788***	.8769428	-1.86317
Adult	.0123667	.0628169	1.012444	.17524
Education of respondents®				
Primary	.2628131	.0373115***	1.300584	3.52076
Secondary	.2780355	.0383187***	1.320533	3.78206
Higher_edu	.435601	.1558511***	1.545892	5.34681
Marital_s	.5370142	.0588244***	1.710891	7.64035
Head_f	.1431934	.0538546***	1.153953	2.11288
Head	.2586483	.0435399***	1.295178	3.85463
Household characteristics				
Hh_size	-.0837839	.0082028***	.9196299	-1.1883
Roof_d	.1608219	.0643583**	1.174476	2.18307
Wall_d	-.0633425	.0392151	.938622	-.90201
Toilet_d	-.0869862	.0421148**	.9166898	-1.23765
Sd_water	.3622123	.1135645***	1.436504	4.58296
S-dining	-.2721483	.0511255***	.7617413	-3.61201
S_kitchen	.1894154	.0428934***	1.208543	2.60439
Electricity	.0190407	.0431789	1.019223	.27011
Economic status				
Log_exp	.00002	2.99^{-06***}	1.00002	2.84^{-04}
Environmental characteristics				
D_pop	-.0000593	.0000225***	.9999407	-8.42^{-04}
Ave_tem	-.193339	.0260214***	.8242025	-2.74212
Ann_rain	-.0000911	.0000344***	.9999089	-.00129
Area	-.0220791	.0525532	.9781629	-.31379
Constant	3.834662	.6118613***	-	-
Number of obs	48969			
Pseudo R2	0.0374			
Log pseudo Likelihood	-22357.354			
Wald chi2(22)	1037.23			
Prob>chi2	0.0000			
Pearson chi2	48955.75			
(df)	(48779)			
Prob>chi2	0.2852			
Hosmer-Lemeshowchi2(8)	26.26			
Prob > chi2	0.0009			

Note: **Significant at 10%, **Significant at 5%, ***Significant at 1%*

Illness

For the household data collection, 8,909 individuals reported being ill within the recall period of 1 month. Among these respondents, 6,236 (70%) reported only once and 1,604 (18%) individuals reported illnesses twice. The remaining 12% reported three or more times. Average illness episodes among respondents who reported illness were 1.4 per individual. We applied a logistic model to estimate the probability of illness by individuals. The estimated coefficients of explanatory variables are shown in Table 2. A number of individual, household, and environmental-level characteristics emerged as statistically significant. As expected, the age of the individual was found to be significant negatively associated and the square of age significant positively related with illness show evidence age was a quadratic function with the illness (Wooldridge, 2009). Males were significantly less likely to report illness than females; individuals in households headed by females were statistically significantly more likely to report illness

than individuals in households headed by men. Among the characteristics, married persons and heads of household have positive effect on illness and injuries. The individuals who had primary, secondary or higher education compared to non-educated individuals led to a greater likelihood of illness. Being an individual belonging to a household which had either a good roof, piped-in water or a separate kitchen, or a higher household monthly expenditure, had a positive effect on the likelihood of illness. In addition, individuals belonging to large households, good toilet or a separate dining were found to be negatively associated with the likelihood of illness. Regarding the geographical location of the household, individuals in higher average temperature or higher annual rainfall or more density populated area had significantly negative effect on the likelihood of illness.

Choice of health care provider

Considering health utilization of health services, it is first worth noting that 18.19% of the population experienced illness or injuries in the last 30 days. Among those, around 6.53% sought advice from government health care, 26.32% from private health care, 4.34% from traditional healer, 24.56% from salesman of a pharmacy and the remaining 38.24% obtained self-treatment or did not receive any health services. Choice of health care providers was categorized according to the first treatment episode. Because of financial constraints, people chose self-medication as their first treatment choice.

