



Factors affecting out-of-pocket healthcare expenditure of the urban people of West Bengal with particular reference to Siliguri Municipal Corporation

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Abstract: *Though Indian National Health Policy, 2002 was developed to meet the basic needs of the citizens of the country for preventive and curative measure of physical and mental health through providing equal access to healthcare facilities at free of cost at the point of access, still government finance (as a % of GDP) in healthcare sectors is quite less or limited. Further, with the advent of privatisation, deregulation of medicine price and introduction of modern and expensive technology in the healthcare market during 1990's, and low health insurance coverage of lower income groups compelling lower income groups to seek healthcare facilities from private sources despite higher costs. Thus, private sector has emerged as the leading source of both institutional and non-institutional healthcare delivery services, resulting in high out-of-pocket healthcare expenditure (OOPHE) and a greater financial burden on low income groups. Against this backdrop, the present study makes an attempt to identify the factors affecting out-of-pocket healthcare expenditure incurred by the people of Siliguri Municipal Corporation (SMC) through the utilisation of healthcare facilities considering the demographic and socio-economic characteristics of the people of the region. The problem calls for an in-depth econometric analysis since the study on this issue has been rare or very limited for the area concerned.*

Key Words: *Out-of-pocket healthcare expenditure, Siliguri Municipal Corporation.*

1. INTRODUCTION:

All the countries across the world tries to make possible attempts to provide their people good healthcare services at affordable costs. The distribution healthcare services should be based on individual 'need' rather than on individual 'demand'[6]; based on 'medical need', not on the 'economic status'[17][23]. Further, economists are also concerned with the impact of high healthcare expenditure imposed on the government, patient and others [18]. But whether actually there is any obligation of the government to intervene in the healthcare market [3] [4] is a debatable issue. However, more often it is contended that on efficiency and equity ground, and controlling the market failure government interference becomes essential in healthcare sectors. But rarely there exists any standard principle or universal accepted method so far for allotting government fund on healthcare services of the country. Many studies [1] [16][9][10][13][14][15][16][21 highlighted that healthcare expenditure (both private and public) depends on GDP of the country, and for achieving better health outcomes of the people, spending of at least 5 percent of GDP on healthcare services is recommended [27]. But, in many developing countries including India, government spending on healthcare services is very less or limited [18], forcing economically disadvantaged groups seek healthcare facilities from private sources with significant detrimental effects[5][30]. However, with the advent of privatisation, deregulation of medicine price and introduction of modern and expensive technology in the healthcare market, raises a crucial question as to who will bear the increasing costs of healthcare services, whether the individual himself or the government or other agencies[28].



2. LITERATURE REVIEW:

A study by a group of researchers [6] found that the healthcare expenditure varies markedly among different illness types, while acute illnesses account for 37.4 percent and chronic illnesses account for 32 percent out-of-pocket expenditure on health. Demographic, socio-economic factors of the households and types of healthcare service provider (private, public and charitable etc.) were found as the important factors affecting the costs of illness. However, in examining households' out-of-pocket healthcare expenditure, a study revealed that cost of treatment increases when duration of illness increases and when treatment is received from private healthcare facilities [8]. But in another study estimated that, about 50 percent OOPHE was made for the of non-communicable diseases in India, and OOPHE increased from 31.6 percent in 1995-96 to 47.3 percent in 2004 and major part of expenditure comprised of buying of medicines, medical equipment and diagnostic tests. Using multivariate regression analysis, the study found that costs of hospitalisation for the treatment of non-communicable diseases, such as for cancer diseases was 160 percent higher and for cardiovascular diseases, it was 30 percent higher than that of any other communicable diseases [19]. Using World Health Survey, 2003 dataset on expenditure in 39 low and low-middle income countries on outpatient consultations as well as inpatient stays in public and private, the study revealed that on average, 45 percent of total payments for outpatient services and 60 percent for inpatient services were paid to the public facilities. Moreover, the study found that the largest part of OOPHE in both public and private facilities was on medicines, which accounted for more than 57 percent of outpatient direct payment at public facilities and more than 45 percent of outpatient OOPHE at private facilities [25].

