

DETERMINANTS OF HEALTHCARE EXPENDITURE ON HUMAN CAPITAL AND ECONOMIC GROWTH IN BANGLADESH: A LONGITUDINAL DATA ANALYSIS FROM 1995-2010

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This paper is available online at www.jprhc.in**ABSTRACT**

The objective of this study was to examine the determinants of healthcare expenditure in Bangladesh between 1995 and 2010 by applying the World development indicator data. First, I developed an empirical model for longitudinal data analysis to determinant the healthcare expenditure under the human capital and economic growth. Next, I explored the dynamic relationships among healthcare expenditure, human capital and economic growth using OLS model. The expenditure in private healthcare was 2.3% and 1.2% GDP for the public health in 2010. A Wald statistic determined the joint significance of the data and $R^2=99.42\%$ for human capital and $R^2=99.44\%$ for economic growth indicates this model was the best fit. The empirical results concerned that healthcare expenditure GDP per capita plays an important role in economic growth and an income elasticity about 0.34 that implies healthcares are not luxury good in the Bangladesh.

KEYWORDS

Healthcare expenditure, Economic Growth, OLS Model, longitudinal data.

INTRODUCTION

Expenditures on healthcare are an issue which dominates health policy and its indicators. The life expectancy in Bangladesh was only 62.0 years in 1995 but had increased to 69.0 years in 2010 (World Development indicator, 2010). Factors such as improved nutrition indicators, healthcare expenditure on GDP percent per capita and public health infrastructure have gradually increased the human life span. The relative contribution of these factors is depending on the level of economic development and healthcare expenditure. The GDP per capita was US \$323 in 1995 and US \$675 in 2010; and the healthcare expenditure GDP per capita 3.5% was same between 1995 and 2010. ¹Rahman had examined the determinants of public health expenditure from Indian states. His empirical results showed that the most important determinant in the explanation of the regional health expenditure are real state per capital income and literacy rate while other factors like population over age 60 population per doctor and population primary health care center. But this study set out to provide the determinants of healthcare expenditure on economic growth human capital in Bangladesh. The study of healthcare expenditure in developed countries has been growing from last decade while there are few studies that focused at factors of health expenditure in developing countries.² The main purpose of this study is to determinants of expenditure on health with emphasis on variables by following economic and human growth using two models. Healthcare expenditure is given on the basis of sum of expenditure on all the care health functions i.e. total healthcare services, medical goods, prevention and public health services and health insurance public healthcare expenditures are shared by the governments. Many variations among healthcare spending levels of government and private sectors can be observed into Bangladesh (See, **Table 1**). Through the result I found that private healthcare expenditure is greater than the public one and the growth of government and private healthcare expenditure percent of GDP shows in Table 2. From this, a very important point arises that government priority for healthcare expenditure to private expenditure is decreasing over the years most of the countries into Bangladesh, which means that less and less money is being spent by government on healthcare as a percentage of GDP income. When I look at the conditions of health facilities, such as primary healthcare the picture is chilling around the world. To illustrate, only average 0.31 hospital bed used per 100 people, average 0.25 physicians serving treatment per 1,000 people, and average 0.28 per 1000 people have nurse-midwives in Bangladesh(see, table 3).

To my knowledge, this is the first study to examine the determinants of healthcare expenditure in Bangladesh using World development data (WDI) and UN data (2010) sets. Healthcares expenditure was not increasing rapidly from 1995-2010 in our country. When compared with indicators of health care access and utilization, expenditure is an ideal measure because it “captures the differences in intensity of care, as well as it allows for a more finely grained quantification of disparities among those who are the most medically needy”¹⁰. In this study, I examine private healthcare expenditure was highly increasing in Bangladesh compare to public expenditure. To assess healthcare expenditure patterns, I run OLS model which shows positive effects of economic growth i.e. GDP per capita and human capital i.e. literacy rate and aging population 65 and above in the Asian country of Bangladesh. Section 2, describes the empirical model of public healthcare expenditure and data for analysis. In section 3, empirical results and discussions of the estimated parameters are given. Finally the conclusion of the paper appears in section 4.

