IMPACT OF GOVERNMENT HEALTH EXPENDITURE ON HEALTH OUTCOMES IN THE WEST AFRICAN SUB-REGION

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Abstract

Research background: Health outcome such as infant mortality rate is an important measure of the standard of living. It is a part of Millennium Development Goals, which all countries of the World strive to achieve, by allocating enormous economic resources to the health sector respectively.

Purpose: The study assessed the impact of government expenditure on health and on health outcome (infant mortality rate) in the West Africa Sub-region.

Research methodology: Secondary data were collected from 2000 to 2015 on thirteen countries in the Sub-region. Owing to the fact that the nature of the data involved is macro-panel data, the study performed the pre-estimation test (such as panel unit-root test and co-integration test) to ascertain the time series properties of the series. Based on the results of the pre-estimation tests, the work employed the fully modified ordinary least square (FMOLS).

Results: It is found in the study that public health spending has an indirect impact on infant mortality rate in the West Africa Sub-region.

Novelty: No extant study examined the impact of public expenditure on health and on maternal mortality rate using the West Africa Sub-region as an area of coverage. This study employed a fully modified OLS (FMOLS) to assess the impact of public expenditure on health and on infant mortality rate in the West Africa Sub-region.

Keywords: government expenditure, health outcomes, infant mortality rate, West Africa, fully modified OLS

JEL classification: H51, I10

Introduction

In 1995 more than nine million children under five years in developing countries died avoidable deaths – more than the entire population of Sweden or Zambia (Filmer, Pritchett, 1999). The cumulative human suffering in the individual and familial tragedies behind these statistics is tragic and creates a powerful drive to action. Infant mortality rate is among the important health outcomes. Following the United Nations Summit on millennium development goals in the year 2000, all one hundred and ninety one (191) United Nations member countries resolved to strive to achieve the goals which include: eradicating extreme poverty and hunger; achieving universal primary education; promoting gender equality and empowering women; reducing child mortality; improving maternal health; to combat HIV/AIDS, malaria, and other diseases; to ensure environmental sustainability; and to develop a global partnership for development. Since then, huge resources have been committed to the realization of the goals, among which infant mortality rate is, by international organizations and government of countries of the world.

With reference to Figure 1 the trend of infant mortality rate in the fifteen countries of the West African Sub-region is downward between 1967 and 2019 with fluctuations at some points in the rate in some countries like Nigeria, Niger, Mauritania, Liberia and Senegal. On average, the rate of infant mortality in the sub-region is on a downward trend, which may not be unconnected to the efforts of individual households, the government, and international communities. Given the enormous resources committed to the realization of the goals, this study intends to examine the impact of government expenditure on the child mortality rate (under-five mortality rate) in the West Africa Sub-region. The countries in the sub-region include: Benin Republic, Burkina Faso, Cape Verde, Cote d'Ivoire, Ghana, Guinea, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, The Gambia, and Togo. The choice of the study area is purposive.

Figure 1. Trend of Under-Five Mortality Rate in Each of the West African Sub-region Countries

Source: own elaboration.

The research question in the study is: i) does government health spending have an impact on the health outcomes in the West Africa Sub-region? ii) Does government spending on health have an impact on infant mortality rate in the West Africa Sub-region? The research objectives include: i) to assess the impact of government health spending on health outcomes in the West Africa Sub-region. ii) To assess the impact of government health spending on infant mortality rate in the West Africa Sub-region. The hypotheses of the study are: H_{01} : Government health spending does not have an impact on infant or under five mortality rate in the West Africa Sub-region. H_{02} : Government health spending does not have an impact on infant or under-five mortality rate in the West Africa Sub-region.

The paper is divided into five sections. Section one focuses on the introductory aspect of the study. Section two deals with the literature review. The methodology of the study is discussed in section three while section four deals with a presentation and discussion of the results. The conclusion and recommendation are provided in section five.

1. Review of the Literature

This section deals with the review of the related literature. Currently, there is a dearth of theory on the relationship between government health expenditure and health outcomes in economics literature. Although, there are some existing theories that relate to the subject under consideration. Firstly, Wagner's Law which was postulated by the German economist in 1890 states that economic growth and the level of industrialization influences economic growth. In contrast Keynes (1936) put forth health expenditure-led economic growth. According to the theory, it is government expenditure on health that determines economic growth or the level of industrialization. Therefore, there is no any existing theory that discusses the impact analysis of government expenditure on health outcome(s) (like infant mortality rate). Also, the empirical studies on the subject, particularly on African countries, are scant. However, the study reviews the existing studies from 1995–2017.

