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Impact of Government Health Expenditure on Child Mortality in Nigeria

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Abstract

The study analyzed the impact of Government Health Expenditure on child mortality in Nigeria data for this study was sourced from National Bureau for Statistics, WHO and the Central Bank of Nigeria. The study employed Auto Regressive Distributed Lag Model to analyse the data collected including Augmented Dickey-Fuller unit root for stationary testing. The study utilized the ARDL technique which is robust to autocorrelation and heteroskedasticity. From the estimation, findings show that capital government health expenditure has a negative and statistically significant effect on child mortality in Nigeria in both short and long run. The long-run co-integrating parameter estimates indicate that an increase in capital government health expenditure reduces child mortality. The findings from the analysis also revealed that the independent variable recurrent government health expenditure has a negative and statistically significant effect on child mortality in Nigeria in the long run. The long- run estimation parameter estimates, results opined that an increase recurrent government health expenditure decreases child mortality in Nigeria. This result is consistent with established theories that when government increases its expenditure in health sector, quality increases and mortality rate reduce. Similarly, the independent variable maternal literacy has a negative and statistically significant effect on child mortality in Nigeria. Results of the research revealed that government investment on healthcare has a greater influence on the growth and development of any economy. This implies that the absence of good health investment can affect the quality of life in a country. The study recommended that government should increase its capital health expenditure in order to reduce mortality rate in the country. Similarly, Government recurrent health expenditure should be enhanced, in order to motivate all health personnel in giving their full commitment.

Keywords: *ARDL Model, Child mortality, Government health expenditure, Nigeria*
JEL Classification: H51, C32

Contribution to/Originality Knowledge
The paper has provided a better framework for understanding the concept of government investment expenditure on healthcare and its significance on child mortality and maternal literacy in Nigeria using a recent dataset.

1.0 Introduction

Health has been a concern of many countries in the world for a long time. This is not only because it is important in general human capital formation, but also because the delivery of its inputs is complicated (Naveed, 2018). Health is a state of human well-being, which, in 1948, the United Nations (UN) declared as a right (United Nations, 2008). Thus, striving for improvement in health is a moral obligation for policymakers at all levels of governance. Therefore, many developed and developing countries have been faced with a huge task of

determining how to invest in healthcare for promotion of health (Tangcharoensathien et al., 2015; Zaman and Hossain, 2017).

Globally, the reduction of under-five mortality rate was given great priority (Suriyakala et al., 2016). The Millennium Development Goal 4 proposes a reduction of under-five mortality rate by 4.3 per cent within the stipulated period to attain the goal. However, this goal was not met by the end of 2015. Globally, the annual rate of reduction of under-five mortality increased from 1.8 per cent in 2000, to 3.9 per cent between 2000 and 2015, leaving a deficit of 0.4 per cent to attain the MDG. It is worthy of note that some developing regions met this target at least by two-thirds. Among such regions are Northern Africa, Eastern Asia, Latin America and the Caribbean (Dhrifi, 2018). According to the Inter-agency Group for Child Mortality Estimation (2015), the under-five mortality rate decreased by 53 per cent, from 91 deaths per 1,000 live births in 1990 to 43 per 1,000 live births. According to Bokhari, Gai and Gottret (2007). Health challenges have given rise to the death of over 11 million children in a particular day. This has shown how deplorable the world's health sector is especially, in the countries that are termed less developed.

The mortality rate of infants in countries that are less developed and Nigeria to be specific is being estimated according to Adewumi, Acca and Afolayan (2018) to fall between 4 to 300 deaths for each 1000 live births. The causes of these deaths could be as a result of challenges such as infant-prone diseases, diarrhea, malaria, measles, pneumonia, and HIV/AIDS likewise dehydration, infection, congenital malfunction (Babatunde, 2012) which the United Nations (2004) estimated to account for over 50 percent of deaths that occur in children. This infant mortality rate has become a big challenge to the health of the publics in other developing countries and in Nigeria. The UN (2004) attributes 20 percent of the mortality to improper antenatal care and also malnutrition. This could be as a result of inadequate health facilities, the financial status of parents and lack of access to the right medical care (Bolu-Steve, Adegoke & Kim-Ju, 2020).