MATERIALS AND METHODS

Data

The subject of this study is conducted in Bangladesh. The main sources of data are the World development indicator (WDI, 2010). I utilize two sources of data to create the determinants of healthcare expenditures in Bangladesh. The first task is the determinants of healthcare expenditure into Bangladesh and its effect on human capital and economic growth. The WDI provides this data by year. However, since much of this data not found, I also create a second task of the determinants of healthcare expenditures in Bangladesh using the UN data (2010). If a year is missing a value for healthcare expenditures in the WDI data, in that case I replace that value with our second task of healthcare expenditures from the UN data. I also collected the literacy percentage rate of people’s data from the UN. In order to determinants healthcare status in Bangladesh, I closely examine these factors of public healthcare expenditure. In this sense, it focuses on the estimation of longitudinal models in between 1995 to 2010. All these outcome by using Stata 12.0.

Table 1: Expenditure on Health (% of GDP) in 1995-2010

Indicators	Years			
	1995	2000	2005	2010
Government	1.276	1.098	1.120	1.170
Private	2.249	1.717	2.089	2.314
Total	3.524	2.815	3.208	3.484

An Empirical Approach to Determinates of healthcare Expenditure

To determinants of healthcare expenditure within a year in Bangladesh, I consider an empirical model to analysis of longitudinal data. To estimate parameters of longitudinal data, one can choice between fixed effects (FE) or random effects (RE) models. Here, I used ordinary least square regression model. Let us consider, two empirical models are specified as follows-
Healthcare expenditure per capita on human capital

$$HEPC_t = \alpha_1 + \alpha_2 LE + \alpha_3 P + \alpha_4 PAO65 + \alpha_5 NM + \alpha_6 HB + \alpha_7 PSE + \alpha_8 LR + \varepsilon_t \quad (1)$$

And healthcare expenditure per capita on economic growth

$$HEPC_t = \beta_1 + \beta_2 LnGDP + \beta_3 PHEGDP + \beta_4 THEGDP + \beta_5 GHE + \beta_6 THE + \varepsilon_t \quad (2)$$

where HEPC is the dependent variable, and remaining variables are independent variable, t refers to time (t=1995,...,2010), $\alpha_1, \alpha_2, \dots, \alpha_8$ and $\beta_1, \beta_2, \dots, \beta_6$ are corresponding unknown parameter to be estimated for both model and random error $\varepsilon_t \sim N(0, \sigma_{\varepsilon_t}^2)$.

Table 2: Growth of healthcare expenditure (%) in Bangladesh

Indicators	Change (US\$)				Percentage Change (\$)			
	1995-2000	2000-2005	2005-2010	1995-2010	1995-2000	2000-2005	2005-2010	1995-2010
Government	-1.279	-0.096	-0.096	-1.470	-0.145%	-0.013%	-0.013%	-0.166%
Private	4.101	-4.024	-1.211	-1.134	0.150%	-0.128%	-0.044%	-0.041%
Total	2.823	-4.120	-1.307	-2.604	0.078%	-0.106%	-0.037%	-0.072%

Hitiris and posnett³ determinants healthcare expenditures per capita on several socio-economic, demographic and life style variables. A different study has done in different time on health expenditure. You may see Blomqvist and carter⁴, Hitiris⁵, Giannoni and Hitiris⁶, Cantarero², and Di Matteo⁷. In the Alok Bhargava⁸ *et al.* showed that effect of health expenditures on economic growth by including human capital such as life expectancy. ¹Rahman arguments on empirical model by including human capital and health expenditure, where health facilities were developed human capital which meant not a luxury good.

