



## Analysis of Government Expenditure on Health and Its Impact on Under-Five Mortality in Ghana

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### Abstract

This paper investigates the effectiveness of health expenditure on under-five year mortality in Ghana between 1985 and 2014 using multiple linear regression. The result obtained shows that per capita gross domestic product (GDP), health expenditure and immunization against measles reduces under-five mortality. However, corruption which measures the effectiveness of governance increases under-five mortality. The policy implication is that achieving the Millennium Development Goal of lowering under-five year mortality rate by two-thirds in Ghana may be unattainable if the level of corruption is not reduced considerably.

**Keywords:** Health Expenditure; Under-Five Mortality; Governance.

### Introduction

Health is an essential element of human well-being. At society level, good health status is a component of a country's human capital, contributing to its competitiveness in productivity. The provision of quality health care is interconnected in many ways to the ability of a nation to meet its overall set targets and improve economic conditions. Hence, it is imperative on the side of government to provide good and quality health services that are accessible and affordable to its citizen. In the past few decades, Ghana together with its counterparts in the sub-region have made remarkable improvements in health conditions and status. However, they still suffer from some of the worst health problems in the world.

Under-five mortality is one of the fundamental indicators of assessing a country's health status.

The rate is the probability per 1,000 that a new-born dies before reaching age five. The rate is a measure of child survival in every country and a reflection of the social, economic, health and environmental conditions in which children live. At the United Nation's millennium summit in September 2000, Ghana as well as the many participating nations pledged to ensure a two-thirds reduction of under-five mortality between 1990 and 2015 as part of the fourth goal of the Millennium Development Goals (MDG) of reducing child mortality. Over the past decade there has been a seemingly accelerated effort by governments in sub-Saharan Africa to combat child mortality. However, with the current trend of under-five mortality it is unlikely that the MDG target of reducing mortality by two-thirds would be met by 2015.

Over the past two decades, the likelihood of under-five mortality rate has been reduced by nearly up to 50% (MDG, 2014). Regardless of this impressive effort, Ghana has failed to achieve the two-thirds mortality reduction it set out to achieve. As it stands, there are about 60 children who die before their fifth birthdays per every 1000 new-born. This clearly shows that there is indeed still much work to be done to secure for ourselves a productive future of improved health care, since the development of every nation heavily depends on its young population.

At the 58th World Health Assembly held in Geneva, Switzerland in May 2005, developed and developing countries attention was drawn towards ensuring universal access and coverage in health services provision. Further recognition of the importance of universal coverage and equity in health services provision led the WHO to propose at the 2010 World Health Assembly issues that will address financing of health that will ensure universal coverage (Ataguba and Akazili, 2010).

However, the provision of quality health and its financing do not only constitute the vast investment in the health sector, but much importantly the equity in the accessibility of health care irrespective of the citizen's level of income. Carrin et al (2007) wrote that the accessibility of needed health care is largely influenced by how health systems are financed. On account of that, many Sub-Saharan African countries including Ghana have made efforts at devoting huge public funds to health care provision with the hope of improving the health of the citizenry and consequently contribute meaningfully to the economic development.

However, the role of good governance is key to an effective development. This need to be observed for effective development. Merely allocating public resources for the right services may not end up with expecting outcomes if budget institutions—involving budget formulation, execution and monitoring are malfunctioning (World Bank, 2003). In the light of this background, the study investigates the relationship that exists between health expenditure and health indicators in Ghana focusing on under-five mortality and factoring in the impact of governance.

## Health Expenditure and Outcome

The estimates for childhood mortality including under-five mortality have changed over the years. In this regard, there is a continuous research year after year to investigate this phenomenon in order to determine the risk factors that affect this problem and suggest possible ways of reducing it to the barest minimum. Examples of these risk factors include maternal education, mother's age, occupation of parents, type of residence, region of residence, wealth quintile or income level of the household, size of the family and sanitation facility. Others include sex of the baby, birth weight of the baby, birth order, previous birth interval, antenatal care, breastfeeding and immunization.

