PUBLIC HEALTH SPENDING AND CHILDHOOD MORTALITY IN SUB-SAHARAN AFRICA: DOES GOVERNANCE MATTER?

By

KAFIGA, Yusuph

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF PUBLIC POLICY

2018

PUBLIC HEALTH SPENDING AND CHILDHOOD MORTALITY IN SUB-SAHARAN AFRICA: DOES GOVERNANCE MATTER?

By

KAFIGA, Yusuph

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF PUBLIC POLICY

2018

Professor Jaeun SHIN

PUBLIC HEALTH SPENDING AND CHILDHOOD MORTALITY IN SUB-SAHARAN AFRICA: DOES GOVERNANCE MATTER?

By

KAFIGA, Yusuph

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF PUBLIC POLICY

Committee in charge:

Professor Jaeun SHIN, Supervisor 

Professor Seulki CHOI 

Professor Tae-Hee CHOI 

Approval as of May, 2018

ABSTRACT

This study examined direct and indirect impact of governance on childhood mortality in sub-Saharan Africa countries. Governance was measured by using two indexes which are government effectiveness and corruption index from World Bank Governance indicators. To determine the direct effect, government effectiveness and corruption indexes were treated separately while to determine the indirectly effect, government effectiveness and corruption indexes were interacted with public health expenditure. This empirical study uses longitudinal data sourced World Bank dataset covering 1995-2014 for 41 sub-Saharan countries depend on the availability of data on variables of interest. Under-five mortality rate was used as indicator for childhood mortality. To examine the impacts of governance on under-five mortality rate, we used fixed effect method. The study finds that government effectiveness has both direct and indirect strong effect in reducing rate of deaths of children below age five in sub-Saharan Africa. Moreover, study find improvement in water source, GDP per capita and AIDS/HIV prevalence all have statistically impact on under-five mortality rate. These findings corroborate previous related empirical evidence that governance has impact on reducing childhood mortality. These empirical estimates call for public health policy makers to take attention to the following; excellent public health services, political pressures, formulation and implementation of health policies and government commitment to health policies formulated.

Keywords: Public health Spending; Under-Five mortality; Governance, Government Effectiveness & Quality of corruption index, Sub-Saharan Africa

Dedicated to my beloved wife and mom

ACKNOWLEDGEMENTS

First, I extend my inmost honor to Professor Shin, Jaeun; Major supervisor and Professor Choi, Seulki; second supervisor, whose expert advice, motivation, constructive criticism and guidance made this study possible. The same applies to Professors at KDI School through their knowledge and wisdom they have imparted to me.

Second, I want to give thanks to all my KDI School colleague and staff who provided assistance that compelled me to complete this study. Also I want to appreciate government of Korea for offer me Scholarship and because of this now resulted this paper.

Lastly, sincere honor goes to my family for their prayers, love, support and encouragement. To my loving wife Essah Kafiga, your love, motivation, compassion and encouragement illuminates my world. Also my sincere gratitude goes to whoever accorded any form of assistance in the accomplishment of this study.

May God bless you all

Contents

LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
FE	Fixed Effects
RE	Random Effects
GDP	Gross Domestic Product
HIV	Human Immunodeficiency Virus
MDGs	Millennium Development Goals
OLS	Ordinary Least Squares
SDGs	Sustainable Development Goals
UNICEF	United Nations Children's Fund
WHO	World Health Organization
UN	United Nations

1 INTRODUCTION

1.1 Background of the Study and Overview

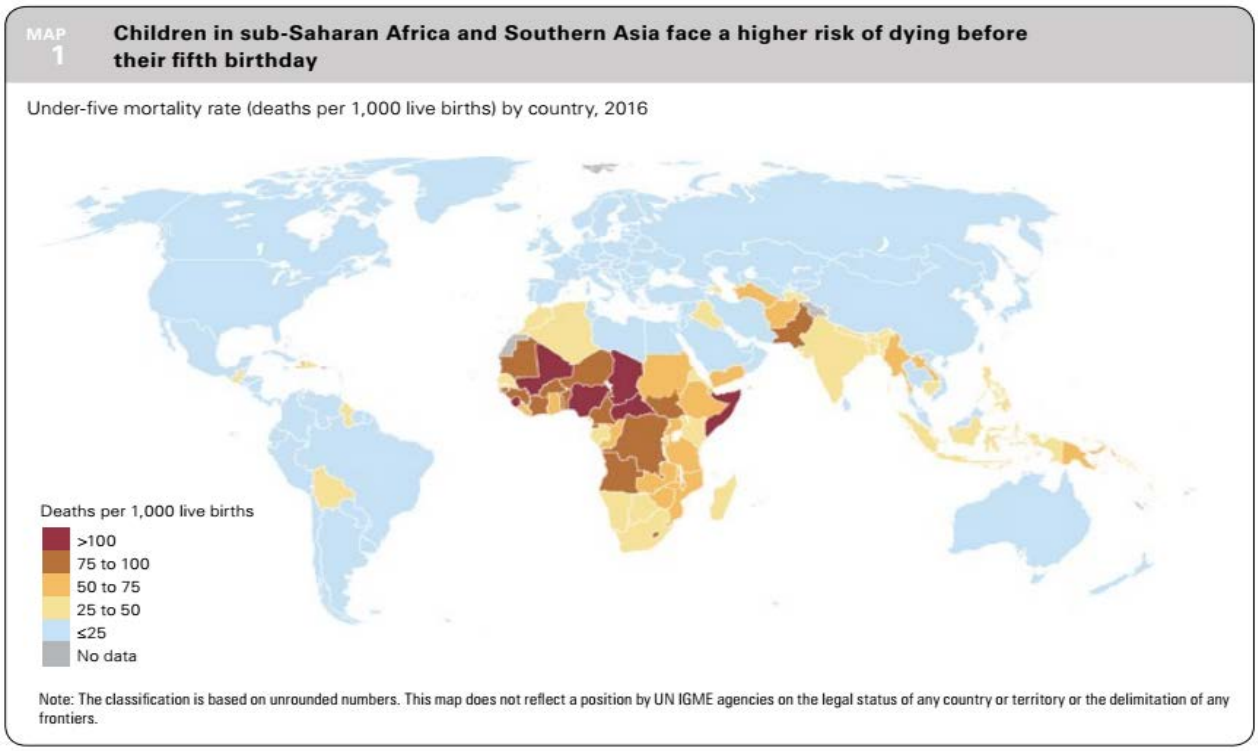
Child mortality is the one of the main indicator that shows the child health and well-being. On 25th September, 2015 global leaders agreed to end poverty, keep planet safe and ensure development for all developed and developing nations as part of a new Sustainable development agenda and each goal has to be achieved by 2030. Among the 17 goals, Goal number three talk about health and well-being at all ages. Currently there is debate on how these sub-Saharan countries can attain goal number three by 2030. Statistics shows that between 1990- 2015, globally under-five mortality rate was decline by 47 deaths per thousand live births.

