



IMPACT ASSESSMENT OF THE PUBLIC HEALTH EXPENDITURE ON THE HEALTH OUTCOME IN NIGERIA



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ABSTRACT

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Government.

This study is conceived mainly to assess the impact of the public health expenditure on the infant mortality rate in Nigeria. The study made use of an ex-post facto research design and time series data spanning the period of twenty-four years (1994–2017). The data covered the Health Recurrent Expenditure (HRE), the Health Capital Expenditure (HCE) and Infant Mortality Rate (IMR) in Nigeria sourced the Central Bank of Nigeria statistical bulletin 2016 and the World Bank report. Descriptive statistics were used to analyse the data while Ordinary Least Square (OLS) technique was used to estimate the model. The study revealed that both the HRE and the HCE by the government of Nigeria had a significant negative effect on the Infant Mortality Rate (IMR) for the period of 24 years under review. Similarly, HRE had a more significant negative effect on the infant mortality rate than the HCE in this study. The authors, therefore, concluded that the Nigerian government at various levels should spend adequate funds on all the tiers of health care system in order to promote efficiency and effectiveness of the health sector. By so doing, it might lead to a phenomenal reduction in the current infant mortality rate in the country.

Contribution/ Originality: This study contributes to the existing literature by examining jointly and separately both recurrent and capital components of the public healthcare expenditure and their respective impacts on the infant mortality rate in Nigeria. This has also “dove-tailed” into the methodology with respect to the research design and the statistical analysis.

1. INTRODUCTION

How a nation funds its health care system tailored towards meeting maternal and child health need reflects on the mortality outcome. In this regard, Infant Mortality rate (IMR), has been used as measures of children's health (Issa and Ouattara, 2005; Anyanwu and Erhijakpor, 2009). Some pieces of evidence on IMR indicate a significant reduction over the last century globally. However, according to Issa and Ouattara (2005) there exist dichotomous variations between developed and developing countries in this circumstance. Infant mortality is regarded as an important indicator of the availability, utilization and effectiveness of healthcare as it points to social, economic and environmental disparities in several developing countries (Anyanwu and Erhijakpor, 2009). A study conducted by Lawn *et al.* (2005) accounted for 10.7 million children under the age of five years that died each year. Specifically, 4

million out of these children die during the first four weeks of life, with 3.3 million being stillborn. [World Health Organization \(2016\)](#) reported that the deaths of children under five years of age accounted for 75% at the global level, with Africa having the worst (55 per 1000 live births) scenario and share of it.

As this becomes central issues in public health agenda of most developing countries especially Nigeria, several policies geared towards improving child health have been implemented but infant mortality remains high and varies dramatically ([Frey and Field, 2000](#); [Issa and Ouattara, 2005](#)). With a substantial reduction in infant mortality in Nigeria in the last 30 years, the country continues to register high mortality rates of infants with 41 per 1000 live births with 57% highest risk in the first month after birth ([WHO, 2016](#)). According to [Odeyemi and Nixon \(2013\)](#) IMR has a close link with the 4th Millennium Development Goal (MDG). The MDG 4 is targeted at reducing the under-5 child mortality rate of each member country by two thirds between 1990 and 2015. However, the case of Nigeria is worth considering in this study vis-à-vis its healthcare expenditure. In the year 2000, IMR per 1000 live births in Nigeria was put at 116 deaths. Interestingly, over a decade (2000–2010), the country witnessed consistent improvements to the extent that the infant mortality rate fell to 88.

1.1. Statement of Problem

Generally, adequate and efficient health-related spending is regarded as vital in the improvement of health status ([Anyanwu and Erhijakpor, 2009](#)). Governments in Nigeria, over the years, have been making frantic efforts at ensuring that there is an increase in the level of public expenditure on health. The financial commitments of government to the health sector are both the recurrent and capital expenditure on health. [WHO \(2010\)](#) sees public health expenditure consists of recurrent and capital spending from government budgets, external borrowings and grants (including donations from international agencies and NGOs), as well as compulsory health insurance funds. According to [Oluwatoyin et al. \(2015\)](#) the capital expenditure of government decrease from N7.3million in 1970 to N4.88 million in 1972 before it rose again to N126.75 in 1994. It dropped sharply to N79.2 million in 1982. From 1982 to 1987, capital expenditure on health declined from N72.9m in 1982 to an all-time low of N17.2m in 1987. In 1988 there was a significant rise to N297.96m. By 1991, the statistic dropped to N137.3m but plummeted to N33.72m in 1992. The figure rose steadily from N586.2 million in 1993 to N17, 717.42m, N33, 396.97m and N34, 647.9m in 2003, 2005 and 2007 respectively. The capital expenditure on health stood at N64, 922.9m in 2008 and N79, 321.09m in 2011.