Table 3: Summary of statistics in selected variables

Variables	Minimum	Q1	Q2	Q3	Maximum	Mean	Stdv
LE (years)	62.123	63.978	65.889	67.489	68.635	65.691	2.085
LR (%)	47.486	47.486	52.133	56.780	56.780	52.133	6.572
NM (per 1000)	0.272	0.272	0.272	0.280	0.280	0.275	0.005
P (per 1000)	0.200	0.201	0.257	0.295	0.300	0.254	0.044
PSE (%)	84.120	86.523	90.324	92.890	94.874	89.811	3.894
GDP (US\$)	322.927	353.797	371.960	455.046	674.932	421.940	104.097
HEPC	8.517	9.274	10.570	15.437	23.293	12.681	4.608
PHEGDP (%)	1.055	1.118	1.168	1.219	1.276	1.168	0.063
PRHEGDP (%)	1.589	1.754	2.001	2.259	2.314	1.994	0.266
THEGDP (%)	2.734	2.899	3.166	3.435	3.524	3.161	0.289
GHE (%)	6.152	7.509	8.142	8.541	8.996	8.025	0.722
THE (%)	31.659	34.643	37.067	39.770	42.303	37.155	3.084
HB (per 100)	0.300	0.300	0.300	0.320	0.340	0.310	0.020
PA065 (%)	3.819	3.952	4.149	4.386	4.586	4.173	0.252

RESULTS AND DISCUSSIONS

The summary of statistics for key variables used in our analysis is given **Table 3**. The statistics are explored about human capital and healthcare expenditure of Bangladesh in between 1995-2010. In 1995-2010, the average GDP per capita was US \$421.94 and the healthcare expenditure per capita was US \$12.68. The public healthcare expenditure GDP was about 1.17% in comparing with the private healthcare expenditure was about 1.99%. The average number of primary school enrolment was 90% and literacy rate was 52%. The population aging 65 year and above were 4% and the average life expectancy was 66 year. Econometric results from estimating equation (1) and (2) with the OLS are presented in **Table 4** and **Table 5**. A Wald statistic is included to evaluate the joint significance of the variables for the both full models and R-square 99.42% in Model1 and 99.44% in Model2 implies that the OLS model was the best fit on the selected variables.

Table 4: Effect of the Healthcare expenditure per capita (HEPC) on human capital

Variables	Model 1			
	I	II	III	Full OLS
Intercept	-104.52*** (-4.56) [CI: -153.69- -55.35]	120.02*** (9.83) [CI: 93.15-146.90]	118.72***(10.11) [CI: 92.56-144.88]	101.70* (2.55) [CI: 9.82-193.59]
LE	1.78*** (5.11) [CI: 1.04-2.53]	-5.75*** (-14.05) [CI: -6.65- -4.85]	-5.57***(-13.47) [CI: -6.49- -4.65]	-5.49*** [CI: -7.27- -3.71]
P		-22.25** (-2.87) [CI: -39.32- -5.17]	-28.76** (0.008) [CI: -48.29- -9.23]	-24.55* (-2.63) [CI: -46.05- -3.05]
PA065		67.86*** (18.81) [CI: 59.92-75.80]	67.55*** (0.000) [CI: 59.83-75.27]	60.35*** (6.77) [CI: 39.81-80.89]
NM		-26.98 (-1.15) [CI: -78.46- 24.49]	-31.17 (-1.38) [CI: -81.57-19.23]	-24.41 (-0.99) [-81.18- 32.35]
HB			22.17 (-1.40) [CI: -57.40-13.06]	-18.02 (0.298) [CI: -55.37- 19.33]
PSE				0.413 (0.205) [CI: -0.28- 1.11]
LR				0.02 (0.03) [CI: -1.29-1.33]
Wald test	26.16	318.73	277.18	197.03
Prob.	0.0002	0.0000	0.0000	0.0000
R ²	65.14%	99.14%	99.29%	99.42%

Notes: Values in First bracket corresponding t- values. Values third bracket corresponding 95% CI and * Significant at P<0.05 ** Significant at P<0.01 *** Significant at P<0.000

In Model 1 life expectancy (LE), Physician (P), and population aging 65 year and above (PA065) shows significant relationship with healthcare expenditure per capita.

Table 5: Effects of the Healthcare Expenditure per capita (HEPC) on Economic growth

Variables	Model 2		
	I	II	Full OLS
Intercept	-108.81*** (-13.41) [CI: -126.21- -91.41]	-112.95***(-13.46) [CI: -131.23- -94.67]	-210.78***(-6.80) [CI: -279.87- -141.71]
LnGDP	20.18*** (14.98) [CI: 17.29-23.07]	18.39***(15.98) [CI: 15.88-20.90]	16.87***(15.85) [CI:14.50-19.25]
PHEGDP		4.08 (1.05) [CI: -4.38- 12.54]	-80.99**(-3.10) [CI: -139.11- -22.87]
THEGDP		3.22**(3.42) [CI: 1.17- 5.26]	36.76**(3.49) [CI: 13.31- 60.21]
GHE			-0.36 (-0.90) [CI: -1.24-0.53]
THE			2.77**(3.16) [CI: 0.82-4.73]
Wald test	224.54	326.34	353.86
Prob.	0.0000	0.0000	0.0000
R ²	94.13%	98.79%	99.44%