Using the cross sectional data from National sample Survey on consumption expenditure of 1993-95 and 2004-05, the study findings revealed that in India, expenditure on healthcare as a percentage of households' consumption expenditure increased from 4.39 percent in 1993-94 to 5.51 percent in 2004-05. Although the other components of OOPHE considerably increased during two study periods, surprisingly households' expenditure on medicine declined from 81.66 percent in 1993-94 to 71.71 percent in 2004-05, and for West Bengal, it decreased from 77.87 percent in 1993-94 to 65.80 percent in 2004-05. Further, the range of healthcare expenditure on medicines in richer states such as Maharashtra, Gujarat, Kerala, Karnataka and Punjab was 60-67 percent and that of for poorer states such as Orissa, Bihar, Uttar Pradesh and Assam was 79-85 percent [11]. Further, by applying multivariate regression, the study [23] examined the caste-based inequalities in per capita households' OOPHE in Kottathara Panchayat of Kerala based on the data from panel survey data (during 2003-2004), and found that households with chronic healthcare were at higher chance of incurring large expenditures on healthcare, and hospitalisation expenditure was found to be the most impoverishing impacts on households belonging to Paniya, other ST, SC and OBC castes. (Mukherjee et al., 2011). On the other hand, using 60th round National Sample Survey Organisation (2004) data, the study found that expenditure on medicine contributed major part of total OOPHE, and in hospitalisation cases, it accounted for 19 to 47 percent expenditure and in outdoor cases it accounted for 9 to 86 percent of expenditure in Haryana and Punjab, and Union Territory of Chandigarh.

Reviewing the studies [26] on impact of out-of-pocket payments for treatment of non-communicable diseases in some of the developing countries like India, China, Pakistan, Burkina faso, Georgia, Vietnam, Kenya, Lebanon, Russia, Brazil, it was found that households experienced substantial financial hardship and impoverishment due to high OOPHE for different types of non-communicable diseases and this OOPHE ranged from 4.1 percent of households income in Vietnam with chronic disease to a 34 percent in poor people of India with diabetic diseases. Further, hospitalisation cases represented much higher expenditure than the others. However, in another study [2] at Kadugondanahalli in South India, showed that cost of medicines constituted largest share (66.3 percent) of OOPHE, followed by expenditures on travel at referral hospitals (20.6 percent) and at super-specialty hospitals (16.4 percent) of OOPHE. Households with chronic conditions spent 3.2 percent of their income from their own pockets for outpatient care. In private sector, this share was 3.3 percent and in public sector it was 2.4 percent. It was found that burden for the poorest quintile was considerably higher than that of the richest quintile.

The study based on cross-sectional survey data from the WHO Study on Global Ageing and Adult Health (WHO SAGE) in India, 2007, covering nationally representative samples of six states viz. Assam, Karnataka, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal, highlighted that OOPHE for outpatient visit increased from Rs. 272.1 with no NCD (non-communicable disease) to Rs. 454.1 with more than two NCDs during preceding 12 months, but OOPHE for hospital stay did not increase considerably with number of NCDs. For outpatient and inpatient care, medicine constituted the major part healthcare spending, followed by consultation fees and others [22].

3. MATERIALS:

Present study used cross-sectional person survey method and the schedule was prepared after thorough literature search to meet the objectives of the study. The study continued with the sample size of 1684 though the planned minimum



sample size was 1664 persons (according to pilot study) and reference period (Recall Period) for illness episode was twelve months (i.e. one year). The study found total 696 illness episodes in SMC, out of which 638 illness episodes (i.e. 91.67 percent) utilised at least one healthcare facility and for rest of 58 illness episodes (i.e. 8.33 percent) did not utilise any healthcare facility during those reference period.

4. METHOD:

The study calculated the total Out-of-Pocket Healthcare Expenditure (OOPHE) by summing up the payments made by a person for all the members of the family (i.e. public hospital card/ registration fees, transportation costs, doctors'/consultation fees, diagnostic test charges, private health insurance or similar type of premiums, medicine costs, hospital or nursing home charges including surgery not covered by health insurance and other miscellaneous expenditure including the fees of physiotherapist during the reference period. Later on, by applying econometric approach, a log linear multivariate regression model in log-log form was developed to get the effect and identify the factors affecting out-of-pocket healthcare expenditure incurred by the people of Siliguri Municipal Corporation (SMC) through the utilisation of healthcare services. The goodness of fit for the model is tested by using ANOVA and F-value at normal level of significance. The contribution of each individual independent variables is tested using t-test at normal level of significance. Finally, multi-co linearity was checked by two statistics such as variance inflation factor (VIF) and tolerance. Multi-collinearity was checked by two statistics such as variance inflation factor (VIF) and tolerance. Tolerance is just the reciprocal of VIF (Miles, 2014). Higher levels of tolerance and lower levels of VIF are always desired as it directly affects the results associated with a multiple regression analysis. Minimum accepted value of tolerance is 0.10 (Tabachnick and Fidell, 2001) and maximum accepted value of VIF is 5 (Rogerson, 2001).

