Government health expenditure and child health: empirical evidence from West African countries

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Abstract

Purpose – The purpose of this paper is to study the effect of government health expenditure on the health of children (under-five mortality rate and prevalence rate of stunting) among West African countries.
Design/methodology/approach – The study utilizes heterogeneous panel from the period 1990 to 2018 among 16 West African countries for the analysis. The effect of government health expenditure on under-five mortality rate is measured in per 1,000 live births while that of stunting is measured in percentage. The study employs Pooled Mean Group (PMG) estimation technique and Impulse Response Functions (IRFs) for the analysis.
Findings – The results indicate that government health expenditure has negative effect on under-five mortality rate and prevalence rate of stunting in the long-run but not significant in the short-run. In addition, the IRFs result indicates that under-five mortality rate and prevalence rate of stunting both respond negatively to shocks in government health expenditure.
Practical implications – Governments should ensure that inefficiencies in the public health sector are reduced by licensing the health workers of this sector and allowing independent bodies to appoint the heads of health institutions. This will improve the delivering of health services for the health of children.
Originality/value – Previous studies carried out have not examined the short-run and long-run effects of the relationship under study among West African countries.
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Keywords Government health expenditure, Under-five mortality rate, Prevalence rate of stunting, Effectiveness of governance, GDP per capita

Paper type Research paper

Introduction

The health of children is paramount to every country overall the world. Governments commit resources to the health sector, some of these resources are channelled towards improving the health of children (Adeosun and Faboya, 2020; Bingjie and Ronald, 2013; Issa and Ouattara, 2012). That is reducing mortality, morbidity and stunting among children. The magnitude of governments' health expenditure tends to differ among countries and continents.

While some governments commit more resources towards financing the health sector, other governments commit less resources towards the health sector (Hammers and Spears,

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2016; Byaro, 2021). For instance, statistics from OECD countries indicate that government health expenditure per capita in 2000 was US$2,338, this increased to US$5,431 in 2018 (Organization Economic Corporation and Development, 2018). Governments in Latin American Countries (LAC) were not able to commit more resources to the health sector. As their health expenditure per capita was US$1,235 in 2018 when compared with OECD countries (Organization Economic Corporation and Development, 2018). LAC countries performed relatively better when compared with Sub-Saharan African (SSA) countries. Governments among SSA countries' health expenditure per capita in 2000 stood at US$79 while in 2018 it was US$243 (World Bank, 2018).

For West African countries, government health expenditure per capita in 2000 stood at US$47.82 while in 2018 it was US$196.2 (World Bank, 2018). These statistics show that, governments among West African countries have increased their health expenditure per capita by 311.58% over the period 2000 to 2018 (World Bank, 2018). Nonetheless, this performance is relatively low when compared with LAC and OECD countries. Governments in West African countries showing commitment towards financing the health sector, while addressing inefficiencies and misallocation of these resources is relevant (Baldacci *et al.*, 2004; Ashiabi *et al.*, 2016; Jeffery and Jeffery, 2010). It is expected that these resources will be channelled towards providing adequate quality health equipments, provision of medical drugs, constructing hospitals and others. When these resources are well operationalized, it is expected to improve citizens' health especially the health of children.

With the health of children, mortality rate and the prevalence rate of stunting have imposed challenges to children among West African countries (Bingjie and Ronald, 2013; Alexiou and Trachanas, 2021; Novignon *et al.*, 2012). In 2018, statistics among West African countries show that, the mortality rate of children under five years was 127.4 per 1,000 live births while the prevalence rate of stunting was 34.24% (World Health Organization, 2018). Has the increase in government health expenditure produced any short-run and long-run effect towards reducing under-five mortality rate and prevalence rate of stunting among these 16 West African countries? In 2012, research conducted by Africa Health Research Institute (2012) identified that, government health expenditure tends to have more long-run effect on the health of South Africans than short-run effect.

Does this result holds for West African countries calls for a thorough investigation into this issue? Hence, this study seeks to fill the yawning gap in existing empirical studies by examining the short-run and long-run effects of government health expenditure on the health of children among West African countries. It is important to investigate this issue because this will guide policymakers to implement the right strategies in order to ensure that, government health expenditures produce good results both in the short-run and long-run on the health of children. The outcome of the study is also relevant to governments and other stakeholders towards fine-tuning of policies' frameworks to make the needed contributions towards improving the health of children among West African countries.

Literature review

This section reviews Wagner's theory of public expenditure and the relevant empirical studies to help deepen our understanding on the subject matter.

Theoretical review

Wagner's theory of public expenditure developed by Adolph Wagner in 1883 was reviewed for the study. The theory postulates the extent to which governments work towards increasing their public expenditures in diverse aspects of the economy with respect to sectors such as: health, employment, education, housing facilities and others. The intention behind

this laudable development is to work towards improving the standard of living of the citizenry which covers adults and children. The theory predicts that the development of countries depends heavily on governments' ability to commit the needed public expenditure to propel the needed growth in economic activities. Wagner (1883) stated that, governments in their attempt to achieve that, should ensure that there is a long-run tendency for the share of public expenditure to increase relative to national income. The theory predicts the extent to which governments should make effective public expenditure in ever-increasing social services for the citizenry. It further stated that, governments' inability to make the required public expenditure will mount increasing political pressure on governments.