The recurrent expenditure on health also rose gradually from N12.48m in 1970 to N59.47m in 1977 but fell to N40.48m in the successive year. The pattern of health expenditure at this period is a reflection of both the product of the disposition of government policy towards health issue and the determination of the Federal Government to improve the health care system with the windfall of oil revenue. Recurrent expenditure nose-dived into N15.32m in 1979 before it rose to N52.79m, N84.46m N82.79 million in 1979, 1987 and 1983 respectively. From 1984 to 1986, recurrent expenditure rose from N101.55m to N134.12m when the recurrent expenditure as a percentage of total expenditure stood at 77.4 per cent. The value of recurrent health expenditure reduced significantly in 1987 to N41.31m before it rose steadily from N422.80 in 1988 to N24, 522.27m in 2001. This figure rose again from N40, 621.42 in 2002 to N44, 551.63, N58, 686.56 and N72, 290.07 in 2005, 2006 and 2007 respectively. Recurrent expenditure on health stood at N18, 200.0 million in 2008 and N21, 542.9m in 2011.

The public sector has played a vital role in meeting with the SDGs as the impact of spending on social indicators in meeting the SDGs is achieved. [Poullier et al. \(2002\)](#) revealed that health spending as a share of gross domestic product (GDP) is high ranging between 1.5% to 13% among developed countries with the highest shares found in Europe and the Americas, while Africa and some Asian regions contribute the lowest. However, in Nigeria where resources are relatively scarce, health expenditure has received less attention in government budgets. According to [Poullier et al. \(2002\)](#). Total health expenditure is considered as a summation of both public and private spending on all health-related goods and services. The public outlay of expenditure is usually financed through

social security contributions, various forms of taxation to various branches of government and from external sources, including grants and loans.

There are several socio-economic factors shown in literature as having to affect the decline in IMRs such as expenditure on health, Per capita income, maternal age and education, environment, birth weight, reproductive history, birth spacing, breastfeeding, and geographical location amongst others (Issa and Ouattara, 2005; Anyanwu and Erhijakpor, 2009; Godson and Nnamdi, 2012). As summarized by Odeyemi and Nixon (2013) total health expenditure as a percentage of GDP increased from 4.7% in 2000 to 5.1% in 2010 for Nigeria, but an inconsistent trend is observed in that it reached 7% in 2004 but had fallen to 5.7% in 2006 and 2008. The data for per capita total health care expenditure indicate that in 2000 Nigeria spent US\$ 17 which generally rose yearly in the country to reach US\$ 63. Data for public health expenditure as a percentage of total health expenditure in Nigeria rose slightly from 33% in 2000 to 38% in 2010.

The aforementioned scenario clearly underscores the fact that healthcare expenditure in Nigeria has been on the increase over the years. It should, however, be noted that despite the increase in government expenditure in health care in Nigeria, the contribution of this to health is still marginally low whereas the extent and magnitude of its impact on IMR in Nigeria as at 20117 are undetermined. This is particularly worrisome as several questions have been raised on the situation. How has the health expenditure impacted on the health of infants? Is there any relationship between the pattern of health expenditure and the rate of infant mortality in Nigeria? Against this background, this paper seeks to examine the healthcare expenditure in Nigeria and its impact on infant mortality rate for the period of twenty-four (24) years spanning 1994-2017 respectively. However, the import of this study is that it provides a bridging gap between demography and medical sociology. In other words, healthcare expenditure is one of the core aspects of medical or health sociology that impacts on infant mortality rate, a key subject in demography.

The main objective of this study is to assess the impact of the country's healthcare expenditure on the infant mortality rate for the period of 24 years while the specific objectives are to:

1. Assess the impact of the recurrent health expenditure on the infant mortality rate
2. Assess the impact of the country's capital healthcare expenditure on the infant mortality rate

1.2. Hypothesis

H₀₁: HRE is not likely to impact on Infant Mortality Rate in Nigeria

H₀₂: HCE has no effect on Infant Mortality Rate in the country.