Despite progress that the World has achieved to reduce child mortality, Africa still remain the continent with the highest rate of deaths of children below age five in the World when compared to other region for instance in the year 2016 child mortality was 79 deaths per 1,000 live births (Unicef 2017). When translated into ratio it means that 1 child out of 13 children passing away before reach age five and Sub-Saharan Africa is 15 times more compared to high income countries (Unicef 2017).

This statistics cannot be ignored if it is serious sub-Saharan countries want to achieve the SDG goal number three by 2030. According to Uniccef Report 2017 it shows that countries having child mortality above 100 deaths per 1,000 live births are all found in Africa. Among 195 countries, 116 countries have already met SDG target, 27 will meet the target by 2030 based on their current progress, 52 countries have to make more effort and imitative for them to meet the mentioned target and among these counties most of them are from Africa continent. Some of the

countries from Africa approximately 13 countries are expected to not attain the stipulated target even until 2050 if nothing will be done to accelerate the current status (Unicef 2017). Therefore this statistics shows how is important for sub-Saharan countries to make more effort than before to end child mortality.

Figure 1



Source: Unicef Report, 2017

Despite the huge success that is obtained since 1990 to 2015 still Child survival remains to be an urgent issue not to be ignored. If we will not take this issue as serious issue which need attention especially in southern part of Africa its means we are going to lose 69 million children before they reach age five by 2030 (Unicef report 2015). The mentioned statistics are very high

which make alarm to leaders and African policy makers to take this issue as serious and special attention to end these preventable deaths to our children.

More than half of the childhood mortality can be ended with simple, affordable interventions (WHO 2017). Those main causes of childhood mortality in sub-Saharan are acute lower respiratory infections, prematurity, waterborne diseases, Malaria and nutritional conditions (Table 2)

Table 2: Causes of death among children 0- 4 years of age in Southern African countries, 2013 (000)

	Acute lower respiratory infections	Prematurity	Communicable, perinatal and nutritional conditions	Diarrheal diseases	Congenital anomalies	Injuries	HIV/AIDS	Other
Angola	31.4	19.8	19.3	26.2	8.8	8.2	2.3	24.3
Botswana	5.8	9.7	4.9	3	4.8	2.8	2.8	6.4
Congo (DR)	16.3	12.6	11.6	10.9	4.5	5.3	1.2	16.5
Lesotho	15.8	13.1	10	9.5	5.5	5.2	9.6	13
Madagascar	9.2	6.6	6.1	5.7	3.8	4.4	0.4	8.4
Malawi	9.3	8.9	8	5.7	4.5	4.5	6.3	10.4
Mauritius	1.8	3.6	1.1	0.4	3.2	0.4	0	3.1
Mozambique	12.4	9.9	7.3	7.7	4.2	4.5	5.1	12.8
Namibia	8.6	7.2	5.3	4.5	3.6	3.6	2.5	6.5
Seychelles	0.7	3	1.9	0.1	3	1.1	0	3
South Africa	7.4	5.3	5.9	4	3.6	3.7	4.5	6.4
Swaziland	12.1	7	7.2	6.9	5.7	4.8	9.8	8.7
Tanzania	8	5.9	6	4.6	4.3	4.1	2.1	7.8
Zambia	12.5	7.3	7	6.8	4.4	4.5	4.8	9.3
Zimbabwe	10.2	10.2	9.2	7.8	5.3	5	6.8	8.1

Source: World Health Organization (WHO)

1.2 Statement of the Problem

To investigate how public health expenditure is related with childhood mortality in Africa remains an important area which needs further studies. This is because childhood mortality is still high as demonstrated in the introduction part of the paper. To find if expenditure on health has an effect on reducing deaths of children is still a research question which is not well answered. Other studies concluded that government expenditure on health has an effect on reducing childhood mortality while other studies concluded that has no effect and if there is effect is not statistically significant on reducing childhood mortality.

Because of the unsettled conclusion from previous studies that is the main reason for this study to include the issue of good governance. Recently most international organization emphasizes the importance of governance as the key factor for intended outcomes. Even it has been reported that barely to allocate public spending for products may not guarantee good and intended results if the is weakness in the responsible institutions especially those deals with budget. (World Bank 2003). The main reason why African countries and other transitional countries do not do translate their expenditure into planned outcomes is because of the great weakness which is found in budget process especially formulation, execution and monitoring the allocated budget (World Bank 2003).

Recently the issue “governance” and “good governance” are being discussed in various development literatures. Bad governance is regarded as the main root of all evil that is happening in the society and this lead various international organization provide their aids and loans to the developing countries based on the prevail condition of governance. Governance means the process of which the decision are made and implemented either in a good way or bad way.