This theory is relevant for the study because it emphasizes on the need for governments among West African countries to increase their public expenditures on social services especially in the health sector. This should contribute significantly towards improving the health of the citizenry especially children.

The central tenet of the theory supports Abuja Declaration for health which entreats governments among African countries to commit 15% of their annual budgets towards financing the health sector to improve the health of the citizenry especially that of children (African Union, 2001). Despite the slow growth in their economies relative to developed countries, these governments have no option but instead to keep on increasing their investment in the health sector. Especially, with respect to the health of children where the issue of under-five mortality rate (for diseases such as malaria, diarrhoea, measles, diphtheria and others) and prevalence rate of stunting should be properly tackled with these government expenditures on the health sector towards achieving this objective.

Empirical review

Numerous empirical studies have been carried out examining the effect of health expenditure on the health of children.

Empirical studies carried out by Ashiabi *et al.* (2016) and Akinlo and Sulola (2018) examined the subject matter focusing on SSA countries. In the case of Ashiabi *et al.* (2016) examined how government health expenditure and private health expenditure affect maternal and child health among SSA countries. Comparing this with that of Akinlo and Sulola (2018), Akinlo and Sulola (2018) rather examined how government health expenditure affects the health of children among SSA countries. This means that, the study carried out by Akinlo and Sulola (2018) did not consider the aspect of private health expenditure and maternal health in their analysis as done in the case of Ashiabi *et al.* (2016). Results from the study of Ashiabi *et al.* (2016) indicated that, public health expenditure has reduced infant and under-five mortality rates among SSA countries. With respect to private health expenditure, it did not have any significant effect on under-five, infant and maternal mortality rates among these countries. In the case of Akinlo and Sulola (2018), the result indicated that health expenditure by government has increased infant mortality rate.

The results of these empirical studies imply that governments among SSA countries should work towards increasing their health expenditures to improve the health of both mothers and children. As a matter of fact, a lot of efforts will be required on the part of these governments towards achieving that. Indeed, this will be possible when public health sector inefficiencies are dealt with. The issue of the important role of the private health sector was also articulated, hence the necessary measures have to be operationalized towards helping private health sector to play such an important role.

Empirical studies carried out by Olufemi *et al.* (2019) and Adeosun and Faboya (2020) examined the subject matter focusing on countries in West Africa. Olufemi *et al.* (2019) examined the relationship between public health expenditure and under-five mortality rate among West African countries. The study employed panel Fully Modified Least Square

(FMOLS) method and data covering the period 1991 to 2015 for the analysis. Comparing this with that of Adeosun and Faboya (2020), Adeosun and Faboya (2020) rather examined the effect of healthcare expenditure on child mortality by focusing on Nigeria.

Child mortality was measured by under-five mortality and neonatal mortality rates. The study employed time-series data covering the period 1986 to 2016 and Vector Autoregressive (VAR) model for the analysis. Comparing the two empirical studies, Olufemi *et al.* (2019) covered broader scope of study of 16 countries but only concentrated on under-five mortality rate as a measure for child health. The study of Adeosun and Faboya (2020) even though concentrated on one country (Nigeria), its measurement of child health was broader, that is the use of under-five mortality and neonatal mortality rates. Results from the study of Olufemi *et al.* (2019) indicated negative relationship between public health expenditure and under-five mortality rate. In the case of Adeosun and Faboya (2020), the result indicated that healthcare expenditure has reduced under-five mortality and neonatal mortality rates in Nigeria.

Results of these studies imply that, one specific aspect of child health these governments among West African countries should focus on is addressing the issue of under-five mortality and neonatal mortality rates. Information gathered from World Health Organization (WHO) indicates that, under-five mortality and neonatal mortality rates are among the leading cause of health problems among children in Africa. Hence, these governments have to operationalize expenditure rationalization towards making enough revenue available to achieve this objective.

These empirical studies and others (Novignon *et al.*, 2012; Issa and Ouattara, 2012; Bingjie and Ronald, 2013; Musonda and Byaro, 2016; Hammers and Spears, 2016; Byaro, 2017; Barenberg *et al.*, 2017; Abeka-Nkrumah *et al.*, 2021) even though focused on examining the effect of health expenditure on health outcomes of children. The issue of how government health expenditure effect on child health differs comparing the short-run and long-run outcomes was not identified by these studies. Hence, this study contributes towards filling the yawning gap in existing empirical studies by examining the extent to which government health expenditure affects the health of children both in the short-run and long-run.

Carrying out this study is important because it will guide policymakers the right strategies to implement to ensure that, government health expenditure produces higher effect on child health both in the short-run and long-run. The outcome of the study is also relevant to governments and other stakeholders towards fine-tuning of policies' frameworks to make the needed contributions towards improving the health of children among West African countries.

Methodology and data

This section focuses on explaining the model specification and variables used for the analysis.