On the empirical front, the effect of public spending on health outcome is mixed (Hammer and Pritchett, 1998; World bank and IMF, 2005). For instance, using cross sectional data of 50 developing and transition countries, Gupta et al. (1999) found that when expenditure is allocated to the health sector it influences infants' mortality rates to decrease. Shifting health expenditure to cater for primary care reduces infant and child mortality rates. Carrin and Politi (1995) further argued that health outcomes are influenced mainly by poverty and income are critical determinants of health outcomes, but did not recognize that public health expenditure has a statistically significant effect on health status.

Using data from 47 African countries between 1999 and 2004 and fixed effect model, Anyanwu and Erhijakpor (2009) found that health expenditure has a statistically significant effect on infant mortality and under-five mortality. Akinkugbe and Afeikhena (1996) also provided an evidence that the effect of health care expenditure as a ratio of GDP on life expectancy, under-five mortality and infant mortality is positive and significant in Sub Saharan Africa, Middle East and North Africa.

A recent study of 81 countries covering mainly low income and middle-income countries conducted by Gottret and Scieber (2006) revealed that a 10 percent increase in government health expenditure has a larger impact in reducing under-five mortality and maternal mortality than a 10 percent increase in education, roads and sanitation. Government health expenditure has as large an impact as income on under-five mortality but a smaller impact on maternal mortality. In addition, for a 10 percent increase in government health expenditure the decrease in maternal mortality is typically 1 percent point more than decrease in under-five mortality.

## Corruption in Ghana

Corruption, in Ghana, has been a canker that has long plagued the development of the nation. Past governments have though made effort to reduce the level of corruption in the nation. The transparency index of Ghana's ranking on the Transparency International Corruption Perceptions Index has improved slightly for the past decade.

The issue of corruption become a much bigger problem for Ghana after Ghana was ranked second in 2015 as the corrupt country in Africa. The corruption perception index by the Transparency International stated about 71 percent of people living in Ghana say corruption has increased over the last twelve months.

Generally, countries with high poverty are most seen to have high corruption levels. The prevalence of corruption in a country hampers the economic and social growth as a few individuals only have to themselves the nation's resources which is meant for the entire citizenry. The recent exposé in the Judiciary service sparked up the perception that corruption still remains cancerous in Ghana (BBC News, 2015).

Corruption in the health sector may be viewed by examining the roles and relationships among the different players to identify potential abuses that are likely to occur (Ensor, 2002; Savedoff, 2006). The health sector is prone to corruption due to uncertainties surrounding the demand for services as seen in many developing countries and particularly in former centrally-planned economies, where bribery in the form of informal payments from patients to healthcare providers is common and widespread (Savedoff, 2006; Lewis, Maureen, 2000). Ghana's public health care system has been faced with some issues of corruption. In its 2006 Global Corruption report.

Transparency International “has identified the health sector of Ghana as a corruption prone area with evidence of bribery and fraud across the breadth of medical services. This is said to have emanated from petty thievery and extortion to massive distortions of health policy and funding, fed by payoffs to officials in the sector”.

In the health sector, corruption can mean the difference between life and death. Poor people are worst affected. Medical staff can charge unofficial fees before attending to patients. They may demand bribes for medication which should be free. Corruption also costs lives when fake or adulterated medications are sold to health services (Global Corruption Report 2006).

## Governance and Health Outcome

Using a model similar to that of Filmer and Pritchett (1997, 1999), Wagstaff and Cleason (2004) show that good policies and institutions (as measured by the World Bank’s Country Policy and Institutional

Assessment or CPIA index) are important determinants of the impact of government health expenditures on outcomes. The impact of government health expenditures on mortality increases and is statistically significant when the quality of policies and institutions improves. Increasing resources meant for health care expenditure does not guarantee always guarantee positive expected results if there is misappropriation and inefficient use of resources. World Bank (2003) records that an ineffective budget management often results in the inefficient use of public resources for required services in most developing countries and particularly in Africa. In this regard, managing public resources and spending is prime to the development of every nation. This also suggests that effective measures need to be laid down as a springboard to reduce fraud and wholly bring about good governance.

Many empirical studies suggest that improved governance leads to better development outcomes including health. For example, Kaufmann et al (1999) and Kaufmann et al. (2004) showed that governance indicators including voice and accountability, political stability and violence, government effectiveness regulatory burden, rule of law and graft have a strong direct impact on infant mortality. Using 91 developing countries for 1990, 1997 and 2003, Rajkumar and Swaroop (2008) showed that public health spending lowers the child mortality rates more in countries with good governance (as measured by a corruption index and bureaucratic index).