2. REVIEW OF RELATED LITERATURE

Several kinds of research studies have provided the link between public health expenditure and health outcomes as it affects the mortality of infants. The existing literature has drawn several different conclusions as to the relation between public health spending and IMR. Empirical studies suggest that public health expenditure and its financial investments lead to improving health outcomes (Gupta *et al.*, 2003; Issa and Ouattara, 2005; Anyanwu and Erhijakpor, 2009; Novignon *et al.*, 2012; Byaro and Musonda, 2016).

Novignon *et al.* (2012) used a panel data from 1995 to 2010 covering 44 countries in SSA with Fixed and random effects panel data regression models fitted to determine the effects of healthcare expenditure on health outcomes. The results provided evidence that healthcare expenditure was associated with an increase in life expectancy at birth and reduction in death and infant mortality rates. The results also showed that while both private and public sources of health care expenditure were significantly associated with improved health outcomes, public healthcare expenditure had a relatively larger impact. The findings imply that health care expenditures are essential components in improving health status in SSA. Anyanwu and Erhijakpor (2009) in a panel data analysis and using a fixed effect model found that total health expenditures are a significant contributor to health outcomes

with a 10% increase in total healthcare expenditure per capita resulting in 21% and 22% decrease in under-five and infant mortality rates respectively.

[Gupta et al. \(2003\)](#) in a study to assess the relationship between public spending on health care and the health status of the poor and confirm that the poor have significantly worse health status than the non-poor. The regression result shows that public spending on health care matters more to them. The difference in the impact of spending between the poor and non-poor could be substantial for a 1% increase in public spending on health reduces infant mortality by twice as many deaths among the poor. However, the results suggested that increased public spending alone will not be sufficient to significantly improve health status. The study suggested primary enrolment, economic growth are significant determinants of health status particularly among the poor.

[Issa and Ouattara \(2005\)](#) studied the relative importance of public and private health expenditure on IMRs at a different level of development while shedding light on the other determinant of IMRs. The study employed ordinary least squares (OLS) and panel data techniques on 160 countries and it shows a strong negative relationship between health expenditure and IMRs, with effect channelled through public expenditure at low development levels and through private expenditure at high development stages. Testing the changing roles of public and private expenditures on health along development process, public expenditure in early development states is more effective and highly significant in the group of low incomes countries in which an increase in this expenditure of 1% increase would on average; reduce infant mortality by 0.16%. As the economy developed, private expenditure becomes increasingly more effective in the group of high-income countries with a significant relationship in which a 1% increase in private health expenditure causes between 0.36% to 0.85% decreases in IMRs.

Other studies find no evidence that total health expenditure has any impact on IMR. However, the relationship remains uncertain as a result of no relationship between public health expenditure and health outcomes ([Musgrove, 1996](#); [Frey and Field, 2000](#); [Yaqub et al., 2012](#); [Oluwatoyin et al., 2015](#)). The findings of the study by [Musgrove \(1996\)](#) show no evidence that expenditure on health as a share of GDP reduces child mortality, for either rich or poor countries. Moreover, the share of public health expenditure to the GDP is found to have no impact on child mortality, whether for all countries together or separately for those who spend either a high or a low public share. In [Frey and Field \(2000\)](#) study assessing the empirical validity of five competing theories of the cross-national variation of infant mortality reveals that economic disarticulation, female education, reduction in foreign debt has a positive effect on infant mortality. [Yaqub et al. \(2012\)](#) investigates the effectiveness of public health expenditure as affected by governance in Nigeria using both the Ordinary Least squares and the two-stage least squares and the study showed that public health expenditure has negative effect on infant mortality when the governance indicators are included implying that an increase in public expenditure on health is less likely to lead to improvement in health status unless corruption as issue is addressed. [Oluwatoyin et al. \(2015\)](#) examined public health expenditure and health outcomes in Nigeria using an empirical evidence of the impact of public health spending on health outcomes in Nigeria between 1979 and 2012. The study made use of the Johansen Co-integration and the Vector Error Correction Model (VECM) econometric technique to determine the long-run relationship between public spending on health and health outcomes in Nigeria. The study found out that public spending on health has a significant relationship with health outcomes as well as environmental factors such as air pollution, hospitals, provision of adequate drugs amongst others were identified as being important in determining health outcomes in Nigeria. [Byaro and Musonda \(2016\)](#) examine the impact of public health expenditure on health outcomes (infant and under-five mortality rate) in Tanzania over the period 1995 to 2013 using Per capita GDP as an indicator of income level and improved sanitation facilities used as explanatory variables. The results show that, despite changing patterns of government health expenditure over the period 1995 to 2013, still government health expenditure had no impact on health outcomes (infant and under-five mortality) in Tanzania and the study further shows that the mean for income levels represented by (GDP per capita) had a positive significant effect on both infant and under-five

mortality decline. The failure to bring impact on health outcomes (infant and under-five mortality) was probably due to its low level of public health spending.