In an investigation that employed a cross-sectional analysis and which was carried out by Elola and Navarro (1995) in Western Europe, using 17 systems of health parameters and differentiating national health services from social security, established that economies with national health services resulted in a reduced rate of infant mortality. The result also revealed that government expenditure on health care and GDP level have an indirect relationship with infant mortality.

In a related study by Filmer and Pritchett (1999) where the impact of government spending on health outcomes was analyzed employing independent variables such as per capita captured as a ratio of GDP to population; share of public expenditure captured as a ratio of GDP; the level of education of female and other various social-economic variables. Mainly, their findings from the ordinary least square and two-stage least show that the impact of government spending on infant death rate is negative.

In another study, Berger and Messer (2002) examined a number of health variables among which were health care expenditure and health behaviour, in the Organisation for Economic Corporation and Development (OECD) member countries, employing the gini coefficient technique. They found out that an increase in the public finance of health spending has significantly high relationship with mortality rates.

Chung and Muntaner (2006) also examined some variables, among which were, welfare state policies (social security transfer and percentage of population under public medical coverage), political environment, health care system, gross national product, income inequality, and the Gini coefficient, and their effect on infant mortality rate, under-five mortality rate, and

low birth weight rate. Their findings suggest that income inequality is not causing bad health outcomes, but it is a result of something else that directly affects population health. The Gini-coefficient was not significantly associated with infant mortality or low birth weight. However, the provision of public health services was the only variable that showed a consistent relationship with infant mortality rate.

Rajkuman and Swaroop (2007) employed data between 1990 and 2003 to analyze the effect of public health spending on the under-five children's death at birth, by means of corruption and bureaucratic quality as parameters for degree of governance, in which their study categorized governments into three: good governance; average; and weak governance. They realized, in their findings that, a 1 percent increase in public health spending will decrease the mortality rate by 0.32%. In average-governance-countries, the impact reduces to 0.20% and there was no impact recorded in countries that have weak governance. This could be because government officials will embezzle the money earmarked for public health expenditure.

In Nigerian society, Yaqub, Ojapinwa and Yussuff (2012) considered the effectiveness of expenditure of government on health and the influence of governance. The governance variable was proxied by the corruption perception indicator while health outcome variables were infant mortality, children below the five years mortality rate and life expectancy, employing both the ordinary least squares and the two-stage least squares as tools for analysis. Their results revealed that public health expenditure has a negative effect on infant mortality and children below the five years mortality rate with the inclusion of governance indicators.

In the developed nations, Tae and Shannon (2013) empirically studied the connection that existed between public health spending and the health outcomes between 1973 and 2000 using a panel data taken from more than fifteen OECDs. Public health expenditure represented government expenditure on health care and the health outcome was measured by infant mortality as well as life expectancy. Their result revealed the existence of an inverse relationship between expenditure on health and health outcome (infant mortality), and a direct relationship between health expenditure and health outcome (life expectancy). In essence, a 1 percent rise in expenditure on health, on the average led to about a 0.8 percent reduction in health outcome, using infant mortality as a yardstick and an increase in life expectancy at birth by approximately 0.03 percent.

Matthew, Adegboye and Fasina (2015) investigated the influence public health expenditure has on health outcomes in Nigeria from 1979 to 2012, making use of co-integration and error correction tools to establish a long-run association between public spending on health and health

outcomes in Nigeria. The study revealed that public expenditure on health has a significant connection with health outcomes in Nigeria.

On the Nigerian economy, Edeme, Emecheta and Omeje (2017) studies the influence of expenditure of public health and on health outcomes using two parameters as a proxy to health outcome (life expectancy at birth and infant mortality rate) and employing the cointegration technique. Their findings indicated that there exists a long run relationship between expenditure on public health and health outcomes. More so, the findings revealed that a rise in expenditure on public health leads to an increase in life expectancy at birth and a fall in the infant mortality rate.

2. Methodology

This section focuses on the methodology of the study. The study adopted the model of Filmer and Pritchett (1999) with some modifications. In their study all the variables in the model were analyzed in log form while this study did not analyze the variables in the log form. Also, some variables used in their model are excluded purposively from the model in this study due to the dearth of data.

2.1. Model Specification

The model of the study which expressed the under-five mortality rate (UFMR) as a dependent variable, government expenditure on health (GEH), gross domestic product per capita (GDPPC) and unemployment (UNEMPLO) as independent variables is expressed below.

$$UFMR_{it} = \delta_{01} + \delta_{11} GEH_{it} + \delta_{21} GDPPC_{it} + \delta_{31} UNEMPLO_{it} + \varepsilon_{it}.$$

2.2. Definition of Variables

UFMR is the infant mortality rate or under five mortality rate. The under-five mortality rate is the probability per 1,000 that a newborn baby will die before attaining the age of five, if subjected to age-specific mortality rates of the specified year (source: World Bank, World Development Indicator, 2018).