Model specification

The study employs Pooled Mean Group (PMG) estimation technique for the analysis. The model is specified based on the concepts of Wagner's theory of public expenditure. This estimation technique is appropriate because the study is dealing with heterogeneous panel (where the time period is greater than cross sectional units). In examining short-run and long-run effects with panel data, only models like PMG, Mean Group (MG) and Dynamic Fixed Effect (DFE) models can be used. These models rely on heterogeneous panel data with long time period for robust results. Hausman test selected PMG ahead of MG and DFE models for the analysis. The time period in this study is from 1990 to 2018 while the cross-sectional units

is 16. This time period is chosen because over these periods these countries have experienced different health policies, changes in governments and expansion in their economies. These have affected their governments' expenditures on the health sector. This study is interested to find out how governments' commitment towards financing the health sector has affected the health of children. Again, the estimation technique is appropriate because it provides both short-run and long-run results. This will guide governments and other stakeholders the right policies and strategies to implement to achieve good results for the health of children both in the short-run and long-run.

PMG relies on ARDL model for estimation as proposed by Pesaran *et al.* (1999). Hence, the general ARDL model as specified by Pesaran *et al.* (1999) is written as;

$$Y_{it} = \sum_{j=1}^{p} \lambda_i Y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij}' X_{i,t-j} + \alpha_i + \mu_{it} \quad (1)$$

where Y_{it} is the dependent variable, $X_{i,t-j}$ is a $K\,x\,1$ vector of variables that are either purely $I(0)$ or $I(1)$ or cointegrated; λ_i is the coefficient of the lagged dependent variable called scalars; δ_{ij}' are $K\,x\,1$ coefficient vectors; α_i is the unit-specific fixed effects; $i = 1, \ldots\ldots, N$; $t = 1, 2, \ldots\ldots\ldots T$; p, q are optimal lag orders; μ_{it} is the error term.

Re-parameterized ARDL gives Error Correction Model (ECM), the general model as specified by Pesaran *et al.* (1999) is written as:

$$\Delta Y_{it} = \phi_i \xi_{i,t-1} + \sum_{j=1}^{p-1} \lambda_{ij}' \Delta Y_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij}' \Delta X_{i,t-j} + \sum_{j=0}^{q-1} \gamma_{ij}' X_{i,t-1}' + \alpha_i + \beta_i t + \mu_{it} \quad (2)$$

where $\xi_{i,t-1} = Y_{i,t-1} - \Theta' X_{it}$ represents the deviation from the long-run equilibrium.

Y_{it} is the dependent variable

X_{it} is the vector of explanatory variables.

μ_{it} is the error term whose variance differs across groups.

The coefficient ϕ_i is the short-run error correction term that measures the adjustment speed towards the long-run equilibrium.

δ and γ are the vectors of short-run coefficients and long-run coefficients

α_i and β_i are country specific effects

Hence, the model for the study is specified as;

$$\begin{aligned} \Delta CHEALTH_t = {} & \phi_i \xi_{i,t-1} + \sum_{j=1}^{p-1} \lambda_{ij}' \Delta CHEALTH_{t-j} + \sum_{j=0}^{q-1} \delta_{ij}' \Delta EXP_{t-j} \\ & + \sum_{j=0}^{q-1} \gamma_{ij}' \Delta EXP_{t-j} + \sum_{j=0}^{q-1} \delta_{ij}' \Delta X_{i,t-j} + \sum_{j=0}^{q-1} \gamma_{ij}' X_{i,t-1}' + \alpha_i + \beta_i t + \mu_{it} \end{aligned} \quad (3)$$

where $\xi_{i,t-1} = Y_{i,t-1} - \Theta' X_{it}$ represents the deviation from the long-run equilibrium.

where CHEALTH is Child Health EXP is Government health expenditure

Y_{it} is the dependent variable (child health is measured by under-five mortality rate and prevalence rate of stunting under-five). The prevalence rate of stunting is used for robustness check.

X_{it} is the vector of explanatory variables (GDP per capita, sanitation services, effectiveness of governance, female literacy rate, health facility, employment rate).

Variables used for the model

This section explains the variables used for the analysis. All these variables are collected from World Bank (World Development Indicators) with the exception of effectiveness of governance that is collected from World Governance Indicators (WGI).

Dependent variable. Child health is measured by under-five mortality rate and prevalence rate of stunting (height-to-age ratio for under-five) as done in the study of Olufemi *et al.* (2019). Under-five mortality rate refers to the number of children who die before the age of five years per 1,000 live births. Prevalence rate of stunting refers to the percentage of children who are under-five years whose height for age is below the median for the international reference population. Under-five mortality rate is measured in per 1,000 live births and stunting is measured in percentage. These variables are appropriate for measuring child health because according to United Nations Children Fund (UNICEF), mortality rate and stunting are among the health problems that adversely affect the health of children in Africa. Data on children who are aged 14 years and 18 years was not available, hence the use of these proxies.

Independent variable. Government health expenditure in this study consists of recurrent and capital spending incurred by government on the health sector, as done in the study of Ashiabi *et al.* (2016). The variable is included in the analysis to examine how government expenditure has contributed towards improving the health of children both in the short-run and long-run period. The variable is measured in US dollars. The variable is appropriate for the analysis because governments' ability to provide the needed: medical drugs, health facilities, training of health personnel and subsidizing health expenditures, will contribute towards improving the health of children. Hence, it is expected to have negative effect on under-five mortality rate and prevalence rate of stunting.