The results from estimated coefficients in the Multinomial Logit Model for the choice of health care providers are presented in Tables 3. We obtained negative χ^2 results from the Hausman specification test and interpreted this as accepting the null hypothesis according to the Stata reference manual (Stata, 2008). This result is not an unusual outcome for a Hausman test, especially if the sample size is relatively small (Stata, 2008). In our model, there were only 387 observations for traditional healer.

Table. 3. Estimated coefficients in multinomial logistic regression for the choice of health care provider. ®No education=reference group, ¥Diarrhea=reference group

	Govt. vs no care or self medication		Private vs no care or self medication		Traditional healer vs no care or self medication		Salesman vs no care or self medication	
Variable	**Coef.**	**Robust SE**	**Coef.**	**Robust SE**	**Coef.**	**Robust SE**	**Coef.**	**Robust SE**
Age	.00267	.00476	-1.156^{-4}	.00318	-.02396	.00655***	-.00050	.00280
Gender	-.07784	.12060	.06032	.07676	.14943	.13199	.18970	.07519**
Adult	-.39670	.23556*	-.19558	.13312	-.07991	.25641	.06487	.13628
®Primary	.06938	.14125	.06743	.09572	-.17696	.16860	-.22487	.09087**
®Secondary	.42351	.15238***	.29213	.09873***	-.17890	.17206	-.35227	.10593***
®Higher_edu	.27361	.12745**	.32107	.04131***	-.12048	.05613**	-1.4677	.53894***
Marital_s	-.11750	.24531	-.13976	.14250	.22034	.28930	-.30237	.16015*
Head_f	-.05678	.21527	.18217	.14036	.16808	.08918*	.22256	.14692
Hh_size	.04331	.03215	-.02055	.02306	-.08149	.04481*	-.03761	.02357
Head	.19649	.16830	-.06492	.10975	-.20493	.20196	.07119	.10178
Chronic	-.66220	.34936*	-.25704	.20207	-.25598	.40080	-.24082	.23190
Ch_ill_d	.67747	.36281*	.43508	.20680**	.61098	.42800	.08963	.23961
¥Disease2	-.53606	.24916**	.43896	.17213**	.29746	.14687**	.29803	.18380
¥Disease3	.32474	.13536**	-.08131	.17733	-.02957	.30756	.06282	.17322
¥Disease4	.98529	.33825***	.53741	.25655**	-.52647	.75190	.35632	.31930
¥Disease5	-.03663	.18219	.32377	.13429**	.40465	.21930*	.92389	.13238***
Travel_pro	3.46179	.47992***	3.3643	.45289***	2.9339	.50260***	2.7304	.46484***
Reacht_pro	-.89352	.33946***	-.67893	.30885**	-.57308	.36387	.12156	.36764
Spend_time	.99823	.18483***	.40504	.16810**	.35257	.21056*	1.0922	.14991***
Wait_tp	-4.7927	.26857***	-4.0821	.24111***	-3.4622	.28211***	-2.8663	.25152***
Log_exp	-2.98^{-5}	1.4^{-5}**	1.9^{-5}	9.46^{-6}**	-3.22^{-6}	2.72^{-5}	1.68^{-5}	.00001*
Area	-.64441	.20605***	-.10802	.14853	.41545	.20251**	.29142	.16578*
Constant	4.2950	.54678***	4.01659	.47770***	2.5652	.60442***	2.4506	.51207***

Log pseudo likelihood=-10612.258, Wald chi2(88)=1051.07
Prob>chi2=0.0000, Pseudo R2=0.1357
Hausman test of IIA assumption; chi2(66) =-3.96(omitting govt. health care)
chi(66)=13.40 (omitting private health care)
chi2(65) =-4.22 (omitting traditional healer)
chi2(65) =21.85 (omitting salesman of a pharmacy)

Note: *Significant at 10%, **Significant at 5%, ***Significant at 1%

A first analysis compared government health care with self-medication or no care. Compared to a non-educated person, secondary and higher educated persons were more likely to be treated using government health care. Compared to diarrhea, injury and non-communicable disease had significant positive effect but communicable disease had significant negative effect on using this type of provider. Adult, chronic illness, individual reach time at provider, provider's spending enough time to examine, individual's higher waiting time at provider to be examined and higher household expenditure made it less likely to use government health care. On the other hand, longer chronic illness duration and traveling to the provider by engine facility vehicle had positive significant effect with using government health care. Rural individuals were less likely to use this type of health care.

