The Interrelationship Linking Income, Healthcare Expenditure, and Health outcome

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Abstract

The combination of low incomes and low healthcare expenditure have been obstacles to improving health status, and an overall impact on the socio economic development of many developing nations. The rich contribution of rising income through healthcare expenditure on health status must be complemented by a similar effort to better understand the mechanisms through which improved health outcome contribute to economic growth and development. The main aim of this paper is to review and attempt to synthesis the relevant literature on first, the economic growth (GDP)/income - healthcare expenditure - heath outcome nexus and , second, the reverse causality linking improved initial health status to economic growth and healthcare expenditure. A successful national healthcare policy must be context specific and take into consideration the initial health status of each country.

1. Introduction

Low income and low healthcare expenditure (HCE) have been major obstacles in improving the health status of a country. Existing literature have linked income to healthcare expenditure and eventually health outcome, and a similar attention has also been made to the role that good health status plays in contributing to the productivity and Gross Domestic Product (GDP) growth of every nation. The effect of public health expenditure is justified by its effect on the individual's health outcome and the impact on the general economic growth. This study reviews and synthesizes the existing literature on the interlinkages of income (GDP), healthcare expenditure, and health outcome, across the globe.

It is only logical to think that richer countries are able to provide better services and come closer to universal health coverage, while low income countries have less coverage. The differences in per capita income of developed countries and developing countries have to a large extent contributed to the wide disparity in their levels of socio-economic development. In the year 2013, Gross Domestic Product (GDP) of the Organization for Economic Co-operation and Development (OECD) stood at $45.76 trillion with a per capita of $44,479. The OECD healthcare expenditure was recorded at 9.5% of GDP with a life expectancy rate of 81 years. The total population of OECD countries is only less than 20% of the world's population but accounts for more than 80% of the world's health spending. Total GDP of low income countries is estimated at $629.6 billion and a per capita income of $728. The healthcare expenditure for low income countries is 5.5% of GDP. The GDP of sub-Saharan Africa (SSA) alone is estimated at $1.643 trillion with a per capita of $1,686. The sub-Saharan African countries spend 5.7% of their GDP on health.

By April, 2012, the total global health expenditure was estimated at US$6.5 trillion. The per capita health expenditure (life expectancy) in 2012 stands at $8745 (78.7 years) for USA, $6,140 (81.5 years) for Norway, and $6,080 (82.8 years), but only$12 (62.24 years) for Eritrea. In the same year, healthcare expenditure as a percentage of GDP stood at 3.2% for Congo, Rep, 5.2% for Ghana, but 17.9% for United States, the highest in the world (World Bank).

According to the Commonwealth Fund report, US ranks last among 11 most industrialized nations in terms of healthcare system. The ranking is based on health system quality, efficiency, access to care, equity and healthy lives. United Kingdom is ranked first, followed by Switzerland, Sweden, Australia, Germany, The Netherlands, New Zealand, Norway, and Canada. A recent study by the PricewaterhouseCooper's Health Research Institute estimated that more than half of the estimated US$2 trillion per year healthcare expenditure is wasted. The European Health care Fraud and Corruption Network says that out of the global healthcare spending of about US$5.3 trillion, over US$300 billion (6%) is misappropriated due to corruption. While some countries lose more than others, healthcare funds are wasted due to mismanagement,

irrational medicine use, or lack of supervision. It is important to mention that when policy makers are calling for more money to carry out health intervention programmes, they should thrive for getting value for money. Every step must be taken to limit any unnecessary purchase and use of equipment, especially in low income countries. Adequate remuneration and better match of skills to task are good ways of improving productivity of health workers. Hospital inefficiencies can be reduced by enlarging the size and scope of hospitals to fully utilize resources.

Many countries have instituted national health insurance schemes to ensure increased access to healthcare, especially by the vulnerable in society. Other nations still rely on direct cash payment by individuals. There are many obstacles to direct repayments and pooled funds. It is only essential that international donors increase their support towards funding healthcare. In the year 2013, it was estimated that a person living in Japan could live up to 82 years, but the one in Chad has a life expectancy of 51 years, with that of Ghana being estimated at 61 years. It is expected that increasing healthcare expenditure will result in improved health status. However, empirical evidence suggest that it is not always true, as some parts of the world experience the reverse case.