This study wants to show empirically the effect of governance which will be measured by using governance effectiveness and corruption as among the main determinant on determine how government expenditure on health are effective on reducing children mortality in Sub-Africa. Therefore findings that will be obtained can give possible explanations to the previous existing surprising results from empirical paper that expenditure on health does not have an impact in reducing childhood mortality.

1.3 Research Questions

2. What is the direct impact of governance on under-five mortality rate in sub-Saharan Africa countries?
3. What is the indirect effect of governance on Public health spending in sub-Saharan Africa?

1.4 Objectives of the Study

General objective of the paper is to find the link and how public health spending (% of GDP), governance and childhood mortality are related and affect each other. To examine the role of governance, government effectiveness index and corruption index from governance World Bank indicators are used in order to determine its impacts.

This broad objective is divided into two specific objectives:

I. To investigate whether governance has direct and indirect (on public health spending) effect in reducing deaths of children under age five in sub-Saharan Africa
II. To determine effects of other economic and non-economic variables (control variable) that has impacts on deaths of children who died before they reach age five.

1.5 Hypothesis

This study will test the hypothesis that governance (Government effectiveness and corruption index) does affect direct and indirect in reducing deaths of those children died before they reach age five in sub-Saharan Africa.

1.6 Significance of the Study

Interrelationship between the public health spending and childhood mortality is still hot topic which needs much attention. This is because of the difference results obtained from previous empirical research paper where by other found public health expenditure has impact on reducing childhood mortality while others found no impact. Therefore to introduce the issue of governance to study this link is of great importance for policy makers for the sake of achieve Sustainable Development Goal number three by the end of 2030.

1.7 Organization of the Paper

The first chapter introduces the topic under study, chapter two is literature review. Chapter three presents methodology used. In chapter four and five study concludes with the study's major findings and policy recommendation respectively.

2 LITERATURE REVIEW

2.1 Empirical literature Review

2.1.1 Literature showing the relationship between Public Health Expenditure, Health outcomes and Governance.

Rajkumar and Swarrop (2007) found government expenditure on health and education does not give the expected results. They found quality of governance is the main reason why public health spending to have no impact on reducing childhood mortality. Countries that have good governance their public health spending tend to reduce child mortality rates than poor

governed countries. Corruption and bureaucratic quality index was used to measure governance. Also Kaufmann et al (2004) by using all governance indicators from World Bank dataset concluded that these indexes have effects in reducing childhood mortality. The most striking characteristic of these results they found is that the magnitudes of the estimated coefficient are very large therefore it indicates that there is large payoff in terms of per capita income to improvements in governance. Therefore they concluded that governance does matter a lot in allocation of government spending to get the intended results.

Nandakumar, (2013) as well as Gupta (1999) points out strong link between expenditure on health and its outcome. Gupta point out level of childhood mortality has correlation with corruption means high corrupted countries have high childhood mortality compared to less corrupted countries. Nandakumar by using 133 from developing countries concluded that countries that have good governance their health expenditure have effects on reducing childhood mortality. Their results shows infant mortality reduced from elasticity 0.13 to 0.33 and for the case of under-five mortality elasticity of 0.15 to 0.38. Also De La Croix (2006) concluded citizens that are highly corrupted tend to invest in housing and other physical materials instead in health sector.

Ojapinwa and Yussuff (2012) investigated the effect of governance on reducing childhood mortality only for the case of Nigeria. As it is well known from Statistics is among the country in Africa that is highly corrupted that why they want to measure their effect. Corruption perception index from the World Bank dataset was used and regressed on under-five, life expectancy and infant mortality rate. By using two-stage least squares concluded governance has effect on reducing child mortality. Therefore the concept of good governance should be emphasized more in the developing countries in order to realize the planned outcomes.

2.1.2 Literature Supporting Expenditure on Health's Effect on Child Mortality

Other studies found statistically significant results to substantiate that public health spending leads to decline in childhood mortality rates. Anyanwu and Erhijakpor (2007) showed using infant mortality and under-five mortality as responding variable with per capita and government expenditure on health as well as income per capita as independent variables for forty-seven African countries for the period 1999 to 2004. The authors established that total expenditure on health, encompassing the public element, is a significant contributing factor to health outcomes, whereas HIV prevalence, as well as ethnolinguistic fractionalization, are impacting significantly these outcomes. Anyanwu and Erhijakpor further discussed the implications of these results by linking it to the debate of attaining the MDGs targets.

Furthermore, Novignon et al. (2012) found that mutually public as well as private spending on health have a relationship with health outcomes, though public health expenditure effects were confirmed to be robust. They applied fixed and random effects longitudinal data methodology to investigate whether spending on health care substantially affects health outcome by way of decreasing death, covering the period 1995 to 2010. In the same way like Anyanwu and Erhijakpor (2007), they pointed out that in order to achieve the MDGs increasing health care spending, efficacious public-private cooperation in apportioning spending on health care is necessary (Novignon et al. 2012).

In a study by Gottret and Scieber (2006) which covered eighty-developing countries, they established that 10% rise in government spending on health care has a greater effect in decreasing under-five together with maternal mortality as compared to 10% growth in education, roads and sanitation. Gottret and Scieber concluded that government health spending has a major influence under-five mortality, nonetheless a less significant influence on maternal mortality. Additionally, their study found out that for 10% rise in government health spending

the decline in under-five mortality is usually one percent point below the reduction in maternal mortality.

Furthermore, Farahani et al. (2010) show that in India public spending on health resulted in the decline of women, children and elderly death probability. Similarly, Barenberg et al. (2015), applying a longitudinal for the period 1983 to 1984 and 2011 to 2012, confirmed that expenditure on health reduces infant mortality. Their findings confirm that a rise in health expenditure by one percent of GDP at state-level is connected with the infant mortality rate declining by approximately eight deaths of infant per one thousand live births. Moreover, Barenberg et al. (2015), found out that female literacy and urbanization decreases the infant mortality rate.

