

## **DETERMINANTS OF HEALTH EXPENDITURE: A MACRO LEVEL EVIDENCE FROM INDIA**

Toby Joseph Mathew K.K<sup>1\*</sup>, Arabi. U<sup>2</sup>.

<sup>1</sup>Research Scholar, Department of Economics, Mangalore University,  
Mangalagangothri – 574119, Karnataka State, India.

<sup>2</sup>Professor and Research Guide, Department of Economics, Mangalore University,  
Mangalagangothri – 574119, Karnataka State, India.

### **ABSTRACT**

Good health remains one of the top most priorities of most governments in the world-of which the government of India is not an exception- and hence not surprising that it was part of the Millennium Development Goals (MDGs) 4 and 5 and currently Sustainable Development Goal (SDG) 3. However, one major driver of good health adopted by various governments is health expenditure. Hence in order to use health expenditure to gain good health, it is necessary to know the determinants of health expenditure. This study therefore used times series data on India from 1995-2014 whiles employing the Ordinary Least Square (OLS) regression and the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity as the empirical estimation techniques to investigate the determinants of health expenditure in India. The study found that, while life expectancy had a positive effect on total health expenditure, population and maternal mortality had negative effects. Also, whiles access to measles vaccine by children was found to decrease total health expenditure, death rate was found to increase it. Further, maternal mortality, life expectancy and death rate were found to have negative, positive and positive significant effects on public health expenditure respectively while access to measles vaccine by children was found to reduce private health expenditure in India. In addition, inflation and Gross Domestic Product (GDP) were found not have any significant effects on total, public and private health expenditures in India. It can therefore be concluded that, population, life expectancy, maternal mortality, access to measles vaccine and death rate are the determinants of health expenditure in India.

**Keywords:** Health Expenditure; India; Ordinary Least Square (OLS) regression

## **1.0 INTRODUCTION**

One of the most valuable assets that are very essential to life is good health. This is because good health has long term ramifications on economic growth and hence economic development. Thus when people are healthy, they are able to perform better at work which increases productivity leading to higher tax revenue and economic growth at that the macro level. Moreover, at the individual level, as healthy people work hard, they would gain higher income which means poverty reduction as well as ability to afford basic necessities of life such as clothing, shelter, good food etc. which may in the long run lead to economic development. For even children, good health is very important because it positively influences educational attainment. Therefore, it was not surprising that good health was part of the Millennium Development Goals (MDGs) - MDG 4 (reduce child mortality) and MDG 5 (improve maternal health) - and currently part of the Sustainable Development Goal (SDG) 3 (healthy lives and well-being).

Given the above, governments including that of India and stakeholders have resorted to attaining good health by increasing one of its major drivers-health expenditure. Thus governments and stakeholders have mostly sort to increase health expenditure in order to influence good health. However, in order to use health expenditure as a tool, it is important to investigate the factors that influence it. This study therefore investigated the determinants of health expenditure in India at the macro level. This is very important because even though health indicators such as under-five mortality rate and maternal mortality are estimated at 49 per thousand live births and 120 per hundred thousand live births (Singh, Maitra, Bhaskar, Pal & Hansrag, 2015) which are far above the SDG targets of 25 and 70 by 2030 respectively, health expenditure in India as a percentage of GDP is surprisingly very low. For example, data from the World Development Indicators (WDI) of the World Bank (2016), revealed that, total health expenditure as a percentage of GDP in India was 4.68509% in 2014 with an average of 4.292434% from 1995 to 2014 while public health expenditure, had an average of 1.126597% from 1995 to 2014 and private health expenditure had an average of 3.165837% for the same period.

Thus if really India wants to quell health challenges such as under-five and maternal mortalities, it is necessary to find out what are the determinants of health expenditure in order to be used as a tool to attain better health.