Control variables. GDP per capita refers to gross domestic product of a country divided by the population. The variable is included in the analysis to examine the extent to which increase in GDP per capita translates into improving the health of children. The variable is measured in US dollars. The inclusion of this variable in the analysis is appropriate because increase in GDP per capita enhances the standard of living of the citizenry. All things being equal, the increase in GDP per capita will increase parents' income.

This will help them towards providing for their children the right medication, nutrition and live in a healthy environment. This will contribute towards improving the health of children that is reducing both under-five mortality rate and prevalence rate of stunting.

Female literacy rate in this study measures the percentage of females who are 15 years and above who can read and write and are able to understand issues concerning their lives. The study carried out by Baldacci *et al.* (2002) used the same variable for analysis. The variable is included in the analysis because women spend more time with their children than their fathers. The inclusion of the variable is relevant because when the knowledge of mothers is enhanced, it helps them to take better health decisions to improve the health of their children. Hence, female literacy rate is expected to have negative effect on under-five mortality rate and prevalence rate of stunting. The variable is measured in percentage.

Effectiveness of governance as used in this study measures how the government is able to produce quality products and implement good policies, as done in the study of Bingjie and Ronald (2013). The inclusion of the variable is important because governments' ability to render quality services contributes positively towards improving the health of children. It is expected that, governments' ability to render quality services will help to reduce mortality rate and prevalence rate of stunting. Hence, the variable is expected to have negative effect on under-five mortality rate and prevalence rate of stunting. The variable is measured on scale from −2.5 to 2.5.

Sanitation services refers to percentage of people who have access to sanitation facilities and they do not share with other households. The study carried out by Checkley *et al.* (2004) used the same variable for analysis. The variable is included in the analysis because having proper sanitation services helps to prevent diseases like malaria, cholera, diarrhoea and others. This contributes towards improving the health of children. Hence, it is expected to have negative effect on under-five mortality rate and prevalence rate of stunting. The variable is measured in percentage.

Health facility as used in this study is proxied by hospital beds, as done in the study of Abeka-Nkrumah *et al.* (2021). Hospital beds measures inpatient beds which are available in public, private, general and specialized hospitals per 1,000 people. The variable is included in the analysis because governments' ability to provide the needed health facilities, helps health personnels to render better health services to children. This contributes positively towards improving the health of children. Hence, health facility is expected to have negative effect on under-five mortality rate and prevalence rate of stunting. It is measured in per 1,000 people.

Employment rate is proxied by employment to population ratio. The study carried out by Kuhlthau and Perrin (2004) used the same variable for analysis. This refers to the proportion of the country's population within the working age who are engage in economic activities. This variable is included in the analysis because when the individuals are able to secure jobs, it helps them to afford medical drugs, good healthy meals and live a healthy environment. These help them to improve their health including their children. Hence, it is expected that employment rate will have negative effect on under-five mortality rate and prevalence rate of stunting. The variable is measured in percentage.

Results and discussion

Estimates from descriptive statistics

Estimates from the summary statistics have been presented in Table 1. The under-five mortality rate has a mean value of 132.10 per 1,000 live births, with a minimum value of 15.8 per 1,000 live births and a maximum value of 329.6 per 1,000 live births. This means that, there is a wide difference in the under-five mortality rates among these 16 countries. Concerning the prevalence rate of stunting, the estimates indicate a mean value of 34.67, a minimum value of 22.13 and a maximum value of 45.3. This means that, there is not so much wide difference in the prevalence rate of stunting among these countries. Estimates from government health expenditure per capita indicate a mean value of 32.99, a minimum value of 10.059 and a maximum value of 225.65. This means that, there is a wide difference in government health expenditure per capita among these countries.

Correlation and Hausman test

Correlation test is carried out for the explanatory variables in checking for multicollinearity using the Variance Inflator Factor (VIF). The result as shown in Table 2 indicates no multicollinearity among the independent variables. According to the results, sanitation services has the highest VIF of 4.63. According to the rule of thumb, a variable with VIF higher than 5 is said to be causing multicollinearity in the analysis. Since the VIF of these

Variables	Observation	Mean	Std. dev.	Minimum	Maximum
Under-five mortality	464	132.10	57.50	15.8	329.6
Prevalence of stunting	464	34.67	4.97	22.13	45.3
Government health expenditure	304	32.99	36.49	10.06	222.65
GDP per capita	454	834.31	680.69	138.70	3740.37
Employment rate	448	61.28	9.75	40.51	72.99
Effectiveness of governance	272	22.71	15.49	2.88	65.05
Female Literacy rate	464	28.79	12.28	8.90	52.99
Health facility	464	0.61	0.27	0.81	1.2
Sanitation services	464	21.43	5.69	13.04	31.89

Note(s): Std. Dev. represents standard deviation
Source(s): Authors own creation

Table 1.
Descriptive statistics

variables are less than 5, there is no existence of multicollinearity among the independent variables. Hausman test as shown in Table 2 indicates a p-value of 0.81. This means that, PMG is selected for the analysis ahead of the Mean Group (MG) estimator.