Gani (2008), utilizing data from Pacific Island nations over the period 1990-2002, examined per capita public spending on health's impact on infant mortality, controlling variables such as income per person, immunization, urbanization and caloric intake. The author established a statistically negative link between expenditure on health per capita and infant mortality rate. According to Gani (2008), a 10% increment in per capita, health expenditures could cause approximately 6.6% decline in infant mortality.

In their research of 50 low-income nations, Gupta et al. (1999) established an empirical proof to validate the assertion that more public health expenditure lowered infant as well as child mortality rates. Likewise, Gupta et al. (2001) indicates that public spending on health decreased childhood mortality using a larger sample of seventy developing countries. In another study, Bokhari et al. (2006), using data from 127 nations, confirmed that a rise in per capita public health spending by 10% results to decline in under-five mortality rates by 3.3% on average.

2.1.3 Empirical studies that found no impact of health expenditure on Child Mortality rate

Musgrove (1996) as well as Kim and Moody (1992) find no evidence of health expenditure effect on childhood mortality outcomes since the findings were statistically insignificant. Musgrove further asserts that public spending on health merely substitutes out-of-pocket (OOP) health spending and hence it has an insignificant impact on childhood mortality. Using a multivariate regression, Filmer and Pritchett (1999) point out a very weak effect of government health spending. Filmer and Pritchett's results established a statistically insignificant impact and a change in public spending on health could explain below a seventh of 1% disparity of under-five mortality between nations. They concluded that variables such as female education achievement, a nation's income per capita and region selection could account for 95 percent of the change in under-five mortality.

World Bank (1995) stated health expenditure led to decline in deaths of children in low-income regions, nonetheless not in higher income regions in the Philippines. Furthermore, the World Bank (2004) analyzed health care spending and infant mortality using Indian states panel data during the period 1980-99. The study concluded that when linear time trend state and fixed effects are incorporated into the model, the effect of health spending on childhood mortality is not statistically significant (World Bank 2004). Similarly, Kaushal et al. (2013) conducted their study on public health expenditure and its relation to childhood mortality (measured by infant and under-five mortality) in India; by means of time-series cross-sectional for the period 1985-2009. In addition, OLS, generalized least squares as well as fixed effects econometric models were used. Their findings establish an insignificant result between public spending on health and infant as well as under-five mortality for the Empowered Action Group (EAG) government regions and at the country level. Conversely, significance in the relationship between improved

child survival with female literacy and state per capita income was found. They suggest that implementation of other actions accompanied by improved public expenditure on health could lessen India's child mortality rate (Kaushal et al. 2013).

Additionally, Rajkumar and Swaroop (2008) used an OLS regression for ninety one high and low-income countries using annual data for the years 1990, 1997 and 2003 to investigate social results of expenditure on health. The authors' findings confirm that countries with low level of corruption and strong governance have impact on public health expenditure on child mortality. In addition, Rajkumar and Swaroop, pointed out that public health care spending per se do not assure improvement of social outcomes, but sound governance factors such as efficient budget design, implementation and monitoring are critical to attaining a higher quality health status.

3. METHODOLOGY OF THE STUDY

3.1 Methodology

From the hypothesis mentioned in chapter one to investigate if there is direct and indirect effect of governance on reducing deaths of children before they reach age five in sub-Saharan Africa, this hypothesis will be tested empirically using causal inference models with panel data.

Panel data set is one that follows a given sample of individuals over time, and thus gives multiple observations on each individual in the sample. In this study, we use a sample of 41 cross-section sub-Saharan Africa countries. Some of the benefits of using panel data include the following; panel data give researcher a large number of data points (N*T), increasing the degrees of freedom and it may reduce collinearity among explanatory variables.

This study will use two econometric methods to find the effects of governance on childhood mortality. First estimation will be Ordinary Least Squares (OLS) with pooled data. ` Weakness of the pooled OLS estimator tend to produce biased coefficients due to ignorance of country-specific effects.

The second method which is the main method that will be used in the conclusion of regression results is either Fixed Effects or Random Effects depend the results from test from Hausman results. The test tends to measure the consistency of an estimator. There are assumption which guide Hausman test includes consistent, both are analyzed in the same null hypothesis states that Random Effect method is preferred so if after running the data reject it, and then fixed effect is preferred (Hausman, 1978; Wooldridge, 2012). Therefore according to hausman test, this study will use Fixed Effects to analyze the given research questions.

3.2 Model specification`

Three models are specified to examine the effect of Governance on deaths of children below age five. First equation includes governance effectiveness and control variables. First governance effectiveness will be included independently without interact with public health spending for the sake of determine direct effect of government effectiveness on reducing deaths of children below the age of five. Also to measure the indirect effect, government effectiveness will be interacted with public health spending.

$$\text{Under 5 Mortality}_{it} = \alpha_i + \beta_1 \text{PubH exp}_{it} + \beta_2 \text{GovnEffect}_{it} + \beta_3 \text{PubHexp}_{it} * \text{GovnEffect}_{it} + \theta X_{it} + \varepsilon_{it}$$

i=1……..N and t=1….T……. (1)

Under-five mortality$_{it}$ represent dependent variable, PubH exp$_{it}$ is the public health spending, GovnEffect$_{it}$ is the Government Effectiveness index, PubHexp$_{it}$*GovnEffect$_{it}$

interaction between Public health spending and effectiveness of government and X_{it} is a vector of other socioeconomic variable that influencing under-five mortality. The control variables include GDP per capita, HIV/AIDS prevalence, Urban Population (%of total), improved water source, Immunization and fertility. Θ coefficient of the control variables, α_i country fixed effects and ε_{it} error term.