Table 1: Health expenditure and health outcome rates, by region (2012).

Region	Per capita health expenditure (US$)	Life expectancy at birth (years)	Infant mortality (per 1,000 live births)	Under-five mortality (per 1,000 live births)
East Asia/Pacific	630	74	16	16
Europe & Central Asia	2,270	77	11	13
Latin America & Caribbean	729	75	16	19
Middle East & North Africa	400	72	21	25
South Asia	56	67	46	59
Sub-Saharan Africa	96	56	63	96

Source: Author's computation using data from World Bank

From the table above, it is found that regions with higher per capita healthcare expenditure also have high life expectancy rate at birth, except for Sub-Saharan Africa (SSA) whose per capita health care expenditure is higher than that of South Asia (SA) but its life expectancy rate at birth is lower. SSA also has higher rates of the two mortalities in spite of its high per capita HCE. In the same table, it can be observed that Latin America & Caribbean spend higher on per capita HCE ($729) but has higher under-five mortality rate (19 per 1,000 live births) than East Asia & Pacific.

## 2.0 Measurement of variables

2.1 Gross Domestic Product/national income

The gross domestic product is the sum of the total monetary value all goods and services produced in a country within a given period. It is calculated on annual basis. The sum of GDP and net factor income from abroad gives the national income. Per capita income is equal to the division of national income by the total population of a country. It can also be defined as the per person income of a particular country. Per capita income is used to compare the levels of standards of living among countries. For standardization and international comparison purposes, both the GDP and per capita income are measured in US dollars.

2.2 Healthcare expenditure

A country's value of the health of its citizens is captured in the amount of GDP spent on health. The most explicit and effective measure to ensure reduction in mortality rates is increasing health expenditure, both publicly and privately. Donor countries provide grants or sometimes, concessional loans, and are often asking questions about how much of those funds are allocated to health and whether they are used effectively. Within a country's budget, there is provision for preventing and curing sicknesses of the people. Some amounts are allocated for undertaking a national health survey. There is also public provision of hospitals, health insurance. For a study like this, there are good proxies for measuring healthcare expenditure. It can be viewed as healthcare expenditure per capita, healthcare expenditure as a percentage of GDP (private and/or public), healthcare expenditure, private as a percentage of government expenditure, healthcare expenditure, public as a percentage of total health expenditure, or their components of out-of-pocket health expenditure. Currently, the United States of America spends more on healthcare expenditure per person than any other country.