In order to address the high rate of infant mortality which is as old as man, the UN in 1990 organized a World Summit for Children (WSC) where the welfare of children was their major agenda as a promise was made to improve the lives of children in every part of the world (Bolu-Steve et al, 2020). The resultant effect of the summit in Nigeria was the constitution of National Child Welfare Committee (NCWC) which came up with strategic actions that would be of help to improve child survival in Nigeria. These strategic actions according to Otite (2012) include combating childhood diseases through low-cost remedies and strengthening the Basic Health Services Scheme (BHSS), prioritizing the prevention and treatment of AIDS, providing universal access to safe drinking water and sanitary excreta disposal, and controlling for water borne diseases.

These actions were further strengthened by The United Nation who also have it in plan to eradicate poverty and to give remedies to extreme hunger, malnutrition and disease in member-nations and the entire world. For this reason, a development agenda was formed in September, 2000 known as the Millennium Development Goals (MDGs). Over 189 countries subscribed into this development plan, and the plan was targeted to be met in 2015. Some health-related

issues contained in the development plan include a target to reduce children mortality by 50%, maternal mortality by 65%, under five mortalities by 75%, and prevalence of underweight etc. (UN, 2004). Till date, Nigeria is still battling with these problems six years after the targeted year. Therefore, the major function of every government is to make sure that funds are made available for the provision of quality healthcare services for the citizens' social welfare especially the infants which would enable them to contribute their quota towards the development and growth of the country and to enable the UN reach their target. One of the ways to do this is for the government to increase budgetary allocation on social services so as to ensure quality health service delivery to its citizens (Ogunjimi & Adebayo, 2019).

In the light of the above, Bakare and Sanmi (2011) submit that there have been frantic efforts made by the Nigerian government in increasing health expenditure and enhancing human capital development for the realization of World Health Organization (WHO) target over the years. There has been an increase in government expenditure in health as Adewumi, et al (2018) note that in 1970, health care current expenditure was ₦12.48 million. This figure rose geometrically to ₦52.79 million and ₦500.70 million in 1980 and 1990 respectively. This trend continues as the expenditure rose steadily from ₦15.2 billion in 2000 to ₦102.6 billion in 2010 and further increased to ₦236.1 billion 2017 respectively. Varrell (2021) also notes that by 2021, the Nigeria's expenditure on healthcare is projected to increase with ₦1,478 billion. This had expressly reveals that the Nigerian government have and is making huge effort in improving health care every year.

Be that as it may, despite the increase in government expenditure on health, it has not positively affected child mortality as it is still on the increase in Nigeria. Records by United Nations International Children Emergency Fund (UNICEF) (2017) has it that, in Nigeria, about 2,300 under-five year olds and 145 women of child-bearing age loss their lives daily which now makes the country the second largest contributor to under-five and maternal mortality rate in the world. Researchers and scholars like Dedini, Odimegwu, Imasiku, Ononokpono, and Ibisomi, (2014) and Boulet, Alexande, Salihu and Pass (2003) have estimated that infant mortality rate in Nigeria is approximately 1 in every 10 live births. Again, UNICEF (2016) record shows that Nigeria is one of the ten countries with highest infant mortality rates in Africa and the world at large. It should be right to say that the increase in the allocation on health should provide positive result by enhancing service delivery but the reverse is the case and it has made one to wonder where the huge money allotted for health is going to in Nigeria. One of the reasons for this is misappropriation of the funds resulting from corrupt leaders or people tasked to carry out the work. In most occasions, the people saddled with the responsibility of ensuring good and quality health service delivery are involved in cunning activities that results to misappropriation which renders health facilities ineffective in their service delivery. This is really detrimental to the survival of infants in the country.