## Theoretical Framework

The health production function for estimating the relationship between health expenditure, corruption and child health is expressed as below;

$$HS = f(HEXP, PGDP) \dots (1)$$

Where HS is Health Status of under-five mortality rates. PGDP is real Gross Domestic Product per capita (real income per capita); HEXP is health spending (total, public and private health care spending)

From *Equation 1* the model assumes that; increase in real per capita GDP leads to a reduction in under-five mortality rates. The mechanism through which real income per capita affects child health is the allocation of more financial resources to child health services. Health expenditure influences child health through the channels of availability of child health focused interventions such as immunization, nutrition boosters and supplements and child growth monitoring. Health expenditure also facilitates availability of adequate health workers, drugs and medical supplies and infrastructure (clinics and hospitals) for provision of the child health related health services.

Improving quality of governance by reducing corruption leads to a decline in under-five mortality rates. Since low corruption environment is likely to promote transparency and accountability in provision of health services. Hence, reducing leakages which might affect effectiveness of health service delivery to children.

*Equation 1* is transformed in a *Cobb-Douglas* health production model. The production function relates health status with health spending and real gross domestic product (GDP) per capita. The Cobb-Douglas model is presented below;

$$Output_i^P = e^{A_i} * \left(\frac{GDP_i}{N_i}\right)^\alpha * \left(\frac{PubEx_i^P}{GDP_i}\right)^\beta \dots (2)$$

$$\text{where } \alpha > 0, \beta \geq 0$$

Where  $PubEx_i^P$  is public spending on program  $p$  that produces  $Output_i^P$  in country  $i$ ,  $N_i$  is the country's population,  $GDP$  is gross domestic product and  $A$  represents a set of country specific factors. The production function in *Equation 2* indicates that the development outcome of a public program  $p$  in a country:

- a) Improves with an increase in its income;
- b) Improves (or does not worsen) if an increased proportion of the country's resources are spent on that public program.

c) Depends on other country-specific factors.

The outcomes could, for example, be indicators of health status such as child mortality or under-five mortality at any given point of time, which can be influenced, among other factors, by public spending.

The transformed model is hence expressed in the relationship below as *equation 3*;

$$HS = e^A * (PGDP)^\alpha * (HEXP)^\beta \dots (3)$$

Taking the logarithms of *equation 3* transforms it into a linear *equation 4*

$$\ln HS = A + \alpha \ln PDGP + \beta \ln HEXP \dots (4)$$

The parameters are defined as follows:  $\alpha$  is the coefficient of real GDP per capita; which measures the elasticity of under-five mortality rates with respect to change in income.  $\beta$  is the elasticity of under-five mortality rates with respect to change in health expenditure.

The model is the augmented with corruption variable and this relationship is expressed as *equation 5*

$$\ln HS = A + \alpha \ln PDGP + \beta \ln HEXP + \sigma COR \dots (5)$$

Hence  $\sigma$  is the coefficient of corruption which measures the elasticity of under-five mortality rates with respect to change in level of corruption.

The model was further extended for the purpose of this paper to include dummy variables of the corruption variable which was an ordinal variable. The corruption index which was originally scaled from 1 to 10, where 1 represent poor levels of corruption and 10 represent good level corruption. The index was re-scaled into five categories presented in *table 1* below. Four dummy variables were created and introduced into the model using the following categories- extremely corrupt, highly corrupt, corrupt and fairly corrupt. The final model is, thus, presented below in *equation 6*.

**Table 1: Dummy Variables Used**

Scale Interval	Category
2.5 to 3.0	Extremely Corrupt
3.0 to 3.5	Very Corrupt
3.5 to 4.0	Highly Corrupt
4.0 to 4.5	Corrupt
5.0 to 5.5	Fairly Corrupt

Where ExCOR represents extremely corrupt, HiCOR represents highly corrupt, COR represents and FaCOR represents fairly corrupt.

$$\ln HS = A + \alpha \ln PDGP + \beta \ln HEXP + \sigma_1 ExCOR + \sigma_2 HiCOR + \sigma_3 COR + \sigma_4 FaCOR \dots (6)$$