2.1. Theoretical Framework of the Study

There are different frameworks in which the effect of health expenditure on Infant mortality rate may be considered. In examining the health outcome as measured by infant mortality and healthcare expenditure in Nigeria, the study adopts the Mosley-Chen framework ([Mosley and Chen, 1984](#)). This framework is a model that sees socioeconomic determinants acting through biological mechanisms to influence mortality. Based on this approach, the underlying socio-economic (e.g. social, economic, biological, environmental.) status manifests itself in proximate determinants (maternal fertility, environmental contamination, disease control etc.). The values of these variables influence the risk of disease which links to the probability of death.

The Mosley-Chen model motivates the idea that country's health expenditure will influence infant mortality rate depending on the composition of public spending allocated across health input during the budget process since the relationship is mediated in several ways. As documented by [Issa and Ouattara \(2005\)](#) that public expenditure on health during early development stages is more effective on infant mortality. Public expenditure on IMRs along the development process has important policy implications that matter governments for appropriate design of their health programmes that aim to improve health outcome in general and particularly, IMRs. Health inputs are allocated to all activities related to health sectors. Since the Nigerian Health sector reform made primary health care the cornerstone of the nation's health system, when the government increases budget in building dispensary or health centre, it may lead to more or less effective spending into the supply of services. The money spent on building dispensary or health centre whether it creates effective health services or not depends on the public sector efficacy. Similarly, the consumers will be willing to make choice on the type of health services provided depending on the price of public and private health services providers, quality of services offered and travel time. If the kind of medical treatment offered by private or public is effective in eliminating a certain kind of diseases it will have an impact on health services provided ([Byaro and Musonda, 2016](#)). However, Nigeria despite her wide range of resources is still faced with several health challenges because of weak healthcare delivery systems serving as an important barrier. Unfortunately, the funding for health sector has been very low and the sector is experiencing a number of basic systemic problems, which contribute to the low level of performance of the sector. Poor management of funds and human resources, limited coverage and inadequate number of workers are some of the key sectoral problems. The Nigerian health sector could not be said to be performing well when looked at from any angle and since it involves the lives of individuals in the country this sector should be given more consideration by the government and its people ([Yesufu, 2000](#)).

3. MATERIALS AND METHODS

The main objective of this study is to evaluate the impact of the country's healthcare expenditure on the infant mortality rate for the period of 24 years (1994-2017). However, the specific objectives are to: (1) assess the effect of the recurrent health expenditure on the infant mortality rate in Nigeria. (2) assess the effect of the country's capital healthcare expenditure on the health outcome. Subsequently, the study made use of an ex-post facto research design to determine the effect of the Nigerian government health expenditure on life expectancy at birth. The government expenditure on health is indicated by Health Recurrent Expenditure (HRE) and Health Capital Expenditure (HCE). Similarly, health outcome is proxied by the Infant Mortality Rate (IMR). Furthermore, the time series data on the public healthcare expenditure and infant mortality rate were extracted from the Central Bank of Nigeria's statistical bulletin and the World Bank respectively.

In order to examine the fitness of the regression model, the F-statistic was used. This is because the F-statistic could only take on positive values, and large values indicate that the regression model explains a significant degree of variability between and among the variables embedded in the study. The decision rule holds that if the P-value of the F-test is below 0.05, it implies that the model is significant and fitting. Therefore, it is admissible for decision making. In addition, the Durbin-Watson statistic test was applied to this study to detect autocorrelation in the data. Autocorrelation is a situation whereby sample or population observations that are related to each other in the areas of time, space or other criteria ([Sede and Ohemeng, 2015](#)). Correlated observations are common but pose a problem. The reason is that it violates the normal prerequisite of the simple random sampling assumption hence, the necessity of testing for autocorrelation. The benchmark for check autocorrelation using Durbin-Watson is within the range 2.5 and 1.5. This implies that any Durbin-Watson test result that is above the threshold of 2.5 and below 1.5 indicates the presence of either positive or negative autocorrelation. Furthermore, a diagnostic statistic test was carried out to detect any likely presence of collinearity in the data with the aid of tolerance and Variance Inflation Factor (VIF). When checking for collinearity or multi-collinearity by applying tolerance and VIF, the decision rule is that the tolerance error should not be above 0.10 while the VIF must be below 10. Thereafter, Ordinary Least Square (OLS) technique was adopted to estimate the model and test the null hypotheses of this study earlier formulated. The analysis of the data was aided by the application of the SPSS software version 20.