Notes: Values in First bracket corresponding t- values. Values in third bracket corresponding 95% CI and * Significant at P<0.05 ** Significant at P<0.01 *** Significant at P<0.000

The other selected variables nurse-midwives (NM), hospital bed (HB), primary school enrolment (PSE) and literacy rate (LR) show no statistically significant relationship with healthcare expenditure per capita. The population aging 65 and above (PAo65) 60.35 [95% CI (39.81-80.89); p-value= 0.000] were strongly significant positive effect on population aging 65 and above into Bangladesh. As found in previous studies, population aging 65 and above has a positive relationship with HEPC, which was inconsistent with findings in previous studies (Rahman, 2008).

A change in the HEPC has a significantly negative effect on our life expectancy rate (LR) and physician (P) i.e. -5.49 [95% CI (-7.27- -3.71); p-value= 0.050] and -24.55 [95% CI (-46.05- -3.05); p-value= 0.000] respectively.

In Model 2 GDP per capita (LnGDP), public healthcare expenditure percent of GDP (PHEGDP) and total healthcare expenditure (THE) shows significant relationship with healthcare expenditure per capita; and government health expenditure shows no statistically significant relationship with healthcare expenditure per capita. The GDP per capita was strongly significant positive effect on healthcare expenditure per capita i.e. 16.87 [95% CI (14.50-19.25); p-value= 0.000]; whilst PHEGDP -80.99 [95% CI (-139.11- -22.87); p-value= 0.01] were negatively significant and total healthcare expenditure 2.77 [95% CI (0.82-4.73); p-value= 0.000] were also positively significant with healthcare expenditure per capita. In the field of health economics, the value of healthcare expenditure income elasticity is a determinant the effect of per capita income. If this income elasticity is greater than unity, healthcares are luxury good and their increase is a natural outcome of economic growth see, Robert⁹. To evaluate income elasticity in the country of Bangladesh in between 1995-2010, I estimated parameter of OLS model on LnHEPC with all other Model 2 response variables and value of the LnGDP=0.34, which was not statistically greater than unity. Henceforth, income elasticity indicates that healthcares are not a luxury good into Bangladesh.

CONCLUSIONS

The determinants of healthcare expenditure in Bangladesh from 1995–2010 have analyzed. The OLS estimator supports the theory that healthcare expenditure per capita has a statistically significant positive relationship with GDP per capita. These results also indicated that HEPC has a detrimental effect on GDP per capita by increasing economic growth within countries over time. To make better capture of the dynamic relationships among HEPC, GDP, life expectancy, and Literacy rate because the full expenditure on health to society in Asia are often not realized for several years due to increasing economic growth. The empirical results of the model show that the statistically significant determinants in the explanation of the GDP per capita, Literacy rate, Life expectancy and public healthcare expenditure in relation with ageing population. Factors such as primary school enrolment and other characteristics of the demand variable are not statistically significant. Further work needs to be done to increasing healthcare expenditure, explore heterogeneous effects of healthcare expenditure on medicine, political stable decisions to recognize the importance of good public health service, plan and big invest in health.

Appendix A: Variables and its definitions.

Variable(s)	Definitions
LE	Life expectancy at birth total (years)
LR	Literacy rate, adult total (% of people)
PSE	Primary School enrolment (% gross)
GDP	Gross Domestic Product per capita (Current)
PHEGDP	Public Health care expenditure (% of GDP)
THEGDP	Total health expenditure (% of GDP)
GHE	Government health expenditure (%)
THE	Total health expenditure (%)
PA065	Population aging 65 and above (% of total)
HB	Hospital per bed (per 100 people)
NM	Nurses and Midwives (per 1000 people)
P	Physicians (per 1000 people)

Conflict of Interest: No

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