Also, quality of corruption index was included for the aim of test its direct and indirect effect on reducing under-five mortality. The equation for estimation is given as below

$$\text{Under 5 Mortality}_{it} = \alpha_i + \beta_1 \text{PubH exp}_{it} + \beta_2 \text{ Corruption}_{it} + \beta_3 \text{PubH exp}_{it} * \text{Corruption}_{it} + \theta X_{it} + \varepsilon_{it} \ldots\ldots (2)$$

Lastly, equation one and two are both included in the same equation as shown below;

$$\text{Under 5 Mortality}_{it} = \gamma_i + \beta_1 \text{PubH exp}_{it} + \beta_2 \text{Governance Effectiveness}_{it} + \beta_3 \text{PubH exp}_{it} * \text{Governance Effectiveness}_{it} + \beta_4 \text{ Corruption}_{it} + \beta_5 \text{PubH exp}_{it} * \text{Corruption}_{it} + \theta X_{it} + \varepsilon_{it} \ldots\ldots\ldots\ldots (3)$$

3.3 Definition of Variables

As mentioned earlier in the methodology and model specification, the dependent variable is child mortality which is measured by under-five mortality rate. On the side of explanatory variable there are two main explanatory variables which are government expenditure on health measured as percent of GDP and Governance measured by corruption and Government effectiveness index from World Bank government index. The control variables are HIV/AIDS prevalence, GDP per capita, urbanization, fertility, improved water source and immunization.

Under-five mortality rate is the main dependent variable and defined as the percentage per 1000 a little one will decease before 5 years old. Also according to UNICEF 2015 under-five mortality in Southern African region has reduced from average of 136.1 in 2000 up to 66 in 2013.

Public health expenditure Public health expenditure consists of recurrent and capital expenditure from government (central and local) budgets, external borrowings and donations (including donations from international agencies and non-governmental organizations), and social (or compulsory) health insurance funds. In this study variable is measured in terms of public health expenditure as a percentage of GDP.

Public health expenditure*Governance is the interaction term to determine the indirect effects of Governance (in this study it will be measured in two context, firstly by using government effectiveness index and secondly using corruption index) to under-five mortality rate.

GDP per capita -Gross domestic product transformed to foreign dollars applying purchasing power parity rates. GDP per capita is the one of the main indicators of the nation's economic performance. It is used as indicator for measuring living standard of the people. This is important explanatory variable because a country's ability to spend on healthcare is mainly affected to degree of its income level which is measured by GDP per capita. As we have seen in the from other empirical studies they suggested that income level is the main is the main determinant of health expenditure. This is to say that as the level of income increases lead to health care budget to rise when you hold other factors constant.

Urbanization rate capture the people living in urban areas/cities. The motive to use this variable is due to the fact that in urban areas people find easy to get health care facilities

compared to rural areas where transport system is very poor. Also in urban areas is easy to find health care facilities like hospitals and dispensary compared to rural areas especially in the developing countries.

HIV/AIDS prevalence ascribe the probability of people aged 15-49 that are influenced with HIV. Africa is the highest afflicted by HIV/ AIDS approximately 1 in every 25 adults (4.2%) living with HIV and accounting for approximately two-thirds of the people with HIV worldwide (WHO Report 2015). Due to this some of the countries like Botswana, Lesotho, Swaziland and Zimbabwe have reported increase of under-five mortality due to HIV/AIDS (UNECA 2015).

Improved water source means the probability the total population utilizing improved drinking water source. This includes piped on dwellings and other improved sources of potable water such as public taps, boreholes, protected (wells and springs), and rainwater gathering.

Total fertility rate represents the probability that women will conceive or having the ability to conceive during their lifetime. High fertility rate means more children to be born which implies more cost will be needed in the health facilities. This leads to positive effect to children under-five mortality rate.

Immunization indicates the percent that a child aged 12-23 vaccinated before 12 months. Children put under the category of being vaccinated when received at least one dose of vaccine.

Control of corruption index Control of Corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Estimate gives the country's score

ranging from -2.5 to 2.5. -2.5 indicate the highest corrupted rank while 2.5 show highest level rank of not be corrupted. We expect that when a country is more corrupted even government expenditure could not do what was intended to do.

Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Also the estimate ranging from -2.5 to 2.5 as control of corruption index.

Table 2: Summary Statistics

VARIABLES	N	Mean	Std. Dev	Max	Min
Health expenditure, public(% of GDP)	832	2.460	1.351	9.087	0.0447
Under-five mortality(per 1,000 live births)	840	118.3	48.63	279.5	13.90
GDP per capita, PPP (current international $)	837	3,712	5,241	40,016	247.4
Corruption index (-2.5 to 2.5)	672	-0.659	0.575	1.217	-1.773
Government effectiveness (-2.5 to 2.5)	672	-0.749	0.584	1.044	-1.885
Urban population (% of total)	837	35.03	14.99	86.92	7.211
Prevalence of HIV, total (% of population ages 15-49)	820	6.120	7.091	30	0.100
Improved water source (% of population with access)	838	64.97	16.37	99.90	19.50
Immunization, measles (% of children ages 12-23 months)	832	69.98	18.03	99	15
Fertility rate, total (births per woman)	840	5.370	1.154	7.725	1.430
Corruption*Health expenditure, public(% of GDP)	669	-0.393	0.685	4.814	-2.710
Government effectiveness*Health expenditure, public(% of GDP)	669	-0.479	0.706	5.855	-2.835
Number of country	41	41	41	41	41

3.4 Expected Results

Given the model specification in methodology and model specification part above, the expected results are as follows:-

Variable	Expected Sign

Health expenditure, public (% of GDP)	Negative
GDP per capita, PPP (current international $)	Negative
Government Effectiveness Index (-2.5 to 2.5)	Negative
Corruption Index (-2.5 to 2.5)	Negative
Health expenditure * Corruption index	Negative
Health expenditure * Government effectiveness	Negative
Improved water source (% of population with access)	Negative
Urban population (% of total)	Negative
Prevalence of HIV, total (% of population ages 15-49)	Positive
Fertility rate, total (Births per woman)	Positive
Immunization	Negative

3.5 The Data and Sources

This study utilized panel data set from a sample of 41 sub Saharan countries. The choice of countries of sub Saharan countries was based on the availability of data on variables of interest. The data set used is from World Bank Development indicators and World Bank Governance indicators from 1995 to 2014. (See Appendix 1)

4 RESULTS AND DISCUSSION

Under this section detailed findings obtained from pooled OLS and Fixed Effect estimators from equations 1-4. Table 3 shows the general empirical results from empirical regression on a sample of 41 sub-Saharan Africa. Also the regression table below shows interaction results to measure indirect effect of Public health expenditure.