3.1. Model Specification

In this study, the measurement indicators for the government healthcare expenditure are Health Recurrent Expenditure (HRE) and Health Capital Expenditure (HCE). HRE and HCE jointly represent the independent or explanatory variables of the study while the health outcome was proxied by Infant Mortality Rate (IMR), the dependent variable. To further address the objectives and the test of the null hypotheses of the study, Ordinary Least Squares (OLS) linear regression was applied to estimate the model. The application of this technique is anchored on the strength of its properties of Best Linear Unbiased Estimator (BLUE). The linear equation between the dependent (IMR) and independent variable (HRE; HCE) is expressed below:

$$\text{IMR} = f(\text{HRE} + \text{HCE}).$$

Where:

$$\text{IMR}_t = \beta_0 + \beta_1 \text{HRE}_t + \beta_2 \text{HCE}_t + \mu_t \dots \text{[Model]}$$

Where:

IMR_t = Stands for Infant Mortality Rate (the outcome or dependent variable);

β_0 = a constant;

$\beta_1 - \beta_2$ = Coefficients of the Independent Variables;

HRE_t = represents Health Recurrent Expenditure (Independent Variable or explanatory variable)

HCE_t = Stands for Independent Variable (Health Capital Expenditure);

f = Functional Relationship;

t = Time series and

μ_t = Residual.

4. DATA PRESENTATION

The time series data in table 1 below shows the figures for Infant Mortality Rate (IMR) obtained from the World Bank reports in 2016 on human development indicators as well as [CIA World Fact Book \(2017\)](#). In the same table are the data on Health Recurrent Expenditure (HRE) and Health Capital Expenditure (HCE) extrapolated from the CBN statistical bulletin, 2016.

Table-1. Time Series Data on HRE; HCE and IMR

S/No	Year	IMR (1,000 live births)	HRE (N'Billion)	HCE (N'Billion)
1	1994	124.6	2.09	4.99
2	1995	123.6	3.32	9.22
3	1996	122.	3.02	8.66
4	1997	120.2	3.89	6.9
5	1998	117.8	4.74	23.37
6	1999	115.5	16.64	17.25
7	2000	112.3	15.22	27.97
8	2001	109.2	24.52	53.34
9	2002	106.1	40.62	32.47
10	2003	102.9	33.27	55.74
11	2004	99.8	34.2	30.03
12	2005	96.5	55.66	71.36
13	2006	93.2	62.25	78.68
14	2007	90	81.91	150.9
15	2008	87	98.22	152.17
16	2009	83.9	90.2	144.93
17	2010	81.1	99.1	151.77
18	2011	78.3	231.8	92.85
19	2012	75.7	197.9	97.4
20	2013	73.3	179.99	154.71
21	2014	71	195.98	111.29
22	2015	69	257.72	82.98
23	2016	66.9	202.36	79.63
24	2017	69.8	236.10	147.90

Source: CBN Statistical Bulletin, 2016 and United Nations Inter-agency Group for Child Mortality Estimation (UN IGME) (2017)

The descriptive statistics resulting from the data analysis are hereby presented in table 2 below. The Infant Mortality Rate (IMR) for the period under study spanning 24 years (1994-2017) clearly indicated an average IMR of 95.4000 deaths per 1,000 live births with the standard deviation of 19.68498. Also, the maximum IMR within the period accounted for 124.60. Similarly, the minimum IMR was 66.90 deaths. In terms of the corresponding healthcare expenditure by the Nigerian government within the period under evaluation, the average HRE and HCE stood at ₦90.4467 billion and ₦74.4379 respectively. The maximum HRE was ₦257.72 while the minimum HRE showed ₦2.09 billion. According to the same table 2, the maximum HCE was ₦154.71 billion and the minimum stood at ₦4.99 billion.