GEH is the government spending on health. It is calculated as the ratio of government health expenditure to GDP. GDPPC is the Gross Domestic Product calculated using the base year price. It is the value of GDP in a year divided by the total population of the country (source: World Bank, World Development Indicator, 2018).

UNEMPLO is the unemployment rate. It is calculated as the fraction or the percentage of the population not employed (source: World Bank, World Development Indicator, 2018). Meanwhile, the data are collected for the period of 2000 and 2015, which is the life span of the millennium development goals, with the intent of examining the impact of government health expenditure on under-five mortality rate (one of the goals of millennium development).

2.3. Expected Results

It is expected that the estimates of the GEH and GDPPC will be negative while the estimate of UNEMPLO is expected to be positive. Therefore, $\delta_{11} < 0$, $\delta_{21} < 0$ and $\delta_{31} > 0$. These postulations and assumptions are based on economic logic and the findings from extant literatures (e.g Edeme et al., 2017; Tae, Shannon (2013)). For instance, increase in unemployment implies a low level of economic activities, which may bring about an increase in infant mortality rate. On the other hand, a fall in unemployment rate signifies an increase in the level of economic activities which may result in a fall in the level of mortality rate.

3. Discussion of Results and Findings

This section deals with a discussion of the results and findings. The pre-estimation test conducted on the variables include: unit root test which tests for the time series properties of the variables and the co-integration test which test for the long-run relationship of the variables. The study employed different panel unit root tests which include: Levin, Lin and Chu (2002). Im, Pesaran and Shin (2003), ADF – Fisher (1981) and Phillip and Peron (1988). The results of the unit root test reveal that all the variables (that is GDPPC, GEH and UNEMPLO) are stationary at first difference (I ~ 1) except for UFMF which is stationary at level (I ~ 0) (see Table 1–4).

Table 1. Panel unit root test for First Difference of GDPPC

Method	Statistic	p-value	Cross-sections	Observations
Levin, Lin & Chu t*	-5.33939	0.0000	13	156
Im, Pesaran and Shin W-stat	-4.16266	0.0000	13	156
ADF – Fisher Chi-square	62.76600	0.0001	13	156
PP – Fisher Chi-square	57.02880	0.0004	13	169

Source: own elaboration.

Table 2. Panel unit root test for First Difference of GEH

Method	Statistic	<i>p</i> -value	Cross-sections	Observations
Levin, Lin & Chu t*	-6.07229	0.0000	13	155
Im, Pesaran and Shin W-stat	-5.38439	0.0000	13	155
ADF – Fisher Chi-square	77.46880	0.0000	13	155
PP – Fisher Chi-square	162.55200	0.0000	13	168

Source: own elaboration.

Table 3. Panel unit root test for First Difference of UFMR

Method	Statistic	<i>p</i> -value	Cross-sections	Observations
Levin, Lin & Chu t*	-14.7264	0.0000	13	169
Im, Pesaran and Shin W-stat	-10.8322	0.0000	13	169
ADF – Fisher Chi-square	134.5740	0.0000	13	169
PP – Fisher Chi-square	137.8240	0.0000	13	182

Source: own elaboration.

Table 4. Panel unit root test for First Difference of UNEMPLO

Method	Statistic	<i>p</i> -value	Cross-sections	Observations
Levin, Lin & Chu t*	-3.49237	0.0002	13	156
Im, Pesaran and Shin W-stat	-2.25214	0.0122	13	156
ADF – Fisher Chi-square	43.04610	0.0191	13	156
PP – Fisher Chi-square	54.33500	0.0009	13	169

Source: own elaboration.

In addition, a co-integration test using the Johansen-Fisher co-integration test reveals that all the variables have a long-run linear relationship, which is indicated by the probability values of all of the co-integrating equations in Table 5. As such, all the variables are co-integrated.

Table 5. Johansen Fisher Panel Co-integration Test for GDPPC, GEH, UFMR and UNEMPLO

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	<i>p</i> -value	Fisher Stat.* (from max-eigen test)	<i>p</i> -value
None	461.4	0.0000	337.7	0.0000
At most 1	305.0	0.0000	204.8	0.0000
At most 2	175.0	0.0000	127.6	0.0000
At most 3	112.5	0.0000	112.5	0.0000

Source: own elaboration.

