Public Health Expenditure and Economic Growth in Nigeria: Testing of Wagner's Hypothesis

Saheed O. Olayiwola[†], Tunde Abubakar Bakare-Aremu[§] and S. O. Abiodun[‡]

Abstract

The idea supporting the relationship between public expenditure and economic growth is that an increase in public spending is an inevitable consequence of economic growth. This propelled Wagner to hypothesize a connection between economic growth and public expenditure. However, arguments on the impact of public health expenditure on economic growth remain inconclusive. This study re-examined the connection between public health expenditure and economic growth in Nigeria within the context of Wagner's theory of ever-increasing State activities. The study found evidence of a long-run relationship between public health expenditure and economic growth. The granger-causality test results, indicate neither uni-directional nor bi-directional relationship between public health expenditure and GDP. But health expenditure as a share of total government expenditure and population has a uni-directional causal relationship with real GDP. Thus, public expenditure pushes public health expenditure. It was concluded that though there is no causal relationship between public health expenditure and GDP, public health expenditure and GDP still have evidence of a long-run connection. Therefore, health insurance should be expanded to cover more people to mobilize more resources for the health sector. These may engender the required impact of health care expenditure on economic growth in Nigeria.

Key Words: Wagner's Theory, Public Health Expenditures

JEL Classification Codes: E62 H51 I15

[†] Department of Economics, Federal University of Technology, Akure, Nigeria, saheedolayiwola@yahoo.com, soolayiwola@futa.edu.ng, +234-706-065-1440

[§] Department of Economics, National Open University of Nigeria, Abuja, tundebakare4u@gmail.com, abakare-aremu@noun.edu.ng +234-803-385-1266

[‡] Department of Economics, Tai Solarin College of Education, Omu-Ijebu, Ogun State, abiodunlalekan@gmail.com

1. Introduction

Wagner (1883), in examining the growing importance of government activities, postulated a law of expanding state activities. Wagner (1883) suggested a connection between economic growth and public expenditure. The idea supporting this relationship is the fact that increases in public spending are an inevitable consequence of economic growth. This means that the share amount of public spending rises with an increase in the rate of output growth. Public health expenditures refer to the expenditures of Federal, State, and Local governments in the health sector. It constitutes a significant part of government social spending and hence, government expenditures. The multiplier effect of increased public health expenditures may lead to an increase in total expenditures and aggregate demand. As an indication of commitment towards improving the performance of the health sector in its fiscal operation, the Nigerian government took the responsibility of providing good healthcare facility by increasing her expenditure on health. Available data shows that on the average, about 2.1% to 5.8% of total government expenditure was allocated to the health sector between 2000 and 2019. The country's public expenditure on health as a percentage of GDP is about 4.1% against 4.6% African average and 6.3% in developed countries (Olarinde & Bello, 2014). However, the multiplier effect of increasing government health expenditure in Nigeria is still marginally low and the level of its impact on economic growth is transitorily small. This is particularly worrisome given the hypothesized relationship between public expenditure and economic growth by the Wagner (1883) theory.

Under the Abuja Declaration of 2001, West African nations resolved to expand public health expenditure to 15% of total government expenditure. Therefore, a key issue in the health expenditure argument is whether nations are veering to the Abuja declaration target or not (Tandon & Cashin, 2010; WHO, 2013). In Nigeria, public health expenditure as a percentage of government expenditure has been fluctuating over the years. It fluctuated between 5.72% and 9.19% from 2008 to 2019. As a percentage of GDP, it recorded 0.91%, 1.15%, 1.03%, 0.88%, and 0.92% from 2010 to 2019 respectively. While the increase in budgetary allocation to the health sector is highly desirable, it is not sufficient to guarantee economic growth. This is because there is a transmission mechanism between increased government health expenditure and economic growth. And this transmission mechanism works through the overall health performance of a country. Nigeria's overall health performance was still ranked 187th among the 191 Member States by the World Health Organization (WHO) as of 2017**.** Available statistics from World Bank (2017) reveal that although infant mortality fell from 140 in the 1970s to 87.8 and 80.4 per 1000 birth in 2008 and 2011 respectively, the rate is still higher than the regional average for Sub Saharan Africa of 70.2 and 65.8 for 2008 and 2011 and 57.3 in 2010 for all developing countries. Life expectancy is about 49.8 years compared with 53.5 years for Sub Saharan Africa, 65.4 years for developing countries in 2007, and the country only managed to achieve marginal improvement with a value of 51.7 in 2011. Also, the maternal mortality ratio of 1,500 - 2,000 per 100,000 live births is among the highest in the world. From the above, it shows that increased government expenditure may be important to economic growth and vice versa according to Wagner's theory of ever-increasing State activities but the connection between increased public health expenditure and economic growth remains ambiguous. Though previous studies (e.g. Edeme & Olisakwe, 2019; Yaqub et.al, 2012; Udeorah *et al.*, 2018; among others), have examined the impact of health expenditure on economic growth, the results are inconclusive, raising the importance of reexamining the linkage

between public health expenditure and economic growth under Wagner's theory of ever-increasing State activities.

Considering the size, composition of public health expenditure and economic growth in Nigeria, the total government health expenditure in Nigeria, like most nations, comprises the health capital expenditure and the health recurrent expenditure. The health capital expenditures include government expenditures on health care infrastructures, health facilities, investment and development expenditure. This kind of expenditure involves physical asset as well as intangibles such as education, health, research and development and every other expenditure that improves the functionality of the assets, distinct from repairs (Davina, 2009). Alternatively, the health recurrent expenditure consists of government health expenditures in which the benefits are not expected to be consumed within a year. This kind of expenditure reoccurs on an annually.

