# REVIEW ARTICLE

# HEALTH EXPENDITURE AND ITS REPERCUSSIONS ON HEALTH STATUS-AN ANALYSIS OF SOUTH-ASIAN COUNTRIES

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| ARTICLE INFO | ABSTRACT |
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| | Government has an essential role in making the health of its population and this role has risen substantially in today's scenario. This scenario is unlike that of private sector where the prices are high and question of affordability is the biggest challenge thus it becomes prior to study the causality between public health expenditure and health status. The prime objective of this study is to figure out the impact of per capita public health expenditure on health status of the population across countries using infant mortality rate, maternal mortality rate, and under-5 mortality rate as proxies using cross-sectional data of South-Asian countries. Dataset has been prepared by taking annual data for the years 1994 onwards till 2014 from World Bank and World Development Indicators. We adopt a robust Fixed Effects (FE) model as the baseline specification and compare the results with robust OLS and robust OLS with lagged explanatory variables. This study unveils that public health expenditure although is an important factor affecting health outcomes but other social factors such as education, poverty, strong governance, community involvement at all the levels etc. does have a strong impact on health status of a country. |

## INTRODUCTION

Improvement in human capital is sought as a foundation for economic growth and development in economics. Developing nations has the potential to compete against the developed by focusing upon enhancing their labour productivity which is a direct function of the health of its populace. Government has an essential role in making the health of its population and this role has risen substantially in today's scenario. The equity dimension of provision of health related goods, infrastructure to support its provision, the required number of doctors, nurses and midwives-all are or to say, can be ensured by government financing if provided efficiently. This scenario is unlike that of private sector where the prices are high and question of affordability is the biggest challenge thus it becomes prior to study the causality between public health expenditure and health status. The link between health expenditure and health status is ambivalent. There exists a wide range of thoughts ranging from positive to negative to no association between health expenditure and health status.

If we trace it to the economics literature, we can find three directions for the possible linkages as to what will be the effect of public health spending on health outcomes. First, there is an "economic growth oriented view" according to which government spending does not have any impact on the health outcomes and it is the broader macroeconomic conditions of an economy which will guide and be a prime factor that influences the health status of an economy, Second set of studies favor the linkage between public health spending and the health status of an economy, There is yet another set of opinions and studies like one by Rajkumar and Swaroop (2008) [1]who found out that public health spending do have an impact on the health outcomes but the linkage is driven by the presence of other factors such as efficiency, bureaucracy effectiveness, and so on.[1] Furthermore demographic composition, community involvement and other socio-economic factors also influence the impact of increasing public health spending on the health status of its populace. Thus the debate centring around the relationship between public health

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[1]Andrew Sunil Rajkumar, Vinaya Swaroop, Public spending and outcomes: Does governance matter? Journal of Development Economics 86 (2008) 96–111.

expenditure and health outcomes is inconclusive in the presence of such diversified perspectives. Poullier *et al.* (2002)[2] in their study has conceptualised three broad patterns of causality by taking account of spending differentials across countries: Firstly the countries spending low initially show a significant positive association between spending and health outcomes, secondly their study asserts that good governance is a significant contributor to better health outcomes even in those countries where health status is decent despite lower level of spending and lastly Poullier *et al.* concluded that in countries where health spending is already very high the impact of increment is marginal only.[2] While some studies show that the marginal product of health care is negligible in industrialised and high income group countries other studies asserts that medical care is productive at margins despite high spending. (Or 2001)[3] Poullier *et al.* further mentioned about the inequalities in health spending across nations ranging from Africa accounting for 3 per cent of total world's health spending catering 10 per cent of the world's population to Asia and the Pacific (the region including China), catering 25 per cent of the world's population but spends only 2 per cent of world health spending (Poullier *et al.* (2002), pp.7-8).[2] Furthermore financing is not the only way by which governments intervene in the health sector but it can also use different interventions and provisions to make its presence effective in the health care sector for instance a study by Cevik & Tasar (2013) asserted that the government can influence the health sector by altering the amount of public money on health care, changing its social welfare system and regulating the private health sector (Cevik & Tasar, 2013, p. 82)[4].

However the role of government spending on health cannot be neglected. On an average, share of government's spending in

the total health expenditure is substantial in the world. For instance according to World Bank data[5] for the year 2014 developed nations like United States, Germany, Japan, Australia etc. spends more than 8 per cent of their GDP on public health expenditure. However for developing nations like India, Bangladesh and Afghanistan the corresponding figure is only 1.4, 0.8 and 2.9 per cent respectively in the year 2014[5]. However, owing to the differentials in the income levels of different countries, the spending also varies across different countries. Cevik & Tasar, 2013 mentions that the proportion is as high as 8.2% in OECD countries and as low as 2.9% in sub-Saharan countries which accounts for the lowest level of government health spending standing far below the world average (Cevik & Tasar, 2013)[4]. Owing to such high expenditure on health care in high income countries, Or, z (2001) observes that in OECD countries, health status indicators like life expectancy, infant and perinatal mortality, and potential years of life lost from various causes have seen improvement over time particularly from 1960s. Over the past three decades, health status in all OECD countries has improved significantly. The results confirm that there is a significant potential for public health initiatives such as anti-smoking and anti-drinking campaigns to improve health status. Thus an effective health policy framework has to recognise the role for public health with well defined objectives to attain a decent standard of health in a country. (Or, 2001)[6]. Contrary to high income OECD countries, a study by Novignonet. al concluded that majority of the countries in sub Saharan Africa (SSA) rely on donor grants for financing health care as health care expenditure has been low in this region which may be due to the poor tax systems and social security structures. This could be seen from poor health infrastructure and workforce in the light of resource constraints, high catastrophic expenses
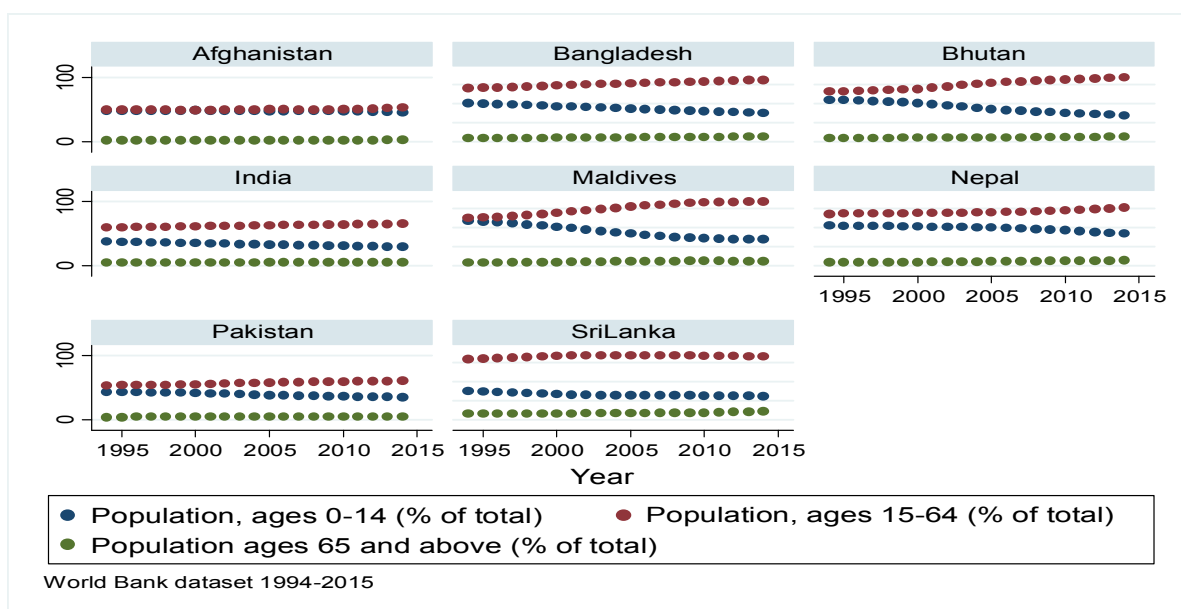


**Figure 1. Demographic structure of South-Asian Countries**

[2]Poullier J-P, Hernandez P, Kawabata K, Savedoff DW. Patterns of global health expenditures: Results for 191 countries. WHO Discussion Paper No 51. 2002.
[3] Or, Z. (2001), "Exploring the Effects of Health Care on Mortality Across OECD Countries", OECD Labour Market and Social Policy Occasional Papers, No. 46, OECD Publishing
[4]Savas Cevik.& M Okan Tasar, Public spending on health care and health outcomes: cross-country comparison, Journal of Business, Economics & Finance (2013), Vol.2, Issue 4.

across the regions despite high poverty levels, under developed public health insurance systems and health care systems based on ability-to-pay. Such grants are often inadequate and

[5]http://data.worldbank.org/indicator/SH.XPD.PUBL.ZS?order=wbapi_data_value_2014+wbapi_data_value+wbapi_data_value-last&sort=desc
[6]Or, Z. (2001), "Exploring the Effects of Health Care on Mortality Across OECD Countries", OECD Labour Market and Social Policy Occasional Papers, No. 46, OECD Publishing

unsustainable given the intensity of health care burden in this region. (Novignon et. al.2012)[7]. Amidst the two extremes lie South-Asian countries which have been characterized as lower middle income countries recording robust economic growth at a rapid pace over the years (World Bank)[8]. The economic growth manifested itself into decline in poverty and development of human resource. However the skewed positive effects of growth are prevalent since despite recording high growth rates the poverty remains very high in the region thereby a large population "suffer from extreme forms of social exclusion and huge infrastructure gaps".8 Thus the role of government becomes even more crucial to ensure equitable access to basic amenities for its populace.