In view of the results of the unit root test and co-integration test, the study employed a Fully Modified Ordinary Least Square (FMOLS). The fully modified ordinary least square

(FMOLS) result shows that all the coefficients of the explanatory variables in the model are statistically significant at the one percent (1%) level of significance with the probability value of 0.00, 0.00 and 0.01 for GDPPC, GEH and UNEMPLO respectively (see Table 6). From the result, the coefficient of UNEMPLO is found to be -4.74 , that of GEH is -2.86 while the coefficient of GDPPC is found to be -0.04 .

Table 6. Method: Panel Fully Modified Least Squares (FMOLS)

Variable	Coefficient	Standard Error	t-Statistic	p-value
GDPPC	-0.039245	0.004890	-8.026115	0.0000
GEH	-2.864907	0.681159	-4.205933	0.0000
UNEMPLO	-4.739780	1.675987	-2.828052	0.0053
R-squared	0.742154		Mean dependent var	114.83480
Adjusted R-squared	0.718714		S.D. dependent var	30.63348
S.E. of regression	16.246900		Sum squared resid	43553.71000
Long-run variance	411.700000		N	181

Source: own elaboration.

So, it is inferred that a negative relationship exists between GDPPC and under-five mortality rate (UFMR), which conforms to a priori expectation. It is equally shown that one unit increase in GDPPC will result in a 0.04 units fall in the under-five mortality rate (UFMR). It can also be concluded that government expenditure on health (GEH) is negatively related to UFMR. This is also in agreement with a priori expectation. Equally, the finding is in line with the finding of Filmer and Pritchett (1999). In addition, one unit increase in GEH would lead to a 2.86 units fall in UFMR. This is in tandem with Tae and Shannon (2013); Rajkuman and Swaroop (2007); Edeme et al. (2017); Matthew et al. (2015); Yakub et al. (2015); Auster, Levenson and Sarachek (1969); Berger and Messer (2002); Deaton (1999); Deaton and Paxson (1999); Deaton and Lant (1999); Deaton (2001) and Elola and Navarro (1995). In the same vein, it can be inferred that a negative relationship exists between UNEMPLO and UFMR which is not in conformity with the a priori expectation. This may not be unconnected with the rate at which female workers may decide to stay out of employment so that they could have time to take care of their small children (infants or under-five children) So, a one unit increase in UNEMPLO would lead to a 4.74 units decrease in UFMR. The R-squared is 0.74; which implies that over seventy four percent (74%) of the total variation in UFMR is explained by the independent variables in the model (that is GDPPC, GEH and UNEMPLO). The model is subjected to various robustness tests such as the Wald test, variance decomposition test, and normality test.

Table 7. Coefficient Variance Decomposition Associated Eigen-Value for the Model

Sample: 2000, 2014

Included observations: 181

Variable	1	2	3
GDPPC	0.0000	0.0020	0.9980
GEH	0.0091	0.9908	0.0000
UNEMPLO	0.9998	0.0002	0.0000

Source: own elaboration.

Table 8. Wald Test for the Model

Test Statistic	Value	Degrees of Freedom	<i>p</i> -value
F-statistic	30.57100	(3, 165)	0.0000
Chi-square	91.71301	3	0.0000
Null Hypothesis $C(1) = 0, C(2) = 0, C(3) = 0$			

Source: own elaboration.

Figure 2. Normality Test

Source: own elaboration.

The result of the normality test shows the Jarque-Bera value of 13.90 with the probability value of 0.00 (see Figure 2). This implies that the error terms are normally distributed. The test of variance decomposition shows that GDPPC will bring about variation in UFMR from the first year through the second year. The test equally shows that GEH will bring about variation in UFMR in the first year. Likewise, UNEMPLO will bring about variation in UFMR in the second year (see Table 7). The result from the Wald test shows the probability of F-statistics and chi-Square to be 0.00. This suggests that the null hypothesis that the coefficients of exogenous

variables do not jointly affect the endogenous variable (UFMR) will be rejected. By implication, the coefficients of GDPPC, GEH and UNEMPLO jointly affect UFMR (see Table 8).

Conclusion and Recommendation

Because there are no existing theories on the impact of government health expenditure on health outcomes, the study could not review any theory related to government expenditure and health outcomes. But, a number of extant studies, which are not many, were reviewed on the impact of public health expenditure on health outcome. It is found in the study that public expenditure on health has a negative impact on infant mortality rate, per capita GDP and unemployment in West Africa.

Based on our findings that the government spending on health has an impact on health outcome (Under-five mortality rate) in the West Africa Sub-region, it is recommended that the government should continue to increase spending on the health sector, particularly spending on programmes that have a direct bearing on infant mortality rate as a health outcome.

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