Table 3: Regression results of Under-five Mortality in Sub-Saharan Africa

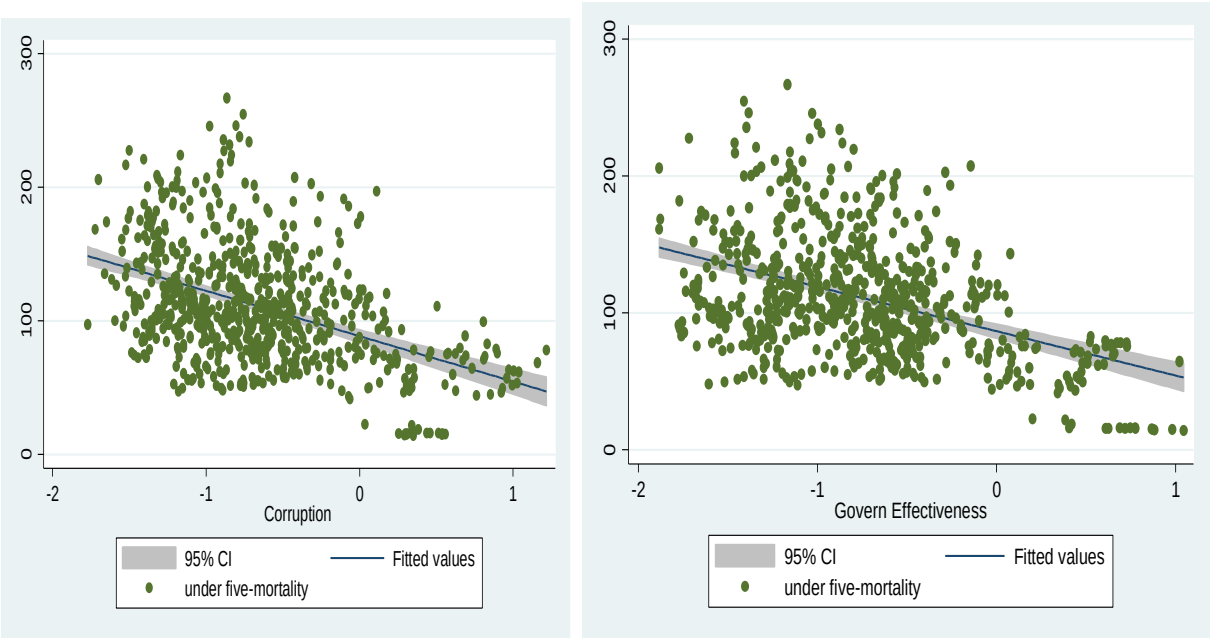
VARIABLES	(1) OLS Results	(2) F.E with Government Effectiveness	(3) F.E with Corruption Index	(4) F.E both Government & Corruption
Public health spending	-0.0237	-0.0388*	-0.0347	-0.0351
	(0.0187)	(0.0231)	(0.0223)	(0.0232)
GDP per capita	-0.0818***	-0.0599**	-0.0757***	-0.0558**
	(0.0142)	(0.0253)	(0.0262)	(0.0255)
HIV/AIDS prevalence	0.0116***	0.0250***	0.0267***	0.0244***
	(0.00160)	(0.00354)	(0.00368)	(0.00357)
Urban Population(% of total)	0.000510	0.00178	0.00101	0.00220
	(0.000842)	(0.00252)	(0.00262)	(0.00253)
Improved water source	-0.00501***	-0.00572***	-0.00724***	-0.00588***
	(0.000722)	(0.00124)	(0.00128)	(0.00125)
Immunization, measles	-0.00647***	-0.000616	-0.00104**	-0.000597
	(0.000602)	(0.000455)	(0.000465)	(0.000455)
Fertility rate	0.169***	0.0207	0.0568**	0.0215
	(0.0110)	(0.0262)	(0.0266)	(0.0262)
Government Effectiveness		-0.140***		-0.108***
		(0.0248)		(0.0332)
Government Effectiveness*public health spending		-0.0391**		-0.0625**
		(0.0173)		(0.0315)
Corruption			-0.0781***	-0.0551
			(0.0253)	(0.0340)
Corruption*public health spending			-0.0227	0.0293
			(0.0185)	(0.0324)
Constant	5.118***	5.399***	5.482***	5.347***
	(0.143)	(0.287)	(0.298)	(0.288)
Observations	802	646	646	646
R-squared	0.598	0.874	0.865	0.875
Number of country		41	41	41

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Fixed effects method is preferred for the estimation of the under-five mortality equation based on Hausman test (Prob>Chi$_2$=0.000).

Figure 2



The scatter graph above (figure 2) shows how government effectiveness and corruption are correlated with under-five mortality. This scatter graph shows that both government effectiveness and corruption are negatively with under-five mortality as expected.

Generally, the results above are consistent with previous studies. Colum one of the regression results in the table 3 shows Pooled OLS results. OLS results shows public health expenditure has expected negative sign but statistically insignificant while GDP per capita, HIV/AIDS prevalence, improved water source, immunization and fertility are statistically significant.