## Empirical Model

In order to investigate the impact of health expenditure on under-five mortality rates, two models are specified. The first model contains health expenditure and an additional variable (Immunization, measles (% of children ages 12-23 months). This is the baseline model to study the relationship between health expenditure and under-five mortality rates. It is written as follows.

$$\ln HS = \beta_0 + \beta_1 \ln PDGP + \beta_2 \ln HEXP + \beta_3 MEAS \dots (7)$$

The model in *equation (7)* was extended to include the corruption perception index in order to capture the direct effects that governance (measured by the level of corruption) may have on health status (under-five mortality) to yield the following model.

$$\ln HS = \beta_0 + \beta_1 \ln PDGP + \beta_2 \ln HEXP + \beta_3 ExCOR + \beta_4 HiCOR + \beta_5 COR + \beta_6 FaCOR + \beta_7 MEAS + \varepsilon \dots (8)$$

The coefficients  $\beta_1$  and  $\beta_2$  are the coefficient estimates of health spending and are expected to be negative.  $\beta_3$  through  $\beta_6$  are coefficients of level of corruption and are expected to be negative.  $\beta_7$  is the coefficient for the additional variable and  $\varepsilon$  is the error term which is assumed to be normally distributed.

### Data and Choice of Variables

In the empirical analysis, we used data from 1985 to 2014. This interval of years was chosen because we have, for them, the necessary information on the various variables employed in the study. The data used in the study are mainly sourced from the World Bank Development Indicators.

We study the impact of public health spending on child (under 5) mortality. We model the interaction between public spending and governance indicators in assessing this impact. The main variable in the study is health expenditure which like many other variables is sourced from the world development indicators. We measure governance using the transparency international corruption perception index (CPI). It measures the level of corruption in a country's public sector. The CPI is scaled from 1 to 10, with 10 as least corrupt or clean and 1 as most corrupt. The other variable which we use in our regression is immunization against measles, proportion of children aged between 12-23 months.

### Empirical Results

Equation (5) was first estimated with the ordinary least squares (OLS) techniques. In this model, the governance variables are ignored to measure the effect and contribution of the non-governance variables on our dependent variable, under-five mortality. In the second model, the corruption variable was introduced to measure the direct effect of corruption on governance and its corresponding effect and contribution to the dependent variable, under-five mortality. Moreover, out of the four dummy variables created for the five categories, the corruption index, three were ignored since they were not significantly related to the dependent variable, under-five mortality.

**Table 2: Summary Statistics If Variables Are Used**

	N	Mean	Maximum	Minimum	Std Deviation
Under-five mortality	30	103.20	154	64	25.58
Per-capita GDP	30	2449.5	3894	1832.5	605.21
Health Exp.	30	3.7	5.6	3.7	1.02
Immunization against measles	30	74.2	95.0	21.0	17.6

The summary statistics are presented in Table 2 above. It shows that for the period between 1985 and 2014, average mortality is 103.2 with a minimum of 64.00 and a maximum of 154.6. The mean per capita GDP is US\$ 2449.4513 with minimum 1832.45 and maximum of 3894. The average Health Expenditure as a proportion of GDP is 3.7 with minimum 2.68 and maximum 5.6. The average immunization against measles is at 74.2% with a minimum and maximum of 21% and 95% respectively. The average corruption index is 3.41 with minimum 2.6 and maximum 4.70.

### Model 1: Specification

Table 3 below contains the estimates for the OLS regression on model 1 of equation 1e. The results show that there is a negative relationship between under-five mortality and all the independent variables which is in line with theoretical expectation. From the model specification table, per capita GDP (-0.621) has the strongest relationship with the outcome, under-five mortality as compared to Immunization against measles (-0.349) and Total health expenditure (-0.083). The p-values shows that all the independent variables are statistically significant expect for Health expenditure with is insignificant. The R value of 0.991 shows strong relationship between our independent and dependent variable whereas the R<sup>2</sup> value of 0.982 indicates that 98% of the variations in the outcome (under-five mortality) is explained by the combination of the independent variables entered in the model.

Hence it can be said that higher per capita income would deliver lower under-five mortality which is consistent with results in the literature and the link between public health expenditure and under-five mortality is negative.