Figure 1 depicts the demographic distribution of South-Asian countries over the years. It is observed that South-Asian countries has a very high proportion of population in the working age thus there exists a potential gain that can be reaped from demographic dividend that these countries possess. Further it is observed that persistently the share of population above the age of 65 has been low and stagnant throughout the years indicating lower life expectancy in these countries. In lieu of the fact that majority of the population is in the age group of 15-64 and miniscule proportion in the age group of 65 plus it becomes crucial to study the health status of the people residing in these countries and role of government in bringing about a change, if any in the health status of its populace. On an average spending on Public Health Expenditure as a percentage of GDP in South Asian Countries excluding Iran has increased from 1.7 per cent in 1995 to 2.3 per cent in 2013 With respect to enhanced allocation of funds over the years it becomes even more important to study the overall performance of key health indicators in South Asian Countries.

## Objective

The pattern, proportion and direction of health spending differs across various countries and with respect to such differential pattern of spending and a complex environment in which health system remains, it is worth-while to see whether just by increasing government spending on health can prove to be beneficial for a country's health system or not. Thus the prime objective of this study is to analyze the impact of per capita health expenditure and other public and private components of health care expenditure on health status of its population across South-Asian Countries using infant mortality rate, under 5 mortality rate, maternal mortality rate as proxies. The specific objective of the study includes analyzing the patterns and differences in health spending and health status across South-Asian countries, determining which of the health expenditure (public or private) factor is a significant contributor in improving health status, examining the key factors affecting the maternal and child health over the years and evaluating income-based differentials, if any in the health status of the South-Asian countries.

## Review of Literature

There exists a wide range of studies analyzing the impact of government health expenditure on the health status. Studies show mixed results about relationship between public health expenditure and health status. Some studies have found that though it does affect health outcomes, but is not the dominant driver. Some researchers have found factors like education, income and cultural differences, technological change to be major drivers of health outcomes while others have found a significant association between public health expenditure and health outcomes. A study by Nixon and Ulmann (2006) states that the process of establishing a relationship between health expenditure and health outcomes is complicated due to difficulties involved in defining health expenditure and presence of other important variables that affect health outcomes and as Wagstaff and Cleason (2004), mentioned in their study that health goals cannot be achieved only by increasing the government spending and in order to achieve the health goals under Millennium Development Goals there is a need to strengthen the policies and institutions not only within health sector but beyond that as well[9]. Nixon and Ulmann's (2006) results show a strong significant association between public health expenditure and reduction in infant mortality rate in European Union, however there is only a marginal influence of health expenditure on life expectancy as per their econometric exercise.[10] Similarly Novignon et al. (2012) have highlighted the crucial role of public health spending to improve the health status in Sub-Saharan African countries and further the authors asserted that countries where health infrastructure is underdeveloped, health care expenditure can prove to be an important step towards the health-related Millennium Development Goals (MDGs) and health development. [7]

A study of 17 OECD countries by Kim and Lane (2013) showed significant association of increment in health expenditure with reduction in infant mortality rate and increment in life expectancy using mixed-effect model for the year 1973 to 2000[11] furthermore time series data from 21 OECD countries showed that a larger share of public financing of health care is also associated with lower rates of premature, perinatal and infant mortality. (Leu, 1986; Babazano, 1994; Or, 2000 as cited in Or, 2001)[12] Berger & Messer (2002) in their study has concluded that mortality rate does not only depend upon health spending but also on the type of health insurance coverage in OECD countries.[13] Various studies using data for both developed and developing countries show that income is the major determinant of the population's health status, while the ratio to GDP of public spending on health care, as well as the share of public outlays in total health care spending, are relatively poor predictors of cross-country differentials in health indicators (Filmer and Pritchett, 1999; Filmer et al., 2000; Jack,1999 as cited in E. Baldacci et al, 2003)[14] However as Or (2001) mentions in the study that although there exists inequalities across various social-economic classes but the reason behind their existence is less clear.[6] The author further mentions that education is an important factor explaining

[7]NovignonJ.,Olakojo S. &Nonvignon J. (2012) "The effects of public and private health care expenditure on health status in sub-Saharan Africa: new evidence from panel data analysis," Health Economics Review, Springer, vol. 2(1), pages 1-8, December.

[8]http://www.worldbank.org/en/region/sar/overview#1

[9]Adam Wagstaff and Mariam Claeson (2004), The Millennium Development Goals for Health, Rising To The Challenges, 29673, The World Bank.

[10]John Nixon and Philippe Ulmann (2006) The relationship between health care expenditure and health outcomes.

[11]Tae Kuen Kim and Shannon R. Lane (2013), Government Health Expenditure and Public Health Outcomes: A Comparative Study among 17 Countries and Implications for US Health Care Reform.

[12] Or, Z. (2001), "Exploring the Effects of Health Care on Mortality Across OECD Countries",

[13] Berger, Mark. C. & Messer, Jodi. (2002) "Public financing of health expenditures, insurance, and health outcomes", Applied Economics, 34, 2105–2113.

differences by enabling important decisions involving choice of job, ability to adopt a healthy life style, effective use of medical care, etc. (Or,2001)[6] and as Baldaccie et.al, (2003) asserts that unfavourable initial conditions like high illiteracy rates reduce the effectiveness of public health care spending.[14] The differential impact of public health spending on health status can be justified on grounds of variations in the socio-economic factors specific to a country.

Various authors have identified the associated factors for example a time series analysis by Akinkugbe *et al*. Showed in addition to public health expenditure, availability of practitioners, child immunisation and female literacy matters (as cited in Novignonet. Al. 2012)[15] , another study by Anyanwu and Erhijakpor (2007) have used the panel data for African countries and have shown that although Total Health Expenditure (public and private) is a significant contributor to improvement in health outcomes, contributors like ethno linguistic fractionalization and HIV prevalence leads to deterioration of health outcomes and on the other hand factors like higher female literacy rate and higher number of physicians have a significant impact upon reduction in mortality indicators.[16] Thus as asserted by Anton and Onofrei in their study that despite a significant role played by health spending and GDP in Central and eastern European countries in determining the inter country differentials in the health status, the role of various factors related to lifestyle in determining the differentials cannot be neglected[17] Coming to the effect of private health expenditure, a study conducted by Rad (2013) using a panel data for Eastern Mediterranean countries from 1995 to 2010 found out that there is no significant association between private health expenditure and infant mortality rate(as a variable explaining health status).[18]

A study by Grigoli and Kapsoli highlights that it is the efficiency with which expenditure is allocated which affect the health outcome and jut by increasing health expenditure does not have a significant effect on the health outcomes[19] and similarly as suggested by Poullier *et al* a better public policy has the potential to improve the health outcomes by improving efficiency with which the available resources are utilised, even when health spending remains low since the positive association between health expenditure and improved health outcomes does exist but the strength of impact varies depending upon the efficiency with which a policy is implemented.[20] Thus the literature summarizes to the conclusion that although public health expenditure is an important component that determines the health status of a country but the other important factors like good governances, female literacy, access to sanitation, availability of doctors, physicians and other health personnel, efficacy with which the

policy is implemented and the resources are allocated etc. plays a pivotal role in determining the health status of a country.