5. DESCRIPTION OF EXPLANATORY VARIABLES:

Like any other goods or services, healthcare service is also demanded by the individual, thus, it must take the form of demand function. In addition, to a large extent, persons' OOPHE can be proxied as demand function for healthcare services. It can be assumed that OOPHE (demand for healthcare services) of the person is affected by following factors:

1) **Burden of Disease:** The study measured the burden of disease in terms of four variables such as category of disease, severity of disease, number of days suffering, nature of disease experienced by the sick people of SMC during the reference period. It is expected that increase in all these leads to an increase in OOPHE incurred by the person.

2) **Choice of Care:** Choice of care is evaluated by four variables, viz. pattern of healthcare facility adopted care (modern care and traditional care), source of healthcare facilities utilised (public, private, charitable healthcare organisations), systems of medicines adopted (allopathy, homeopathy, ayurveda, yoga, physiotherapy, unani and others) and type of visit or nature of utilisation (OPD and IPD) made by the sick person during the illness episode. It is reasonably assumed that treatment with allopathy medicine is much expensive than other systems of medicine. On the other hand, hospitalisation is costlier than non-hospitalisation cases irrespective of choice of care. Further, it is expected that OOPHE in private healthcare facilities is much expensive than in public or charitable healthcare organisations.

3) **Economic condition of person:** Economic condition of sick person are represented by affordability of person. Affordability of the persons represents the financial capability of the person to bear the burden of healthcare expenditure. However, affordability of person is measured in terms of monthly person income. It is assumed that the higher is the affordability of the person, the higher is the chance of incurring OOPHE.

4) **Demographic composition:** Finally, demographic composition of the person is represented by five variables, namely, age, gender, marital status, education level and family size of the sick person. It is reasonable to assume that persons having more number of children and elderly persons would make higher OOPHE. It is also expected that the more is the person member the more is the probability of falling sick in the family, which, in turn, increases the OOPHE of the person. On the other hand, higher educated people are more conscious about their health and they are less likely to fall sick than the other categories, so probability of incurring OOPHE by them is lower than the others.

Specification of Log-linear Regression Model (log-log form)

Based on the assumptions, applying econometric approach following multivariate linear regression model in terms of log-log functional forms is developed to meet the objective of the study.

Functional form of the Model:

$$\text{Ln}(\text{OOPHE}) = f(\text{BOD}, \text{COC}, \text{SEC}, \text{DEMO}, \text{U}_i)$$

Equation form of the Model:

$$\text{Ln} [(\text{OOPHE}_i) =] \alpha_i + \beta_1 \text{Ln} (\text{COD}_i) + \beta_2 \text{Ln} (\text{SOD}_i) + \beta_3 \text{Ln} (\text{NOD}_i) + \beta_4 \text{Ln} (\text{NDAY}_i) + \beta_5 \text{Ln} (\text{POU}_i) + \beta_6 \text{Ln} (\text{TOC}_i) + \beta_7 \text{Ln} (\text{SOM}_i) + \beta_8 \text{Ln} (\text{SOC}_i) + \beta_9 \text{Ln} (\text{AFFORD}_i) + \beta_{10} \text{Ln} (\text{EDU}_i) + \beta_{11} \text{Ln} (\text{POR}_i) + \beta_{12} \text{Ln} (\text{Age}_i) + \beta_{13} \text{Ln} (\text{GEN}_i) + \beta_{14} \text{Ln} (\text{MS}_i) + \beta_{15} \text{Ln} (\text{FS}_i) + u_i$$

The model depicts that the dependent variable $\text{Ln}(\text{OOPHE})_i$ is natural logarithm (henceforth only log will be mentioned) of OOPHE (direct healthcare expenditure) made by the person i during the reference period; sub index i represents the person; α_i = constant term for each person which takes into account the individual characteristics and Ln denotes the natural logarithms. The independent variables (explanatory variables) are natural logarithm of Burden of disease: $\text{Ln}(\text{BOD}_i)$; natural logarithm of Choice of care: $\text{Ln}(\text{COC}_i)$; natural logarithm of Socio-economic conditions: $\text{Ln}(\text{SEC}_i)$ and natural logarithm of Demographic composition: $\text{Ln}(\text{DEMO}_i)$.



i). To run the regression model systematically, each explanatory variable was coded according to reference selection in the study. Since the model is specified in log-log form, the co-efficient estimates (β_i) are elasticities of OOPHE with respect to explanatory variables assumed. The contribution of individual independent variables is evaluated through computation of β_s and is further tested of significance using t-test at normal level of significance. The model is appropriate as the sampled cross-sectional units were drawn from a large population group and it provides us a better insight into the variations of OOPHE by persons with respect to different dimensions of illness characteristics of individuals associated with their demographic and socio-economic conditions through the process of utilisation of healthcare services. For econometric analysis, coding for the explanatory variables was done as follows:

Table 1: Coding of Explanatory Variables

Type of explanatory variable	Explanatory Variable (Natural logarithm of)	Categories	Code (before natural logarithm)
Disease Burden (BOD)	Category of Disease	GIII	1
		GII	2
		GI	3
	Number of days suffered	1-3	1
4-6		2	
7-10		3	
More than 10 days		4	
Severity of Disease	Low	1	
	Medium	2	
	High	3	
Nature of Disease	Chronic	1	
	Acute	2	
Choice of Care (COC)	Pattern of Utilisation	Traditional	1
		Modern	2
	Sources of Care	Self- medication	1
		Private	2
		Public	3
NGOs and others		4	
System of Medicine	Allopathy	1	
	Yoga	2	
	Homeopathy	3	
	Ayurveda and others	4	
	Combination of two or more	5	
Nature of Utilisation/Type of Care	OPD	1	
	IPD	2	
Economic Condition (ECON)	Affordability of the persons	Less than Rs. 10000	1
		Rs.10001-20000	2
		Rs.20001-30000	3
	Monthly Person Income	Rs.30001-40000	4
		Rs.40001-50000	5
		More than Rs. 50000	6
Demographic composition (DEMO)	Age	Less Than 5 years	1
		5-14 years	2
		15-24 years	3
		25-44 years	4
		45-60 years	5
		More than 60 years	6



Gender	Male	1
	Female	2
Marital status	Unmarried	1
	Married	2
	Widow/Widower	3
	Divorcee	4
Education Level	Illiterate	1
	NASA	2
	Up to Primary level	3
	Primary – Secondary	4
	Secondary-HS*	5
	HS- Graduate	6
	Post Graduate	7
Family Size	Less or equal to 4 members	1
	5 and more than 5 members	2

Note: GI: Communicable, maternal, peri-natal and nutritional conditions; GII: Non-communicable diseases; GIII: Injuries and accidents; Low: Normal activity with symptoms; Medium: Impairment of activities; High: Bed ridden for seven days or more; Acute Disease: Suffering for less or equal to 30 days; Chronic Disease: Suffering for more than 30 days continuously; Modern source where opinions or advices are taken from doctors and medical experts by one group, and utilisation of healthcare facilities from ‘traditional source’ where treatment is sought from paramedical staff including personnel in chemist’s shop, self-medication or and from any systems of medicine; Public includes Urban Primary Health centre, Govt. Hospital, Medical etc., Private includes Chambers, Clinics of the doctors or Private nursing Homes, Others include NGOs, Charitable Organisations and others trusts etc.; OPD: Non-hospitalisation cases; IPD: Hospitalisation cases. HS: Higher Secondary; * NASA indicates not attaining school age, they cannot be treated as illiterate though their education level is nil. Here, preparatory school qualification is not considered.

6. ANALYSIS:

It is evident from Table 2 that all the estimated OOPHE elasticities are less than one, therefore, they are said to be inelastic in nature, implying that when any of the explanatory variables of interest changes, OOPHE also changes, but proportionate change in OOPHE is less than proportionate change in variable of interest. Further, positive coefficient of significant variables such as number of days suffered, severity of disease, pattern of utilisation, nature of utilisation, affordability of the household and age of the sick person indicates that when number of days of suffering increases, severity of disease increases, use of the modern method of treatment increases, hospitalisation case increases, affordability of the households increases and age of the sick person increases, OOPHE also increases. On the other hand, negative coefficient of the significant variables, such as sources of care and system of medicine and place of residence of the sick person indicates that as the sick person moves from private care to other sources of care, from allopathy treatment to other alternative system of medicine OOPHE decreases. It may be due to the fact that treatment at private institutions is costlier than the other sources, allopathy system of medicine is expensive than the other alternative system of medicine.