Government health expenditure is composed of both the recurrent and capital expenditure on health. Data available for Nigeria indicates that the health capital expenditure of government decreased from ₦7.3 million in 1970 to ₦4.88 million in 1972 before it rose again to ₦126.75 million in 1974. It dropped sharply to ₦79.2 million in 1982. From 1982 to 1987, capital expenditure on health declined from ₦79.2 million in 1982 to an all-time low of ₦1.2 million in 1987. This development is occasioned by the fact that the government was more preoccupied with the business of paying workers' salaries with less attention being paid to health capital expenditure. In 1988, there was a significant rise to ₦297.96 million. By 1991, the statistics dropped to ₦137.3 million but plummeted to ₦33.72m in 1992. The figure again rose steadily from ₦586.2 million in 1993 to ₦17.7 billion, ₦33.39 billion and ₦34.64 billion in 2003, 2005 and 2007 respectively. The capital expenditure on health stood at N64.92 billion in 2008 and ₦79.32 billion in 2011 (Oluwatoyin *et al.,* 2015). The recurrent expenditure on health in Nigeria also followed a similar trend. It rose gradually from N12.48 million in 1970 to ₦59.47 million in 1977 but fell to ₦40.48 million 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 issues and the determination of the Federal Government to improve the health care system with the windfall of oil revenue. Recurrent expenditure droppedto₦15.32 million in 1979 before it rose to ₦52.79 million, ₦84.46 million, and ₦82.79 million in 1979, 1987, and 1983 respectively. From 1984 to 1986, recurrent expenditure rose from ₦101.55 million to ₦134.12 million when the recurrent expenditure as a percentage of total public health expenditure stood at 77.4 percent. The value of recurrent health expenditure reduced in 1987 to ₦41.31 million before it rose steadily from ₦422.80 million in 1988 and ₦24.52 billion in 2001. This figure rose from ₦40.62 billion in 2002 to ₦44.55 billion, ₦58.68 billion, and ₦72.29 billion in 2005, 2006, and 2007 respectively. Recurrent expenditure on health stood at ₦18.20 billion in 2008 and ₦21.54 billion in 2011 (Oluwatoyin *et al.,* 2015; CBN, 2017).

Table 1: Size and Composition of Public Health Expenditure in Nigeria (₦' Billion) 2000 - 2016

YEAR	Public Health Recurrent Expenditure (₦' Billion)	Public Capital Expenditure on Social Community Services (₦' Billion)	Total Public Health Expenditure(₦' Billion)
2000	15.22	27.97	43.18
2001	24.52	53.34	77.86
2002	40.62	32.47	73.09
2003	33.27	55.74	89.00
2004	34.20	30.03	64.23
2005	55.66	71.36	127.02
2006	62.25	78.68	140.93
2007	81.91	150.90	232.80
2008	98.22	152.17	250.39
2009	90.20	144.93	235.13
2010	99.10	151.77	250.87
2011	231.80	92.85	324.65
2012	197.90	97.40	295.30
2013	179.99	154.71	334.69
2014	195.98	111.29	307.27
2015	257.72	82.98	340.70
2016	202.36	79.63	281.99

Source: Central Bank of Nigeria, 2019

Figure 1: Size and Composition of Public Health Expenditure in Nigeria (₦' Billion) 2000 - 2016

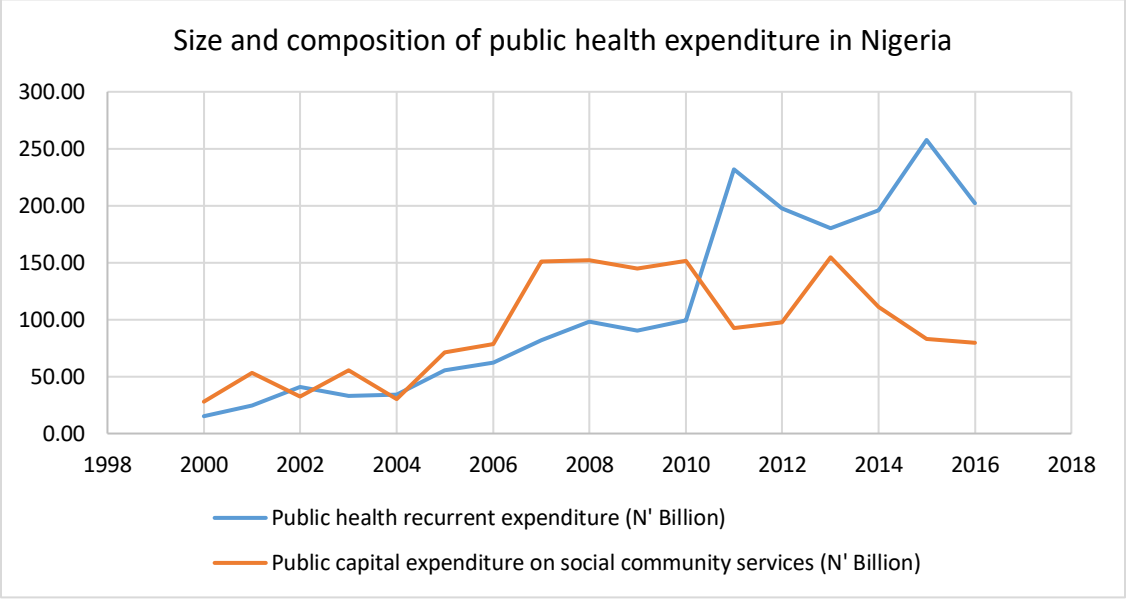


Table 1 illustrates the volume and composition of government health expenditure in Nigeria (measured in local currency unit – Naira, ₦) for the period 2000 - 2016. Data on government's capital expenditure on health is unavailable; hence, data on the government's capital expenditure on social community services was used because capital health expenditure is a subset of expenditure on social community services. Therefore, from Table 1, the health recurrent expenditure of the Nigerian government was initially lower than the capital health expenditure but later remained higher than the capital expenditure. This is especially from 2011 onward. From this

period, there was a distinct gap between the capital and recurrent expenditure on health. In 2002, there was a slight gap between both expenditures, as the government health recurrent expenditure (₦40.62 billion) was somewhat more than the capital health expenditure (₦32.47 billion). In 2007, there was a reversal in the trend as government capital health expenditure (₦150.90 billion) rose above recurrent health expenditure (₦81.91 billion). The capital health expenditure was steadily higher than recurrent health expenditure until 2010. After this period, government recurrent health expenditure has been on the increase. In 2011, recurrent health expenditure became more than twofold capital health expenditure. In 2012, government recurrent health expenditure was ₦197.90 billion, while capital health expenditure was ₦97.40 billion. In 2013, the value of recurrent health expenditure decreased to ₦179.99 billion and was still greater than capital health expenditure which was ₦154.71 billion. A similar trend was observed until 2016. It should be noted that economic growth requires more capital expenditure than recurrent expenditure based on the fact that expenditure that boosts development are those directed to infrastructural development, research and development equipment, and energy.

