

Determinants of Demand for Health Care in Bangladesh: An Econometric Analysis

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This paper attempts to estimate the factors which influence the demand for health care in Bangladesh. A binary logistic regression model is employed to identify the determinants of the demand for health care. The empirical results show that the estimated coefficient of price variable is negatively related to demand for health care and it is statistical significant. The empirical results also indicate that the level of education and income has positive effect on demand for health care. Moreover, the waiting time variable is significant and there is a positive relation between waiting time and demand for health care. So, it could be said that waiting time do not seem to be serious barrier to health care utilization. The quality of care variable is significant. Findings of the study reached the conclusion the price of health care should be reduced in such a way that the patient gets maximum health care services. Government may set up some guidelines on consultancy fees of the private providers because they charge uneven consultancy fees from the patients. Again, the campaign for health awareness as a proxy of education may increase the demand for health services.

JEL Codes: I1, C35, R22

1. Introduction

Identifying the major determinants of health care demand is vital for appropriate government policy formulation as well as to assess the impact of public policy changes on individuals and to estimate their demand for health care services. Bangladesh has a total population of about 150 million of which 40 percent live below poverty line who cannot afford basic health services (GOB 2010). It is also a natural resource constraint country. Among the few resources, population is the most important which is contributing and could significantly contribute to the economic development of the country. Health care service is a precondition to transform this population as human resource and it is evident that a significant public investment in health sector is a must for this purpose. Health sector is one of the prime focused sectors of the government and health expenditure is expected to grow fast in coming years. It is extremely important to establish which factors are the key determinants in affecting peoples' demand for health care in order to maximise the benefits of future public expenditure on health service delivery. This is especially true because the public polices generally show limited understanding about the factors that are important in influencing health service behaviour. Health care is an intermediate commodity which includes hospital care, outpatient care, nursing, home care and informal care. Presently, the health care institutes are facing shortage of qualified professionals like doctors, nurses and other supporting staff. Moreover, many of the nurses are not adequately trained in their own profession. In short, the overall health care delivery system is unbalanced in the sense that health care is provided free of charge in rural areas whereas it is not free of charge in urban areas and the utilization of health care facility is uneven in both the areas. The objective of the paper is, therefore, to analyse the determinants of the demand for health care in Bangladesh by using cross

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sectional data. The rest of the paper is structured as follows: Section 2 represents the literature review, methodology and data of the study is specified in Section 3, while the results and discussion are explained in Section 4. Finally, conclusions and limitations are given in Section 5.

2. Literature Review

Several studies have so far been done in this field. The findings of these studies differed widely from each other. Some studies found that prices are not important determinants of demand for health care (Akin et al. 1981, Heller 1982, Akin et al. 1986 and Schwartz et al. 1988, Ching, 1995). On the other hand, some other studies found that prices are important determinants of demand for health care (Mwabu 1986, Gertler et al. 1987). Ali and Noman (2010) explained that level of income positively affected the demand for health care in Bangladesh. They did not mention the limitation of their study. Akbari et al. (2009) estimated the demand for public health care in Pakistan by using time series data and found that the availability of services is perhaps the most significant determinant of the demand for health care. Appiah-Kubi (2004) found that education, location and socioeconomics affect the utilization of healthcare in Ghana. Jochmann and Leon-Gonzalez (2004) explained the problem of estimating the demand for health care with panel data. They estimated the demand model by applying Markov Chain Monte Carlo (MCMC) technique to calculate individual treatment effect. They found that age and number of doctor visit are positively related till the age of 85. Mwabub et al. (2004) found that medical care demand is inelastic with respect to user fees. Ichoku and Lcibbrandt (2003) found that waiting time does not seem to be serious barrier to health care consumption. Riphahan et al. (2003) estimated the incentive effect in the demand for health care in Germany by applying panel data. They observed that the elasticity of demand for health care for hospital care is small and unresponsive to changes in financial and nonfinancial opportunity costs. They also employed the adverse selection and moral hazed in their model. In these studies various demand determinants were used which were crucial for selecting appropriate variables for the current study. Rous and Hotchkiss (2003) estimated the determinants of household health care expenditures in Nepal. They jointly estimated a system of three equations. They observed that age of the individual was found to be significantly associated with the reporting of illness and injuries but the sign of the parameter is negative. They also found that years of schooling of head of the household emerged as a negative and significant determinant of health expenditure. They did not incorporate price and quality of care variables in their three equations. Vork (2000) observed that demand for health care decreases with increase in the age of the patient in Estonia. Li masako (1996) found that price, income and education are important determinants of demand for medical care in Bolivia. Lavy and Quigley (1993) found that household income is an important determinant of the demand for quality and intensity of medical care but price of medical care is less important determinant of the demand for quality and intensity of medical care in Ghana. Elis and Mwabu et al. (1993) found that distance and user fee were both factors that reduced demand for health care, but income increases demand for health care. Mwabu et al. (1993) showed that lower income households are more likely to seek treatment than higher income household in rural Kenya. Schwartz et al. (1988) found that mother's education has also effect on delivery choice in Philippines. Dor et al. (1987) showed that price and travel time played an important role in rationing health care in rural Ivory Coast. Heller (1982) found that income is an important determinant of demand for health care in peninsular Malaysia. The determinants of demand for health care are vital for improving the utilization of health care facilities and preparing appropriate policy framework for this sector. In addition, degree of influence of these factors on the demand for health care is

