

What Determine the Public Health Expenditure in Pakistan? Urbanization, Income and Unemployment

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Abstract: This study explored the determinants of public health expenditure in Pakistan by utilizing different socio-economic variables. The time series data from the period 1980 to 2009 has been used for the analysis. The results of Augmented Dickey–Fuller unit root test depicted that variables have different order of integrations. Results of OLS showed that income, primary school enrollment and urban population have positive impact on public health expenditure while unemployment rate has negative impact on public health expenditure.

Key words: Pakistan • Public Health Expenditures • Time Series • Unit Root

INTRODUCTION

Health is a necessity rather than a luxury for human beings [1]. A person with poor health can't work properly and efficiently. Labor force is a significant factor of production than capital and technology [2]. Healthy workers can work for longer hours and are more productive than unhealthy workers. As a result they earn higher earnings and play an important role in the economic development of the country. A big determinant of economic growth is investment in human capital. In the case of children, poor health also has negative impact on their learning abilities and educational outcomes. Poor health decreases the efficiency of human capital [3]. That's why increase in public health expenditure got so much importance during the recent years. If the problem of low expenditure on health care services are not solved, it will cause much more problems like human capital inefficiency, low productivity, low saving and investment (As large portion of income spent on poor health and diseases) and low school enrollment rates. Consequently economic growth of the country will be affected. The factors which affect the decisions of public health expenditure not only include environmental and biological factors, they also include demographic, economic and social factors [4].

First time Newhouse [5] found out the determinants of public health expenditure. After that this topic got so much importance in research. Many other researchers have tried to explore the determinants of public health expenditure. Those researchers are Bhat and Jain [1], Font and Novell [3], Gupta *et al.* [4], Siddiqui *et al.* [6], Govindraj *et al.* [7], Filmer and Pritchett [8], Ricci and Marios [9], Sekhar [10], Bhabesh and Sekhar [11], Akram and Khan [12], Rahman [13], Manzoor *et al.* [14], Chaabouni and Abednnadher [15], Potrafke [16], Abbas and Hiemenz [17], Yu *et al.* [18], Xu *et al.* [19], Craigwell *et al.* [20], Imoughle and Ismaila [21] and Yaqub *et al.* [22]

Bhat and Jain [1] tried to explore the effect of Gross Domestic Product on public health expenditure using Indian state level data. The data was collected from 14 states of INDIA. The specific objectives of this study were to explore that public health spending is a necessity or a luxury good. To find out the impact of income on public health expenditure they used per capita gross state domestic product (GSDP) for income and per capita state public health expenditure (PHCE) for health. Panel data used for this analysis was from 1990 to 2002. First they checked the stationarity by using Augmented Dickey–Fuller test. The coefficients of estimates are elastic so the model is specified in log-log form. As a result of Hausman test, Random Effects model is

estimated. Public health spending was declined from 1.3 to 0.9% of GDP from 1990 to 2002. The results also concluded that public health spending is a necessity in a country like INDIA [20].

Font and Novell [3] tried to explore those factors that affect public health expenditure in Spanish states. Data was collected from the time period 1992-1998. First they estimated Ordinary least square with fixed effects Model and Moran I test was computed to test the spatial autocorrelation. Then Kiefer and Slalom test was used to investigate the normality and Breusch and Pagan test to check heteroskedasticity finally, the log-log model was estimated. Variables included in the model were population and per capita GDP of AC, inputs, like the no of doctors and beds. A dummy variable FIORAL was used for fiscally accountable ACs, a dummy variable GDIR was used for health care responsible ACs and a dummy variable POLI1 and POLI2 were also used. The result suggested that the development of fiscal and political decentralization due to competition could increase public health spending. On other hand the study found that public health spending is a necessity rather than luxury. Finally it was concluded that distribution of health spending depends on political policies [14].