The second analysis compared private health care with self-medication or no care. Longer chronic illness duration, traveling to the provider by engine facility vehicle, and higher household expenditure significantly increased the probability of seeking care from private health care. Secondary and higher educated person compared to non-educated person used significantly more likely this type of health care. Compared to diarrhea, communicable disease, injury and other diseases had significant positive effect on using private health care. Provider's spending enough time to examine and waiting time at provider to be examined were significantly less likely to use this type of health care.

Another analysis compared traditional healer with self-medication or no care. Travel to the provider by engine facility vehicle, staying in rural area, household headed by female had significant possible effect to use this service. Also communicable disease and other diseases compared to diarrhea significantly increased the probability of seeking care from traditional healer. Individual's higher age, large household size, provider's spending enough time to examine and waiting time at provider to be examined were negatively associated with using traditional healer. Also higher educated person compared to non-educated person used less likely to be treated using traditional healer.

Finally, we developed a model of salesman of a pharmacy versus self-medication or no care. We found that male, married person, travel to the provider by engine facility vehicle, and higher household expenditure had a positive effect on the likelihood of using a salesman of pharmacy. Compared to diarrhea, other diseases were more likely to be treated by a salesman of pharmacy. Compared to a non-educated person, all other educated persons decreased the probability of using salesman of a pharmacy. Provider's spending enough time to examine and waiting time at provider to be examined also decreased the probability of seeking health care from the salesman of a pharmacy. Rural individuals were more likely to use treatment from a salesman of pharmacy.

Health care expenditure

Expenditure for self medication or no care clustered highly at zero. Some 23.57% of the individuals who used self medication or no care, 8.93% of the individuals who used traditional healer, 3.11% of the cases treated by a private health care, 2.58% of the individuals who used government health care and 1.19% who used salesman of a pharmacy had zero expenditure. This is why individuals who used traditional herbs and roots exclusively as self-medication had no costs and some payments could be made in kind for traditional healers. Since we would like to include all observations in our model, we considered these observations as missing values. Selection model was applied in order to explore the determinants of health care expenditure because the selection model allows us to use information from zero spending individuals to improve the estimates of the parameters in the regression model and the selection model provides consistent, asymptotically efficient estimates for all parameters in the model. In addition to coefficients, marginal effects are presented in Table 4. In our case the marginal effects are evaluated when a dummy variable is transformed from zero to one.

The factors "married", "respondent's secondary education compared to no education" and "respondent's higher education compared to no education" significantly increased the magnitude of health expenditure. Compared to diarrhea, individuals spent more on non-communicable diseases, injury but spend less on the "other disease" category. In contrast, people were more likely to use expenditure on longer chronic illness duration. With respect to household-level characteristics, an individual who belonged to a larger household size or a higher household expenditure emerged as a positive and significantly determinant of the magnitude of health care expenditure. An individual who waited at provider to be examined more than 30 minutes and reach at provider more than 30 minutes significantly increased the magnitude of health care expenditure. On the other hand, providers spend enough time to examine and the individual who travel to the provider by engine facility vehicle had a positive effect on the magnitude of health care expenditure. With respect to the location of the household, rural individuals spent significantly less on health care than urban individuals although rural individuals did not significantly decrease the likelihood of illness and injuries than urban individuals. The selection term, lambda, was found significant, which means that self selection of a health care provider leads to bias. If not controlled, it may cause bias in parameter estimates.