Further, given the above, it was very surprising to note that very little (see for example Hooda, 2015; Brinda, Rajkumar, Enemark, Prince & Jacob 2012; Pal, 2010; & Panda, n.d) has been done on the determinants of health expenditure in India. Moreover, aside the fact that the data used by these previous studies were comparatively older, none of them employed time series data to examine the determinants of health expenditure in India as whole (India as a single entity). This study therefore contributed to literature by being the first to the best of the authors' knowledge,

to investigate the determinants of total, public and private health expenditures in India at the macro level, using a much more recent data (1995-2014) which reflected the current situation better and hence better and timely policy recommendations.

## **2.0 LITERATURE REVIEW**

Theoretically, theories of public expenditure such as the Wagner's Law, the neoliberal argument and the compensation theory can be borrowed to find out the factors that may influence health expenditure.

From the Wagner's law we can say that as society advances, the populace will demand more of social development such as hospitals for better health which may ultimately increase public expenditure and hence public health expenditure. This rise in public expenditure and hence public health expenditure is normally generated by increases in economic growth (Guandong & Muturi, 2016). Regarding the neoliberal argument, it simply means globalization may make domestic firms less competitive and hence in order for government to make them competitive, government may reduce taxes which may reduce public expenditure and hence public health expenditure. However, per the compensation theory, due the negative effects of globalization such as income inequality, government in the attempt to compensate for these negative effects may increase welfare expenditure and hence may lead to an increase in public health expenditure (Sagarik, 2016).

Empirically, Nghiem and Connelly (2017) revealed that technological progress was the major driver of health expenditure among OECD countries. Shaikh and Singh (2017) found final household expenditures as a share of GDP to be the major determinant of out-of-pocket expenditure in India, Pakistan, Sri Lanka, Maldives, Nepal, Bangladesh and Bhutan. Khan, Razali and Shafie (2016) in Malaysia found that percentage of population age 65 years and above, percentage of the population under 15 years and population growth rate had negative significant effects on health care expenditure while life expectancy and income/GDP per capita had positive significant effects. Boachie et al. (2014) found that public health expenditure in Ghana is positively determined by real GDP, life expectancy and crude birth rates. Hosoya (2014) among 25 OECD countries found ageing and per capita real GDP to have positive effects on health expenditure. Angko (2013) found per capita GDP, urbanization rate, life expectancy, age structure and percentage of the population with access to basic health care to be the long run determinants of public healthcare expenditure in Ghana. Ehikioya and Mohammed (2013) found unemployment rate, political instability, population per physician, consumer price index and per capita GDP to be insignificant determinants of health expenditure in Nigeria while health expenditure share in GDP and population of 14 years and below were significant. Gregorio and Gregorio (2013) revealed among 159 nations that, for every increase in a nation's regime score

towards democratic authority, there were significant increments in per capita general government expenditures, the percentage of GDP expended on health care, total per capita expenditures on health and the percentage of general government expenditures targeted to health care while controlling for other factors. Samadi and Rad (2013) in Economic Cooperation Organization (ECO) countries found long term relationship between health expenditures per capita and GDP per capita, population above 65 years and below 15 years, urbanization and number of physicians. Nguyen, Häkkinen, Pekurinen, Rosenqvist and Mikkola (2009) in Finland found the main health expenditure determinants to be the rate of disability pensions, the municipal tax rate, the proportion of elderly, income, population density and the employment-to-population ratio, among others. Chaabouni and Abednnadher (n.d) found that, real GDP, environmental quality and ageing population had positive significant impacts on health expenditure in Tunisia. Furuoka, Yee, Kok, Hoque and Munir (n.d.) examined the determinants of health care expenditure in 12 Asian countries and found per capita real GDP and the percentage of population aged 65 years and above to have positive significant effects on health care expenditure.