However, Ogunjimi and Adebayo (2019) indicate that, government expenditure on health is not adequate thereby rendering to the high cost of health services which in turn results to mortality to those that cannot afford to pay. The high cost of medical funding is the sole reason why the WHO has recommended that 13 percent of the country's budget should be given to

the health sector so as to ensure effective funding. In a similar case, the African Union (AU), going in line with the resolution of WHO recommended 15 percent of annual budget be allotted to the health sector but it is unfortunate that this recommendation is not strictly abide by and even if it is, the fund is not enough to cater for numerous health challenges befalling the infants in the country thereby, making infant mortality rate high. This and other reasons has therefore informed the researcher to carry out a research on the Impact of Government Expenditure on Child Mortality in Nigeria.

There have been serious efforts by the Nigerian government and other independent organizations on curbing this menace which result to huge spending in the health sector. Aside from that, Nigerian government registered itself as an UN member country which automatically made it to uphold the objectives of MDGs later changed to Social Development Goals (SDGs) targeted for 2015. Out of the objectives, two are paramount here, that is; to reduce under-five mortality rate and the improvement in maternal health which by implication increases the chance of child survival. Similarly, the Nigerian government never relent in its effort to curb child mortality by further establishing National Health Policy which two key objectives were on maternal and child health likewise immunization. Despite much progress in advanced countries, Nigeria has failed to make significant progress in checking the rising mortality rate among the under-five. This could be as a result of inadequate expenditure on health system or the right policies are not adopted to improve the health system of the country. More to this, the government do not motivate health worker to take their work very serious and for this reason, health workers do not have the passion to put in their best while rendering services. This has also affected child mortality in Nigeria. It is on this note that the researcher intends to carry out a research on the impact of government expenditure on child mortality in Nigeria.

2.0 Literature Review

In this section, various issues related to government expenditure and child mortality rate in Nigeria are highlighted and synthesized taking into cognizance both developed and developing countries.

2.1 Conceptual Framework

2.1.1 Child/Infant Mortality

Child mortality is a very worrying demographic phenomenon especially in developing countries, which has attracted the attention of various stakeholders including researchers and policymakers. Today, combating this scourge is considered a key policy objective and strategy. At the same time, international organizations, such as UNICEF, the World Bank and WHO have incorporated the objective of reducing child mortality into most of their future programmes (Dhrifi, 2018). The United Nations (2014), UNICEF (2010) see child mortality as the probability of a child born in a specified year dying before reaching the age of five. It is also seen according to UNICEF (2018) reports that, about 29,000 children under the age of five die every day, in other words an average of 21 per minute, mainly from preventable causes. Most of these deaths occur in developing countries. Research and experience show that of the

almost 11 million children who die every year, 6 million could be saved by simple measures, such as vaccines, antibiotics, insecticide-treated bed nets, micronutrient supplements, improved family care and breastfeeding (Dhrifi, 2018). For that reason, reducing the burden of mortality and morbidity among the poor is widely regarded as one of the foremost public health challenges in the world today and has become a major concern of the international community, as was reflected in the Millennium Development Goals where it proposed to reduce the under-five mortality rate by two thirds, from 93 deaths per 1,000 live births in 1990 to 31 per 1,000 live births by 2015. It is now in the Sustainable Development Goals of the 2030 Agenda for Sustainable Development. The goal targets that, by 2030, it would end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortalities to at least as low as 25 per 1,000 live births.