Gupta *et al.* [4] tried to explore the determinants of public health expenditure and its effect on poor using, the data from 1990 to 1999. They used cross sectional data to explore the effects of public expenditure on poor's health status. OLS regression was used for estimation. Two functional forms; log-log specification and linear-log specification were used to explore the relationship between health status and its determinants. Later on the robustness test was applied to test the robustness of results. The explanatory variables included in the baseline model were country level enrolment ratio of primary school, country level per capita public health spending and per person mean consumption of subgroup. Later on to test the robustness of the results some other variables such as urbanization and private spending were added to the model. Their estimates showed that health of poor people is worse than the rich and their results are the proof that poor have more effect of public spending on health than rich people [21].

Siddiqui *et al.* [6] tried to find out those social and economic factors that affect public health resources in Pakistan. This in result affects the health status of people. These social and economic factors were GNP-per capita, urbanization and education. Multivariate regression analysis was estimated for each health resources variable. They used the data from 1974 to 1993; they concluded that political conditions and socio-economic factors

are good determinants of health resources of Pakistan. But the problem is that these resources *i.e.* doctors and nurses are now increasing in Pakistan but their distribution and utilization still remain a problem [12].

Govindraj *et al* [7] showed the findings of World Bank of Caribbean and Latin America to analyze health expenditure in Caribbean and Latin America during 1990. The regression analyses for the public and private subsectors were used. Public health expenditure was used as dependent and government consumption and private consumption as per GDP, GDP per capita, life expectancy, mortality rate, urban population and literacy rate, average years of schooling, hospital beds per capita and dummy variables of different regions were used as independent variables. Their results proved that there is positive relationship between health expenditures and income in public and private sectors. Public and private health expenditures are more in rich countries than poor countries in Latin America. When expenditures on health are measured in GDP, income and expenditure on health relationship holds in public sector only [22].

Filmer and Pritchett [8] tried to explore the effects of public expenditure on different health factors to determine child and infant mortality using cross-national data from 1987-1995. Variables included in the model were log of child mortality (M), mean per capita income, GDP/N, public spending share of GDP, H/GDP female education level and other social and economic variables. First of all they estimated a multivariate regression analysis then to check robustness, two robustness checks were applied. Finally for the solution of reverse causality and measurement error two-stage Least Squares (2SLS) were estimated. The result found that increase in the public health spending can affect under 5 mortality rates in less proportion. But Under 5 mortality rate heavily depends on other non-health factors [8].

Ricci and Marios [9] explored the impact of health policies on health status by analyzing household behavior about education, health expenditure and their saving pattern using the data set from 80 countries for the period 1961 to 1995. Variables included in the model were life expectancy at birth, physicians per 1000 people, adult illiteracy rates and sanitation, GDP per capita in PPP dollars, tertiary education enrollment rates and primary and higher education attainment rates. OLS regression analysis was estimated and a robustness check was also applied for OLS results. This paper suggested that primary education is more effective determinant of income growth than tertiary education. Tertiary education might have positive impact on health status but it is less effective for income per capita [23].

Sekhar [10] tried to explore the effects of personal household income (PHI) and the household head's education (EDN) on the public health expenditure (PHE). The objective of the study was to examine the impact of education and income on health spending. On the basis of random sampling method primary data was collected from a district for October 1999 which was selected on the basis of 1991 census. Regression and descriptive statistics were estimated to examine the effect of education and income on health spending. Three variables; spending on household health, household income and education of the household's head were used in this paper. A finding of the study is that an individual spends only 2% of his income on expenditure of health from his own income in tribal Orissa. The tribal people prefer their own less expensive ways of treatment instead of going to hospital. They think that worshipping their village god, any diseases will be automatically cured. As compared to the people of rural and urban areas their level of education was also low. They also used roots and leaves made medicines of different plants and herbs [24].