Table. 4. Estimated coefficients in the selection models for health care expenditure in Bangladesh. ®No education=reference group, ¥Diarrhea=reference group

Variable	Coefficients	Robust Std. Err.	Marginal Effects (%)
Individual characteristics			
Age	-.0003821	.0014531	-.03821
adult	.0537464	.0675105	5.37464
Gender	-.00593	.0349319	-.59300
Marital_s	.2087886	.0770929***	20.87886
Education of respondents®			
Primary	.0288415	.0461377	2.88415
Secondary	.2530256	.0460836***	25.30256
Higher_edu	.3725263	.2255819*	37.25263
Head	-.0714981	.0507838	-7.14981
Household characteristics			
Head_f	.0422851	.0684889	4.22851
Hh_size	.0221809	.0099755**	2.21809
Illness condition			
Chronic_ill	.1314026	.1096688	13.14026
Ch_ill_du	.2034066	.1140624*	20.34066
Health facility characteristics			
Travel_pro	.8271241	.0826778***	82.71241
Spend_tp	.2276885	.0546292***	22.76885
Wait_tp	.7723056	.0478166***	77.23056
Reacht_pro	.5010258	.0807404***	50.10258
Reported morbidity¥			
Disease2	.0567925	.0802029	5.67925
Disease3	.1730122	.0906485*	17.30122
Disease4	.7493081	.1474302***	74.93081
Disease5	-.484256	.0602348***	-48.4256
Economics status			
Log_exp	.0000218	4.05e-06***	.00218
Environmental characteristics			
Area	-.1353066	.0532374**	-13.53066
Constant	5.539247	.125092***	
Selection term			
Lamda	.244052	.0111098***	
Log pseudolikelihood	-15565.01	Number of obs	8909
Wald chi(18)	1967.01	Censored obs	964
Prob>chi2	0.00000	Uncensored obs	7945

Note: *Significant at 10%, **Significant at 5%, ***Significant at 1%

VII. Discussion

The aim of this study was to provide important input for policy applications to enhance health care utilization through examining the illness, the decision to seek health care and the amount of expenditure incurred in Bangladesh. The common perception is that the decision of whether and where to seek care and the amount of expenditure depends on how serious the illness is. However, our results showed that illness is not the only factor involved in demand for health care. Other influences, such as individual, household and environmental characteristics, have been brought together to determine the magnitude of health care expenditure incurred.

Compared to other persons, household head and married persons reported illness more frequently. According to illness rural and urban individuals do not differ significantly but rural individuals spend less than urban individuals. The reason might be that they received treatment from the mostly lower demanded unqualified medical practitioner. In fact, in rural area of Bangladesh the medical cost is less than that of urban area. Another reason, this may be a reflection of the less developed infrastructure in rural area. Compared to male respondents, females were more likely to report illnesses. Consistently, individuals living in female- headed households were more likely to report illness, to choose health care. One possible reason is that women are more caring and more in touch with family members than male household heads. Economic status and literacy of the individuals were identified as key determinants in all aspects of illness, choice and amount of expenditure for health care provider in Bangladesh. Our findings on the effects of household income on health expenditure are consistent with the results of earlier studies (Hjortsberg, 2003; Rous & Hotchkiss, 2003). Literacy of an individual had a positive influence on illness, the choice health care providers and amount of expenditure for health care. Secondary and higher educated people compared to non-educated people spend more on health care expenditure. One common reason is that educated people are more conscious about their health care

and they know the value of health. However, the very low literacy rate in Bangladesh may obstruct demand for health care and health care expenditure to improve health status. Information, education and communication (IEC) programs are urgently needed to inform the population on the cause and potential risk of diarrhea, parallel to other preventive and control measures and medical facilities have to be available for all people in Bangladesh to control diseases.