also important to know the efficiency of health care delivery system. Most of the studies were focused on the choice of the recipients receiving health services from different service providers by using different econometric methodology. In order to address these issues, a new specification of the demand for health care is developed. In this study, demand for health care is estimated directly by using binary logistic regression model, which is more capable of explaining the factors determining demand.

3. Methodology

3.1 The Study Area, Sampling Technique and Data

Bogra, a district in northern Bangladesh, was chosen for the study in which a maximum health care set up was available. There are one medical college hospital, one district hospital, one Tuberculosis (TB) hospital, one TB clinic, one school health clinic, one diabetic hospital, one maternity and child welfare centre, three urban health dispensaries, one missionary hospital and six urban health care centres in that district. Besides, there are many private hospitals and 865 registered pharmacy shops in Bogra. Prior to primary data collection, a list of the patient who were suffering from different diseases during last one month were made on the basis of available information from medicine shopkeepers, records of public and private hospitals and clinics and household visit. Primary data were collected with the help of a well structured questionnaire with face-to-face interview. The questions regarding socioeconomic, demographic and health indicators of the patient were included in the questionnaire. The primary data were collected randomly from Ward no. 12 in Bogra Municipal area as sampling unit. Ward is a unit of area under Municipal Corporation. There are 12 Wards under Bogra Municipal Corporation. For pre-testing of the questionnaire 15 patients were interviewed. The questionnaire was improved after the pre-testing. The final survey was carried out during the period of March to May 2007. The respondents were selected by employing simple random sampling devised by Krejcie and Morgan (1970). A sample size of 276 was obtained from a total of 983 patients. They were selected randomly for interview and the interview was carried out at their residence. When the patient was a child, the interview was conducted with the mother or father of the child. In absence of the respondent, interview was conducted with adult or reliable person of the family who had well knowledge about the patient and his/her disease. Validity of questionnaire was achieved by content validity. Variables and questions were drawn from literature which ensured the validity of the questionnaire. Reliability of the questionnaire was achieved by internal consistency. The internal consistency of the questionnaire was obtained by asking respondents questions more than once during a face to face interview.

3.2 The Economic Model of Demand for Health Care

As the primary focus of this paper is to analyse the determinants of the demand for health care, the econometric model is specified to facilitate the test of hypothesis that whether explanatory variables influence the demand for health care. Demand for health care is defined as whether a patient has sought health care for any illness during the last one month. The demand for health care is a derived demand from the demand for health and health care is demanded as a means for consumers to achieve a large stock of health capital. Grossman (1972b) explained that health care is a consumer good as well as an investment good. As a consumer good health is desired because it makes people feel better. As an investment good health is also desired because it increases the number of healthy days available to work and earn income. In this study the demand for health care Q_d is dichotomous variable. It takes the value one ($Q_d = 1$) with probability π

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if the patient has demand for health care and zero ($Q_d = 0$) with probability $1 - \pi$ if the patient has no demand for health care. The explanatory variables used in this model may be quantitative or qualitative in nature. The quantitative variables are price of health care service, cost of drug, income of the consumer, patient's age, patient's education level, distance to the provider, waiting time, and duration of illness.