**Data and Methods**

Dataset has been prepared by taking annual data from 1994 onwards till 2014 for all the South-Asian countries from World Bank website (/data.worldbank.org/). The year 2014 has been taken since the latest data was available for this year furthermore 1994 was chosen as the base year to show the improvements (if any) in 2 decades. In this paper, health outcome is proxied by three major health indicators maternal, under-five and infant mortality rates for the analysis. The countries incorporated in the data set include Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. Iran has been dropped for the analytical purpose since it has been included in the South-Asian countries recently due to political reasons. The panel data of the South-Asian countries was tabulated and analyzed using statistical software packages like STATA and SPSS. The important variables used for the analytical purpose are as mentioned below:[21]

**Dependent Variables**

- Infant mortality rate(IMR)
- Maternal mortality rate (MMR)
- Under-5 mortality rate

**Independent Variables and Control Variables**

- Public health expenditure
- Total Fertility rate
- Female Literacy Rate
- Access to improved sanitation facilities and Access to Improved Water Source
- Out of pocket expenditure

The association between health expenditure and health status will be estimated by regressing the cross countries health indicators on a set of regressors of two types: public and private health expenditure along with various control variables. The equation that will be estimated to analyze the null hypothesis that there is no relation between per capita public health expenditure and health status against the two tailed alternative hypothesis that there is a statistically significant relationship between per capita public health expenditure and health status is as follows:

$$InYit = b\circ + b1INX1it + b2Xnit + uit + vi$$

Where *InYit* is the log of dependent variable for country 'i' and time period 't', For the purpose of study MMR, IMR and U5MR has been used as dependent variables as proxies for health outcomes. InX1it is the log of per capita public health expenditure(PHE/population) measured in current US dollars of country 'i' and time period 't' and Xn represents the other independent and control variables for example out of pocket expenditure, total fertility rate female literacy rate, access to improved sanitation facilities etc. The coefficient $b\circ$ represents the intercept and *b1* and *b2* represents the slope of dependent variable with respect to change in corresponding independent and control variables, *uit* represents the time variant error terms and *vt* represents country specific variables which are time-invariant.

[14]Baldacci E. ,Guin-Siu M.T., Mello L.D.(2003)"More On The Effectiveness Of Public Spending On Health Care And Education: A Covariance Structure Model

[15]Novignon J. ,Olakojo S. &Nonvignon J. (2012) "The effects of public and private health care expenditure on health status in sub-Saharan Africa: new evidence from panel data analysis,"

[16] John C. Anyanwu and Andrew E. O. Erhijakpor (2007), Health Expenditures and Health Outcomes in Africa

[17]Sorin Gabriel Anton and Mihaela Onofrei, Health Care Performance and Health Financing Systems in Countries from Central and Eastern Europe

[18]Rad, E.H. ,2013, "Comparison of the Effects of Public and Private Health Expenditures on the Health Status: A Panel Data Analysis in Eastern Mediterranean Countries".

[19] Francesco Grigoli and Javier Kapsoli, Waste Not, Want Not: The Efficiency of Health Expenditure in Emerging and Developing Economies.

[20]Jean-Pierre Poullier Patricia Hernandez Kei Kawabata William D. Savedoff (2002), Patterns of Global Health Expenditures: Results for 191 Countries.
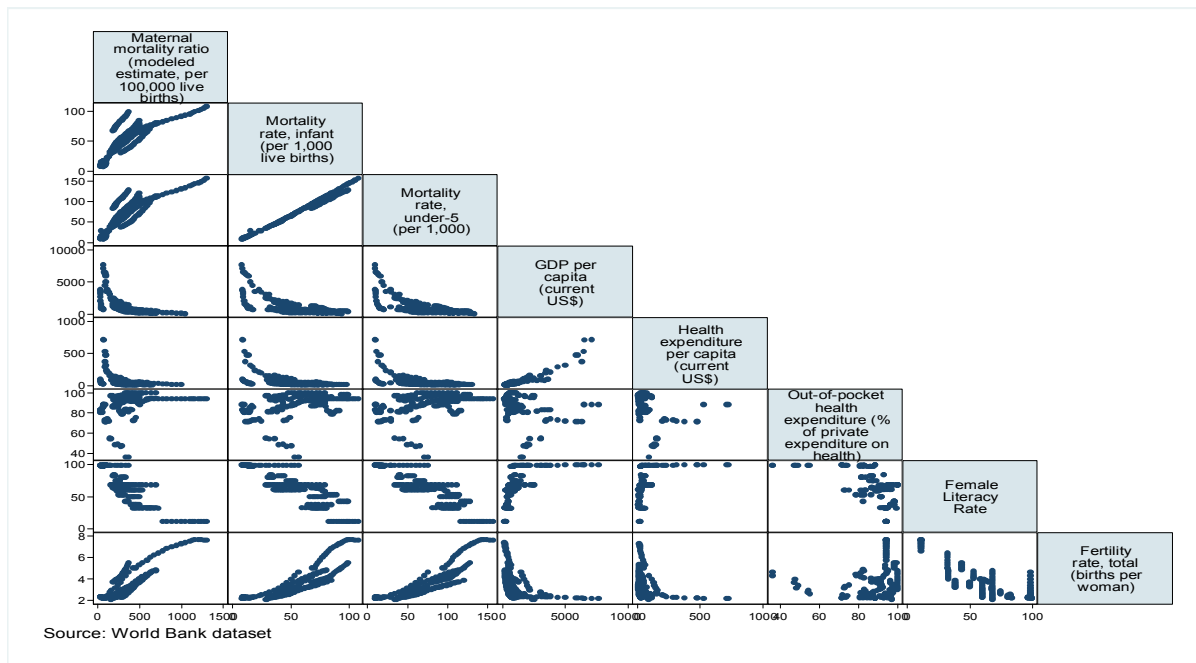
[21] World Bank Definitions

Source: World Bank dataset

**Figure 2. Scatter Plot Matrix of Relationship between Key variables at a Glance**

**Table 1. Descriptive statistics of Selected Variables**

|  | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Variables | N | mean | Std. dev | min | max |
| GDP per Capita | 161 | 1,284 | 1,457 | 119.9 | 7,635 |
| Population | 168 | 1.85e+08 | 3.62e+08 | 245000 | 1.30e+09 |
| Per Capita Health Expenditure | 145 | 69.98 | 114.95 | 8.45 | 720.46 |
| Infant Mortality Rate (IMR) | 168 | 52.89 | 26.94 | 7.800 | 107.7 |
| Under 5 Mortality Rate (U5MR) | 168 | 70.49 | 38.26 | 9.200 | 156.8 |
| Maternal Mortality Ratio | 168 | 345.1 | 357.2 | 31.10 | 1,600 |
| Private Health Expenditure (as a % of GDP) | 145 | 2.849 | 1.616 | 0.612 | 8.692 |
| Public Health Expenditure (as a % of GDP) | 168 | 2.021 | 1.464 | 0.551 | 6.607 |
| Total Health Expenditure (as a % of GDP) | 145 | 4.955 | 1.898 | 2.553 | 11.37 |
| Life Expectance at Birth | 160 | 65.31 | 5.69 | 52.61 | 76.60 |
| Life Expectance (Male) | 160 | 64.18 | 5.31 | 51.57 | 75.63 |
| Life Expectancy (Female) | 160 | 66.49 | 6.20 | 53.713 | 77.63 |
| Total fertility Rate | 160 | 3.62 | 1.48 | 2.08 | 7.63 |
| Female Literacy Rate | 168 | 64.19 | 26.11 | 11.14 | 99.36 |
| % of Population with access to improved sanitation facilities | 168 | 48.18 | 24.38 | 11.40 | 98 |
| % of Population with access to improved water source | 168 | 80.04 | 18.05 | 21.40 | 100 |
| Number of Countries | 8 | 8 | 8 | 8 | 8 |

Source: World Bank

**Table 2. Mean Values of the Selected Health Indicators across Countries**

| Countries | Infant Mortality Rate | Maternal Mortality Ratio | Under 5 Mortality Rate |
|---|---|---|---|
| Afghanistan | 87.07 | 876 | 123.87 |
| Bangladesh | 55.04 | 336.81 | 73.89 |
| Bhutan | 49.81 | 355.52 | 66.01 |
| India | 58.50 | 313.19 | 79.01 |
| Maldives | 26.52 | 156.67 | 33.33 |
| Nepal | 51.23 | 469.47 | 68.07 |
| Pakistan | 82.26 | 268.43 | 104.44 |
| Sri Lanka | 12.63 | 47.24 | 15.25 |
| Total | 52.88 | 352.92 | 70.488 |