Accessibility to health care is so important. Access costs of health care, such as long journeys, are burdensome to the individual (MOHFW, 2008) and matter when deciding to seek care at a health facility or not. Having means of transportation is obviously important and a motor vehicle has a positive impact on the decision to choose health care providers and health care expenditure to improve health status. Individuals use engine facility vehicle to receive treatment even expenditure is more that means if communication system will high standard then they will go to the health care providers to save their life even higher health care cost. There are some issues in relation to the results that can be directly connected to current problems in the Bangladeshi health sector. In the analysis of what choice the individual makes we find that financial means are important, as economic status of the household is positively related to choosing to act. This implies that when ill, individuals who are better off economically are more likely to seek health care. Financial means are important for explaining health care expenditures incurred. The individual's economic status still reflects positively on health care expenditures. Individuals, who have the financial means, spend more on health, implying that poor individuals do not receive the care they should. The general policy of universal coverage in which the Ministry of Health and Family Welfare (MOFHW) pays for the poor needs to be investigated further. In practice the safety net is ineffective because the ministry is poorly funded and invariably fails to compensate health facilities for services rendered to government-responsibility patients. Consequently poor patients have to pay for services. Although, Government of Bangladesh (GOB) are providing free medical facilities especially family planning treatments and in some districts free medical treatments are serving by some NGOs but these are not sufficient.

Waiting time to take health care services from the health care providers is very important for individuals. It has a negative effect in taking health care services. Improved management, including filling vacant posts and ensuring the attendance of doctors and other service providers regularly, can reduce waiting time. A 2003 survey of government health facilities reported many unfilled posts for service providers and that many doctors were absent from the facilities at the time of unannounced visits (Chaudhury & Hammer, 2003). The enough spending time by provider to examine for health care of individuals has also significant positive influence to the health care expenditure. This reflects the individual's satisfaction for receiving health care service. Individuals, who are satisfied for the examination spending time by provider, spend more on health, implying that unsatisfied individuals do not take the health care they need. So the health care providers in Bangladesh should try to reach the satisfaction of individuals. This finding is consistent with Chakraborty et.al., 2003. They argued that most people in Bangladesh have fairly low expectations of their health services.

Revenue generation and allocation of resources to cover the health needs of people are the main factors in financing health care. As in other developing countries, user fees have been implemented in Bangladesh to overcome government budgetary constraints. Although a national policy on exemption exists, it is not applied effectively in Bangladesh and there are no exact criteria for exemption. As a result, sick people were discouraged from seeking health care and utilization of public health facilities has declined. A safety net should be provided for the poorest and disadvantaged groups such as children, oldest and disabled people through proper exemption processes, so that the very needy are not excluded from access to necessary health care.

VIII. Conclusion and Recommendations

In this study, we controlled potential biases by an advanced statistical technique and the analysis of payment options according to cultural context as well as careful categorization of the provider's choice. We believe that our results can provide unbiased estimates of the magnitude of household health care expenditure in Bangladesh. Our findings can also be used as inputs for policy implementation to improve health system performance in Bangladesh through enhancing health care utilization, and also to compensate the peculiar problem of scarcity of information in South-East Asia. Some key recommendations are as follows:

(i) Government should take necessary steps so that the rural people can get treatment by qualified medical practitioners and try to develop infrastructure in rural areas for the development of health status.

(ii) High literacy rate in Bangladesh is essential to improve health status. Information, education and communication (IEC) programs are urgently needed to inform the people about the cause and potential risk of diarrhea, parallel to other preventive and control measures and medical facilities have to be available for all people in Bangladesh to control diseases.

(iii) Improved management, including filling vacant posts and ensuring the attendance of doctors and other service providers regularly can reduce waiting time to take health care services from the health care providers and the health care providers in Bangladesh should try to fulfill the satisfaction of individuals.

(iv) A safety net should be provided for the poorest and disadvantaged groups through proper exemption processes, so that the very needy are not excluded from access to necessary health care.

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