Table 2: Parameter Estimates of Log-linear Multivariate Regression Model

Variables	β	Tolerance	VIF
Constant	6.274 ¹	-	-
Ln (Category of disease)	0.119	0.739	1.353
Ln (Number of days suffered)	0.532 ¹	0.573	1.745
Ln (Nature of disease)	-0.027	0.746	1.340
Ln (Severity)	0.978 ¹	0.792	1.263
Ln (Pattern of utilisation)	0.423 ¹	0.675	1.482
Ln (Type of care)	2.270 ¹	0.891	1.123
Ln (System of medicine)	-0.271 ¹	0.801	1.249
Ln (Sources of care)	-0.372 ¹	0.917	1.090
Ln (Affordability category of person)	0.451 ¹	0.630	1.586
Ln (Education)	-0.092	0.672	1.489
Ln (Age category)	0.332 ¹	0.360	2.778



Ln (Gender category)	-0.037	0.900	1.111
Ln (Marital status category)	-0.029	0.487	2.053
Ln (Family size category)	-0.030	0.685	1.460
Number of observation	638	-	-
R-square	0.792	-	-
Adjusted R-square	0.627	-	-
F-value	69.837	-	-
SEE	0.79424	-	-

a Dependent Variable: Ln (Out of pocket Healthcare Expenditure); Ln: natural logarithm; ¹p<0.01, ²p<0.05, ³p<0.10

7. FINDINGS:

Log-linear regression model shows that high proportion of variation explained by the independent variables (i.e. R-Square =0.792, Adjusted R-Square =0.627), and estimated F value is 69.837 and significant at 0 percent level. Results also reveal that log of number of days suffered (henceforth log will not be mentioned), severity of disease, pattern of utilisation, sources of care, system of medicine, type of visit (or nature of utilisation) and economic condition of the sick person or affordability of the household have emerged out as statistically significant at normal level of test of significance. Further, except age of the sick person all other variables of demographic composition are not significant. In addition, the estimated OOPHE elasticities with respect to number of days suffered is 0.532, severity of disease is 0.978, pattern of utilisation is 0.423, type of care is 2.270, system of medicine is -0.271, sources of care is -0.372, affordability of household is 0.451 and age of the sick person is 0.332 respectively

8. RESULT:

The results depict that a 10 percent increase in number of days of suffering will increase the OOPHE 5.3 percent. Similarly, we can expect that a 10 percent increase in severity of disease, pattern of utilisation, affordability of household and age of the sick person lead to an increase in OOPHE by 9.8 percent, by 4.2 percent, by 22 percent and by 3.3 percent respectively. On the contrary, results reveal that 10 percent change in system of medicine from allopathy to other systems leads to a decrease in OOPHE by 2.7 percent. Similarly, when source of healthcare services changes by 10 percent from private care to others sources, OOPHE decreases by 3.7 percent. Again, study finds that tolerance statistics for number of days suffered is 0.573, for severity of disease is 0.792, for pattern of utilisation is 0.675, for type of care is 0.891, for system of medicine is 0.801, for sources of care is 0.917, for affordability of household is 0.630 and for age is 0.360, and tolerance value for each of the variable of interest is reasonably much greater than 0.1, implying that there is no chance of multi-co linearity among the significant variable of interest and other remaining predictor variables used in regression analysis. Further, results show that VIF for number of days suffered is 1.745, for severity of disease is 1.263, for pattern of utilisation is 1.482, for type of care is 1.123, for system of medicine is 1.249, for sources of care is 1.090, for affordability of household is 1.586, for place of residence is 1.281 and for age is 2.778 respectively, and VIF for each of the variable is much lesser than 5 indicating that there is very negligible or no correlation exists among the significant variables of interest and the remaining predictor variables (i.e. no multi-collinearity). Comparing all the elasticities, it can be said that OOPHE elasticity with respect to type of care is larger than any of the other elasticities, indicating that type of care is more important to explain the variations in OOPHE than other variables in SMC. It is probably because of as nature of healthcare utilisation or type of care changes from OPD to IPD, healthcare expenditure increases by manifolds, as latter type is much more expensive phenomenon than the former category

9. RECOMMENDATIONS:

- As possibility of incurring out-of-pocket healthcare expenditure is seen to be lower for female, to remove this gender biasness, encouragement of women empowerment, awareness campaign etc. may be initiated by suitable policy.
- To make the healthcare facility available and accessible for all the sections of the society, appropriate policy should be framed out so that private players can be regulated and controlled.
- Policy makers should rationalize the fact that cost of allopathy system of medicine is much higher than the other alternative systems of medicine, and take necessary steps to make other alternative systems of medicine available at affordable price.
- Health insurance and other medical benefits may be encouraged by the concerned authority for all income group people as hospitalization is an expensive phenomenon in private set up in the region .



10. CONCLUSION:

From the econometric analysis, it can be concluded that number of days suffered, severity of disease, pattern of utilisation, sources of care, system of medicine, nature of utilisation, affordability of the household and age of the sick person are the important factors affecting out-of-pocket healthcare expenditure in Siliguri Municipal Corporation.

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