Bhabesh and Sekhar [11] explored the effect of education and income on health expenditures of households. By the method of judgment sampling two cities Bhubaneswar and Cuttack were chosen, from where primary data was collected. Both these cities represent urban Orissa. To select households (HHs) method of Multi-stage random sampling was adopted. Regression analysis and descriptive statistics were estimated to explore the effect of education and income on health expenditures of household. Three variables; expenditure on household health (H), household income (Yd) and education of the household's head were used in this paper. The finding of the study was that there is a significant effect of household's income on health expenditure. The impact of education on health spending of this household was insignificant. This paper found that as the household disposable income (Yd) increases, individual health expenditure (H) increases but to an extent [10].

Akram and Khan [12] explored the relationship between government expenditure and health in Pakistan at provincial level. They used the primary data from 2004-2005. The three step benefit incidence technique has been used to explore the relationship between the government spending and health sector in country like Pakistan. They concluded that health system in Pakistan is expensive, inefficient and inadequate. Factors behind this poor condition of health system are poverty, malnutrition, infant mortality and high population growth [7].

Rahman [13] explored the determinants of public health expenditure in India using panel data from the period 1971 to 1991. Variables included Per capita public health expenditure (PCHE), per capita domestic product (PCDP), Proportion of persons over sixty years of age (AP), Population per primary health centre (PPHC), Population per doctor (PPD) and Literacy rate (LR). Using panel data, RE model was estimated including Hausman test and Wald statistic. They found that literacy rate and per capita income are the basic determinants of expenditure on public health in India. This paper concluded that economic growth does not mean good health conditions in country [17].

Manzoor *et al.* [14] from Department of community medicine, Medical and Dental College, Lahore investigated the determinants and pattern of utilization of health service by the Allama Iqbal University's postgraduate students in Pakistan. The study was cross sectional and it was done from December 2008 to April 2009 in (AIOU) Pakistan. The convenient non-probability sampling technique was used. Data was collected through questionnaire to explore the utilization pattern of health services by postgraduate students. Data was entered in SPSS 16. Test of significance was Chi-square test with p value fixed significant at 0.05. The result showed that majority of the post graduate students was using private health services. Total participants were 129, 75% of males and 65% of female were using health care services from private sector. The educated class was attracted towards private health facilities due to their good facilities [25].

Chaabouni and Abednnadher [15] explored the determinants that affect health expenditures in Tunisia. The aim of the study was to explore the income elasticity's magnitude and the effects of those health expenditures determinants which are not related to income. Time series data was used from 1961-2008. First of all ARDL approach was used to explore the long run relationship between variables. Then Granger causality test was applied to check the causality between the health expenditures, medical density, GDP, environmental quality and population ageing. Later on unit root test and cointegration tests were also applied. According to the ADRL test per capita health expenditures, medical density, GDP, environmental quality and population ageing had a long-run stable relationship while causality test represented the bidirectional relationship between health expenditures and income. The findings of the study were that health is a necessity not a luxury good in a country like Tunisia. It was concluded that behavior of health expenditure changes with the change in level of economic development [2].

Potrafke [16] tried to explore the effects of government policies on public health spending in 18 OECD countries from the 1971-2004. The OLS dummy variable estimator was estimated to get growth rates. In addition, different tests were applied to check the problem of heteroskedasticity and autocorrelation. The explanatory variables included in the model were real GDP per capita growth rate ($\Delta \log \text{GDP}$ it), the growth rate of unemployment ($\Delta \log \text{Unemployment}$ it) and dependency ratio growth rate (Citizens above 64 and below 14) ($\Delta \log \text{Dependency Ratio}$ it). The results found that Government authorities increase the public health spending near elections. The debates before elections highlighting importance of public health expenditure and reformation of public health policies had no impact on public health spending [19].

Abbas and Hiemenz [17] explored the macroeconomic determinants of public health expenditure in Pakistan. They used time series data over a period of 1972-2006 on socio-economic and demographic variables. ADF tests told that all variables have one unit root. Cointegration and error correction approaches were used to find out the long-run and short-run relationships between variables and health care expenditures. The result proved the existence of long-run relationship between variables. The income elasticity of public health spending was less than one because the people of Pakistan are poor and can't access to health services easily. Unemployment and Urbanization have negative effect on health expenditures [26].