Regarding studies conducted on only India or a part of it, Hooda (2015) examined the determinants of public health expenditure from 1987-88 to 2011-12 across the 16 major states of India and found that, engagement of people in politics of a certain state, fiscal capacity and reforms in health policy started in 2005 played an essential role in positively influencing government health expenditure. Brinda et al. (2012) investigated the determinants of out-of-pocket health expenditure among elderly people in Kaniyambadi block, Vellore (India) and found that, being male, depression, respiratory ailments, diabetes, malaria, tuberculosis, dementia, disability, poor sanitation and gastrointestinal diseases were associated with higher out-of-pocket expenditures. Pal (2010) using data from the 61<sup>st</sup> round of socio-economic survey (July, 2004 to June, 2005) in India found that, education can be used as a tool to decrease the incidence of catastrophic spending. Panda (n.d) investigated the determinants of state financing of health among south Indian States from 1993-94 to 2007-08 and found that, health spending was influenced positively by states' resource capacity, infant mortality rate and central transfers or revenue.

However regarding the studies conducted on only India or a part of it, aside the fact that the data used were comparatively older, none of them employed time series data to examine the determinants of health expenditure in India as whole (India as a single entity). This study therefore filled a major gap in the literature by being the first to the best of the authors' knowledge, to investigate the determinants of total, public and private health expenditures in India at the macro level, using a much more recent data (1995-2014) which reflected the current situation better and hence better and timely policy recommendations.

### 3.0 METHODS

This study used time series data on India from 1995-2014 sourced from the World Bank's World Development Indicators (2016). The study used 1995-2014 due to incomplete data on some periods for some variables. Thus we did not consider before 1995 and after 2014 since some variables had missing data. Concerning the empirical estimation technique, since we had time series data, the study used the Ordinary Least Square (OLS) regression as the empirical estimation technique while the Breusch-Pagan / Cook-Weisberg test was used to test for heteroskedasticity. Therefore the model for examining the determinants of total health expenditure (TE), public health expenditure (PB) and private health expenditure (PR) was as below:

$$HE_t = \alpha_0 + \alpha_1 INF_t + \alpha_2 P_t + \alpha_3 GDP_t + \alpha_4 LE_t + \alpha_5 MM_t + \alpha_6 UM_t + \alpha_7 IM_t + \alpha_8 DR_t + \alpha_9 TT_t + \alpha_{10} MS_t + \varepsilon_t \quad (1)$$

Where HE represented health expenditure proxied by total health expenditure (TE), public health expenditure (PB) and private health expenditure (PR) and as such a regression was run for each health expenditure proxy, INF, P, GDP, LE, MM, UM, IM, DR, TT and MS represented inflation, population size, gross domestic product, life expectancy, maternal mortality, under-five mortality, infant mortality, death rate, access to tetanus vaccines by newborns and access to measles vaccines by children respectively. Also  $\alpha_0$  referred to the intercept of the regression equation,  $\alpha_s$  referred to the coefficients of their respective variables and  $\varepsilon_t$  indicated the error term at time t.

### 4.0 RESULTS AND DISCUSSION

This section covered the regression results on the determinants of total health expenditure, public health expenditure and private health expenditure in India as shown below.

**Table 1: Regression Results on Determinants of Total Health Expenditure in India**

Variable	Coefficient	Standard Error	P-value
INF	-.0048861	.0119789	0.693
P	-3.91e-07	1.68e-07	0.045
GDP	-3.27e-14	3.11e-14	0.320
LE	18.90545	7.218829	0.028
MM	-.1615196	.0718236	0.051
UM	-.0131388	.5313995	0.981
IM	.4033599	.7101739	0.584
DR	18.51838	6.444018	0.018
TT	-.0098948	.0340665	0.778
MS	-.0237287	.0111698	0.063
Constant	-890.6115	337.6273	0.027

Source: Author's Computation from World Bank (2016)