The logit form of the demand for health care function is written as:

$$\ln \frac{\pi}{1 - \pi} = \beta_0 + \beta_1 P_1 + \beta_2 P_2 + \beta_3 Y + \beta_4 Ag + \beta_5 Ed + \beta_6 T + \beta_7 W + \beta_8 K + \beta_9 S + \mu_i$$

Where

- Q_d = demand for health care
- P_1 = price of health care service
- P_2 = cost of drug
- Y = family income of the patient
- Ag = patient's age
- Ed = patient's education level
- T = distance
- W = waiting time
- K = quality of care
- S = duration of illness
- μ_i = error term

The demand for health care model cannot be estimated by using standard regression techniques due to the dichotomous nature of the dependent variable. In that case logistic regression technique is employed to estimate the determinants of the demand for health care. Logistic regression explains the relation between dependent qualitative variable and one or more qualitative and quantitative explanatory variables. Logistic regression model cannot be estimated by standard ordinary least squares (OLS) method because the logistic regression model suffers from heteroscedasticity and non-normality problem in the error term (Sarkar 2004). In that case, maximum likelihood method is used to estimate the parameters of logistic regression model. A limited number of studies have incorporated cost of drug (Akin et al. 1986) and quality of care (Hanson, Yip & Hsiao 2004, Peabody et al. 2006) as explanatory variables to health care model. These two variables are very crucial to affect the demand for health care. However, these two variables were not simultaneously used and tested in the previous studies. With the exclusion of one independent variable, the model might suffer from specification error which poses biased and inconsistent estimator (Gujarati 2003). This is the first study, to our knowledge, that has included cost of drug and quality of care together in the model for overcoming specification error. This inclusion of these variables simultaneously has improved the explanatory capability of the model. This is an improvement of the present study over past studies.

3.3 Variables Definition

In this study, the demand for health care depends on individual and household factors such as income, cost of drug, age, level of education, duration of illness and health care delivery characteristics like price, distance, waiting time and quality of care. The definitions of the explanatory variables are given as follows:

3.3.1 Price

The demand for health care depends on the price of that service. Fees are considered as price of the services. In this study, the price of health care is measured by unit price of the providers.

3.3.2 Cost of Drug

Cost of drug influences the demand for health care. In this study, cost of drug is considered as money price.

3.3.3 Income

Income is an important determinant of the demand for health care. Income influences the demand for health care. High-income individuals seek more formal health care and prefer private facilities because they can afford it. Income is measured by monthly income of a household

3.3.4 Education

Education is also an important determinant of demand for health care. Education can improve access to health services by increasing individuals' patience and motivation. Education can also enhance the demand for health care by several ways that is awareness, knowledge of health care and motivation. More educated persons produce better health status and typically engaged in healthier behaviours. In this study, education is measured by the level of schooling of an individual.

3.3.5 Age

Age is an important factor for explaining the demand for health care. In this study, age is a continuous variable. It is assumed that older people and child tend to consume large amount of health care than others.

3.3.6 Quality of Care

Quality of care also influences the demand for health care. Quality of care can be measured by internal quality and external quality. Internal quality of care is measured by using level of satisfaction, quality of the service provider and behaviour of other staff. In this study, internal quality of care is adopted to explain the perceived quality of care. For this reason, a specific measure is employed in this study in which the rating scale 2, 1 and 0 represents good, average and bad respectively. Measurement of external quality of care is based on consumer's perception.

3.3.7 Distance

Distance variable affects the demand for health care. Distance variable is measured in kilometre. Generally, patient would like short distance for getting treatment. But sometimes, patient would like long distance for getting better quality of treatment.

3.3.8 Waiting Time

Waiting time may influence the demand for health care. Waiting time is measured in terms of minute. Generally, positive demand shocks will lead to higher waiting time. In that case, patient may expect to wait for a provider who has a good reputation.

3.3.9 Duration of Illness

Duration of illness also influences the demand for health care. It is measured in terms of number of days suffered from the diseases.

4. Results and Discussion

4.1 Descriptive Statistics of the Variables

Table 1 shows the variables used in estimations and their sample statistics namely maximum and minimum values, mean and standard deviation. Table 1 reveals that the mean education level of the respondent is 1.46 years and standard deviation of the education level of the respondent is 1.36. Average waiting time is 51.16 minutes. The maximum and minimum waiting time is 210 and 0 minutes respectively. The mean age of respondent is 36.25 years and standard deviation of the respondent is 18.26.