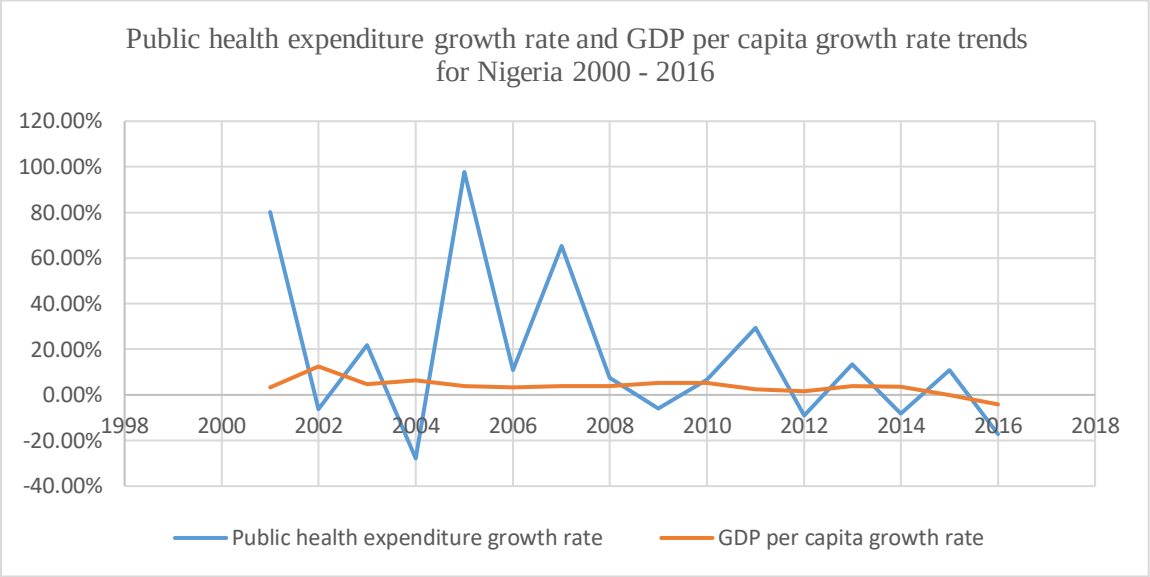
The growth rate of public health expenditure is plotted against the growth rate of GDP for trend analysis. This is to examine the behaviour of both variables within the context of Wagner's theory. Wagner's theory hypothesizes that government expenditure increases as the economy grows. In this context, GDP is expected to increase as public health expenditure grows, and vice versa. The public health expenditure growth rates and the GDP growth rates were characterized by several fluctuations from 2000 to 2016 (see Table 2 and Figure2).

Table 2: Growth Rates of Public Health Expenditure and GDP Per Capita for Nigeria 2000-2016

YEAR	Public health expenditure growth rate (%)	GDP per capita growth rate (%)
2000	-	-
2001	80.30	3.29
2002	-6.13	12.46
2003	21.78	4.66
2004	-27.83	6.49
2005	97.76	3.72
2006	10.95	3.33
2007	65.19	3.82
2008	7.56	3.97
2009	-6.10	5.20
2010	6.70	5.16
2011	29.41	2.53
2012	-9.04	1.47
2013	13.34	3.85
2014	-8.19	3.51
2015	10.88	-0.03
2016	-17.23	-4.17

Source: Author's Computation

Figure 2: Trends of Public Health Expenditure and GDP Per Capita for Nigeria 2000-2016



From Figure 2 above, the growth rate of public health expenditure and real GDP followed a different path but public health expenditure changes at a faster rate than GDP. This appears to suggest that the growth rates of GDP and public health expenditure had asymmetric movements. For instance, in the year 2001, public health expenditure growth rate was 80.30%, while the growth rate of GDP was 3.29% and in 2002, public health expenditure growth rate declined with a negative value -6.13% while GDP growth rate rose to 12.46%. Similarly, in 2003, both variables witnessed divergent changes in their growth rate as public health expenditure increased by 21.78%, and GDP reduced by 4.66%. The value further dropped by -27.83% for public health expenditure and rose by 6.49% for GDP in 2004. In 2005, the growth rate of public health expenditure rose sharply by 97.76% while GDP growth rate dropped by 3.72%. This trend persisted over the years as both components followed dissimilar patterns. In 2010, the growth rate of public health expenditure was 6.70% and GDP growth rate was 5.16%. The former rose by 29.41% in 2011 and the latter dropped by 2.53%. The growth rate in 2016 was -17.23% for public health expenditure and -4.17% for GDP. From the figures above, it is obvious that public health expenditure changes at a higher rate than GDP. This means that the rate of changes in public health expenditure is more volatile and higher than that of GDP. These results show that the trend of public health expenditure and GDP in Nigeria though follows a different path, continues to increase according to Wagner's (1883) theory.

The rest of the paper is divided into five sections. Section 2 provides a theoretical and empirical review of literature while section 3 contains methodology and theoretical background. Section 4 encompasses research findings and discussion; while section 5 concludes the study.

2. Review of Theoretical and Empirical Literature

It is a major economic fact that economic growth for any country depends on the abundance of human capital of the country. Mainly the human capital is composed of health and education. These two components are considered to be important pillars for human capital development, economic growth and development. Many theories had examined the relationship between human

capital accumulation (through developing education and health) as a subset of public expenditure and the economic growth of the country. These theories include Wagner's theory of ever-increasing state activities, Peacock-Wiseman theory, and Keynesian theory of public expenditure among others. Previous literature revealed the importance of health as a fundamental element in human capital, stimulating economic growth and raising the welfare level of the society, labour productivity and quality of life. However, many countries focused on developing the educational aspect, while ignoring the importance of health aspect (Boussalem & Taiba, 2014). Health expenditure means investment in health sector and infrastructure, spending on medical care, community health activities, prevention, rehabilitation, health administration and regulation, and capital formation which indirectly means investment in human capital and leads to human capital accumulation (Ndedi, Metha & Nisabwe, 2017). Moreover, health expenditure is considered as investment in human resources which promotes the productive capacity and improves the country's economic growth. In this regard, there was a wide range of literature that discussed the relationship between economic growth and health spending.