Figure 1: Per capita Healthcare Expenditure in US$, by region (2000-2012)
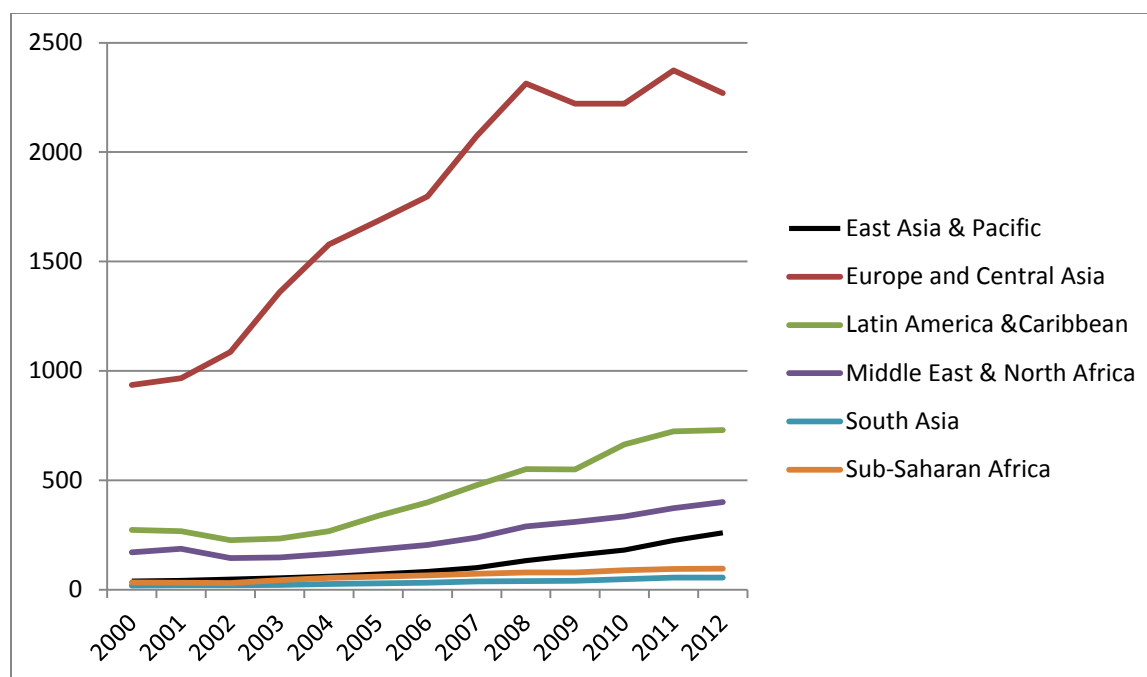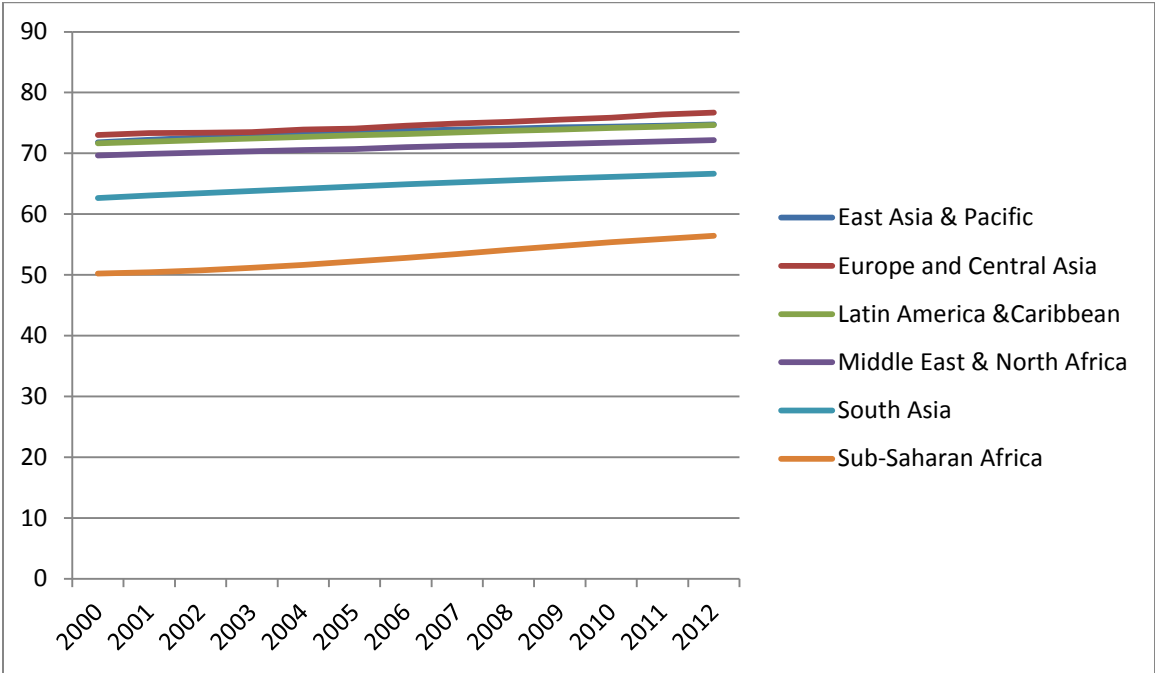

Source: Author's computation using data from World Bank

2.3 Health outcome

In the year 2000, about 189 countries adopted the Millennium Development Goals (MDGs) to attain improvement in their life by 2015. Three of such goals are health-related: under-five mortality, maternal mortality, and HIV/AIDS and malaria. While some countries have made progress to reduce these mortalities, other countries still need to do more. International and regional bodies like WHO, UNICEF, UNDP, and AU have recommended concrete measures to scale up efforts to achieve these three MDG goals on health.