Source: World Bank

**Table 3. Mean values of Country-Specific Indicators**

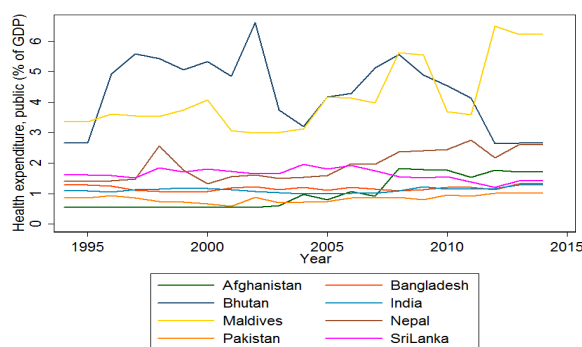| Country | Female Literacy rate | Total fertility rate | Improved water source | Improved sanitation facilities |
|---|---|---|---|---|
| Afghanistan | 19.13153 | 6.77975 | 37.45238 | 25.78571 |
| Bangladesh | 55.02901 | 2.89245 | 78.9381 | 49.52857 |
| Bhutan | 67.96426 | 3.2054 | 88.59048 | 37.1381 |
| India | 65.87406 | 3.0726 | 84.44762 | 29.60952 |
| Maldives | 98.70483 | 2.82505 | 96.3619 | 85.95714 |
| Nepal | 54.80621 | 3.52965 | 80.98095 | 28.09524 |
| Pakistan | 54.54768 | 4.368 | 89.28095 | 44 |
| Sri Lanka | 97.49372 | 2.29015 | 84.2381 | 85.34286 |
| Total | 64.19391 | 3.620381 | 80.03631 | 48.18214 |

Source: World Bank

The dependent variables and independent variable PHE/population are transformed into logarithm form and log-log functional form is chosen to take account of the skewness present in the data and to make scale neutral interpretations. Hausman test has been done to choose between fixed and random effects model and fixed effects model was chosen as baseline specification model after testing the respective coefficients. The null hypothesis will be analysed using fixed effects model to address the problem of unobserved heterogeneity in the data and the results will be compared with robust Ordinary Least Squares (OLS) estimates and OLS with lagged explanatory variable/s. Figure 2 represents the scatter plot matrix of relationship between the key variables that will be analyzed in the study. The descriptive statistics of key variables are as given in Table 1, 2 and 3. The study henceforth will focus upon econometric estimations and results. The sub topic econometric estimations and results is divided into five sections Section one includes evaluating trends in the public health expenditure as a percentage of GDP across countries, Section two deals with the bifurcation of the two components of Health Expenditure (Public and Private) and study their respective shares in total health expenditure across countries and years. Section three deals with identifying the key factors affecting the key health indicators MMR, IMR and U5MR individually and study the differences prevalent across countries. Section four gives an overview of the trends in health expenditure and performance of health indicators across countries stratified into income groups. Section five presents a brief discussion, conclusion and policy recommendations based on the results.

## Econometric Estimations and Results

Figure 3 shows the trends of public health expenditure (as a percentage of GDP) which according to World Bank definition comprises of "recurrent and capital spending from government (central and local) budgets, external borrowings and grants (including donations from international agencies and nongovernmental organizations), and social (or compulsory) health insurance funds" [21] It is observed that Maldives is spending the highest proportion of their GDP in the year 2014 on health amongst South-Asian countries, it has nearly doubled from 3.4 percent to 6.2 per cent amidst the two decades. Maldives ranks second in perfomance of the major health indicators as shown in Table 2 standing just next to Sri Lanka where despite increase in per capita GDP the proportion of health spending has declined over the years. Countries like Afghanistan, Bangladesh, Nepal have recorded a slow paced growth in per capita GDP but despite that health spending has risen in Afghanistan and Nepal. A study by Xu, Saxena and Holly (2011) mentioned regarding the stark variations ranging from less than 5 per cent to 15 per cent in public health expenditure as a percentage of GDP. Furthermore their study indicates that growth in health expenditure varies with growth in GDP[22] and as shown in the scatter plot matrix in Figure 2, there is a direct and positive association between per capita GDP and Health Expenditure per capita.

Figure 4 shows the share of public and private health expenditure as a percentage of GDP in total health expenditure across countries and across years. It is observed that total



Source: World Bank dataset

**Figure 3. Public Health Expenditure as a % of GDP in South-Asian countries**
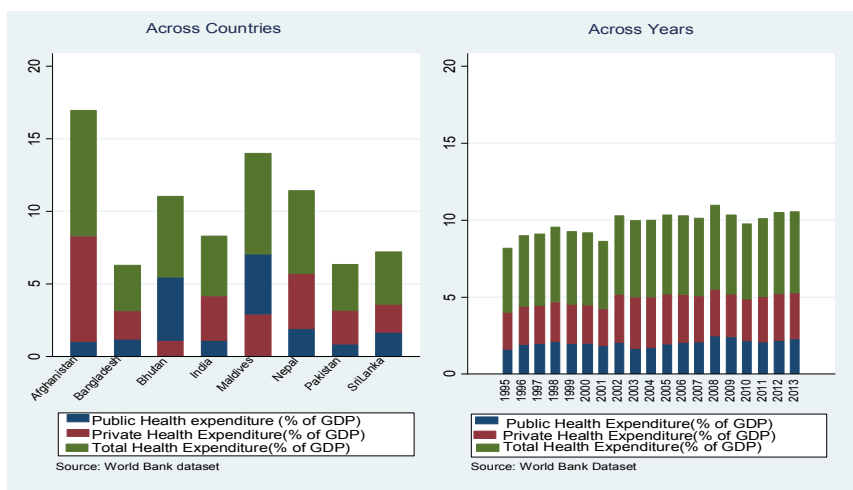


**Figure 4. Trends of Various components of Health Expenditure as a % of GDP (Public, Private and Total)**

[22] Xu Ke , Priyanka Saksena and Alberto Holly, (2011), The Determinants of Health Expenditure: A Country-Level Panel Data Analysis.

expenditure on health as a percentage of GDP has risen over the years and both public and private health expenditure has recorded a gradual increment over the years. However bifurcation of the two components public and private health expenditure as a % of GDP across countries indicates that there are stark variations in the shares for example Afghanistan and India has a very high share of private health expenditure in the total health expenditure as a % of GDP whereas Bhutan records a very high share of public health expenditure in the total health expenditure and relatively much lower share of private health expenditure in the total health expenditure as a % of GDP. Similarly Maldives also has a very high proportion of public health expenditure in total health expenditure as compared to countries like Bangladesh, Nepal and Pakistan which has relatively lower share of public health expenditure. Sri Lanka has almost equal percentage of public and private health expenditure as a proportion of their GDP.
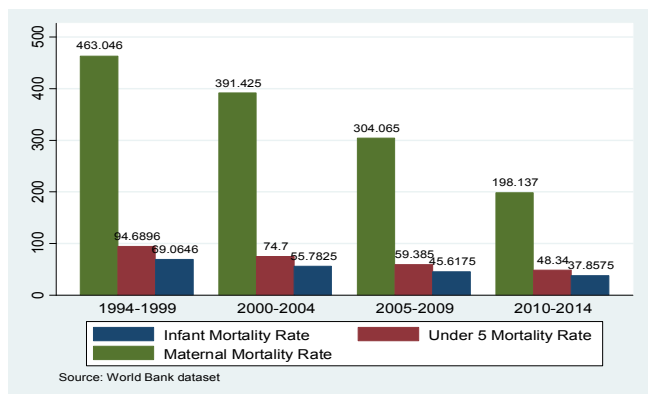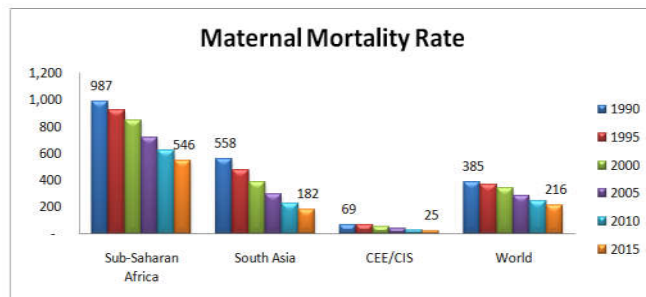


**Figure 5. Trends in IMR, MMR and U5MR in South-Asian Countries in past 2 decades**

Figure 5 depicts that there has been a considerable decline in the Infant Mortality rate, under five Mortality rate and Maternal Mortality Ratio over the two decades. It is observed from the figure that the average Maternal Mortality Ratio in the South-Asian region has declined from 463.05 deaths per 100, 000 live births in 1994-199 to 198.14 in 2010-14, noting a decline of more than fifty five percent in two decades. Similarly there has been a reduction of around fifty per cent in infant and under five mortality rates amidst the study period. Infant Mortality rate has reduced from 69.1 to 37.9 per 1000 live births in two decades and Under 5 mortality rate has declined from 94.7 to 48.34 per 1000 live births in the time period 1994-99 to 2010-14. The decline can be attributed to various factors individually and collectively impacting the health outcome. This section of the study focus specifically upon the three core indicators of health individually and will unveil the major factors that affect the health outcomes proxied by Maternal Mortality Ratio (MMR), Infant Mortality rate (IMR) and Under 5 Mortality rate (U5MR) and present an overall picture of the direction and magnitude of relationship. Henceforth the important factors leading to such a steep decline in the health indicators will be identified separately for each health outcome.