Wagner (1883) theory postulates that government expenditure increases as a result of industrial and economic growth in a country. This theory argued that there is both an absolute and a relative expansion of the public sector at the cost of the growth in the private sector. This is based on the assumption that during an industrialization process, as the real income per capita of a country increases, the share of public expenditure is also expected to increase (Serena & Andrea, 2011; Babatunde, 2011). This suggests that the development in the industrial sector of a country will be accompanied by increased government expenditure. Therefore, increased government expenditure (recurrent or capital) occurs to maintain the industrial and growth process. Bird (1971) justifies this postulation based on three evidences: the administrative and protective functions of the government require huge capital expenditure outlay; the need for increased provision of social and cultural goods and services as the industrial sector grows and the need for government expenditure to manage and finance natural monopolies and ensure smooth operation of the market forces. It was also argued that government would have comparative advantages (e.g. capital) alongside the private sector in a growing economy (Rowley & Tollison, 1994). This is because the growth in the economy will attract shocks within the system and to reduce the effect of these shocks, the government's intervention becomes necessary. Furthermore, the industries set up by the private sector will look forward to the government's involvement in ensuring sustainability and effectiveness through the provision of key facilities such as: infrastructures, health services and security. The provision of these facilities will involve an increase in government expenditure. Therefore, the main postulation of the Wagner's theory is that government expenditure usually increases to match the growth rate of the industrial sector of the country.

Peacock-Wiseman (1961) theory also known as Displacement Theory was proposed by Peacock and Wiseman (1961), in their monograph "The Growth of Public Expenditure" in the United Kingdom. Their hypothesis explained why government expenditure tends to change in a step-like pattern, corresponding with social upheavals, notably wars. The theory argued that the growth of public expenditure follows political economic path. The authors adopted an inductive approach to explain the growth of public expenditure. Peacock and Wiseman (1961) observed that expenditures over time appeared to outline a series of hills separated by peaks, and that these peaks coincided with periods of war and preparation for war. The three basic propositions underlying the Peacock and Wiseman analysis are that (i) government can always find profitable ways to spend available

funds, (ii) citizens, in general are unwilling to accept higher taxes, and (iii) government must be reactive to the wishes of their citizens (Henrekson, 1990). The occurrence of unexpected social disturbances would necessitate an increase in government expenditures but the inadequacies of revenue position compared with the desired expenditure would cause the government to find a solution to the revenue shortage and also motivate the tax payer to attain a new level of tax tolerance (Ajibola, 2008). This displacement from previous tax level is known as the displacement effect. Also the government has a tendency to take larger proportion of national economic activities resulting from unexpected occurrences, a phenomenon known as the concentration effect (Kasimu & Aggreh, 2014). However, in another article, Peacock and Wiseman (1979) suggested two complementary approaches to the empirical analysis of the public expenditure growth, the first being represented by factor analysis at the general econometric level, and the second by the development of models of group behaviour leading to explanations in terms of the changing relationships of social groups through time.

The Keynesian theory (1936) of public expenditure argues that economic growth occurs as a result of rising public sector expenditure. In this context, government expenditure is treated as an independent exogenous variable and could be used as an efficient policy variable to influence economic growth. According to the Keynesian school of thought, public spending boosts economic activities as well as act as a tool to stabilize the short run fluctuations in aggregate expenditure (Ju-Haung, 2006). This view is consistent with the evidence found in some previous empirical studies such as (Omoke, 2009) which show a positive impact of government expenditure on economic growth. The Keynesian macroeconomic model advocates an active government intervention in the economy through an increase in government spending, money supply in order to stimulate the demand for goods and services during periods where there is lack of demand (low demand) and put the unemployed back to work. This illustrates the importance of aggregate demand in the Keynesian macroeconomic framework to determine the level of output and income in the economy. Barro (1990) also argued in endogenous growth theory that government expenditure directly affects the private production function. Keynes (1936) argued that market economies had no automatic capacity to generate full employment and that the economic policy is and should be intimately linked to social policy (Connor & Simpson, 2011). Kneller *et al.,* (1999) carried out a research on growth of public expenditure and concluded that, at the early stages of economic development, the rate of growth of public expenditure will be very high because government provides the basic infrastructural facilities (social overheads) and most of the projects are capital intensive, thus, government spending will increase progressively. The investment in education, health, roads, electricity, water supply are necessities that can launch the economy from the primitive stage to the take off stage of economic development, making government to spend an increasing amount with time to develop an equal society.

Byaro, et.al (2018) identifies some major drivers of per capita public health expenditure growth in Tanzania using nationally representative annual data between 1995 and 2014. With the use of Bayesian model based on Markov Chain Monte Carlo (MCMC) simulation, the authors found that both real GDP per capita and population age 65 years and older exert a positive effect on per capita public health expenditure growth in Tanzania. But, advances in medical technologies represented by life expectancy reduce real per capita public health expenditure growth in Tanzania. The results suggest that, future trends in per capita public health spending would mainly depend on the development of the economy such as real per capita gross domestic product and that rapid growth

in real per capita public health expenditure may continue in future when the country economy becomes more robust.

According to the American Diabetes Association (2002), health expenditure on people with diabetes is more than double those without diabetes. The same study revealed that diabetes places a substantial cost burden on the society. An increase in health expenditure targeted on improving the lives of people living with diabetes could significantly and positively influence the United States economy. According to White (2007), higher growth rate was experienced in the United States when health expenditure was much higher as compared to the Organisation for Economic Cooperation and Development (OECD) countries whose health expenditures were lower. Gupta *et al.,* (2002) discovered that an increase in health expenditure reduced mortality rates for infants and children whilst at the same time boost productivity. According to Wagstaff (2007), health shocks are more likely to negatively affect the income levels of urban dwellers as compared to the people staying in rural areas. The same study revealed that health shocks result in households significantly reducing food expenditure to focus more on budget items like rental, water, and electricity among others. Liu et al (2003) revealed that an increase in medical expenditure reduced the level of poverty or increased GDP per capita in the rural areas of China in a significant way. Zon and Muysken (2001) also argued that countries whose health expenditures is very low are associated with low productivity rates across all the sectors of the economy as well as stagnant or negative economic growth. The same study found out that health expenditure compliments economic growth and any attempt to re-allocate health labour force to other sectors of the economy may negatively hinder the growth of the economy.