Table-2. Descriptive Statistics on the Healthcare Expenditure

	N	Minimum	Maximum	Mean	Std. Deviation
IMR	24	66.90	124.60	95.4000	19.68498
HRE	24	2.09	257.72	90.4467	87.69090
HCE	24	4.99	154.71	74.4379	54.19786
Valid N (listwise)	24				

Authors' Computation Using SPSS Version 20.

The F-statistic of 159.419 and the p-value of 0.000 in table 3 above showed that the model meets the prerequisite of the fitness test and therefore, considered reliable and admissible for decision making. Since the F-statistic could only assume positive values and large values imply that the linear regression explains a significant degree of variability between independent and dependent variables of the study, it could be concluded that the F-statistic of 159.419 is satisfactorily significant. In view of the fact that the P-value in the ANOV^a table 3 is very small and the diagnostics pointed out no problems with the model assumptions, a deduction can be made that the linear regression HRE and HCE explains a significant amount of the variability in IMR.

Table-3. ANOVA^a on F-Statistic Test for the Fitness of the Model

Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2	4180.861	159.419	.000 ^b
	Residual	21	26.226		
	Total	23			

a. Dependent Variable: IMR

b. Predictors: (Constant), HCE, HRE

Source: Authors' Computation Using SPSS Version 20

The Ordinary Least Square (OLS) regression results in table 4 below show the coefficient of determination denoted by Adjusted R-squared (R^2) which stood at a value of 0.932. This figure implies that the model accounts for 93% of the systemic variation of the dependent variable (IMR). Also, the Durbin-Watson statistic of 1.522 which is approximately 2 implies that there is no autocorrelation in the data. In other words, the independent variables (HRE and HCE) of the study do not affect each other as demonstrated by the Durbin-Watson test result.

Table-4. Model Summary^b on Autocorrelation Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.969 ^a	.938	.932	5.12110	1.522

Source: Authors' Computation Using SPSS Version 20

In applying tolerance and VIF to check for the presence of collinearity in the data or model, the results in table 5 below indicate the absence of collinearity in the data. That is, the VIF of 1.766 which is less than 10 and with the tolerance value of .566 show that there is no collinearity in the data. Also, the degree to which both the HRE and HCE (the independent variable) exerted influence on the IMR could be explained from the same table. The table shows that at 0.00 level of significance, HRE had a negative impact of -0.154 on IMR for the period of 24 years. Relying on this finding, the null hypothesis one which states that HRE has no significant effect on IMR is rejected. Furthermore, table 5 clearly indicated that HCE reduced IMR by -0.134 at the significance level of 0.00. Based on this foregoing information, the null hypothesis which states that HCE has no significant effect on IMR is rejected. In other words, HCE had a significant negative effect on IMR.

Table-5. Regression Effect of Public Health Expenditure on Infant Mortality Rate in Nigeria

Model	Unstandardized Coefficients		Standardized Coefficients Beta	T	Sig.	Collinearity Statistics	
	B	Std.Error				Tolerance	VIF
(Constant)	119.288	1.810		65.906	.000		
1 HRE	-0.154	.016	-0.684	-9.492	.000	.566	1.766
HCE	-0.134	.026	-0.370	-5.127	.000	.566	1.766

a. Dependent Variable: LED

Source: Authors' Computation Using SPSS Version 20

4.1. Test of Hypotheses

The hypotheses of the study to evaluate healthcare expenditure of the Nigerian government Infant Mortality Rate were subjected to test using Ordinary Least Square. The hypotheses are reiterated below with the results of the test:

H₀₁: Health Recurrent Expenditure (HRE) has no significant effect on the Infant Mortality Rate (IMR) in Nigeria for the period under review.

H₀₂: Health Capital Expenditure (HCE) has no significant effect on IMR in the country.

The result of the test of H₀₁ extrapolated from table 5 shows that at 0.00 level of significance, HRE had a negative impact of -0.154 on infant mortality rate in Nigeria for the period under review. On the strength of this result, therefore, the H₀₁ is rejected. Similarly, the result from table 5 obviously showed that HCE reduced IMR -0.134 at the significance level of 0.00. Based on this premise, the H₀₂ is rejected accordingly.