Short-run and long-run regression results

Government health expenditure has negative effect on both under-five mortality rate and prevalence rate of stunting among these countries in the long-run, however the short-run results are not significant as shown in Tables 3 and 4 respectively. Controlling for these variables: GDP per capita, employment rate, female literacy rate, health facility, sanitation services and effectiveness of governance. Put differently, it means that in the long-run government health expenditure reduces mortality rate of children under five years and prevalence rate of stunting. These long-run results are consistent with our expectation and empirical studies results of Barenberg *et al.* (2017), Bingjie and Ronald (2013), Issa and Ouattara (2012).

Table 2. Multicollinearity test (variance inflation factor) and Hausman specification test

Variables	VIF	Hausman specification test
Sanitation services	4.63	Prob > χ^2 = 0.81
Prevalence of stunting	4.59	
Per capita	3.17	
Government health expenditure	2.91	
Literacy rate	2.56	
Health facility |	1.73	
Effectiveness governance	1.49	
Employment rate	1.29	
Mean VIF	3.37	

Source(s): Authors own creation

Table 3. Effect of government health expenditure on under-five mortality rate

Under-five mortality rate	Coefficients	Standard error
Long-run results		
Government health expenditure	−13.47**	5.87
GDP per capita	0.013**	0.0054
Employment	1.69**	0.90
Effectiveness of governance	0.19	0.26
Female literacy rate	−0.49	0.37
Health facility	−8.22	10.32
Sanitation services	−3.44***	0.96
Short-run results		
Error correction term	−0.00056***	0.0001
Government health expenditure	0.00021	0.00013
GDP per capita	0.0008	0.0055
Employment	0.0013	0.0015
Effectiveness of governance	−0.00105*	0.0018
Female literacy rate	0.00017	0.00013
Health facility	0.00164	0.0046
Sanitation services	−0.0151**	0.018
Constant	0.033	0.041

Note(s): Standard errors in parentheses, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Source(s): Authors own creation

Prevalence rate of stunting	Coefficients	Standard error
Long-run results		
Government health expenditure	−0.094**	0.32
GDP per capita	0.003	0.004
Employment	0.011	0.059
Effectiveness of governance	−0.019	0.017
Female literacy rate	0.24***	0.024
Health facility	−4.32***	0.68
Sanitation services	−1.42***	0.061
Short-run results		
Error correction term	−0.052***	0.0022
Government health expenditure	−0.00053	0.0075
GDP per capita	−0.000047	0.003
Employment	−0.0052	0.089
Effectiveness of governance	0.0018**	0.0010
Female literacy rate	−0.0058***	0.008
Health facility	0.099***	0.029
Sanitation services	−0.55***	0.10
Constant	3.69***	0.27

Note(s): Standard errors in parentheses $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$
Source(s): Authors own creation

Table 4.
Effect of government health expenditure on prevalence of stunting (robustness check)

Examining the composition of government health expenditure among these countries indicates that, capital health expenditure constitutes 61.8–67% annually on average (World Bank, 2018). Capital health expenditure tends to have long-run effect on the health of children. For example, the construction of children's hospital will take about 2 or more years before the building will be completed. This means that, the effect of this expenditure towards reducing under-five mortality rate and prevalence rate of stunting will be stronger in the long-run. Since majority of these health expenditures are made up of capital health expenditure, it tends to have long-run effect. In addition, the study identified that, most of these countries' governments release of funds towards improving the health sector (which includes improving the health of children) tends to take more time before the money is release due to inefficiencies in the public health sector. This implies that, the release of government health expenditure will have a long-term effect towards reducing under-five mortality rate and prevalence of stunting among these West African countries. These governments have an important role towards reducing the inefficiencies in the public health sector.

GDP per capita has positive significant effect on under-five mortality rate in the long-run. Put differently, it means that an increase in per capita income increases under-five mortality rate in the long-run. The result is not consistent with our expectation and results of these empirical studies (Anyanwu and Erhijakpor, 2007; Baldacci *et al.*, 2004; Cutler *et al.*, 2006). The study identified that, these 16 West African countries over these years have injected a lot of efforts towards increasing the productivity of their economic activities to boost their GDP. Information gathered among these countries over the years indicates that, enhancing economic activities helps to increase GDP among these countries. However, some of these economic activities in the area of mining, manufacturing, exploring oil and others end up polluting the environment.

The pollution of the environment leads to the spread of diseases such as low birth weight, asthma, lung diseases, respiratory infections and other related diseases that affect the health of children. The long-run effect tends to be higher due to the increase in economic activities in

the long-run, hence environmental protection agencies among these countries should work towards dealing with the problem.