Table 1: Descriptive Statistics of Demand for Health Care

Variable	Maximum	Minimum	Mean	Standard deviation	Percentage
Price of health care (Tk.)	500.00	0.00	81.58	112.69	
Cost of drug (Tk.) per illness	3000.00	0.00	363.68	568.15	
Age (year)	90.00	0.13	36.25	18.26	
Level of education (year of schooling)	16.00	0.00	1.49	1.36	
Income (Tk.) per month	30000.00	1000.00	8842.03	5669.90	
Waiting time (in minute)	210.00	0.00	51.16	60.64	
Distance (km)	4.00	0.00	1.17	1.11	
Quality of care (percentage)					
	Good (%)				42.67
	Average (%)				54.31
Bad (%)					3.02
Duration of illness (day)	30.00	1.00	21.62	10.94	

Source: Field Survey, Bogra (2007)

The highest monthly household income is Tk.30,000 and the lowest monthly household income is Tk.1,000. But the average monthly household income is Tk.8842.03. The average distance is 1.17 kilometre. Mean and standard deviation values in this table show a wide variation of the respondents in terms of income, cost of drug and price of health care.

4.2 Model Results

The empirical results based on the survey data are presented in Table 2 by using logistic regression model.

Table 2: The Result of Logistic Regression of Demand for Health Care

Variables	Bogra				
	Coefficient	S.E	Wald	d.f	p value
Price	-0.114*	0.057	3.992	1	0.046
Cost of drug	0.039**	0.022	3.311	1	0.069
Level of education	1.020	1.109	0.846	1	0.358
Age	-0.136	0.089	2.359	1	0.125
Income	0.325	0.713	0.208	1	0.649
Waiting time	0.657**	0.362	3.297	1	0.069
Distance	20.918**	12.198	2.941	1	0.086
Quality of care	5.098*	2.250	5.133	1	0.023
Duration of illness	-0.134	0.101	1.768	1	0.184
Constant	-4.822	3.574	1.820	1	0.177
-2Log likelihood	18.664				
Cox & Snell R-square	0.555				
Nagelkerke R-square	0.950				
Omnibus test of model coefficient (χ^2)	223.503			9	0.000

Source: Field Survey, Bogra (2007),

* Significant at 5%

** Significant at 10%

The price of health care is statistically significant at 5 percent level. Since the value of test statistic lies in the critical region, the null hypothesis that there is no relation between price and demand for health care can be rejected at 5 % level of significance. The estimated coefficient of price variable is negatively related to demand for health care. The estimated coefficient of price of health care is -0.114, which indicates that demand for health care of a patient decreases 0.114 with one unit increase in price of health care.

The cost of drug variable is significant at 10% level. Since the value of test statistic lies in the critical region, the null hypothesis that there is no relation between cost of drug and demand for health care can be rejected at 10% level of significance. The estimated coefficient cost of drug is 0.039, which indicates that if cost of drug increases by one unit, the log-odds of demand for health care of a patient increases by 0.039 times. The cost of drug is positively related to demand for health care. This may be because, patients believe that marginal benefit of drug cost increases with the demand for health care.

The estimated coefficient of education variable is insignificant but the coefficient of education variable has the expected positive sign. Since the value of test statistic lies in the acceptance region, the null hypothesis that less educated individuals are more likely to seek health care can be accepted at 10% level of significance. The insignificance of the education variable arises due to the very low level of education in the study area. The estimated coefficient of education variable is 1.020 which suggests that a unit increases in education, the log-odds of demand for health care of a patient increases by

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1.020. The result is consistent with studies by Propper (2000) while opposite finding is found in Rous and Hotchkiss (2003).

The age variable is insignificant at 10% level. Since the value of test statistic lies in the acceptance region, the null hypothesis that there is no relation between age and demand for health care can be accepted at 10% level of significance. The coefficient of age variable is -0.136 , which suggests that if the age of a patient increases by one-unit, the log-odds of demand for health care of a patient decrease by 0.136. The result reveals that age is negatively related to demand for health care of a patient because the marginal benefit of investment into health decreases with age. The finding is out of line with studies by Li (1996).

The income variable is insignificant but it has expected positive sign. Since the value of test statistic lies in the acceptance region, the null hypothesis that there is no relation between income and demand for health care can be accepted at 10% level of significance. This probable explanation of the insignificance of income variable could be due to high standard deviation as is shown in Table 1. The coefficient of income variable is 0.325, which suggests that a unit increases in income, the log-odds in favour of demand for health care of a patient goes up by 0.325. The finding is contrasted with studies by Ellis and Mwabu (1991).