WHO defines health not only as the absence of sickness, but the state of complete physical, mental and social well-being. While no single variable can be used to describe health outcome, a number of proxies have been used to measure it. Health outcome in this study is measured using maternal mortality ratio per 100,000 live births. This rate measures the number of women who die from pregnancy related causes while pregnant or within 42 days of pregnancy termination per 100,000 live births. In 2013, the countries with the lowest and highest rates are Belarus (1) and Sierra Leone (1,100). This shows that pregnant women in Belarus are more safer than those in Sierra Leone. Infant mortality is another proxy measure of health outcome. It is defined as the number of children per 1,000 live births who die before year one. Per every 1,000 live births, the number of children who do not live to celebrate their first birthday is 2 in Japan but 102 in Angola for the year 2013. Closely related is the estimation of the number of children who do not

live to celebrate their fifth birthday per every 1,00 live births. It is called under-five mortality. While child mortality or under-five mortality rate is 2 and 3 per 10,000 live births in Luxemburg and Finland respectively in 2013, Angola seems to experience the highest under-five mortality rate in the world at 167 per 1,000 live births. Across the globe, variations in life expectancy are mainly attributed to differences in mortality rates.

Figure 2: Life expectancy in years, by region (2000-2012)

Source: Author's computation using data from World Bank

From the above diagram, it is seen that life expectancy in years has been ever increasing for all regions over the period under review. Europe & Central Asia have the highest number of living years with sub-Saharan African having fewer years to live after birth. As mentioned earlier, one would expect a positive relationship between healthcare expenditure and life expectancy at birth. People of SSA will be disappointed to see that even though they spend on health more than South Asia, their life expectancy rate at birth is lower. This confirms the arguments that spending on health is only a necessary condition, and that, what is sufficient is what it is actually spent on. For instance, if health policy makers spend on goods and service which are not medical equipment and drugs, it will only increase health expenditure but would have no direct impact on improving the health status of the country. East Asia seems to earn more health for money since it is ranked fourth in terms of spending on health but second with Latin America & Caribbean when it comes to life expectancy.

Figure 3: Per capita GDP, per capita health expenditure, life expectancy, maternal mortality, infant mortality, and under-five mortality rates in Ghana (2000-2012)
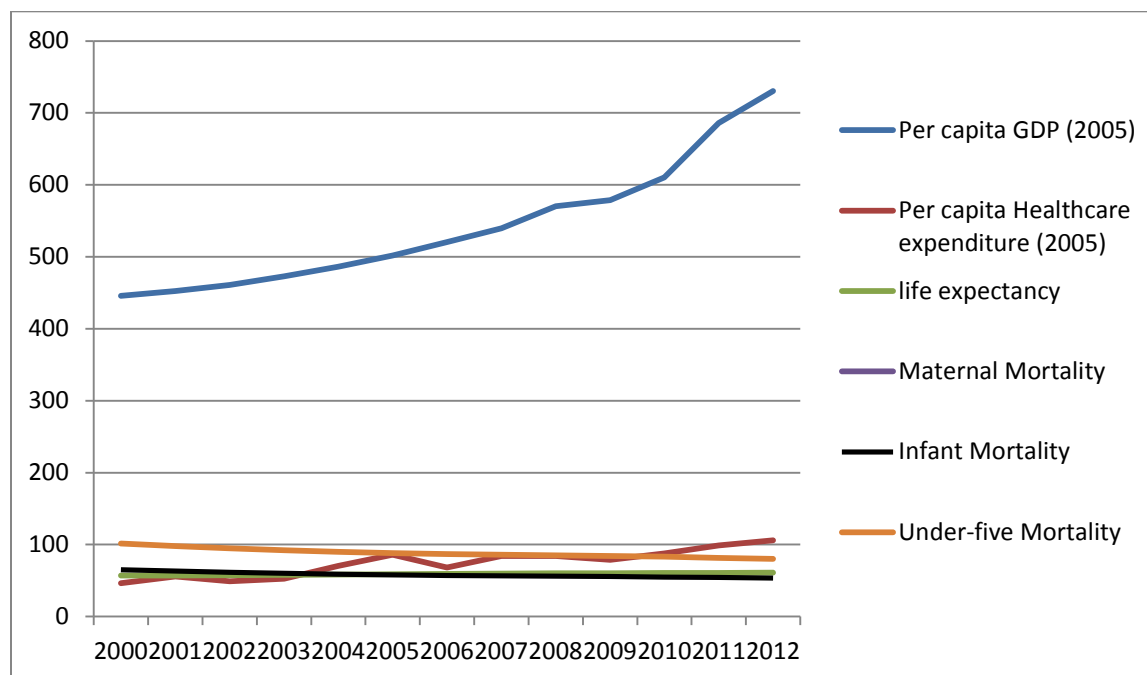

Source: Author's computation using data from World Bank

From the year 2000 to 2012, per capita income and per capita health expenditure in 2005 constant PPP have been rising. However, since the middle of 2000s, the rate of increase in per capita health expenditure out of per capita GDP has not been rising. This means that as a percentage of per capita GDP, government of Ghana has not been increasing health expenditure. Whereas efforts to reduce under-five mortality rates have made significant gains, life expectancy, maternal mortality and infant mortality rates seem to have stagnated over the period.