Sanitation services rendered significantly reduce under-five mortality rate both in the short-run and long-run. These results are consistent with our expectations and empirical studies carried out by Checkley *et al.* (2004) and Hammers and Spears (2016). Government and private waste management companies' ability to provide quality sanitation services and facilities will help to reduce waste-related diseases like malaria, diarrhoea and others. This will help to reduce under-five mortality rate. Over the years, waste management companies have increased with the majority of these companies being private companies. The rendering of sanitation services by these companies and the public willingness to pay for their services have led to the increase in these services. Statistics from Water, Sanitation and Hygiene (WASH) indicate that, over the period the rendering of these sanitation services have increased by 68.5% from the period 2000 to 2018 (Water, Sanitation and Hygiene WASH, 2018). This had led to reduction in under-five mortality rate among these countries both in the short-run and long-run. However, the long-run effect is higher than the short-run effect. This is because, in the long-run, we expect that waste management companies will expand their services more by increasing the construction of recycling plants to improve the environment, hence affecting the health of children positively.

Effectiveness of governance has a negative effect on under-five mortality rate in the short-run. Put differently, this means that governments' ability to implement health policies helps to reduce under-five mortality rate in the short-run period but not in the long-run period. The result obtained in the short-run is consistent with our expectations and the empirical study result of Ashiabi *et al.* (2016). Over the years, these countries have worked towards the formulation and implementation of health policies to improve the health of the citizenry especially children. These policies formulation and implementation were carried out by these governments with the support of foreign agencies and other stakeholders. These governments have also showed commitment towards ensuring training of public health administrators and staff towards improving effectiveness of governance. In most countries in West Africa or even Africa as a whole.

Most at times, there is discontinuity or lack of commitment in implementing government health policies in the long-run especially when there is a change in government or funds for the policies run out. This reason accounted for the effectiveness of governance not producing any long-run effect result.

Employment rate has a positive effect on under-five mortality rate in the long-run. The result in the long-run means that as employment rate increases, it increases under-five mortality rate. The result obtained is not consistent with our expectation and empirical studies carried out by Byaro (2021) and Bingjie and Ronald (2013). Information gathered among West African countries indicates that, most workers are poorly paid especially in their earlier years of work due to their less working experience. However, in the long-run as they work for more years their working experience increases and they are able to obtain additional qualifications. Their work earnings increase, this encourages them to increase their economic activities in their quest to mass more wealth.

Most of these economic activities (especially those that border on mining, manufacturing, production of oil, informal sector activities and others) tend to pollute the environment this has an adverse effect on the health of the citizenry (especially children). This means that in the long run, the increase in employment will lead to an increase in under-five mortality rate. Hence, governments and other stakeholders should work towards ensuring that, these activities should be environmentally friendly to reduce this problem and ensure that these workers are well paid to deal with this problem towards improving the health of children. Error correction term value indicates that, deviations from short run will adjust at a speed of 0.058% towards the long-run equilibrium.

Impulse responses functions

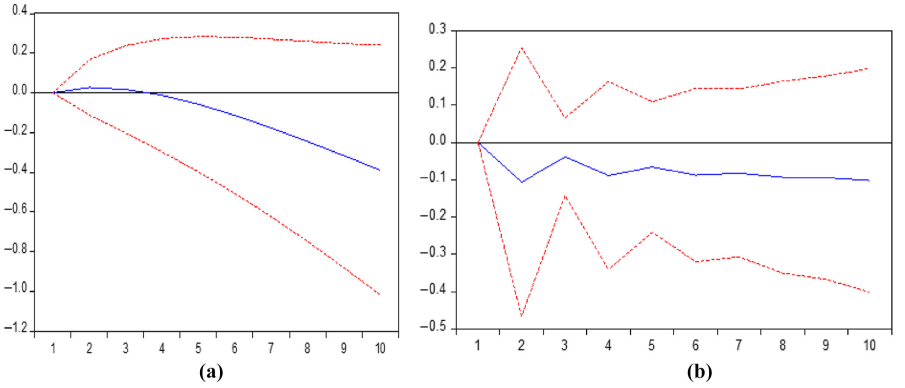
IRF is a dynamic system which its output provides brief input signal called impulse. Simply put, impulse response explains how dynamic system reacts to changes in the system. That is, it describes the reaction of a system as a function of the independent variables that parameterizes the dynamic behaviour of a system. In this study, we are interested in finding out how child health (that is under-five mortality rate and prevalence rate of stunting) responses to shocks in government health expenditure. Under-five mortality rate and prevalence rate of stunting responses to shocks in government health expenditure are represented in Figure 1 a and b respectively.

The findings from the regression estimations are complemented with this impulse responses' results. Thus, responses for under-five mortality rate and prevalence rate of stunting are verified based on shocks in government health expenditure. It is observed that, shocks in government health expenditure reduces under-five mortality rate (see Figure 1a) as well as stunting (see Figure 1b). Figure 1a indicates that, under-five mortality rate increase is minimal at the initial level and starts reducing after the third period. However, it is found in Figure 1b that, the prevalence rate of stunting reduces just after the first period when there is a shock in government health expenditure.

Conclusion and policy implication

Numerous empirical studies have examined the effect of health expenditure on child health. This study contributes to existing empirical studies by examining the short-run and long-run effects of government health expenditure on child health among West African countries. The result of the study indicates that government health expenditure has negative effect on under-five mortality rate and prevalence rate of stunting in the long-run. The impulse responses results indicate that, under-five mortality rate and prevalence rate of stunting both respond negatively to shocks in government health expenditure.