**Maternal Mortality Rate (MMR)**

MMR refers to the number of maternal deaths per 100,000 live births from any cause related to pregnancy.[21] Despite a steep reduction of 45 percent in the number of maternal deaths globally since 1990, the figures are still as high as 2, 89,000 in

2013.[23] Amongst such high number of maternal deaths South-Asian countries alone accounted for 24 per cent of the total maternal deaths in 2013 regardless of the fact that MMR has declined approximately by 65 percent amidst 1990 and 2013[23] According to the World Bank data number of maternal deaths has declined from 185590 in 1994 to 69226 in 2014 but the Maternal Mortality ratio still stands at 190 in South Asia just second highest to 510 in Sub-Saharan Africa.



Source: WHO, UNICEF, UNFPA, World Bank Group and UNPD (MMEIG) - November 2015
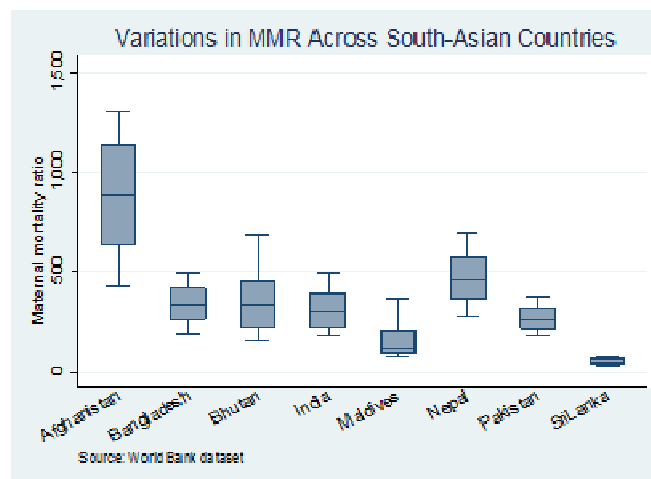
**Figure 6. Trends in MMR**



**Figure 7. Variations in MMR across South-Asian countries**

Figure 6 shows trends in MMR in five year gap starting from the year 1990 up to 2015. It is observed that there is a substantial difference in the MMR across different groups. On one hand the MMR of Sub-Saharan Africa is as high as 546 and on the other hand the MMR of Central and Eastern Europe and the Commonwealth of Independent States (CEE/CIS) stood at 25 in the year 2015. Amidst the two extremes lies South-Asian countries with an MMR of 182 lower than 216 of the world average. There are large variations amongst the South-Asian countries as shown in figure 7 ranging from an average of as high as 876 in Afghanistan to just 47 in Sri Lanka. A study by Hate and Gannon (2010) observes that Sri Lanka has been outlier in South-Asian countries in achieving a large decline in Maternal Mortality Ratio due to high female literacy rate.[24] Although Pakistan ranks second highest in the group standing just next to Afghanistan in the number of infant and under five deaths it has a very low maternal mortality ratio as compared to other South-Asian countries except Nepal and Sri Lanka.

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[23] Trends in maternal mortality: 1990 to 2013, Estimates by WHO, UNICEF, UNFPA, The World Bank and the United Nations Population Division.
[24] Vibhuti Hate and Seth Gannon (2010), Public Health in South Asia.

Table 4 shows the regression results of maternal mortality ratio (Modelled estimates has been used since there were large numbers of missing values in national estimates). From the table it is observed that there is a strong and significant negative association between per capita health expenditure and maternal mortality ratio. A 10 percent increase in per capita health expenditure reduces MMR by 0.5 percent. Furthermore an increase in log of per capita health expenditure has similar impact in t and t+1 time period as shown by the OLS and OLS with lagged explanatory variables estimates that by 10 per cent increase in per capita health expenditure leads to 0.2 percent decline in MMR, however the OLS estimates are not statically significant. Table 4 further shows that an increase in Out of pocket health expenditure do have an inverse association with MMR as shown by the fixed effect model, however external resources for health does not have any significant relationship with MMR, implying lower reliability on external grants for health care in the South-Asian countries. Fixed effect model depicts that the impact of increase in rural population having access to improved water source and improved sanitation facilities significantly contribute to reduction in MMR. To be precise 10 percent increase in % of population having access to improved water source and improved sanitation facilities reduces MMR by 0.1 and 0.05 percent respectively. Fixed effects do not show any significant impact of increase in percentage of urban population with access to improved water source and sanitation facilities. However a marginal decline has been indicated by coefficient estimates of OLS and OLS with lagged explanatory variables. Thus the results of fixed effect model indicate a need to focus more open increasing these facilities in rural areas owing to higher marginal impact of it. Total Fertility rate and female literacy rate are significant factors contributing towards improvement in maternal mortality ratio, while 1 unit increase in Total Fertility rate increases MMR by 0.1 per cent approximately and on the other hand one unit increase in female literacy rate reduces MMR by0.002 percent approximately. Thus female literacy rate is a very important factor impacting maternal mortality ratio and similar results have been observed by Fonseca and Zheng (2011) who in their study has observed the impact of education through various channels on health outcomes.[25] The reason behind negative relationship between TFR and MMR can be justified on research and scientific grounds, an increase in total fertility ratio leads to higher incidence of medical problem like Anaemia among women lowering the probability of survival and as shown in the regression an increase in prevalence of anaemia among pregnant women increase the MMR however the impact is not statistically significant as per fixed effect model but OLS and OLS with lagged explanatory variables show a strong significant negative association between the two variables.

**Infant Mortality rate (IMR)**

IMR as defined by World Bank refers to the number of children dying before attaining one year of age per 1000 live births.[21] A study by Hanmer, Lensink and White has shown a strong negative association between per capita health expenditure with one year lag and infant mortality rates.[26] Their study has also highlighted that persistent gender based inequalities in literacy rate has negative impact on child health.
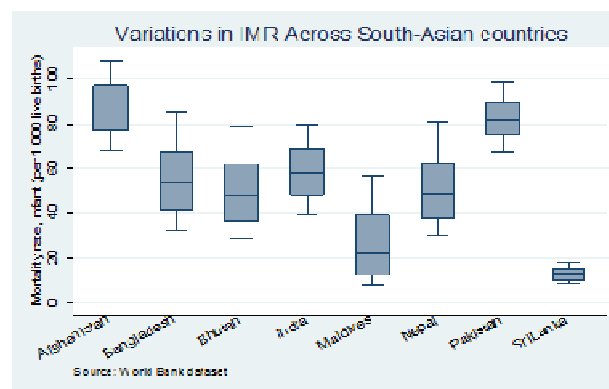


**Figure 8. Variations in IMR across South-Asian Countries**

As figure 8 depicts there are stark variations in Infant Mortality rates amongst South-Asian countries. Countries like Afghanistan and Pakistan have very high rates of infant deaths and contrarily Sri Lanka records a very low average of IMR and with very little variations and reasons behind such sharp progress remains debatable. Other countries like Bangladesh, Bhutan and Nepal have very high average infant mortality rate whereas Maldives has very low IMR standing just second lowest to Sri Lanka. However South-Asia has a long way to go in achieving comparable reductions in IMR because of prevalence of high incidence of malnutrition as a study edited by Gillespie (as cited by Bhutta (2000)[27]) involving seven articles on extent of malnutrition in South Asia asserted that due to various factors like social customs, undernourished mothers etc. around 50 per cent of children in South Asia are underweight.[28] Prevalence of high malnutrition is a major reason behind prevalence of such high number of infant and child deaths in South Asia. Table 5 shows the regression results for Infant Mortality rates. The association between per capita health expenditure and IMR is strong and negative. However the magnitude and level of significance differs if we compare the three models. While fixed effects model show that 10 per cent increase in per capita health expenditure reduces IMR by 0.4 per cent, the results are not statistically significant. OLS model shows that at one per cent level of confidence significant association exists between the variables and interestingly the impact is higher in the OLS model with lagged explanatory variables. The respective coefficient showing decline in IMR with 10 per cent increase in per capita health expenditure for OLS and OLS with lagged explanatory variables are 0.9 and 1.1 respectively. There is a miniscule impact of increase in out of pocket expenditure and external resources for health on IMR and the coefficients are not statistically significant. According to fixed effects model increase in percentage of rural population having access to improved water source and sanitation facilities is statistically significant and the respective coefficients for increase in population with access by 10 percent are 0.08 and 0.02 respectively. However increase in urban population with access to water source and sanitation facilities has no significant impact on reducing IMR. IMR is positively associated with increase in fertility rate and with increase in prevalence of anaemia among children (% of children under 5 years of age) and the later is statistically significant at 1% level of confidence.