3.0 The interrelationships

It is interesting to have discovered the interrelationships linking income, healthcare spending and health outcome. Income of a nation is likely to impact positively on the health of its citizen, and the reverse causality is expected. Similar conclusions can be made at the micro level. This triangular relationship between income, healthcare expenditure and health outcome is illustrated on the diagram below.

Figure 4: Interrelationships between Income, Healthcare expenditure and Health outcome

Income/GDP

Healthcare expenditure   Health outcome
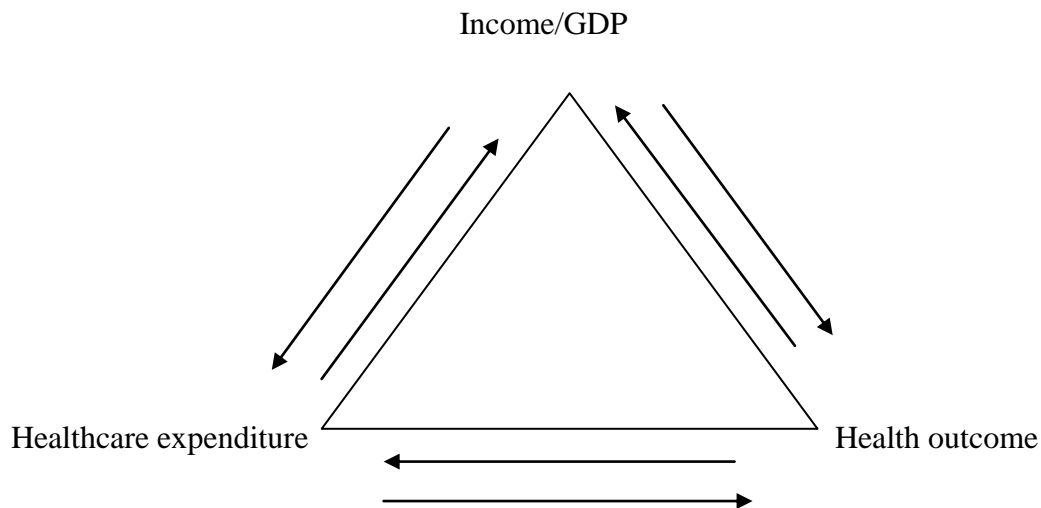
Whereas existing literature provides empirical evidence to support these interrelationships, little is known about the direct impact of health outcome on healthcare expenditure. Similar observation can be made on the direct effect of healthcare spending on income.

3.1 The relationship between income and healthcare expenditure

The relationship between healthcare expenditure and GDP has been of major interest among many health economists. Whereas some use a single year cross sectional data, others use time series, and panel data to provide evidence of the positive correlation between healthcare expenditure and GDP (Hitiris and Posnett, 1992). Among OECD countries, health expenditure (HCE) as a percentage of GDP has been rising since 1960. Some writers like Newhouse (1977). Roberts (1999) finds that variations in per capita GDP are closely correlated with variations in per capita healthcare expenditure. Using data from health Canada, statistics Canada and santé Quebec, Hansen and King (1996) concluded that the variables in a 'standard' model of aggregate health are expenditure for 20 OECD members as used in the studies by Culyer (1990) and Hitiris and Posnett (1992), have not been stationary in levels, violating one of the key assumptions of Ordinary Least Squares (OLS). This poses a problem for the statistical test of significance, without disproving the importance of income in determining health expenditure levels. This has led to the conclusion of possible misspecification of the standard model.