Child mortality rate according to Okunwa and Adejo (2020) symbolizes a measure of a country's health policy, systems and practices, an aspect of its national development. It is often associated with socio-economic factors of unemployment, poverty, income disparity, among others, in a polity. Infant and maternal challenges should be contextualized in overall national development policies and practices. High rates of infant and maternal mortality express low social integration of children and women. It symbolizes low female gender participation and inclusion in socio-economic processes. Nigerian women generally lack the power to determine child spacing, access and choice of modern healthcare, among others (Okunwa & Adejo, 2020). This is a denial of women human rights, and remotely, children's survival rights and a backward step towards high birth and death rates.

2.1.2 Causes of Child Mortality

The causes of child mortality are numerous. Okwuwa and Adejo (2020) give varying reasons or causes of child mortality ranging from medical to also include socio-economic and cultural causes. The medical causes include Low Birth Weight (LBW), Sudden Infant Death Syndrome (SIDS), lack of Vitamin A intake, HIV/AIDS, malaria, cholera, tetanus, whooping cough, measles, polio and diarrhea. Socioeconomic and cultural causes include low education, harmful traditional values, religion, and social class status, among others. In the same vein, Lawn, Blencowe and Oza (2014) are of the opinion that in Nigeria, children die from these preventable diseases itemized above. They note further that the Hausa women in the northern part of Nigeria, for example, are no strangers to sickness with regular outbreaks of cholera, meningitis, and malaria in their children (Lawn et al, 2014). Related to this, Okekea and Charib (2018) have argued that the lack of institutional care at birth may be related to higher child mortality rates. Again, Okekea and Charib (2018) point out the regional differences in child mortality rates. Studies have shown differences in child mortality rates for mothers in North-West and North-East regions relative to South-West and North Central parts of Nigeria (Okekea & Charib, 2018), pointing to the higher proportion of mothers with less education in the northern regions.

Bolu-Steve et al. (2020) also stipulate that, cultural practices in Nigeria is also another cause of mortality in children. In Nigeria, there are certain practices that may be related to greater

health risks for children. One example of harmful practice given by Bolu-Steve eat al (2020) involves the traditional surgical cut performed on the umbilical cord of a child by traditional birth attendants who are preferred due to their easy availability, intimate relations, and low fees. Not being aware of the concept of using sterile instruments, birth attendants may use different types of instruments such as blades, knives, or bamboo edges to cut the umbilical cord of the newborn. After cutting the umbilical cord, they use different applications on the navel of the newborn, including cow dung, talc powder, cow urine, and cow bile to clean the umbilical cord (Fayehun & Obafemi, 2012), which can lead to infant death. Other examples of cultural practices include mothers resorting to native medicine rather than accessing proper medical attention when children have problems related to convulsions or dysentery.

Furthermore, in Nigeria, if the cause of an illness is not properly diagnosed, people tend to turn to traditional spiritual healers to help them identify the cause of the illness (Akwenabuaye & Ebingha, 2018). In these cases, the cause is always supernatural, and usually a member of the extended family will be accused of causing the illness (Oladejo, 2006). Oftentimes, these traditional spiritual healers adduce the cause of the illness to the operation of witches that need to be appeased or placated through processes such as rituals, sacrifices, and other traditional form of worship. In most cases, the traditional healers are the medium for such appeasement to stop the innocent child from being harmed (Bolu-Steve, et al., 2020). If a child is thought to have been bewitched, herbalists are consulted to cure the victim by appeasement. One illustration involves a folklore explanation by Agara, Makanjuola, and Morakinyo (2008) in Yoruba language which states, 'the witch cried yesterday, the child died today'. The interpretation of that means a child's death is often attributed to the operations of witchcraft who then would doubt that the witch that cried yesterday is responsible for the death of the child. While witches draw their powers from the cosmic realm, sorcerers get their own power by invoking spirits.