N=20, Prob > F= 0.0030, R-squared =0.8919, Adj R-squared = 0.7718

Concerning the determinants of total health expenditure in India as in Table 1, the study showed that increases in total population decreased total health expenditure. Hence increasing population tends to reduce total health expenditure in India which is disturbing because as population rises, total health expenditure is expected to rise to match-up the rising population. This finding could be that, although population has increased in India, the necessary increment in total health expenditure is yet to be done. The finding on population is similar to those of Khan et al. (2016) in Malaysia who found population to decrease health expenditure. Further GDP was found to be insignificant which is similar to the findings of Ehikioya and Mohammed (2013) in Nigera but conflicts the findings of Khan et al. (2016), Boachie et al. (2014) in Ghana, Hosoya (2014) among 25 OECD countries, Chaabouni and Abednnadher (n.d) in Tunisia, and Furuoka et al. (n.d.) in 12 Asian countries who found GDP/real GDP/per capita GDP/real per capita GDP to increase health expenditure. The finding on GDP could be that most growth enhancing expenditures were not done in the health sector.

Also, maternal mortality and life expectancy had negative and positive 10% and 5% significant coefficients respectively. Thus, percentage increases in maternal mortality and life expectancy decreased and increased total health expenditure respectively. Thus whiles maternal mortality decreased total health expenditure, life expectancy increased it.

The result on life expectancy which is in line with those of Boachie et al. (2014) was anticipated because the higher the life span of a populace, the more will be the spending on health. Moreover, quiet surprising was the result on maternal mortality, which gave the impression that, rising maternal mortality decreased total health expenditure. Also, it was found that whiles access to measles vaccine decreased total health expenditure, death rate increased it. The result on death rate implies that, as death rate rises, stakeholders try to increase health expenditure which could decrease deaths especially those related to sickness. Also, the result on measles vaccine could be that, when children get immunized, they grow to become healthy adults and therefore the less probability of increasing total health expenditure. The **Prob > F= 0.0030** revealed that although some variables were not significant statistically, together, all the variables had an impact on total health expenditure in India.

**Table 2: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity**

<b>Ho: Constant variance</b>	
<b>Chi2(1)</b>	<b>Prob &gt; chi2</b>
0.04	0.8450

**Source:** Author's Computation from World Bank (2016)

Further, the finding from the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity concerning the total health expenditure model as shown in Table 2 revealed no heteroskedasticity and hence showed how strong the model was.

**Table 3: Regression Results on Determinants of Public Health Expenditure in India**

Variable	Coefficient	Standard Error	P-value
INF	-.0062988	.0059594	0.318
P	-1.24e-07	8.35e-08	0.171
GDP	2.39e-15	1.55e-14	0.881
LE	7.942116	3.591341	0.054
MM	-.088681	.035732	0.035
UM	.4779143	.2643693	0.104
IM	.0527685	.3533089	0.885
DR	6.268422	3.205875	0.082
TT	.0067718	.016948	0.699
MS	-.0010208	.005557	0.858
Constant	-434.2481	167.9683	0.029

Source: Author’s Computation from World Bank (2016)

N=20, **Prob > F**= 0.0011, **R-squared** = 0.9152, **Adj R-squared** = 0.8210

Concerning the determinants of public health expenditure as seen in Table 3, it was found that, a percentage rise in life expectancy led to a 7.94% increase in public health expenditure. This finding on life expectancy was as expected because the higher the life span of a populace, the more will be the spending by government on health (health investment).

Also on how public health expenditure was impacted by maternal mortality, the results showed that a 1 percent rise in maternal mortality decreased public health expenditure by 0.09% and suggested that rising maternal mortality reduced public health expenditure. This finding is very surprising and hence government must increase public health expenditure to be in line with the rate of maternal deaths in order to tackle the menace.

Also, a percentage rise in death rate was revealed to increase public health expenditure by 6.27%. Thus, as death rates increased, government try to increase the expenditure on health which could reduce deaths especially those related to sickness. The **Prob > F**= 0.0011 revealed that although some variables were not significant statistically, together, all the variables had an impact on public health expenditure in India.