Abegunde *et al.,* (2007), observed that if health expenditure was not increased to reduce the risk of chronic diseases, developing countries would lose an estimated figure of US$84 billion in form of economic decline between the period 2006 and 2015. Approximately US$8 billion would be saved and channeled towards boosting economic growth if health expenditure especially on chronic diseases is accelerated by the developing countries. According to Boussalem et al (2014), health expenditure was found to have a significant impact on economic growth in the long term only and not in the short term in Algeria. Furthermore, a study by Rajeshkumar and Nalraj (2014) based on time series revealed that economic growth was granger-cause by public expenditure on health in all the four Indian States. Odior (2011) also found that an increased in public spending on health infrastructure led to an increase in economic growth in Nigeria. The economic growth associated benefits are widened and increased if more money is rechanneled towards health expenditure, as shown by Adeniyi and Abiodun (2011). In concurrence, Bakare and Sanmi (2011) found the existence of a unidirectional causality relationship running from health expenditure to economic growth in Nigeria. Mehrara and Musai (2011) found a very weak causality relationship between health expenditure to economic growth. But, Rengin (2012) discovered the existence of a long term causality relationship running from health and education expenditures towards economic development whilst the same study discovered no relationship in the short run. In addition, Babatunde (2014) found that economic growth was to a larg extent determined by gross capital formation, health spending and labour force productivity in Nigeria. The same study suggested that lower life expectancy negatively impacted on economic prospects in Nigeria. The findings from a study done by Rico et al (2005) also resonate with the Keynesian view on public expenditure on health infrastructure. Erdil and Yetkiner (2009) revealed that economic growth was only granger-cause by expenditure on health related infrastructure in high income countries whilst

the reverse causality was established for low to medium income countries. Arawomo, Oyebamiji and Adegboye, (2018) in their examination of the dynamics of economic growth, energy consumption and health outcomes in selected Sub-Sahara African countries (SSA) with annual data over 1990-2014 and fitted in a panel vector autoregression model revealed that neither economic growth nor energy consumption was found to affect health outcomes significantly. But medical factor such as health care expenditure remains an important determinant of health outcomes in SSA. However, all the variables employed in the study have joint significance to Granger-cause health outcomes, but individually only CO2 causes a marked change in health outcomes. They further found the existence of "Neutrality hypothesis" in a causal relation. The authors found no evidence of causality running from health outcome to energy consumption or economic growth and no evidence of causal pattern running from either energy consumption or economic growth to health outcome. This study further drives home the significance of health expenditure in economic development trajectory.

Previous research that support theory advanced by Wagner (1890) include Subramanian *et al.*, (2002), Dritsakis (2004), Narayan *et al.,* (2008), Alhowaish (2014), Mehrara and Musai (2011a), Mehrara and Musai (2011b), Goel and Garg (2011), Erdil and Yetkiner (2009), Elmi and Sadeghi (2012) and Bala (2011), among others. Subramanian *et al*., (2002) revealed that the level of economic development played a larger role in determining health expenditure. Higher economic prosperity increases the capability of countries to purchase and build better health infrastructure, argued Subramanian *et al.,* (2002). The same study discovered that higher poverty levels contributed to poor health of societies and among individuals. Moreover, the causality relationship between health expenditure and the economy is not linear as it depended on other factors such as national wealth distribution fairness (Subramanian *et al.,* 2002). The causal relationship from economic growth to government expenditure was found to be much stronger in low GDP per capita OECD countries. In a study on Greece and Turkey, Dritsakis (2004) discovered evidence that supports Wagner's law. According to Narayan et al. (2008), the subnational data on China's central and Western provinces also supported Wagner's Law. In a study of four Southern Indian States, Bala (2011) found a uni-directional causality relationship from economic growth to health expenditure in Andhra Pradesh province. The same study could not find any long run relationship between health expenditure and economic growth in the other Indian provinces of Karnataka, Kerala and Tamil Nadu during the period 1960 to 2009. Alhowaish (2014) also discovered results that are consistent with Wagner's Law. A uni-directional causality relationship running from economic growth to healthcare spending in Saudi Arabia was discovered at one percent level of significance by Alhowaish (2014). The same study found that healthcare spending had an insignificant impact on economic growth in Saudi Arabia. Mehrara and Musai (2011a) also shown that health expenditure was granger-cause by GDP in Iran. According to Mehrara and Musai (2011a), an increased public expenditure significantly contributed towards lowering poverty levels though the impact on economic growth was very minimal in Iran. However, in a study on Bangladesh, Rahman (2011) could not find results that resonate with the Wagner's law. Elmi and Sadeghi (2012) discovered results that support Wagner's law in the short run only in developing countries whereas the same study could not confirm the health-led growth hypothesis in the short run. A study by Nasiru and Usman (2012) revealed the existence of a long term relationship between health expenditure and economic growth in at least one direction. The same study using granger causality tests showed that there is a bi-directional causality relationship between public health expenditure and economic growth. Sghari and Hammami (2013) also found results that are

consistent with the bi-directional causality relationship between health expenditure and economic growth in developed countries. A study by Erdil and Yetkiner (2009) revealed that the bidirectional causality relationship between health expenditure and economic growth was the most dominant view across low, medium and high income countries. Also, Ibukun & Osinubi (2020) in the examination of the relationship among environmental quality, economic growth and health expenditure in 47 African countries using both static (pooled OLS and fixed/random effect) and dynamic (system GMM) estimation methods and data covering the period 2000 to 2018 with three proxies (carbon dioxide, nitrous oxide and methane emission) to capture the effect of environmental quality found evidence of a positive and significant effect of economic growth on health expenditure. The authors further established a positively significant relationship between poor environmental quality and health expenditure. The findings of this study suggest that of the three proxies of environmental quality; carbon dioxide emission had the highest effect on healthcare expenditure while economic growth significantly increased health expenditure across the five African regions (North Africa, East Africa, Central Africa, West Africa and Southern Africa). The study concludes among others that health is a necessity good and a deterioration of the environmental quality increases health expenditure. These results call for a need to maintain the SDG clean energy policies that focus on reducing environmental pollution while working to achieve inclusive and sustainable economic growth.

The previous empirical evidences seem to be mixed and contradictory. Even studies that investigated the case of one country with near time frames completely contradicted each other. Example is the case of Turkey. However, there were studies on Nigeria that came up with the same result. This shows that results can be similar for the same country. These similarities occur when talking about the impact of human capital in terms of health and education on the economy. Theories agreed to a large extent that human capital accumulation promote economic growth. But, studies on the impact of health expenditure on economic growth mostly found conflicting results. Some of these studies supported the growth-led Wagnerian hypothesis while others agreed with the health-led hypothesis and the Keynesian school.

3. Methodology

3.1. Theoretical Framework

This study adopts Wagner (1883) theory of ever-increasing state activities as theoretical framework. Wagner (1883) argued that government expenditure increases as a result of industrial and economic growth in a country. The theory argued that there is both an absolute and a relative expansion of the public sector at the cost of the growth in the private sector. This is based on the assumption that during an industrialization process, as the real income per capita of a country increases, the share of public expenditure is also expected to increase. It is assumed that countries increase their public health spending as a result of an increase in their gross domestic product (GDP). The rate of changes in the total output of the economy assumes to be the principal determinant of government health expenditure.