In Baumol's (2008) model of 'unbalanced growth', he assumes two sectors of the economy: 'progressive' and 'non-progressive'. The model assumes that while the per unit cost of output in

the non-progressive sectors tends to infinity, the per unit cost of output in the 'progressive sector' stays constant. The price elasticity in the 'non-progressive' sector is low. Examples include educational and health sectors. A larger share of labour force is expected to move to the 'non-progressive' sector. The rate of labour productivity growth is likely to increase due to the medical price deflator. However, the model has not been able to unravel the upward bias of the medical price indices. The model predicts that wage increase in excess of labour productivity drives the increment in healthcare expenditure. The empirical test used a sample of 19 OECD countries covering a period 1990-2003, giving about 622 observations. The paper regressed the growth rate of per capita HCE on the difference between growth rates of nominal wages per employee and productivity to obtain the cross section random-effect as well as the time random-effects along with OLS. Baumol's theory of 'unbalanced growth is supported empirically by the data such that the coefficient of the difference between nominal wage and productivity are statistically different from zero (positive) and close to one. For robustness check, the inclusion of real GDP growth does not alter the effects of the log of difference between nominal wage and productivity on HCE.

Unlike the country by country approach used by Hansen and King (1996), McCoskey S. K. and Selden (1998) used a recently developed unit root test that exploits the panel nature of the data from OECD countries. The conclusion is that researchers need not be concerned so much about the unit root hypothesis since the test that exploits the panel nature of the data rejects the null hypothesis of unit root.

In estimating the relationship between healthcare expenditure and GDP for 42 African countries covering a period from 1995 and 2009, Zhike and Zhu estimates the income elasticity of healthcare expenditure for to be 0.71 and 0.78 for lower and middle-income African countries respectively. This makes healthcare a necessary good for Africans. They also found a negative relationship between infant mortality rate and health expenditure.

The movement from healthcare expenditure to income is scarcely researched in the literature. But it could be explained that countries with initial low HCE should be encouraged to work harder to earn more income in order to have enough to invest in healthcare.

3.2The relationship between healthcare expenditure and health outcome

Governments have spent considerable among of their Gross Domestic products (GDP) on healthcare. The growing concern however is to ask how far public spending on health has been essential in bringing about improvement in health status. One might think that increasing healthcare expenditure will always improve health outcome. However, empirical evidence does not suggest ever-positive relationship between them, neither does it suggest a linear relationship. As has been observed earlier, there are instances where increasing public health expenditure does not result in a commensurate increase in health outcome.

Early studies (Musgrove, 1996; Kim and Moody, 1992) have found no evidence at all that spending on health has any significant impact on under-five mortality. Instead, the determinants of child mortality were found to be social, cultural, and demographic factors. While some recent studies have established a positive relationship between health expenditure and mortality rates (Or, 2000a ,b; Baldacci et al, 2002), other have found that the contribution of public health spending on health outcomes is either small or statistically insignificant. Cremieux et al (1999) studied the relationship between healthcare expenditure and health outcome in ten provinces in Canada for a 15-year period. They concluded on the strong relationship existing between healthcare spending and health outcomes, despite the rather small differences in per capita health care spending. Findings are also that if healthcare spending changes by 10%, infant mortality rates among men and infant mortality rates among women will change by 0.5% and 0.4% respectively. Life expectancy will respond by 6 months and 3 months respectively for men and women. Using data from India state between 1980 and 1999, World Bank (2004: 45-50) found no evidence of the effect of health expenditure on mortality rates after controlling for state fixed effects and linear time trends in the model.

For the period 1980-1995, Nixon and Ulmann (2006) estimated for 15 European countries, the relationship between health expenditure and health outcome. The econometric analysis using fixed effect model results in a significant association of increasing health expenditure and reducing infant mortality, but only marginal in relation to life expectancy rate.

Novingnon et al (2012) concluded that both public and private healthcare expenditure significantly influences the overall improvement in life expectancy and infant mortality. They drew this conclusion from the results of their panel data (1995-2010) analysis from 44 Sub-Saharan African (SSA) countries. In the SSA where incomes are low, one would expect a relatively low per capita heath expenditure.

The ultimate aim for any healthcare expenditure is to improve the health status of individuals. It should therefore be logically deduced that individuals with low initial health status will require high investment in healthcare, and vice versa. Some parts of the world are mostly associated with certain disease which may require much more healthcare expenditure. For instance, malaria and HIV/AIDS are mostly prevalent in developing countries whereas citizens of advanced countries are easily infested with diseases such as dementia and flu. It is worth noting that when countries face epidemic diseases like EBOLA their healthcare expenditures automatically should increase beyond the budgeted amounts. In the recent years past, Ghana was plagued by cholera outbreak. Though no literature has been reviewed on this, it is only observable that health expenditure for the country might have increased beyond budget. At the micro level too, individuals suffering from any illness is likely to spend more in order to receive healing.