Yu *et al.* [18] investigated what determine the health care expenditures in China. They used panel data of 31 provinces of china from the period 1997–2008. Variables included in the model were Provincial public health expenditures (PHE), provincial gross domestic product (PGDP) and income variable. To check the impact of health spending behavior of neighbor province on decision making of other provinces of China a spatial Durbin panel model was estimated. We found that as the health spending of one province increases, the other province decreases its health spending. They concluded that in making health spending decisions provincial government should consider neighbor's economy [27].

Xu *et al.* [19] tried to explore the trajectory of health spending using panel data from 1995 to 2008, from 143 developing countries. To find out the determinants of total health expenditure and its components standard fixed effects and dynamic models were estimated. These health expenditure components were government health expenditure and out-of-pocket payments. The results showed that after including other factors health

expenditure does not increase faster than GDP. In fixed effect model Income elasticity was 0.75 to 0.95 but Income was less elastic in dynamic model. This study found an increase in health expenditure during this period. But this increase was temporary for some countries. The economic crises had impact on developed countries health systems as well as in developing countries [5].

Craigwell *et al.* [20] tried to explore the efficiency of public spending on health and education by focusing on the school enrolment rates and life expectancy of 19 Caribbean countries health data for the period 1995 to 2007 and education data for the period 1980 to 2009 was used in the paper. Three regression analysis using Panel data analysis were estimated. One equation was for health and 2nd for education. Variables included in the study were improved sanitation facilities, carbon dioxide emissions, life expectancy, immunization DPT and measles, adult literacy, primary school enrollment, urbanization and government education expenditure. These variables were stationary in levels, while remaining variables were stationary at order zero $[I(0)]$. The study concluded that health expenditure has positive impact on health status of people but expenditure on education has no significant impact on school enrollment ratio [18].

Imoughele and Ismaila [21] tried to explore that what affects expenditure on public health in Nigeria. They used time series data from the year 1986 to 2010. An error correction technique was applied and as a result there was price inelastic health demand in Nigeria. Result showed that in Nigeria major health expenditure determinants are Younger and 14 Years old population from total population and health expenditure share in GDP while insignificant determinants are GDP per capita, Population per Physician, unemployment rate, political instability and consumer price index (CPI) [6].

Yaqub *et al.* [22] investigated the impact of public health spending on infant mortality, life expectancy and under-5 mortality. This paper also explored the relationship between budget allocations and outcomes on health in Nigeria and the impact of governance. Data was used from 1980 to 2008. Corruption index was used as a measure of governance. OLS and Two-stage least square method is used for estimation. The analysis showed that when the governance indicator is included under-5 mortalities and infant mortality decreases with the increase in public health expenditure whereas this is not the case when the governance indicator is not included. This showed that in the presence of corruption, health status remain an issue [11].

The aim of the paper was to investigate the impact of income, unemployment and urbanization on public health expenditure in Pakistan.

Table 1: Summery statistics of variables:

Variables	Mean	Median	Maximum	Minimum	Standard deviation
PCHE	133.4543	94.3	455.95	17.47	108.6269
PCDP	565.1472	570.6749	749.406	396.41	99.62864
PSE	11786900	11277500	18468000	5213000	4342196
URBAN	31.76123	31.71	35.6018	28.066	2.270466
UNEMP	5.288467	5.304	8.27	3.071	1.62547

PCHE is per capita health expenditure; PCDP is per capita domestic product; PSE is Primary school enrollment; URBAN is urbanization and UNEMP stands for unemployment rate.

MATERIALS AND METHODS

Data: Annual time series data from 1980 to 2009 was used to explore the effects of different variables on public health expenditure in Pakistan (Table 1). These variables include per capita health expenditure (*Pche*) for health, per capita domestic product (*Pcdp*) for income, primary school enrollment (*Pse*), urbanization (*Urban*) and unemployment rate (*Unemp*). Data sources included the Economic Survey of Pakistan of different years and the Statistical Handbook on Pakistan Economy (2005) by the State Bank of Pakistan. Data on GDP per capita and unemployment rate was taken from International Monetary Fund, World Economic Outlook Database, October 2013 and data on primary school enrollment was from economic survey of Pakistan (2012-13).