The model is thus expressed as follows;

$$\ln(\text{Mortality}) = 10.428 - 0.688 * \ln(\text{PCGDP}) - 0.8 * \ln(\text{HEXP}) - 0.05 * (\text{MEAS})$$

Table 3: Model 1 Specification						
Coefficients						
	Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
		B	Std Error	Beta		
1	(Constant)	10.428	0.541		19.275	.000
	Per-Capita GDP	-0.688	0.08	-0.621	-8.571	.000
	Public Health Expenditure, %GDP	-0.080	0.069	-0.083	-1.155	0.258
	Immunization against measles	-0.005	0.001	-0.349	-8.404	.000
			R	R Square	Adjusted R Square	Std. error
			0.991	0.982	0.980	0.3556

## Model 2: Specifications

The results for the second model is shown in table 4 below. The results show that there is a negative relationship between under-five mortality and all the independent variables which is similar to the first model. Moreover, from the table, per capita GDP (-0.606) has the strongest relationship with the outcome, under-five mortality as compared to Immunization against measles (-0.251), Extremely Corrupt (0.123) and Total health expenditure (-0.102). In this model the p-value for the independent variables show statistical significance expect health expenditure which is significant only at 10%. The R value of 0.994 shows strong relationship between our independent and dependent variable whereas the R Square value of 0.988 indicates that 98% of the variations in the outcome (under-five mortality) is explained by the combination of the independent variables entered in the model.

Table 4: Model 2 Specification

Coefficients					
Model	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std Error	Beta		
(Constant)	10.21	.45		22.64	.000
Per-Capita GDP	-0.672	0.066	-0.606	-10.11	.000
Public Health Expenditure, %GDP	-0.099	0.057	-0.102	-1.73	0.096
Extremely Corrupt	0.018	0.005	0.123	3.63	0.001
Immunization against measles	-0.004	0.001	-0.251	-5.74	.000
		R	R Square	Adjusted R Square	Std. error
		0.994	0.988	0.986	.0293

$$\ln(\text{Mortality}) = 10.206 - 0.672 * \ln(\text{Per Capita GDP}) - 0.99 * \ln(\text{Health Expenditure}) - 0.04 * \text{Immunization} + 0.018 * \text{Extreme Corrupt}$$

Hence, we can once again conclude that higher per capita income would deliver lower under-five mortality which is consistent with results in the literature. Also, the link between public health expenditure and under-five mortality is negative but the efficacy of public spending in lowering under-five mortality is positively related with the level of governance, which supports the argument for good governance. Thus, well-functioning public institutions are critical for translating public spending into effective services. This is indicated by the positive coefficient of the corruption dummy. In other words, if the level of corruption increases by 1% which imply a fall in the corruption index and thus enters or approaches the extremely corrupt category, under-five mortality is likely to increase.

### Summary and Conclusion

In this paper we have studied the links between public spending, governance, and outcomes. Our primary investigation was to determine whether greater health spending translates into better health performance outcomes. We also examined the role of governance—measured by the level of corruption, and ask how it affects the relationship between public spending and outcomes.

Using data from 1985 to 2014, we found that public health spending has the right impact on under-five mortality when there exists good governance. As the level of corruption goes down and value of the corruption perception index rises,

public spending on health becomes more effective in lowering under-five mortality. This implies that simply increasing public expenditure on health is less likely to lead to improvement in health status unless the corruption issue is addressed.

These results have important implications for enhancing the development of effectiveness of public spending. Simply increasing public spending on health is less likely to lead to better outcomes if the country has poor governance. These findings are particularly relevant for developing countries, where, on average, the state of governance is quite poor.

## Recommendations

As part of the International Development Goals which Ghana is a signatory to, was to lower under-five mortality by two-thirds by 2015. The policy implication of the findings of this paper is that achieving the Millennium Development Goal of lowering under-five mortality by two thirds by 2015 in Ghana may be unattainable if the level of corruption is not reduced considerably. However, with the period haven come to an end, it is imperative that the government takes an extra look at the issue of corruption in order to curb the problem of under-five mortality in the near future.

Increasing public spending on health is an easier option than improving governance, but as our findings suggest the easier option may not lead to achievement of these goals. Hence the budget and auditory systems should be revised to ensure more transparency and supervision of health service delivery.

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