Under column two in the table 3 above, shows the result when government effectiveness is included in the regression by using Fixed effect based on Hausman test (prob> Chi2= 0.000). By including government effectiveness in the regression equation, public health expenditure became significant at 10% level of significance which indicate 1% increment in public health expenditure reduce deaths of children below age five by 0.038%. And when public health

expenditure is interacted with government effectiveness it still significant but at 5% significance level, which shows the indirect effect of government effectiveness to under-five mortality rate. This means that when government effectiveness interacted with public health spending, 1% increase in this interaction lower deaths of children below age five by 0.039%. For the case of control variables, GDP per capita and HIV/AIDS prevalence are statistically significant at 5% .

Apart from that, the same column in the table 3 we can see the direct effect of government effectiveness to under-five mortality rate as stated in the research questions in the chapter one. It shows that government effectiveness has negative statistically significant to reduce rate of deaths of children below age five. Therefore when there is 1% improves of government effectiveness in the country lead to 0.14% decline of under-five mortality rate.

Also in the column 3 in the table above where corruption index included, public health expenditure is statistically insignificant but has expected sign. The direct effect of corruption to under-five mortality rate is significant at 1% means that when there is 1% improvement of corruption index of the country this will lead to 0.078% reduction of under-five mortality rate. The interaction has expected negative sign but not statistically significant shows that when corruption interacted with public health spending the effect to under-five mortality is not statistically significant. On the other hand for the case of control variables, GDP per capita is statistically significant at 1% level of significance, means that when there is 1% increase in GDP per capita, under- five mortality will reduce by 0.075 which is the same case for previous empirical studies. Also HIV/AIDS prevalence has statistically significant effect on under- five mortality rate at 1% level of significance which is true when one look to the health statics which shows sub-Saharan countries have many people who are infected with HIV/AIDS. Also other control variables such as improved water source, immunization and fertility are significant.

Lastly, in the column number four in the same table number 3 both government effectiveness and corruption index are included in the model, public health expenditure has expected sign but not statistically significant but the interaction between public health expenditure with government effectiveness index is still statistically significant at 5% level of significance. This means that government effectiveness is very important in reduction of under-five mortality rate in sub-Saharan Africa. Apart from that indirect effect but also the direct effect of government effectiveness to under-five mortality rate is still consistent statistically significant at 1% level of significance. For control variable, GDP per capita is still consistent significance at 5% level, HIV/AIDS also is still significant at 1% level and improved water source is still statistically significant at 1% level of significance.

5 CONCLUSION

5.1 Summary of the Study

This study met its overall objective of investigating the impact of governance which was measured by using government effectiveness and corruption indexes on under-five mortality in sub-Saharan Africa countries controlling for the effects of GDP per capita, improved water source, the prevalence of HIV/ADS, urbanization, immunization and fertility rate.

In our empirical analysis, we used fixed effect method based on Hausman specification text to determine the direct and indirect impacts of governance on deaths of children below age five in sub-Saharan Africa countries. Our estimation find that government effectiveness has a strong both direct and indirect impact on reducing under-five mortality rates. We also find that an improved water sanitation, GDP per Capita, HIV/AIDS prevalence have impacts on under-five mortality rates.

5.2 Policy Recommendation

This study improves our understanding on the relationship that link between public health spending, governance and childhood mortality. It helps us to try explaining the surprising result from other empirical studies as mentioned in the literature review. By using data from panel data of 41 sub Saharan Africa covering the year from 1995-2014 from World Bank Dataset, we found that Government effectiveness (Standard health services provided, how policies are formulated and implemented , political pressure and commitment of the government to policies) has both direct and indirect effect in reducing childhood mortality in sub Saharan Africa.

Above findings are relevant for sub Saharan-countries because of ongoing debate on how these developing countries can achieve Sustainable development Goals (SDGs) specifically goal number three which focus to end preventable deaths of children by 2030. Therefore in order for sub Saharan Africa countries to reach this target of goal number 3, countries have to look on their level of governance since if there is good governance the impact of increasing public health spending will be realized .

As mentioned early that government effectiveness index that used in this study measures the quality of policy formulation and implementation. Most sub Saharan countries have very poor and bad environment during policy formulation and implementation. This is because most of policies formulated are not research based policies because of poor budget allocated for formulation of policies. Apart from that most of policies are not relevant for addressing the prevailing issues and challenges because it takes long period of time for policies to be reviewed. Therefore it is not only increasing public health expenditure will reduce childhood mortality in sub-Saharan Africa but also countries should take into consideration how policies are formulated especially health policies and how are being implemented.

Aside from the direct and indirect effect of the governance, Sub Saharan countries should also pay attention to improved water source, HIV/AIDS prevalence and make good policies to improve economic activities so as to boost income level of people which was measured by GDP per capita. Also there need to put much effort to prevent new infection of HIV/AIDS in the sub-Saharan Africa.

5.3 LIMITATIONS OF THE STUDY

Study has some limitations. First, we could not manage to include some of the key determinants of child mortality which includes physician's density, birth which was attended by skilled health personnel due to absence of data. Secondly the changes that taken place in most of southern African countries might influence our results. However, we try to control for these changes through the inclusion of country and time fixed effects.

Thirdly, dataset used from World Bank indicators are in aggregate annual measures which measure at national level. It is more useful if we could use household-level data at different stage of the population especially differentiate between rural areas and urban areas. The big issue is to find dataset of household-level data for sub Saharan countries. This could help policymaker to draft relevant and effective policies that target only specific population instead of aggregate policies which most of time become less effective.

Although the above drawbacks of this study, still this study significantly help our knowledge of the role of governance in decreasing childhood mortality in developing countries.

5.4 Suggested Areas for Further study

Furthermore, further studies can disaggregate public health expenditure into recurrent and capital expenditure to examine effectiveness of expenditure. Additionally, it is known that most of the sub Saharan countries depend on donor finances, further studies they can look on how the share of donor funding helps to reduce under-five mortality by comparing countries which receive large amount of fund and those receive small amount of donor fund. This can show how government manages well and utilize donor funds for sake of reducing under-five mortality.