[25] Raquel Fonseca and Yuhui Zheng, The Effect of Education on Health Cross-Country Evidence.
[26] Lucia Hanmer, Robert Lensink and Howard White, Infant and Child Mortality in developing countries: Analysing the data for robust determinants.

[27]Zulfiqar A Bhuttaet. Al (2000) Why has so little changed in maternal and child health in south Asia?BMJ
[28]Gillespie S, editor. (1997)Malnutrition in south Asia: a regional profile. Kathmandu: Unicef Regional Office for South Asia;

**Table 4. Regression Results for Maternal Mortality Ratio**

| VARIABLES | (1) Robust OLS | (2) Robust OLS with lagged explanatory variables | (3) Fixed Effects |
|---|---|---|---|
| Log of Per Capita Health Expenditure | -0.0299 | -0.0228 | -0.0523** |
| | (0.0225) | (0.0222) | (0.0173) |
| Out of Pocket Health Expenditure | -0.000597 | -0.000407 | -0.00327*** |
| | (0.000704) | (0.000688) | (0.000822) |
| External Resources for Health | 0.00661*** | 0.00612*** | 0.000943 |
| | (0.00114) | (0.00109) | (0.000949) |
| % of rural population having access to Improved Water Source | 0.00374*** | 0.00406*** | -0.0140*** |
| | (0.00119) | (0.00120) | (0.00180) |
| % of urban population having access to Improved Water Source | -0.00553*** | -0.00557*** | 0.00246 |
| | (0.00181) | (0.00171) | (0.00232) |
| % of rural population having access to Improved Sanitation Facilities | -0.00196*** | -0.00187*** | -0.00485*** |
| | (0.000665) | (0.000648) | (0.00111) |
| % of urban population having access to Improved Sanitation Facilities | -0.00478*** | -0.00505*** | 0.00682 |
| | (0.00123) | (0.00121) | (0.00429) |
| Total Fertility Rate | 0.0597*** | 0.0622*** | 0.0988*** |
| | (0.0121) | (0.0119) | (0.0220) |
| Female Literacy Rate | -0.00250** | -0.00256*** | -0.00193** |
| | (0.000959) | (0.000917) | (0.000599) |
| Prevalence of Anaemia among Women | 0.0182*** | 0.0177*** | 0.00278 |
| | (0.00109) | (0.00109) | (0.00264) |
| Constant | 2.046*** | 2.035*** | 3.041*** |
| | (0.179) | (0.173) | (0.391) |
| Observations | 144 | 144 | 144 |
| R-squared | 0.977 | 0.978 | 0.968 |
| Overall R-squared | | | 0.402 |
| Number of ctry1 | | | 8 |
| Country FE | | | Yes |

Robust standard errors in parentheses        *** p<0.01, ** p<0.05, * p<0.1

**Table 5. Regression results for Infant Mortality Rate**

| VARIABLES | (1) Robust OLS | (2) Robust OLS with lagged explanatory variables | (3) Fixed Effects |
|---|---|---|---|
| Log of per capita health expenditure | -0.0924*** | -0.112*** | -0.0401 |
| | (0.0162) | (0.0173) | (0.0296) |
| Out of Pocket Health Expenditure | 0.00364*** | 0.00365*** | -0.000537 |
| | (0.000596) | (0.000600) | (0.000624) |
| External Resources For Health | -0.00280*** | -0.00260*** | -0.000228 |
| | (0.000762) | (0.000804) | (0.000507) |
| Population 0-14 years | 0.0234*** | 0.0220*** | 0.0143** |
| | (0.00219) | (0.00219) | (0.00473) |
| Total Fertility Rate | 0.0204 | 0.0150 | 0.0105 |
| | (0.0145) | (0.0140) | (0.0426) |
| Female Literacy Rate | -0.00104* | -0.000905 | -0.000137 |
| | (0.000559) | (0.000565) | (0.000685) |
| Prevalence of anaemia among children | 0.00556*** | 0.00542*** | 0.00435** |
| | (0.000665) | (0.000680) | (0.00175) |
| Improved Sanitation Facilities in Rural | -0.00582*** | -0.00618*** | -0.00220 |
| | (0.000483) | (0.000468) | (0.00158) |
| Improved Sanitation Facilities in Urban | 0.00576*** | 0.00610*** | 0.00732* |
| | (0.000897) | (0.000892) | (0.00316) |
| Improved Water Source in Rural | 0.00506*** | 0.00505*** | -0.00827** |
| | (0.000923) | (0.000937) | (0.00276) |
| Improved Water Source in Urban | -0.0120*** | -0.0123*** | 0.00258 |
| | (0.000911) | (0.000909) | (0.00246) |
| Constant | 1.039*** | 1.094*** | 0.992*** |
| | (0.152) | (0.155) | (0.277) |
| Observations | 144 | 144 | 144 |
| R-squared | 0.978 | 0.978 | 0.969 |
| Overall R-squared | | | 0.623 |
| Number of ctry1 | | | 8 |
| Country FE | | | Yes |

Robust standard errors in parentheses        *** p<0.01, ** p<0.05, * p<0.1

Female literacy has an important role in reducing infant death, although the magnitude is very small as per fixed effects model but the link has been established by various authors like Desai and Alva (1998) who in their study has concluded a strong and significant association between mother's education and infant mortality rate suggesting that education is an instrumental variable signifying the socio-economic conditions of the family. [29]

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[29]Sonalde Desai and Soumya Alva, Maternal Education and Child Health: Is there a strong casual relationship.

**Table 6. Regression results for under 5 mortality rate**

| VARIABLES | (1) Robust OLS | (2) Robust OLS with lagged explanatory variables | (3) Fixed Effects |
|---|---|---|---|
| Log of Per Capita Health Expenditure | -0.0719*** | -0.0964*** | -0.0505* |
| | (0.0191) | (0.0222) | (0.0368) |
| Out of Pocket Health Expenditure | 0.00364*** | 0.00363*** | -0.000210 |
| | (0.000644) | (0.000663) | (0.000691) |
| External Resources for Health | -0.00274*** | -0.00265*** | -0.000133 |
| | (0.000844) | (0.000915) | (0.000661) |
| Prevalence of Anaemia among children | 0.00698*** | 0.00671*** | 0.00421 |
| | (0.000726) | (0.000778) | (0.00242) |
| Improved Water Sources Rural | -0.00412*** | -0.00407*** | -0.00899** |
| | (0.00112) | (0.00113) | (0.00324) |
| Improved Water Source Urban | -0.0111*** | -0.0114*** | 0.00321 |
| | (0.00101) | (0.000992) | (0.00285) |
| Improved Sanitation Facilities Rural | -0.00522*** | -0.00573*** | -0.00163 |
| | (0.000571) | (0.000569) | (0.00179) |
| Improved Sanitation Facilities Urban | 0.00502*** | 0.00547*** | 0.00851* |
| | (0.000969) | (0.000965) | (0.00404) |
| Immunization Measles | -0.00105* | -0.000756 | -0.000535 |
| | (0.000596) | (0.000705) | (0.000556) |
| Female Literacy Rate | -0.00113* | -0.00101* | -0.000379* |
| | (0.000591) | (0.000600) | (0.000702) |
| Total Fertility Rate | 0.0251 | 0.0173 | 0.0326 |
| | (0.0185) | (0.0177) | (0.0510) |
| Population ages 0-14 years | 0.0240*** | 0.0223*** | 0.0165** |
| | (0.00269) | (0.00268) | (0.00582) |
| Constant | 1.137*** | 1.198*** | 0.814** |
| | (0.168) | (0.173) | (0.338) |
| Observations | 144 | 144 | 144 |
| R-squared | 0.974 | 0.973 | 0.937 |
| Overall R-squared | | | 0.538 |
| Number of ctry1 | | | 8 |
| Country FE | | | Yes |

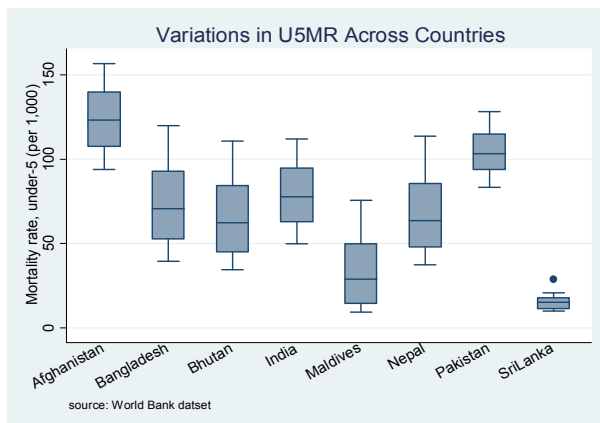Robust standard errors in parentheses    *** p<0.01, ** p<0.05, * p<0.1