The waiting time variable is significant at 10% level. Since the value of test statistic lies in the critical region, the null hypothesis that there is no relation between waiting time and demand for health care can be rejected at 10% level of significance. The coefficient of waiting time variable is 0.657, which indicates that a unit increases in waiting time; the log-odds ratio in favour of demand for health care goes up by 0.657. In that case, patient would like to wait for better quality of treatment. The result is inconsistent with studies by Hanson, Yip & Hsiao (2004).

The distance variable is significant at 10% level. Since the value of test statistic lies in the critical region, the null hypothesis that there is no relation between distance and demand for health care can be rejected at 10% level of significance. The coefficient of distance variable is 20.918, which suggests that for a unit increases in distance, the log-odds ratio in favour of demand for health care goes up by 20.918. Positive relation between distance variable and demand for health care is emerged. So patients like to avail long distance for better quality of treatment.

The quality of care variable is significant at 5% level. Since the value of test statistic lies in the critical region, the null hypothesis that there is no relation between quality of care and demand for health care can be rejected at 5% level of significance. The coefficient of quality of care variable is 5.098, which suggests that for a unit increases in quality of care, the log-odds ratio in favour of demand for health care goes up by 5.098. In that case, the demand for health care would increase with the improvement quality of health care services. The finding is in line with studies by Hanson, Yip & Hsiao (2004).

The duration of illness variable is insignificant at 5% level but it has the expected negative sign. Since the value of test statistic lies in the acceptance region, the null hypothesis that there is no relation between duration of illness and demand for health care can be accepted at 5% level of significance. The coefficient of duration of illness is -0.134 , which indicates that for a unit increases in duration of illness, the log-odds ratio in favour of demand for health care goes down by 0.134. The result shows that patients

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who have been suffering from any disease for a long time or more than four weeks they do not take health care. The result does not support the finding of Li (1996).

In our logistic regression model analysis it is found that *R*-square of Cox and Snell is 0.555 and Nagelkerke *R*-square is 0.950, which suggests that the model fits the data well.

5. Conclusions and Limitations

The empirical analysis of demand for health care in Bangladesh is discussed in this study. Analysis of demand for health care is very important for policies and strategies for the development of health sector. In this paper, logistic regression model is used to estimate the demand for health care. The empirical analysis of demand for health care reveals that price of health care has negative effect on the demand for health care. The cost of drug seems to affect demand for health care. The level of education and income has positive effect on demand for health care. The age of the patient is negatively related to demand for health care. So, the demand for health care decreases with increase in the age of the patient. This result suggests that elderly persons are less likely to seek health care than young people. Though elderly persons typically have higher health care needs. Similar results were also found by Vork (2000). Waiting time may influence the demand for health care. The result shows that there is a positive relation between waiting time and demand for health care. This result suggests that patients would like to wait for better quality of treatment. People may simply expect to wait for a doctor or healer who has a good reputation (Akin et al, 1986). Distance is the important impediment to using health service in Bangladesh. There is positive relationship between distance variable and demand for health care which seems contrary to intuition. This is because patients would like to avail long distance for better quality of treatment. It could be said that waiting time and distance do not seem to be serious barriers to health care utilization in the study area. Duration of illness has a negative effect on demand for health care. This is because, the patients, who have been suffering from any sort of diseases for more than four weeks, do not want to receive treatment. They also believe that they will not be cured from those diseases.

Findings show that there is negative relation between price of health care and demand for health care. So, the price of health care should be reduced in such a way that the patient gets maximum health care services. Moreover, the private providers charge uneven consultancy fees on the patients. So the government may set up some guidelines on consultancy fees of the private providers. According to the findings of the study education and income are positively related to the demand for health care in Bangladesh. So, the campaign for health awareness as a proxy of education may increase the demand for health services. Since per capita income of the people is very low in our country, even lower in the study areas, the government of Bangladesh should expand health service delivery free of cost to those who are unable to pay for health care services. Since positive relation between quality of care and demand for health care is found in the study, the quality of care has to be increased in our health facilities so that patients get quality treatment.

Though the studies on demand for health care in Bangladesh are still scanty, there is a scope for further study. The quality of the study could be improved further by incorporating other areas in the study area. The pitfalls of regression need to be addressed for achieving more reliable results. Other shortcoming of this study is that the overall fitness of a binary logit model is assessed by some ad hoc measures such as

Cox & Snell *R*-square and Nagelkerke *R*-square (Chatterjee & Hadi 2006). These ad hoc measures do not provide accurate fit of the model.

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