**Table 4: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity**

<b>Ho: Constant variance</b>	
<b>Chi2(1)</b>	<b>Prob &gt; chi2</b>
0.93	0.3350

**Source:** Author’s Computation from World Bank (2016)

Regarding heteroskedasticity, the finding from the Breusch-Pagan / Cook-Weisberg test for the public health expenditure model as shown in Table 4 revealed no heteroskedasticity and hence showed how strong the model was.

**Table 5: Regression Results on Determinants of Private Health Expenditure in India**

<b>Variable</b>	<b>Coefficient</b>	<b>Standard Error</b>	<b>P-value</b>
<b>INF</b>	.0014127	.0130696	0.916
<b>P</b>	-2.66e-07	1.83e-07	0.180
<b>GDP</b>	-3.51e-14	3.39e-14	0.328
<b>LE</b>	10.96334	7.876141	0.197
<b>MM</b>	-.0728387	.0783635	0.377
<b>UM</b>	-.4910528	.5797862	0.419
<b>IM</b>	.3505927	.7748389	0.662
<b>DR</b>	12.24996	7.030779	0.115
<b>TT</b>	-.0166666	.0371685	0.664
<b>MS</b>	-.0227079	.0121869	0.095
<b>Constant</b>	-456.3639	368.37	0.247

**Source:** Author’s Computation from World Bank (2016)

**N=20, Prob > F= 0.0511, R-squared = 0.7757, Adj R-squared = 0.5265**

Tackling the determinants of private health expenditure in India as in Table 5, all the variables with the exception of access to measles vaccine by children were insignificant. Thus the study found that population, inflation, gross domestic product, maternal mortality, under-five

mortality, infant mortality, life expectancy, access to tetanus vaccine by newborns and death rate had no statistically significant effects on private health expenditure in India.

However, concerning access to measles vaccine for children, it was found that, a 1% rise in access to measles vaccine by children decreased private health expenditure by 0.02%.

Also, although most of the variables were insignificant, the **Prob > F**= 0.0511 showed that, together all the variables had an impact on private health expenditure in India.

**Table 6: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity**

<b>Ho: Constant variance</b>	
<b>Chi2(1)</b>	<b>Prob &gt; chi2</b>
0.97	0.3257

**Source:** Author's Computation from World Bank (2016)

Concerning heteroskedasticity, the finding from Table 6 revealed no heteroskedasticity in the private health expenditure model and thus showed how strong the model was.

### **5.0 CONCLUSION**

From the findings, it can be concluded that, while life expectancy had a positive effect on total health expenditure, population and maternal mortality had negative effects. Also, while access to measles vaccine by children decreased total health expenditure, death rate was found to increase it. Further, maternal mortality, life expectancy and death rate can be concluded to have negative, positive and positive significant effects on public health expenditure respectively while access to measles vaccine by children can be concluded to reduce private health expenditure in India. In addition, inflation and GDP can be said to have no significant effects on total, public and private health expenditures in India.

Therefore key stakeholders and Government of India should ensure that health expenditure is increased to match-up maternal mortality rate as well as the rate of population growth. Thus, the study found that as maternal mortality and total population increased, total health expenditure decreased. Also maternal mortality was found to decrease public health expenditure.

In all it can be said that, stakeholders and Government of India should pay attention to population, life expectancy, maternal mortality, access to measles vaccine and death rate in the attempt to influence health expenditure.