**Figure 9. Variations in U5MR across South-Asian countries**
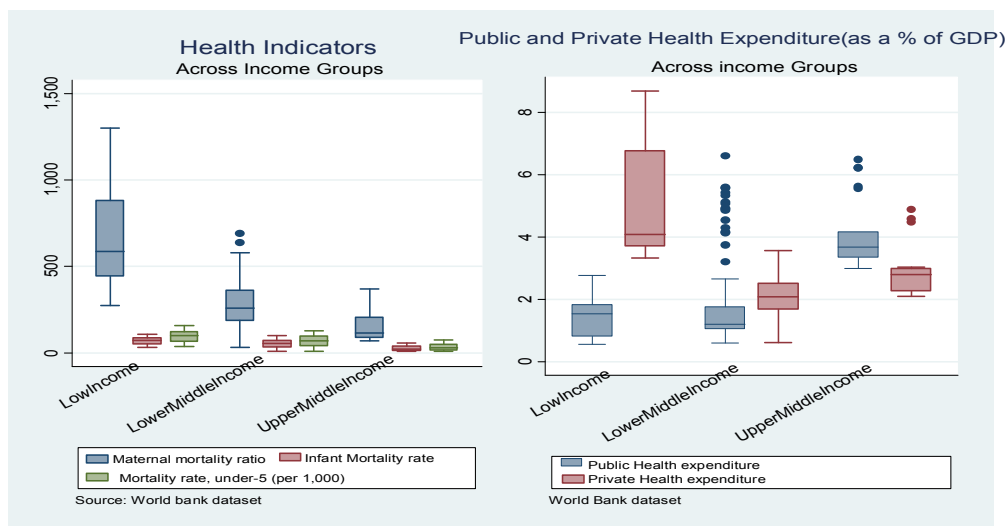


**Figure 10. Income Based Differentials in the Pattern of Health Expenditure and Health Indicators**

## Under five Mortality Rate (U5MR)

U5MR as defined by World Bank refers to the number of children dying before reaching the age of five per 1,000 live births[21]. As per the global estimates there has been a stark decline of around 50 per cent in U5MR since 1990. The number of children dying before reaching five years of age has dropped from 91 deaths per 1000 live births in 1990 to 43 in 2015.[30] As depicted in Figure 4 South-Asian countries has also achieved 50 per cent decline in U5MR in 2014 as compared to the initial levels in 1990 however it still ranks second highest with 1 in every 19 children dying before attaining five years of age which is relatively very high as compared to the average ratio of 1 in every 147 in the high income groups accounting for 3 deaths in 10 global deaths.[30] Overall South Asian group as a whole is close to achieving its targets, the country specific differentials remains.

Figure 9 shows the box plots of variations in under 5 mortality rates in South-Asian countries. Similar to other indicators MMR and IMR Afghanistan has the highest number of children dying before attaining the age of 5 and Sri Lanka has the lowest ratio. While other countries like Bangladesh, Bhutan and India have lower U5MR as compared to Afghanistan and Pakistan but the ratio is still very high. While the U5MR of Maldives is comparatively lower the ratio of Pakistan is very high just next to Afghanistan. Gillespie as cited by Bhutta as mentioned earlier asserts that *"over 50% of the world's malnourished children and low birthweight infants live in south Asia"* (Bhutta 2000).[27] Table 6 shows the regression results for under 5 mortality rates. The effect of per capita health expenditure is higher than for other indicators and indicates a statistically significant inverse relation with U5MR. The coefficient of 0.05 in fixed effect model indicates that a 10 percent increase in per capita health expenditure reduces Under 5 mortality rate by half a per cent. The coefficients of OLS and OLS with lagged explanatory variables are 0.72 and 0.96 respectively indicating that the effect of increase in per capita health expenditure is higher in the t+1 time period than in the current time period t. While the direction is positive in OLS and OLS with lagged explanatory variables model the fixed effect model although indicates a negative association with U5MR but the magnitude is very small and is not statistically significant, similar results are obtained for external resources for health. However the coefficients of OLS and OLS with lagged variables with regard to external resources for health are negative and statistically significant at 1 per cent level of confidence. Fixed effect model show a positive association between U5MR and total fertility rate and prevalence of anaemia among children but the coefficients are not statistically significant. Female literacy rate is statistically significant factor at 10 per cent level of confidence in reducing U5MR and link between mother's education and child's health is apparent from various studies like that of Desai and Alva.[29] Similar to MMR and IMR results the coefficients of fixed effect model show a greater marginal impact of increase in percentage of rural population having access to improved water source and sanitation facilities in reducing the number of children dying before the age of 5 than an increase in proportion of urban population with improved access to water and sanitation facilities. Precisely 10 percent increase in the rural population having access to improved water source and

sanitation facilities reduces under 5 mortality rate by 0.09 and 0.016 per cent respectively.

The results show that under 5 deaths goes down with an increase in the percentage of children who are immunized with measles vaccine and as UNICEF report suggests that approximately one third of the under 5 deaths can be prevented by immunization/vaccination.[31] Our results confer with these findings and show a strong and significant negative association of under 5 mortality rate with Measles Immunization. A report by UNICEF on Universal Immunization coverage[32] identifies South-Asia as one of the region which is lagging far behind in the immunization coverage and India and Pakistan were amongst the countries having largest cohort of unvaccinated children and shows that although India has made progress in recent years Pakistan is still at a stagnant position, precisely the reason for having such high number of deaths of children under the age of five as shown in Figure 9 thus Immunization plays an important role in reducing the number of deaths of children under five years.

### Income Based differentials

Figure 10 shows the differences in health indicators and pattern of spending across different income groups (defined according to World Bank's criterion). It is observed that low income countries have higher rates of MMR, IMR and U5MR as compared to Lower Middle or Upper Middle income groups since lower income countries are categorised by prevalence of high rates of poverty, malnutrition, low literacy etc. Further the problem is exaggerated by low public spending on health care and thus the patterns of spending are worth noting, While Upper Middle Income has higher proportion of public health expenditure than private health expenditure, the case is opposite for the lower income group i.e. Low Income Group has very high percentage of private health expenditure (as a % of GDP) as compared to public health expenditure (as a % of GDP). A study by Ketsche *et al* (2011) has noted that any form of health spending will be collected in form of taxes and their results showed that a higher portion of the income is spent by low income families on health care as compared to the higher income groups in US.[33] Our results show that it is true for the countries as well, lower income countries tends to have higher out of pocket health expenditure as compared to higher income groups.

### Discussion, Conclusion and Policy Recommendations

Although all the South-Asian countries have shown an improvement in the key health indicators over the years but the pace of improvement differs across the countries. While countries like India, Bangladesh, Bhutan has shown greater improvement in health indicators over the last two decades, others like Afghanistan and Pakistan have recorded a slow reduction in the mortality indicators. Maldives and Sri Lanka have shown a remarkable performance in terms of all the indicators and surprisingly Sri Lanka has noted a reduction in IMR, MMR and U5MR despite a decline in percentage of GDP devoted to health care over the years.

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[30]Levels & Trends in Child Mortality, 2015, Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation.

[31]http://www.unicef.org/immunization/
[32] Progress and Challenges with Achieving Universal Immunization Coverage: 2015 Estimates of Immunization Coverage.
[33]Patricia Ketsche, E. Kathleen Adams, Sally Wallace, Viji Diane Kannan and Harini Kannan, Do Lower-Income Families Pay A Higher Share Of Income Toward National Health Care Spending Than Higher-Income Families do

Herwartz and Theilin (2000) points out that country specific effects lead to differentials in their health care expenditures[34] and there were observable differences in trends of spending on health care across South-Asian countries. Countries like Afghanistan, Maldives, and Nepal have spent an increased proportion of their GDP on health and contrarily countries like Bhutan and Sri Lanka have reduced the proportion of GDP spent on health. While countries like India Pakistan and Bangladesh allocated a stagnant proportion with marginal increase to percentage of GDP spent on health over the years. There are stark variations in the per capita health expenditure ranging from 2,095 US$ in OECD countries to 24 US$ in South Asian countries.[20]Despite having persistent poverty, low life expectancy, prevalence of high rates of malnutrition, infant mortality rates, high incidence of TB and HIV along with poor sanitation facilities and poor healthcare access the healthcare expenditure has been very low in South-Asian countries as mentioned by Hate and Gannon (2010) in their study[35]