3.2 Model Specification

The theoretical model of this study assumed a functional relationship between gross domestic product and public health expenditure. The model allows for the identification of the channels through which gross domestic product affects public health expenditure over time. In the specific case of public health expenditure, three groups of independent variables are important vis health stock variables, demographic variables, and economic variables (Anyanwu & Erhijakpo 2009;

Abbas & Hiemenz, 2011). Anyanwu and Erhijakpo (2009) noted that the health stock variables explain the supply factors while the demographic and economic variables emphasize the demand for health expenditure. Based on previous studies (Anyanwu & Erhijakpo 2009; Abbas and Heimenz, 2011) with modification, the determinants of public health expenditure given the budget constraints can be expressed as a function of the health stock, demographic, economic and political variables. Public health expenditure *(PHEX)* like any other good (tangible or otherwise) is mainly determined among other factors by the aggregate level of income *(GDP per capita)*. Economic theory has it that the amount of public health expenditure depends on aggregate spending and the implication of this is that *a priori is* expected to be positive (Bilgel, 2004). Health expenditure as a share of total government expenditure is another factor that determines public expenditure on health. Health expenditures cover the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid was chosen for health. The *a priori* expectation is a negative relationship with public health expenditure as an increase in health expenditure leads to a decrease in public health care spending. Population size is hypothesized to be another determinant of public expenditure on healthcare. It is expected that high population size should exert more pressure on existing facilities and thus higher expenditure requirements. Thus, all things being equal, health expenditure is expected to be an increasing function of the population size (POP) (Omitogun, 2014). This theoretical background gives the following specification of the modified health expenditure regression equation as:

$$PHEX_t = f(GDPPC_t, HSTGEX_t, POP_t) \quad (1)$$

Where $PHEX_t$ = public health expenditure (the outcome or dependent variable); $GDPPC_t$ = Gross Domestic Product per Capita; $HSTGEX_t$ = Health expenditure share in total government expenditure; POP_t = Population. Explicitly and in econometric form, equation (1) can be written as:

$$PHEX_t = \beta_0 + \beta_1 GDPPC_t + \beta_2 HSTGEX_t + \beta_3 POP_t + \mu_t \quad (2)$$

Where, β_0 = a constant; $\beta_1 - \beta_3$= Coefficients of the independent variables and μ_t is the residual. Causality between public health expenditure and GDP was tested with the granger causality test. For this purpose, the causal direction framework developed by Granger (1969) and Sims (1972) was used. The systematic testing and determination of the causal direction framework developed by Granger (1969), and Sims (1972) are based on the assumption that past and present may cause the future, but the future cannot cause the past. The Granger causality test is based on the following equations:

$$\Delta Y_t = \alpha + \sum_{i=1}^{m} \beta i \Delta Yt - 1 + \sum_{j=i}^{n} \beta \varphi i \Delta Xt - 1 + \varepsilon_t$$
$$\Delta X_t = X + \sum_{i=1}^{m} \varphi i \Delta Yt - 1 + V_t \quad (3)$$

Where Y_t and X_t are two stationary series and i and j stand for the lag lengths. The unilateral causality exists when Y_t is said to be Granger caused by X_t which means that the coefficients on the lagged of X_t are statistically significant. On the other hand, a bilateral causality is said to exist

when both coefficients are statistically significant, and there is independence when both are statistically insignificant. *A priori,* it is expected that:

$$\frac{\Delta PHEX}{\Delta GDP} > 0$$
$$\frac{\Delta GDP}{\Delta PHEX} > 0 \qquad (4)$$

The coefficient estimates in this model must agree with the economic theory. From the estimations in this study, a causal relationship is expected between public health expenditure and GDP in Nigeria. The direction of the causality is expected to be positive running from changes in GDP to changes in public health expenditure (i.e. a change in the level of GDP leads to a change in public health care spending) as shown in equation (4). This will establish the Wagnerian perspective that economic growth spurs public expenditure. It is also expected to get a result that aligns with the feedback or bidirectional view of the mutual effect between the two variables.

3.3 Data Sources and Measurement of Variables

The variables under consideration are measured in growth rates to eliminate the effects of trend and irregular movements. This is because most macro-economic time series follow an upward trend over the years. Data for this study are annual time series data from 2000 - 2016 sourced from World Development Indicators and publications of the World Health Organization regarding health and public health expenditures. The total value of expenditures is used to measure GDP per capita (constant 2010 US$).

4. Results and Discussion

4.1 Descriptive Analysis of Variables

Table 3 below shows the descriptive statistics of the variables used in the analysis. According to the table, the mean value of Public health expenditure *(PHEX)* in the period was ₦204.06 million, and that of *GDPPC* was ₦2059.08which ranges from ₦1383.666 to ₦2563.9 with a standard deviation of 103.79 and 378.60 respectively. Also, the health expenditure share in total expenditure *(HSTGEX)* has a mean and standard deviation of ₦3.438 and 0.54 respectively. More so, the total population (POP) has a minimum value of 122.28 and a maximum value of 185.96with mean and standard deviation of 151.74 and 19.56 respectively. The Public health expenditure growth rate *(PHEGR)* ranges from -27.83% to 97.76% with mean 9.9604 and a standard deviation of 34.35. Also, the GDP per Capita growth rate *(GDPPCGR)* ranges from -4.17 to 12.46 with a mean and standard deviation of 3.70 and 3.28 respectively. Finally, the log of GDP per Capita *(LGDPPC)* has a mean of 7.61 with a standard deviation of 0.19 and ranges from 7.23 to 7.85 while log of public health expenditure has a mean of 5.14 with standard deviation 0.66.