Model: Following Abbas and Hiemenz [17] a stochastic model was used in this study. A functional form of log-log model was estimated to explore the impact of different variables on public health expenditure. Therefore our model was specified as:

$$\text{Log}(Pche)_t = \beta_1 + \beta_2 \text{Log}(Pcdp)_t + \beta_3 \text{Log}(Ser)_t + \beta_4 \text{Log}(Urban)_t + \beta_5 \text{Log}(Unemp)_t + \beta_6 \text{Log}(Lr)_t + \epsilon_t$$

where

t = is the time period from 1977 to 2012.

Pche = per capita public health expenditure

Pcdp = Per capita domestic product

Ser = primary school enrollment ratio

Urban = % of total population in urban area

Unemp = variable based on % of total labor force

ϵ_t = white noise error term

From the previous studies we fellow log-log model. As this approach can easily be applied to one country analysis and elasticity estimates can also be easily interpreted. This approach also fellow the previous studies e.g. Gbesemete and Gerdtham [28], Murthy and Ukpolo [29] and Toor and Butt [30].

For time series data analysis, we applied ADF unit root test to check the stationarity of our variables. First the model was estimated using OLS regression analysis and then the granger causality test was applied to check the causality among variables.

RESULTS AND DISCUSSION

Unit Root Test Results (Order of Integration): Time series data is non-stationary in nature. That's why we have used ADF unit root test to check stationarity of the variables. Table 2 shows results of ADF test.

The results showed that after taking log, *lpche* and *lpse* are first difference stationary and *lpcdp* is stationary at level. While *urban* was stationary at level and *unemp* was at first difference stationary.

Ordinary Least Squares (OLS) Regression: A functional form of log-log model was estimated using OLS regression to examine the relationship between public health expenditure and other variables (Table 3).

The results proved that income have positive effects on public health expenditure whereas unemployment, primary school enrollment and urbanization have negative effect on public health expenditure.

The model indicated that 1% increase in income causes and 0.18% increase in public health expenditure of a person. Therefore in case of Pakistan, if income of a person increases, his health expenditure also increases. Now an individual has more income to spend on his health than before.

The effect of primary school enrollment on public health expenditure was negative. 1% increase in primary school enrollment caused 0.078% decrease in public health expenditure of a person. Therefore as the primary school enrollment of children increases, public expenditure on health decreases.

Large portion of Pakistan's population is rural. Rural areas are deprived of basic health facilities and literacy rate is also very low. Therefore as the urban population (Percentage of total population) increases, public health

Table 2: Results of ADF for Unit root test:

Variables	Intercept			Trend and intercept		
	Level	1 st difference	Critical value	Level	1 st difference	Critical value
<i>Log Pche</i>	-0.882	-4.510*	-3.689*	-2.032	-4.321**	-3.580**
<i>Log Pcdp</i>	-0.654	-3.550**	-2.971**	-3.367***	-4.246	-3.238***
<i>Log Pse</i>	-3.255**	-4.709	-2.998**	-1.132	-3.574***	-3.254***
<i>Urban</i>	8.144*	0.106	-3.679*	4.611*	-4.810	-4.309*
<i>Unemp</i>	-1.611	-6.572*	-3.689*	-1.914	-6.584*	-4.323*

* shows the significance level at 1% and ** at 5% and *** at 10% level.

This was taken from Mankinon[31] one-sided p-values.