The study recommends that, for government health expenditure to produce a higher effect on the health of children both in the short-run and long-run. There is the need to ensure that governments among West African countries should commit more expenditure towards financing the health sector. Governments among these West African countries should



Note(s): The vertical axis represents the response of the variables of interest to government expenditure shocks. Whiles the horizontal axis represents the period these variables of interest are expected to experience this shock

Source(s): Authors own creation

Figure 1. Impulse response function (IRF). (a) Response of under-five mortality to government expenditure shocks, (b) response of stunting to government expenditure shocks

implement effective strategies towards ensuring that, there is excessive cut in the wastage of resources in the public health sector.

Africa Development Bank's (AfDB) report in 2021 stated that, the excessive waste of resources in the public health sector has increased by 45–56.1% over the past 8 years among African countries (Africa Development Bank, 2021). An effective measure such as licensing the health workers of public sector and allowing independent bodies to appoint the heads of health institutions, will help towards instilling discipline in the public health sector to help reduce the waste of these resources. These resources can then be channelled towards increasing government health expenditure on children. In addition, governments should ensure continuity in the implementation of child health policies. Especially, when there is a change in governments, this will help to achieve positive effect result.

Studies that can get access to data for long period for example 60 or 83 years should examine the subject matter for the entire African countries or SSA countries. This study could not achieve this, due to unavailability of data.

References

Abeka-Nkrumah, G., Ottie-Boakye, D., Ermel, J. and Issiaka, S. (2021), "Determinants of evidence use by frontline maternal, newborn and child health staff in selected health facilities in Ghana", *Statistics in Medicine*, Vol. 28 No. 3, pp. 221-239.

Adeosun, O.T. and Faboya, O.M. (2020), "Health care expenditure and child mortality in Nigeria", *International Journal of Health Care Quality Assurance*, Vol. 33 No. 3, pp. 261-275.

Africa Development Bank (2021), "The excessive waste of resources in the public sector in Africa", available at: https://www.afdb.org/en/news-and-events/african-development-bank (accessed 8 March 2023).

Africa Health Research Institute (2012), "Government health expenditure in South Africa", available at: https://www.afhri.com/africa-62677577 (accessed 13 March 2022).

African Union (2001), "Abuja declaration, African governments to commit 15% of annual budget towards financing the health sector to improve health of the citizenry", available at: https://apps.who.int/iris/bitstream/handle/10665/341162/WHO-HSS-HSF-2010.01-eng.pdf?sequence=1 (accessed 13 March 2022).

Akinlo, A.E. and Sulola, A.O. (2018), "Health care expenditure and infant mortality in sub-Saharan Africa", *Journal of Policy Modeling*, Vol. 41 No. 3, pp. 168-178.

Alexiou, C. and Trachanas, E. (2021), "Politics, government health expenditure and infant mortality: does political party orientation matter?", *International Journal of Social Economics*, Vol. 48 No. 12, pp. 1810-1825.

Anyanwu, J.C. and Erhijakpor, A.E.O. (2007), "Health expenditures and health outcomes in Africa", *African Development Review*, Vol. 21 No. 2, pp. 401-434.

Ashiabi, N., Nketiah-Amponsah, E. and Senadza, B. (2016), "The effect of health expenditure on selected maternal and child health outcomes in Sub-Saharan Africa", *International Journal of Social Economics*, Vol. 43 No. 12, pp. 1386-1399.

Baldacci, E., Guin-Siu, M.T. and Mello, L. (2002), "More on the effectiveness of public spending on health care and education: a covariance structure model", IMF Working Paper No. WP/02/90, International Monetary Fund, Washington, DC.

Baldacci, E., Clements, B., Gupta, S. and Cui, Q. (2004), "Social spending, human capital, and growth in developing countries: implications for achieving the MDGs", IMF Working Paper No. WP/04/217, International Monetary Fund, Washington, DC.

Barenberg, J.A., Deepankar, B. and Ceren, S. (2017), "The effect of public health expenditure on infant mortality: evidence from a panel of Indian states, 1983-1984 to 2011-2012", *The Journal of Development Studies*, Vol. 53 No. 10, pp. 1765-1784.

Bingjie, H. and Ronald, U.M. (2013), "Public health spending, governance and child health outcomes: revisiting the links", *Journal of Human Development and Capabilities*, Vol. 14 No. 2, pp. 285-311.

Byaro, M. (2017), "Per capita income and public health expenditure: what makes good child health outcomes in Tanzania? A comparison", *International Journal of Health*, Vol. 5 No. 1, pp. 74-81.

Byaro, M. (2021), "Commentary: on the effects of health expenditure on infant mortality in sub-Saharan Africa: evidence from panel data analysis", *Health Economics Review*, Vol. 11 No. 11, pp. 134-149.

Checkley, W., Gilman, R.H., Black, R.E., Epstein, L.D., Cabrera, L. and Sterling, C.R. (2004), "Effect of water and sanitation on childhood health in a poor Peruvian peri-urban community", *Lancet*, Vol. 363 No. 2004, pp. 112-118.