5. DISCUSSION OF FINDINGS

First and foremost, the finding of this study among others has revealed that both the Health Recurrent Expenditure (HRE) and the Health Capital Expenditure (HCE) by the government of Nigeria had a significant negative effect on the Infant Mortality Rate (IMR) for the period under review. Prior to the introduction of the recurrent health expenditure, the infant mortality rate would be 119.288 deaths per 1,000 live births. But with the introduction of the recurrent health expenditure, it can be deduced from this finding in table 5 that when all other IMR determinant factors are held constant, an ₦1.00 increase in public health recurrent expenditure would lead to a reduction in IMR by -0.154. The negative sign here shows a favourable decline in the infant mortality rate. This particular finding is in consonance with the studies carried out by [Novignon et al. \(2012\)](#) where both private and public sources of health care expenditure were significantly associated with improved health outcomes, with the public healthcare expenditure having a relatively larger impact on the IMR. In a similar study, it was established that the total health expenditures were a significant contributor to health outcomes with a 10% increase in total healthcare expenditure per capita resulting in 21% and 22% decrease in under-five and infant mortality rates respectively ([Anyanwu and Erhijakpor, 2009](#)). However, the findings of the study by [Musgrove \(1996\)](#) showed no evidence that expenditure on health as a share of GDP reduces child mortality, for either rich or poor countries. Moreover, the share of public health expenditure to the GDP is found to have no effect on child mortality, whether for all countries together or separately for those who spent either a high or a low public share. In addition, [Gupta et al. \(2003\)](#)'s finding is at variance with this particular study. According to [Gupta et al. \(2003\)](#) the difference in the impact of spending between the poor and non-poor could be substantial, for a 1% increase in public spending on health reduced infant mortality by twice as many deaths among the poor.

In another discovery from this study, it was noted that an increase of ₦1.00 health capital expenditure by the government would produce a corresponding reduction effect of -0.134 on the infant mortality rate in Nigeria. This finding sustains the studies carried out by [Oluwatoyin et al. \(2015\)](#) and [Issa and Ouattara \(2005\)](#). In their study, [Issa and Ouattara \(2005\)](#) noted that public health expenditure in early development states was more effective and highly significant in the group of low incomes countries in which an increase in this expenditure of 1% increase would on average; reduce infant mortality by 0.16%.

However, as the economy developed, private expenditure becomes increasingly more effective in the group of high-income countries with a significant relationship in which a 1% increase in private health expenditure causes between 0.36% to 0.85% decreases in IMRs. Similarly, [Oluwatoyin et al. \(2015\)](#) found that public spending on health had a significant relationship with health outcomes as well as environmental factors such as air pollution, hospitals, provision of adequate drugs amongst others were identified as being important in determining health outcomes in Nigeria. On the contrary, [Yaqub et al. \(2012\)](#) and [Byaro and Musonda \(2016\)](#) some evidence from their separate but related studies that public health expenditure had a negative effect on the infant mortality. [Yaqub et al. \(2012\)](#) particularly reported that an increase in public expenditure on health was less likely to lead to improvement in health status unless the corruption issue was addressed. The results from [Byaro and Musonda \(2016\)](#) equally indicated that, despite changing patterns of government health expenditure over the period under review, still government health expenditure had no impact on infant and under-five mortality. In terms of comparison emanating from this very study, public Health Recurrent Expenditure (HRE) had a more significant negative effect on the infant mortality rate than the Health Capital Expenditure (HCE).

6. CONCLUSION AND RECOMMENDATIONS

Governments in Nigeria, over the years, have been making frantic efforts at ensuring that there is an increase in the level of public expenditure on health. However, this has not led to an appreciable health outcome like the infant mortality rate. It is apparent from this very study that both health recurrent expenditure and the health capital expenditure by the government of Nigeria had a significant negative effect on the Infant Mortality Rate

(IMR) for the period under review. Interestingly, the public health recurrent expenditure marginally impacted more on the infant mortality rate than the health capital component. The import of this is that recurrent healthcare expenditure component has more propensity of reducing the infant mortality rate if the annual budgetary allocation is channelled towards issues like the maintenance of facilities, proper remuneration of the health personnel working in those facilities among others. This will likely promote efficiency and effectiveness of the health sector, including equitable access to the healthcare services by both the rural populace and the urban poor. By so doing, it might lead to a phenomenal reduction in the current infant mortality rate in Nigeria both in the short and long run situation.

Also, the Nigerian government at all levels should re-prioritise such that more funds should be earmarked and deployed into building more hospital structures and equipment. This, of course, should be consummated by adequate and motivated manpower in the health sector in order to make health care services affordable and accessible to the under-5 and infants as well. Moreover, the government at various levels should spend adequate funds on all the tiers (primary, secondary and tertiary).

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