3.3The relationship between income and health outcome

Healthcare cost is among the top most important economic issues facing families. Promoting and enhancing the health status of citizens are essential to the socio-economic development of every nation, through man power development. A healthy status might affect the economic growth and development process by enhancing productivity, increasing labour hours, investment in education and increasing savings (Sen, 1999; Bloom and Canning (2000; 2003). The relationship and causality of healthy life and economic growth and development is not only present in the theoretical literature but evidenced by empirical research. The WHO for example, estimated that a 10% change in life expectancy would cause a 0.35% change in economic growth a year. Since ill health has the potential of reducing work days and eventually reduce productivity, the high associated opportunity cost gives the most reason for high-income economies to increase investment in healthcare. This can be done through preventive and curative measures. Improved initial health status is likely to led to a smaller amount allocated for healthcare, and releases more resource for other productive sectors like infrastructure development.

At the micro level, there exists enough theoretical and empirical literature to support this relationship.

The Grossman model (1972) identifies some reasons why individuals demand health: 1. Health stock diminishes over time and must be augmented 2. the individual is a producer of health 3. stock of health will produce overtime a stream of health time. 4. individuals derive utility from health. Grossman (1972) categorizes demand for health into two: 1. As a consumption good (for happiness) and 2. As an investment good (for productivity).

Stratmann (1999) made a justification for the effect of doctor visit on reduced work loss days. The doctor's visits become more productive when it has clear economic payoffs as it reduces the work loss days. In order to have a broader view of the effects of doctor visits on reduced work loss days, three data sets are analyzed focusing on individuals with acute conditions (influenza), chronic conditions (asthma), and impairment. The individual's decision to visit a physician may be influenced by the level of his income earnings since these visits come at a cost. A low-income earner may visit the physician and gain some days, which are obviously higher than the number of days gained by a high income earner. Data is sourced from the 1989 National Health Interview Survey (NHIS). The Tobit estimation implies that the marginal effect of a doctor visit is 2.7 days reduction in work day loss. This is statistically significant at 1%.

Koopman et al (2002) found out ill health does not only encourage absenteeism, it also reduces the productivity level of individual workers by reducing the normal work quality, a situation he calls presenteeism. Goetzel et al (2003) concluded that in the US, absence and disability losses due to physical and mental health conditions of 374, 799, constituting 29% of the total health and productivity related expenditures for physical conditions and 47% for mental conditions. Strauss (1995) focused on education and health by examining the roles played by households and

families in choosing to invest in the human capital of their members. It was concluded that investments in education and health will enhance productivity. Fisk William J. (2000) contributes to the existing empirical data on the procedure to improve indoor environments in order to improve productivity and health and estimated that in the US, potential annual gains from saving s and productivity gains are $6 billion to $14 billion from reduced respiratory diseases, $1 to $4 billion from reduced allergies and asthma, $10 to $30 billion from reduced sick building syndrome symptoms.

In their paper to investigate the impacts of pesticide use on farmers health and the impact of farmers health on rice production in Philippines, Antle and Pingali (1993) concluded that insecticide use has a negative effect on the famers health and the farmers health has a positive impact on rice production, and that there is a social gain in from the reduction in insecticide use in Philippines rice production. In a study to investigate the influence of health on the growth paths of ten industrialized countries over the course of 100 to 125 years, Suchit (2001) found out that **c**hanges in health increased their pace of growth by 30 to 40 percent. Pitt, M.M. and Rosenzweig, M.R. (1984) found out that in Indonesia, food prices affect health and health interventions programmes, nutritional status and profits.

3.4 Socio-cultural and demographic factors as determinants of health outcome.

In establishing the relationship between healthcare expenditure and health outcome in isolation, we need to account for the social, demographic and geographical heterogeneity of countries. These may include population density (people per sq.km of land area). The educational attainment by the sections of the population in terms of primary, secondary and tertiary levels. Another control variable to be introduced into the regression analysis is the poverty, age, gender, area of location, morbidity of certain diseases, and alcohol and tobacco consumption.