Although all the South-Asian countries have shown an improvement in the key health indicators over the years but the pace of improvement differs across the countries. While countries like India, Bangladesh has shown greater elasticity of improvement in health indicators with an increase in per capita health expenditure, others like Afghanistan, Nepal and Sri Lanka have lower elasticities i.e. increasing per capita health expenditure did not had much impact on health indicators. There were observable differences in trends of spending across countries. Countries like Afghanistan, Maldives, and Nepal have spent an increased proportion of their GDP on health and contrarily countries like Bhutan and Sri Lanka have reduced the proportion of GDP spent on health. While countrieslike India Pakistan and Bangladesh allocated a stagnant proportion with marginal increase to percentage of GDP spent on health over the years. The regression results show that public health expenditure is a significant contributor to improvement in health outcomes. However after controlling for other variables the partial effect of the per capita public expenditure on these health outcomes is comparatively lower. This implies that the other factors like access to sanitation, total fertility rate and education are significant contributors to improvement in health outcomes apart from health expenditure. The maternal mortality ratio is highest in Afghanistan and despite of a steep decline from as high as 1600 in 2002 to 330 in 2010 lot more needs to be done to improve the status of maternal and child health. Descriptive statistics of India and Bangladesh asserts that despite having higher per capita gross domestic product India lags behind Bangladesh in terms of health Indicators. Sri Lanka has the lowest mortality rates as compared to other countries despite spending a very low percentage of their GDP on health. The case study of India analyzes the impact of National Health Mission as a scheme on the health indicators. It is observed that post 2005 there has been a slight improvement in the key health indicators. A steep decline has been observed in all the key health indicators post the introduction of the scheme. The elasticity of improvement has significantly increased post 2005 i.e. with increased allocation the mortality rates are declining at a higher pace as compared to the period before 2005 where elasticity was very low.

Thus, we can conclude that though public health expenditure is an important factor but other social factors such as education, poverty, strong governance, community involvement at all the levels and health infrastructure and private expenditure does have a strong impact on health status of a country. Thus South-Asian countries needs to focus not only upon building the health infrastructure but also focus upon policies to improve the education system, ensuring equitable access to sanitation facilities and involve greater community involvement.

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[34]Helmut Herwartz, Bernd Theilen (2000), The determinants of health care expenditure:Testing pooling restrictions in small samples.
[35]Vibhuti Hate and Seth Gannon (2010), Public Health in South Asia.

health outcomes is comparatively lower. This implies that the other factors like access to improved sanitation facilities, improved water source total fertility rate and female literacy rate are significant contributors to improvement in health outcomes apart from health expenditure. The results are in line with the literature review that although public health spending is a significant factor in improving the health outcomes, the role of specific socio-economic factors of a country cannot be neglected and these factors determine the pace and direction of success that increased expenditure can meet.

Various literatures have mentioned regarding the sorry position of South-Asian countries in terms of maternal mortality ratio which ranks second highest just next to Sub-Saharan Africa in the global estimates, South-Asian countries alone accounts for 24 per cent of the total maternal deaths across the globe.[23]A study by Zulfiqar A.Bhutta*et al*. (2000) has concluded that despite a decent improvement in technological aspect the status of women and child health is substandard in South-Asia as compared to other nations the situation is further aggravated by the presence of the backward status of women and economic inequality.[36]The average maternal mortality ratio over the years has been highest in Afghanistan as depicted in Table 2 and despite a steep decline from 1600 in 2002 to 330 in 2010 lot more needs to be done to improve the status of maternal health in Afghanistan and as shown in   2Afghanistan has a very high total fertility rate thus there is a need to focus upon methods of family planning which has a significant negative impact on maternal mortality ratio as the regression results show. Pakistan also shows the similar descriptive statistics that is higher MMR and very high TFR. Nepal has a very high mean value of maternal mortality ratio as shown in Table 2, this can be attributed to not only persistence of high TFR but also very low percentage of population having access to improved sanitation facilities as shown in Table 3.

Torre and Myrskylain (2011) study the link between income inequality and health of the population and suggest that policies designed to reduce income inequality might result in improvement in child health specifically a male child.[37]A study by Zuehlke have highlighted that despite global reduction in under 5 mortality rate, the dimensions of success are unevenly distributed. The author asserted that Sub-Saharan Africa and Asia together accounted for almost 95 per cent of total number of the children below age 5 dying. Further bifurcation show that 5 countries India, Nigeria, Democratic Republic of Congo, Pakistan, and China accounts for almost 50 percent of total deaths and India and Nigeria together contribute almost 33 per cent of the total deaths. [38] The present study also indicates similar results with regard to child health in South-Asian countries. Child Health has significant negative association with increase in per capita health expenditure. Although public health expenditure is an important indicator but the role of vaccination and immunisation is no less in reducing the number of child deaths thus policy initiatives involving improvements in Immunization coverage are strongly recommended in the South-Asian region. Apart from high MMR Afghanistan also have the highest IMR and U5MR and

an overview of the country by World Bank states that around 41 per cent of children under five years of age suffers from chronic incidence of malnutrition and vitamin and mineral deficiency among women and children is highly prevalent.[39] The prevalence rate of undernutrition is very high in Afghanistan, Bangladesh, Pakistan and India ranging from 38 per cent to 51 per cent and despite having lower MMR, IMR and U5MR as compared to Sub-Saharan countries the undernutrition prevalence in these south-Asian countries outweighs the figure of about 26 per cent in sub-Saharan African countries.[40] An overview of malnourished children in South Asia by World Bank suggests that despite having highest number of malnourished children, nutrition programs are not considered as a priority initiative by the government or other agencies precisely due to the identification problem involved in defining the incidence of malnutrition, less demand for such policies and curbed say of poor families who are ultimate sufferers of the malnutrition.[40]Almost 23 per cent of total people suffering from hunger lives in South-Asia, however the numbers are underestimated since it does not identify correctly the overall hunger burden inclusive of lack of enough nutrients in the diet, less calorie intake than required etc. thus South Asia Food and Nutrition Security Initiative (SAFANSI) was launched with a focus on ensuring food and nutrition security in the South-Asia region.[41]

Thus, it can be concluded that though per capita public health expenditure is an important factor but other social factors such as education, poverty, strong governance, community involvement at all the levels and health infrastructure does have a strong impact on the health status of a country since these factor determines the pace and direction of improvement which the enhance public expenditure aims at. However private health expenditure is not a significant factor contributing in the improvement of health. Female literacy rate is a dominant factor affecting all the health outcomes as increase in female literacy rate will reciprocate itself into more awareness among women regarding importance of ante-natal check-ups, proper intake of necessary nutrients and supplements, thus reduces chances of maternal deaths and proper maternal care manifests into better child health and increases the probability of their survival. These views are consistent with the literature that there exists a strong association between educated mothers and better maternal and child health.  A study by Botting *et al*. (2010) indicates that countries with improved sanitation are 8 to 9 times likely to have a positive impact on reduction in infant and child mortality. Thus their study acknowledges that there is a strong association between accessibility to improved water and sanitation and decline in infant and child deaths.[42] The present study identifies similar results with only a miniscule departure that elasticity of improvement in maternal and child health indicators is higher and negative with an increase in the percentage of rural population having access to improved water source and sanitation facilities as compared to the urban population. Thus South-Asian countries needs to focus not only upon building the health infrastructure but also focus

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[36]Zulfiqar A Bhuttaet. alWhy has so little changed in maternal and child health in south Asia?BMJ. 2000 Sep 30; 321(7264): 809–812.

[37]Roberta Torre and MikkoMyrskyla (2011), Income inequality and population health: a panel data analysis on 21 developed countries, MPIDR Working Paper WP 2011-006

[38]Eric Zuehlke, Child Mortality Decreases Globally and Immunization Coverage Increases, Despite Unequal Access.

[39]http://www.worldbank.org/en/country/afghanistan/overview

[40]http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/0,,contentMDK:20842002~pagePK:146736~piPK:146830~theSitePK:223547,00.html

[41]http://www.worldbank.org/en/region/sar/brief/food-nutrition-security-initiative-safansi

[42]Botting M., Porbeni E. , Joffres M., Johnston B. ,Black and Mills E.(2010) Water and sanitation infrastructure for health: The impact of foreign aid

upon policies to improve the education system and promote female education, design more policies ensuring equitable and enhanced access to sanitation facilities, and take policy initiatives on family planning since TFR of all the South-Asian countries except Sri Lanka is very high. Owing to the fact that maximum number of deaths is attributed to the problems pertaining from malnourishment, nourishment programmes like South Asia Food and Nutrition Security Initiative (SAFNA) should be undertaken and programs involving greater community involvement needs to be undertaken to spread awareness.

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