6. APPENDICES

Appendix 1: List of sub-Saharan Countries Included in the Study

1. Angola	24. Malawi
2. Benin	25. Mali
3. Botswana	26. Mauritania
4. Burkina Faso	27. Mauritius
5. Burundi	28. Mozambique
6. Cameroon	29. Namibia
7. Chad	30. Niger
8. Comoros	31. Nigeria
9. Colombia	32. Rwanda
10. Congo, Dem. Republic	33. Senegal
11. Congo, Republic	34. Sierra Leone
12. Côte d'Ivoire	35. South Africa
13. Eritrea	36. Sudan
14. Ethiopia	37. Swaziland
15. Gabon	38. Tanzania
16. Gambia, The	39. Togo
17. Ghana	40. Uganda
18. Guinea	41. Zambia
19. Guinea-Bissau	42. Zimbabwe.
20. Kenya	
21. Lesotho	
22. Liberia	
23. Madagascar	

7 REFERENCES

Amiri, A., and Gerdtham, Ulf-G. (2013). Impact of maternal and child health on economics growth: New evidence based Granger Causality and DEA Analysis.

Anyanwu J.C. and Erhijakpor A.E. (2007). Health expenditures and health outcomes in Africa. African Development Bank, Economic Research Working Paper, No 91.

Amiri, A., and Gerdtham, Ulf-G. (2013). Impact of maternal and child health on economics growth: New evidence based Granger Causality and DEA Analysis.

Baltagi, B.H. (2008). Econometric analysis of panel data, 4e. John Wiley and Sons Ltd.

Belli, P.C., Bustreo, F. and Preker, A. (2005). Investing in children's health: What are the economic benefits? *Bulletin of the World Health Organization* 83:777-784.

Bokhari, FA.S, Gai, Y. and Gottret, P. (2006). Government health expenditures and health outcomes. *Health Economics* 16(3):257-273.

Cutler, D., Deaton A. and Lleras-Muney A. (2006). The determinants of mortality. *Journal of Economic Perspectives* 20(3):97-120.

Farag, M., Nandakumar, A. K., Wallack, S., Hodgkin, D., Gaumer, G. and Erbil, C. (2013). Health expenditures, health outcomes and the role of good governance. *International Journal of Health Care Finance and Economics* 13(1):33-52.

Farag, M. (2010). Health financing and health outcomes in the Eastern Mediterranean region. Brandeis University Working Paper 10(02).

Filmer, D and Pritchett L. (1999). The impact of public spending on health: Does money matter. *Social Science and Medicine* 49(10):1309-23.

Filmer, D. and Pritchett, L. (1997). Child mortality and public spending on health: How much does money matter? World Bank Policy Research Working Paper No.1864. Washington DC.

Grekou, C. and Perez, R. (2014). Child mortality in sub-Saharan Africa: Why public health spending matters. Université de Paris Ouest Nanterre La Défense, Working Paper 2014-28.

Gupta, S., Verhoeven, M., and Tiongson, E. (1999). Does higher government spending buy better results in education and health care? IMF Working paper 99/21. Washington D.C.

Gupta, S., Verhoeven, M., and Tiongson, E. (1999). Does higher government spending buy better results in education and health care? IMF Working paper 99/21. Washington D.C.

Gottret, P. and Schieber, G. (2006). Health financing revisited: A practitioner's guide. The World Bank, Washington, D.C.

Grekou, C. and Perez, R. (2014). Child mortality in sub-Saharan Africa: Why public health spending matters. Université de Paris Ouest Nanterre La Défense, Working Paper 2014-28.

Hamner, L., Lensink, R. and White, H. (2003). Infant and child mortality in developing dountries: Analyzing the Data for Robust Determinants. *Journal of Development Studies* 40(1): 101-118.

Hausman, J. A. (1978). "Specification tests in econometrics". *Econometrica* 46 (6): 1251–1271.

Issa, H. and Ouattara, B. (2005). The effects of private and public health expenditure on infant mortality rates: does the level of development matters? University of Wales Swansea.

Kaufmann, D., Kraay, A., Zoido-Lobaton, P., 1999. Governance matters. World Bank, Development Economics Research Group, Washington, D.C.

Kaufman, D., Kraay, A., Mastruzzi, M., 2004. Governance matters III: governance indicators for 1996, 1998, 2000, and 2002. World Bank Economic Review 18, 253-287.

Musgrove, P. (1996). Public and private roles in health. Technical Report 339. World Bank Washington, D.C.

Odhiambo, S.A., Wambugu, A., and Kiriti-Ng'ang'a, T. (2015). Effect of health expenditure on child health in Sub-Saharan Africa: Governance perspective. *Journal of Economics and Sustainable Development* 6(8):43-65.

Rajkumar, A. S. and Swaroop, V. (2008). Public spending and outcomes: does governance matter? *Journal of Development Economics*, 86: 96-111.

United Nations. (2016). Sustainable Development Goals report, 17 goals to transform our World 2016 from http://www.un.org/sustainabledevelopment/health/

United Nations. (2015). The Millennium Development Goals Report. Retrieved March 07, 2016 from http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/

UNICEF. (2015). Monitoring the situation of children and women. Retrieved March 06, 2016 from http://data.unicef.org/child-mortality/under-five

UNICEF. (2017). Levels and Trends in Child Mortality Report 2017 from https://www.unicef.org/publications/files/Child_Mortality_Report_2017.pdf

World Health Organization. (2017). Monitoring health for the Sustainable Development Goals report 2017 from http://www.who.int/gho/publications/world_health_statistics/2017/en/

World Health Organization. (2015). World health statistics report 2015 from http://apps.who.int/iris/bitstream/10665/170250/1/9789240694439_eng.pdf

World Bank. 2003. Making services work for poor people. World development report 2003. World Bank, Washington, D.C.

Yaqub, J.O., Ojapinwa, T.V. and Yussuff, R.O. (2012). Public health expenditure and health outcomes in Nigeria: The impact of governance. *European Scientific Journal* 8(13):190-201.