Table 3: OLS regression results

Independent Variables	Coefficient	t-value	R-squared	p-value	F-statistics
			0.095371		0.632553
<i>Constant</i>	-0.180914	-0.191774		0.8495	
<i>Log pcdp</i>	0.180131	0.329915		0.7443	
<i>Log pse</i>	-0.078503	-0.226932		0.8224	
<i>Urban</i>	-0.008262	-0.455196		0.6531	
<i>Unemp</i>	-0.012887	-1.378205		0.1809	

Dependent variable: log per capita health expenditure

After regression analysis, study model was specified as:

$Lpche = -0.180914 + 0.180131Lpcdp - 0.078503Lpse - 0.008262Lurban - 0.012887Lunemp$

Table 4: Granger causality results

Null Hypothesis:	Pair wise Granger Causality Tests		
	F-Statistic	Prob.	Conclusion
PCDP does not Granger Cause PCHE	0.14300	0.8675	PCDP....PCHE
PCHE does not Granger Cause PCDP	1.67118	0.2101	
PSE does not Granger Cause PCHE	4.32727	0.0254	PSE → PCHE
PCHE does not Granger Cause PSE	0.35526	0.7048	
URBAN does not Granger Cause PCHE	1.81024	0.1862	URBAN....PCHE
PCHE does not Granger Cause URBAN	0.14454	0.8662	
UNEMP does not Granger Cause PCHE	2.56909	0.0984	UNEMP....PCHE
PCHE does not Granger Cause UNEMP	0.45033	0.6429	
PSE does not Granger Cause PCDP	1.42629	0.2607	PSE....PCDP
PCDP does not Granger Cause PSE	0.78700	0.4671	
URBAN does not Granger Cause PCDP	2.51958	0.1025	URBAN....PCDP
PCDP does not Granger Cause URBAN	0.70749	0.5033	
UNEMP does not Granger Cause PCDP	5.94268	0.0083	UNEMP → PCDP
PCDP does not Granger Cause UNEMP	1.71567	0.2021	
URBAN does not Granger Cause PSE	7.05516	0.0041	URBAN → PSE
PSE does not Granger Cause URBAN	4.91378	0.0167	←
UNEMP does not Granger Cause PSE	0.61204	0.5508	UNEMP....PSE
PSE does not Granger Cause UNEMP	0.22399	0.8010	
UNEMP does not Granger Cause URBAN	1.08137	0.3558	UNEMP...URBAN
URBAN does not Granger Cause UNEMP	0.98344	0.3892	

spending decreases. 1% increase in urban population caused 0.008% decrease in public health expenditure of a person.

Unemployment rate had negative impact on public health expenditure. As the unemployment rate increases, public health expenditure decreases. 1% increase in unemployment rate caused 0.012% decrease in public health expenditure of a person.

Granger Causality Test: After applying OLS, Granger causality test was applied to check the causality between different variables. Causality refers to the ability of one variable to predict (Cause) the other.

According to study results; income, urban population and unemployment rate did not granger cause public health expenditure. There were no causality between these variables and public health expenditure

while primary school enrollment granger caused public health expenditure. There existed unidirectional relationship between primary school enrollment and public health expenditure.

There also existed unidirectional relationship between unemployment rate and income and bidirectional relationship between urban population and primary school enrollment.

CONCLUSIONS

This study explored the determinants of public health expenditure in Pakistan. The study included different socio-economic variables using time series data from the period 1980 to 2009. ADF unit root test was applied to check the stationarity of variables. A functional form of log-log model was estimated using OLS regression to examine the relationship between public health expenditure and other variables. Granger causality test was applied to check the causality between different variables. The OLS results proved that income have positive effects on public health expenditure whereas unemployment, primary school enrollment and urbanization have negative effects on public health expenditure. The causality test results showed that income, urban population and unemployment rate do not granger cause public health expenditure while primary school enrollment granger cause public health expenditure. There existed unidirectional relationship between primary school enrollment and public health expenditure.

As health is an important factor of economic growth, health care inequality can be harmful. This study suggested that public health expenditure is not independent of government policies in Pakistan. Therefore government should adopt some policies to increase public health expenditure and the availability of health facilities to rural areas. Government should also make strategy to increase primary school enrollment rate and decrease unemployment rate.

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