Anyanwu and Erhijakpor (2007) used a panel data from African countries 1999-2004 to run a panel regression for under-five and infant mortalities on health expenditure, ethnolinguistic fractionalization, female education, urbanization, per capita income, and number of physicians. The method used was robust Ordinary Least Squares (OLS), robust two-stage Least Squares (R2SLS), to control for endogeneity and reverse effects, and fixed-effect estimator to control for measurement error and autocorrelation. The results indicate a positive relationship between health expenditure and health outcome. A 10% change in per capita health expenditure changes under-five and infant mortality rates by 21 and 22 percents respectively. For both mortalities, the coefficient of the dummy for Sub-Saharan Africa is strongly negative but strongly positive for North Africa. What this means is that if all explanatory variables had the same levels, under-five mortality and infant mortality will increase by some 59 to 64 percent and 35 to 40 percent in SSA, while a corresponding decrease is likely to happen in North African countries. Ethnolinguistic fractionalization positively affects both mortalities in Africa, where as female literacy negatively impacts on the health outcome. Urbanization was found to have a weak

negative association with under-five mortality and infant mortality. The number of physician matters when it comes to reducing under-five and infant mortalities.

Bhalotra (2007) conducted a study in India to investigate how the nation spends to save life. The author a micro-data from the second round of the National Family Health Survey of India (NFHS-2) in the period 1998-1999s, and the model used is probit. The justification for choosing India is because it accounts for one forth in under-five mortality rates, one third of the poor, and one sixth of the population in the world. The contribution of this paper lies in the fact that it uses a panel data from sub-national groups. There are striking differences in the effects of health expenditure on health status among the various social groups. For example, the impact is much felt in rural areas than urban centers. In the study, the long run income elasticity of health spending was found to be -0.4 form within-state variations. This indicates that the share healthcare expenditure is decreasing in GDP/income. While the state health expenditure has no effect on infant mortality, it is more effective in urban areas. Interestingly, the mortality risk is hump-shaped in health expenditure, and it turns negative at high levels of expenditure.

Lanjouw and Ravallion (1999) explains such a relationship to mean that at lower levels of expenditure, budget are prioritized politically in curative measures in urban centers, but at higher expenditures, budgets are extended to cover large rural areas on preventive measures which have lower impact on mortality. It is worth mentioning that introduction of time effects reduces income effect to zero. Once common time-varying unobservable are removed, health spending has no effect on infant mortality. Using time series to estimate state specific models, the effects were significant and negative for three out of fifteen states. After dropping state specific trends, health expenditure had a negative significant effect on mortality for five out of fifteen states. In the distributed lag model, the inclusion of state-level covariates increases the income and health expenditure coefficients, but once state-trends are included, it makes little difference. When the paper limits the sample to rural, allows lags, and condition upon state-specific trends, health expenditure have its most effect on mortality. The regression analysis was extended to heterogeneity of social groups, by taking into account age, education, religion, gender, etc. for example, the marginal effects became larger for boys, high caste children, Muslims children, high order birth, children of educated mother, etc. the effectiveness of health expenditure on mortality varies across states, probably due to initial inequality and infrastructure gap.

4.0 Conclusion

It is not enough to advocate for greater health care spending, but also the need for empirical evidence to support it. The combination of initial ill health, and low per capita health expenditure have been obstacles in achieving improved health status. The results have indicated that health expenditure can be effective in moving countries towards improving health status. Governments and multilateral and bilateral cooperation are encouraged to increase public spending on health in

order to enhance health conditions of its citizens and impact positively on economic growth and development. For increased public spending on health to have the utmost effect on health outcome, proper monitoring must be ensured in order to get value for money. Given the limited public resources, the private sector is encouraged to actively participate in the provision and delivery of healthcare services. Other social, cultural and demographic factors have been found to exert some impacts on health outcomes. Countries are advised to consolidate democracy, invest in education, supply for physicians in order enhance and maintain the healthy life of its citizens.

While the theoretical and empirical literature in health economics have been able to explain how income, through health expenditure impacts on health outcome, the reverse causality from health status through health expenditure to productivity at the micro level, and economic growth at the macro level, is also gaining scrutiny by health economists. This study reviewed and attempted to synthesis the literature on income, healthcare expenditure and Health outcome.

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