Table 3: Descriptive Statistics of the Variables Used

	Mean	Standard deviation	Minimum	Maximum	Observations
PHEX	204.07	103.79	43.18	340.7	17
GDPPC	2059.08	378.60	1383.66	2563.9	17
HSTGEX	3.44	0.54	2.14	4.45	17
POP	151.74	19.56	122.28	185.96	17
LPHE	5.14	0.66	3.77	5.83	17
LGDPPC	7.61	0.19	7.23	7.85	17
PHEGR	9.96	34.35	-27.83	97.76	17
GDPPCGR	3.70	3.28	-4.17	12.46	17

Source: Author's Computation

4.2 Unit Root Test

The stationarity of a time series data requires that the statistical features like mean, variance, and standard deviation are constant over some time. The time series equation assuming that p and q are non-stationary can be stated as follows:

$$P_t = \alpha + \beta Q_t + \varepsilon_t \qquad (5)$$

$P_t \ and \ Q_t$ represent individual time series. Differencing a time series gives rise to a set of observations such as first-differenced values, second differenced values, third- differenced values, and so forth. Stationary tests were carried out to know if the variables are stationary at the level or first difference or not at all. If the variables become stationary at level, then the variables are integrated of order zero i.e. I(0). However, if the variables become stationary at the first difference, then the variables are integrated of order one i.e. I(1). The decision rule is to reject the null hypothesis if the ADF statistic value exceeds the critical value at a 5% level of significance. The unit root test results presented in *Table 4* show that *LGDPPC, HSTGEX, POP*, and *LPHE* are all stationary at first difference. Therefore, the null hypothesis which states that there is no unit root was rejected at the first difference *for GDPPC, HSTGEX, POP*, and *LPHE*, and all variables are integrated of order one i.e. I(1).

Table 4: Results of Augmented Dickey-Fuller Unit Root Test

Variable	Level ADF Test Statistics	MacKinnon Critical Value at Level at 5% level	First Difference ADF Test Statistic	MacKinnon Critical Value at First Difference at 5% level	Decision
LGDPPC	-3.893124	-3.081002	-4.189510	-3.759743	I(1)
HSTGEX	-2.878047	-3.065585	-5.263071	-3.081002	I(1)
POP	-2.044453	-3.098896	-4.461591	-3.144920	I(1)
LPHE	-2.152337	-3.065585	-5.962711	-3.081002	I(1)

*Significant at 5% level
Source: Author's Computation

The study employed the Auto regressive redistributed Lag (Bounds Testing) Approach to test long run relationship between human capital formation and sustainable development in Nigeria From table 4.4.1, it can be seen that there is co-integration that is, long run relationship among the variable as the value of the F-statistics (7.476525) is more than 5% Critical value bound of the

critical value. This therefore signifies that there is long run effect of the independent variables (government expenditure on education, primary school enrolment, secondary school enrolment, rate of output per worker) on the growth rate of gross domestic product in Nigeria. The evidence of long run association gives sufficient and necessary condition to estimate both the long run and the short run analysis. The long run dynamics is shown in table 4.3 thus:

4.3 Johansen and Joselieus Cointegration Test

The Co-integration test investigates the existence of a long-run relationship between public health expenditure and economic growth. The study employs Johansen and Joselius (1990) approach which uses the Maximum Eigenvalue test and the Trace test statistic to determine the number of co-integration vectors. The former tests the null hypothesis of *r* co-integrating relations between the variables against the alternative of *an r-1* number of cointegrating relations for r = 0, 1, 2…n-1. This Maximum Eigenvalue test statistic is calculated as:

$$LRmaximum\left(\frac{r}{n}+1\right) = -T^{*}\log(1-\tau) \qquad (6)$$

Where: λ = Maximum Eigenvalue, T = Sample size, r = 0, 1, 2, n-1.

The Trace statistic tests the null hypothesis of *r* co-integrating relations against the alternative *n* cointegrating relations. *n* is the number of variables in the system for r = 0, 1, 2…n-1. The equation for the Trace statistic is written as:

$$LRtrace = -T^{*}\sum_{i=r+1}^{n}\log(1-r) \qquad (7)$$

In determining the number of cointegrating vectors, trace test, and maximum Eigenvalue test, the Mackinon, Haug, and Michelis (1990) was applied. No deterministic trend and restricted constant were assumed for all variables. Akaike Information Criterion (AIC) was selected for the choice of lag. The result for both trace test and maximum Eigenvalue for the unrestricted co-integration rank test are presented in *Table 5* below:

Table 5: Long run Relationship between Public Health Expenditure and GDP in Nigeria

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Values	Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Values
None *	88.0977	47.8561	None *	45.5528	27.5843
At most 1 *	42.5449	29.7971	At most 1	20.1322	21.1316
At most 2 *	22.4127	15.4947	At most 2 *	19.1152	14.2646
At most 3	3.2975	3.8415	At most 3	3.2975	3.8415

Note: * denotes rejection of the hypothesis at 0.05 level

In Table 5 above, the Johansen co-integration test result shows evidence of the presence of 3 co-integrating vectors by comparing the trace statistics values with critical values. The result shows that the trace statistics are greater than the corresponding critical value at a 5% significance level. Hence, it is clear that there is at most 3 co-integrating equations in the model with a trace statistics value of 3.2975and critical values of 3.8415at 5% level of significance. This rejects the null

hypothesis of no co-integration and implies that there exists a long-run relationship among the variables. Also, the Max-Eigen statistics shows that the variables are co-integrated in the long run and shows the presence of 3 co-integrating vectors like the trace statistics.

Table 6: ARDL Bound Test Result

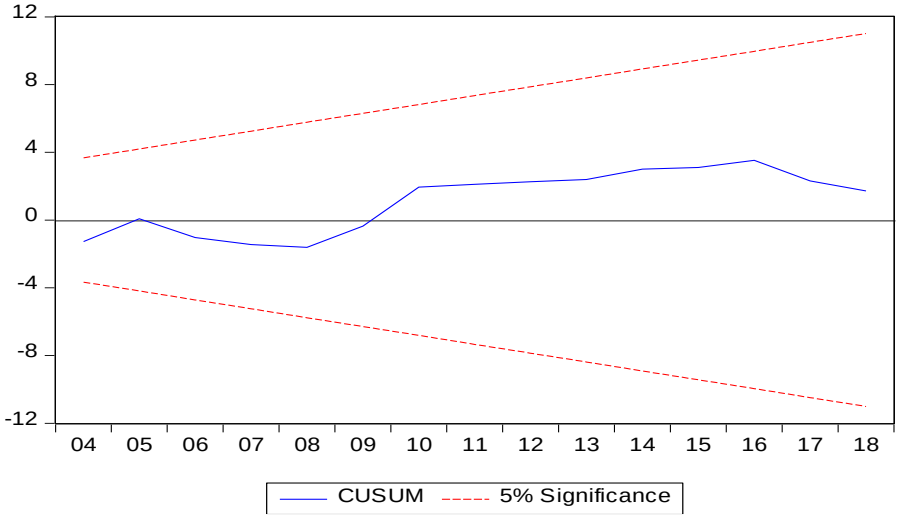
PANEL A		
Test statistic	Value	K
F-statistic	7.476525	4
Panel B		
Critical value bound	I(0)	I(1)
10%	2.75	4.01
5% significant value	2.86	4.61
1%	2.15	4.51

Source: Author's Computation; Critical Bounds from Narayan (2005)

Table 6 depicts the ARDL bound test result for the model in equation 1. The critical bounds are from Narayan (2005). The null hypothesis is that there is no co-integration. To determine the existence of the long run relationship, the F-statistics is compared with the lower I(O) bound and upper I(1) bound. The upper bound assumes all regressors are I(1); the lower bound assumes regressors are I(O). The null hypothesis is accepted when the computed *F*-statistics is below the lower bound and rejected when the *F*-statistics is higher than the upper bound. The test would be inconclusive if the *F*-statistics lies in between the upper and lower bounds. In this study, the *F*-statistics is higher than the upper bound and it is concluded that there is a long run relationship among the variables.

The cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) plots in Figure 3 from a recursive estimation of the model expressed stability over the sample period.

Figure 3: Stability test



From the results of ARDL bound test in Table 6, the null hypothesis of no co-integration can be rejected at 1% significance level. This suggests that health expenditure and economic growth have a long-run relationship. The analysis of the long-run estimate of the impact of health expenditure on economic growth is provided in Table 7. This analysis shows that public health expenditure had positive and significant impact on economic growth both in the short run and long run in Nigeria. This indicates that increasing public health expenditure can spurs economic growth in Nigeria.

Table 7: Result of the Autoregressive Distributed Lag Model

Variable	Coefficient	t-Statistic	Prob.
HSTGEX	0.293506	1.756160	0.0971*
POP	0.300206	1.605577	0.1268
LPHE	4.883181	2.658014	0.0209**
C	71.85802	1.865110	0.0795*
ECT(-1)*	-1.185569	-6.881230	0.0000*
R-squared	0.61	Adjusted R-squared	0.48
F-statistic	1.879270	Prob(F-statistic)	0.0001
Breusch-Godfrey Serial Correlation LM Test	0.722505	Durbin-Watson stat	2.367350
Prob. (F-statistic)	0.5577		

*, ** and *** implies 10%, 5% and 1% respectively

Source: Author's Computation; Note: Dependent variable = GDP Per Capita

4.4 Granger Causality Test

When two variables are found to have a long-run relationship, the direction of the causality of that relationship can be investigated using granger causality test. The granger causality test can be expressed in a bivariate (Q, P) format as follows.

$$P_t = \alpha M + \alpha 1 P_{t-1} + \cdots + \alpha i P_{t-i} + \beta_1 Q_{t-1} + \cdots + \beta_i Q_{t-i} + \mu \quad (8)$$

$$Q_t = \alpha M + \alpha 1 Q_{t-1} + \cdots + \alpha i Q_{t-i} + \beta_1 Q_{t-1} + \cdots + \beta_i P_{t-i} + \mu \quad (9)$$

Where M stands for a constant growth rate of P in equation (8) and Q in equation (9), μ is a white noise error whilst subscripts *t* and *t-i* represent periods. The first granger causality test investigates the null hypothesis that Q does not Granger-cause P whilst the second granger causality test examines another null hypothesis that P does not Granger-cause Q. According to Gul and Ekinc (2006), if the former null hypothesis is not rejected and the latter hypothesis is rejected, the conclusion is that P Granger causes Q. There is a uni-directional causality between economic growth and public health expenditure if one of the null hypothesis is rejected whilst a bi-directional causality relationship occurs if both the null hypothesis is rejected. Duasa (2007) submitted that absence of granger causality exit if both null hypotheses are not rejected. *Table 6* presents the result of the granger-causality test between public health expenditure and other variables. From *Table 8*, the null hypothesis states that *PHEX* does not Granger-cause *GDPPC* and *GDPPC* does not Granger-cause *PHEX*. The rule of thumb states that the probability of *F-statistic* must be less or equal to 0.05 to show a causal relationship. The probabilities for *GDPPC* and *PHEX* are 0.10 and 0.68. Therefore, we accept the null hypothesis and conclude that there is neither uni-directional nor bi-directional causal relationship between public health expenditure and economic growth in Nigeria. The results further show that health expenditure as a share of total government expenditure and population has a uni-directional causal relationship with real GDP. The implication of this is that public expenditure pushes public health expenditure.

Table 8: Result of Granger Causality Test

Null Hypothesis	Obs	F-Statistic	Prob.
LGDPPC does not Granger Cause HSTGEX	15	5.22	0.02
HSTGEX does not Granger Cause LGDPPC		0.18	0.83
LPHE does not Granger Cause HSTGEX	15	0.88	0.44
HSTGEX does not Granger Cause LPHE		12.21	0.0021
POP does not Granger Cause HSTGEX	15	0.29	0.75
HSTGEX does not Granger Cause POP		5.39	0.02
LPHEX does not Granger Cause LGDPPC	15	2.78	0.10
LGDPPC does not Granger Cause LPHEX		0.40	0.68
POP does not Granger Cause LGDPPC	15	6.43	0.02
LGDPPC does not Granger Cause POP		6.13	0.02
POP does not Granger Cause LPHE	15	3.53	0.07
LPHE does not Granger Cause POP		0.48	0.63

* Significant at 5% level

Source: Author's Computation

5. Conclusion

This study examines the dynamics of public health care expenditure within the framework of Wagner's theory of ever-increasing state activities in Nigeria. Though there is a long-run relationship between public health expenditure and economic growth the granger-causality test results show neither uni-directional nor bi-directional relationship between public health expenditure and economic growth. Hence, Wagner's (1883) theory does not explain the relationship between the growth of public health expenditure and the growth of GDP in Nigeria. This shows that an increase in GDP per capita does not necessarily imply an increase in public health expenditure and an increase in public health expenditure does not necessarily lead to economic growth. This may suggest that public health expenditure is not only an important expenditure in a matter of economic growth but the whole total health expenditure (comprising both public and private health expenditures). Therefore, there may be a need to increase individuals earning capacity to raise income and hence, private health expenditure. The government may also need to increase public health expenditure to meet the prescribed allocation of 15% government budget to the health sector. This follows from the fact that the absence of causality between public health expenditure and economic growth may be due to insufficient and fluctuating trends of public health expenditure during the period considered. Health insurance can be expanded and strengthen to mobilize more resources for the health sector. Capital projects like infrastructures, health facilities, machinery and equipment' and manpower training in the health sector should be enhanced to improve the performance of the health sector. These will engender a positive and significant impact of health care expenditure on economic growth in Nigeria.

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