Cutler, D., Deaton, A. and Lleras-Muney, A. (2006), "The determinants of mortality", *Journal of Economic Perspectives*, Vol. 20 No. 3, pp. 97-120.

Hammers, J. and Spears, D. (2016), "Village sanitation and child health: effects and external validity in a randomized field experiment in rural India", *Journal of Health Economics*, Vol. 48 No. 5, pp. 135-148.

Issa, H. and Ouattara, B. (2012), "The effect of private and public health expenditure on infant mortality rates: does the level of development matters?", *Damascus UNIV. Journal*, Vol. 28 No. 1, pp. 21-37.

Jeffery, P. and Jeffery, R. (2010), "Only when the boat has started sinking: a maternal death in rural north India", *Social Science and Medicine*, Vol. 71 No. 10, pp. 1711-1718.

Kuhlthau, K.A. and Perrin, J.M.((2004), "Child health status and parental employment", *Achieves Pediatric Adolescent Medical*, Vol. 155 No. 12, pp. 1346-1350.

Musonda, P. and Byaro, M. (2016), "Impact of public health expenditure on infant and under-five mortality in Tanzania (1995-2013): an application of Bayesian approach", *Journal of Economics and Sustainable Development*, Vol. 7 No. 12, pp. 234-245.

Novignon, J., Olakojo, S.A. and Nonvignon, J. (2012), "The effects of public and private health care expenditure on health status in Sub-Saharan Africa: new evidence from panel data analysis", *Health Economics Review*, Vol. 2 No. 22, pp. 222-243.

Olufemi, S.O., Abayomi, A.A. and Fisayo, F. (2019), "Health expenditure and child health outcome in West Africa", *International Journal of Social Sciences Perspectives*, Vol. 5 No. 2, pp. 72-83.

Organization Economic Corporation and Development (2018), "Government Health Expenditure per capita among OECD countries", available at: https://www.oecd-ilibrary.org/sites/154e8143-en/index.html?itemId=/content/component/154e8143-en (accessed 23 March 2022).

Pesaran, M.H., Yongcheol, S. and Ron, P.S. (1999), "Pooled mean group estimation and dynamic heterogeneous panels", *Journal of the American Statistical Association*, Vol. 94 No. 446, pp. 621-634.

Wagner, A. (1883), "Wagner's theory of public expenditure", *German Economic Review*, Vol. 12 No. 2, pp. 149-164.

Water, Sanitation and Hygiene WASH (2018), "Sanitation services among West African countries have increased by 68.5% over the period 2000 to 2018", available at: https://data.unicef.org/topic/water-and-sanitation/wash-in-schools/#:~:text=Every%20child%20has%20the%20right,WASH)%20services%20while%20at%20school (accessed 15 April 2022).

World Bank (2018), "Governments among SSA countries' health expenditure per capita", available at: https://data.worldbank.org/indicator/SH.XPD.CHEX.PC.CD?locations=ZG (accessed 25 March 2022).

World Health Organization (2018), "Mortality rate of children under five years among West African countries", available at: https://data.worldbank.org/indicator/SH.DYN.MORT? (accessed 21 March 2022).

Further reading

Benedict, O.E., Ngozi, C.O. and Anthony, N.I. (2011), "Fever detection in under 5 children in a tertiary health facility using the infrared tympanic thermometer in the oral mode", *Italian Journal of Pediatrics*, Vol. 3 No. 6, pp. 37-46.

Berger, L.M., Hill, J. and Waldfogel, J. (2005), "Maternity leave, early maternal employment and child health and development in the US", *The Economic Journal*, Vol. 115 No. 501, pp. F29-F47.

British Broadcasting Corporation (2021), "The exploration of oil in the Niger Delta has resulted in oil spills", available at: https://www.bbc.com/news/world-africa-55853024 (accessed 17 March 2022).

Fitzgerald, F.E., Schell, L.M., Marshall, E.G., Carpenter, D.O., Suk, W.A. and Zeida, J.E. (1998), "Environmental pollution and child health in central and Eastern Europe", *Environmental Health Perspectives*, Vol. 106 No. 6, pp. 307-311.

Grigg, J. (2004), "Environmental toxins; their impact on children's health", *Archives of Disease in Childhood*, Vol. 89 No. 7, pp. 244-250.

Inter-governmental Panel on Climate Change (2019), "Climate change research", available at: https://www.un.org/en/topic/climatechange/research (accessed 8 March 2023).

Kaufmann, D., Kraay, A. and Mastruzzi, M. (2003), "Governance matters III: Governance indicators for 1996-2002", Policy Research Working Paper No. 3106, World Bank, Washington, DC.

Musgrove, P. (1996), "Public and private roles in health: theory and financing patterns", Discussion Paper No. 339, World Bank, Washington, DC.

Schultz, T.P. (1993), "Mortality decline in the low-income world: causes and consequences", Economic Growth Center Discussion Paper No. 681, Yale University, New Haven, CT.

Wagstaff, A. (1986), "The demand for health: theory and applications", *Journal of Epidemiology and Community Health*, Vol. 40 No. 1, pp. 1-11.

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