**Acknowledgement:** We wish to thank the World Bank for granting free access to data.

**Conflicts of Interest:** none

**REFERENCES**

- Angko, W. (2013). The Determinants of Healthcare Expenditure in Ghana. *Journal of Economics and Sustainable Development*, 4(15).
- Boachie, M.K., Mensah, I.O., Sobiesuo, P., Immurana, M., Iddrisu, A-Z & Kyei-Brobbe, I. (2014). Determinants of Public Health Expenditure in Ghana: A Cointegration Analysis. *Journal of Behavioural Economics, Finance, Entrepreneurship, Accounting and Transport*, 2, (2), 35-40. DOI:10.12691/jbe-2-2-1
- Brinda, E. M., Rajkumar, A. P., Enemark, U., Prince, M. & Jacob, K.S. (2012). Nature and determinants of out-of-pocket health expenditure among older people in a rural Indian community. *International Psychogeriatrics* 24(10), 1664–1673.
- Chaabouni, S., & Abednnadher, C. (n.d). The determinants of health expenditures in Tunisia: An ARDL bounds testing approach.
- Ehikioya, I.L. & Mohammed, I. (2013). Determinants of Public Health Care Expenditure in Nigeria: An Error Correction Mechanism Approach. *International Journal of Business and Social Science*, 4(13).
- Furuoka, F., Yee, B.L.F., Kok, E., Hoque, M.Z. & Munir, Q. (n.d.).What Are the Determinants of Health Care Expenditure? Empirical Results from Asian Countries. *Sunway Academic Journal Volume*,8.
- Gregorio, L.E & Gregorio, D.I. (2013). Polity and health care expenditures: The association among 159 nations. *Journal of Epidemiology and Global Health*, 3, 49–57.
- Guandong, B.Y.D. & Muturi, W.M. (2016). The Relationship between Public Expenditure and Economic Growth in South Sudan. *International Journal of Economics, Commerce and Management*, 4(6).
- Hooda, S.K. (2015). Determinants of Public Expenditure on Health in India: The panel data estimates. Institute for Studies in Industrial Development, New Delhi, working paper 177.
- Hosoya, K. (2014). Determinants of Health Expenditures: Stylized Facts and a New Signal. *Modern Economy*, 5, 1171-1180.

- Khan, H.N., Razali, R.B. & Shafie, A.B. (2016). Modeling Determinants of Health Expenditures in Malaysia: Evidence from Time Series Analysis. *Frontiers in Pharmacology*, 7 (69). doi: 10.3389/fphar.2016.00069
- Nghiem, S.H. & Connelly, L.B. (2017). Convergence and determinants of health expenditures in OECD countries. *Health Economics Review*, 7 (29). DOI 10.1186/s13561-017-0164-4
- Nguyen, L, Häkkinen, U, Pekurinen, M, Rosenqvist, G, & Mikkola, H. (2009). Determinants of health care expenditure in a decentralized health care system. National Institute for Health and Welfare (THL), Discussion Papers 21/2009, Helsinki.
- Pal, R. (2010). Analysing Catastrophic OOP Health Expenditure in India: Concepts, Determinants and Policy Implications. Indira Gandhi Institute of Development Research, Mumbai. WP-2010-001.
- Panda, P.K. (n.d). Determinants of State level Financing of Health: Evidence from Southern Indian States.
- Sagarik, D. (2016). Determinants of Health Expenditures in ASEAN Region: Theory and Evidence. *Millennial Asia* 7(1) 1–19. DOI: 10.1177/0976399615624054
- Samadi, A. & Rad, E.H. (2013). Determinants of Healthcare Expenditure in Economic Cooperation Organization (ECO) Countries: Evidence from Panel Cointegration Tests. *International Journal of Health Policy and Management*, 1(1), 63-68.
- Shaikh, I. & Singh, S. (2017). On The Examination of Out-Of-Pocket Health Expenditures In India, Pakistan, Sri Lanka, Maldives, Bhutan, Bangladesh and Nepal. *Verslas: Teorija Ir Praktika / Business: Theory And Practice*, 18: 25–32. <https://doi.org/10.3846/btp.2017.003>
- Singh, S.N., Maitra, S., Bhaskar, S., Pal, R.P, & Hansrag, (2015). Millenium Development Goals, India Country Report 2015, Social Statistics Division Ministry of Statistics and Programme Implementation Government of India.
- World Bank (2016). World Development Indicators