Olorundare cited in Bolu-Steve et al, (2020) believes that witch craft is still a dreaded word in Nigeria and that it is not uncommon for people to believe that there is nothing like a natural death. Other examples of cultural practices include the Hausas from the northern parts of Nigeria who believe in the existence of Allah (God) as a highly regarded supreme being who judges by rewarding and punishing each person related to that person's deeds (Adewale, Adedoun, Fola, & Olufemi, 2018 and Babatunde, 2006). According to Bolu-steve (2012), most Northerners believe in destiny, whether good or bad, as preordained by Allah. Central to this belief is the use of herbal remedies for physical aspects, magical ritual for reversing what is beyond normal and sacrifices to appease the supernatural agencies. The Northerners also attribute natural illness to be intensified by the activities of enemies, spirits or demons. Olorundare cited in Bolu-Steve et al, (2020) further reported that for the prevention of evil, some substances such as cowries, scents, features, animal skin, and alms are burnt, which they put on the skin of a sick child to prevent death. Yet, despite the common beliefs related to cultural practices and illness, it is not clear based on extant literature the specific cultural beliefs that may be related to infant mortality and, moreover, how these cultural beliefs may vary by age, education, and income as well as marital status, religious and ethnic group affiliation, and locality.

2.1.3 Ways of Curbing Child Mortality

Notable progress according to UNICEF has been made in curbing child deaths in every region of the world over the past two decades but some regions like the Middle East and Africa are still battling with this menace. Olusegun, Thomas and Mary (2012) maintain that, there need to be a concerted effort by all and sundry towards curbing child mortality therefore, they provide some internationally recommended intervention measures that have been successful in curbing child mortality globally. These include the following:

3.1.4 Child Survival Strategies:

Child survival is said to be a field of public health that is concerned with reducing child mortality. Child survival interventions per Olusegun, et al. (2012) are designed to address the most common causes of the estimated ten million child deaths that occur each year including diarrhea, pneumonia, malaria and neonatal conditions. The programmes are inexpensive, basic interventions that save the lives of children under five from the leading causes of child death and promote healthy and productive families and communities. Some of these programs as indicated by 'State of the World' and curled from Olusegun et al. (2012) are:

Mosquito Prevention and Treatment: In sub-Saharan Africa, one in six deaths is caused by malaria. The use of insecticide treated nets and anti-malarial drugs are essential and can reduce the incidence. Although the cost of these are minimal, only eight percent of children under five in Sub-Saharan Africa sleep under treated nets and only one in three children are treated with antimalarial drugs (Olusegun et al. 2012).

Immunizations: There is a great need to scale up immunization of children. Immunizing children against vaccines-preventable diseases before the first year of life is lifesaving.

Vitamin A: supplements given two to three times per year can prevent blindness and lower the risk for death from diarrhea, malaria and measles. These capsules are inexpensive, yet 28% of children in developing countries are not receiving this treatment (Olusegun et al. 2012).

Promotion of Breastfeeding: Babies not exclusively breastfed for the first six months of life are at an elevated risk for under-nutrition and disease. Exclusive breastfeeding for the first six months has the capability to prevent 13% of all under five deaths in developing countries.

Prenatal Care, Skilled Care during Childbirth, Postnatal Care: 61% of maternal deaths occur in the first six weeks after birth, and nearly half of those occur in the first day after delivery. Postnatal care costs half the amount of skilled care during childbirth and has the potential to save 20 to 40% of newborns' lives (Olusegun et al. 2012).

Promotion of newborn care: Immunizing mothers against tetanus, ensuring clean delivery practices in a hygienic birth environment, drying and wrapping the baby immediately after birth, providing necessary warmth, promoting immediate and continual breastfeeding, immunization and treatment of infections with antibiotics. These can be achieved through

improvement in public health services are essential including safe water and better sanitation can reduce childhood infections and diarrhea (Olusegun et al. 2012).

Focused Ante-Natal Care (ANC): An approach to ANC that emphasizes evidence based goal oriented action and family centered care, quality rather than quantity of visits and care by a skilled provider. WHO recommends at least four antenatal visits in a normal pregnancy. More visits can be arranged in an abnormal situation. ANC increases a mother's chances to stay alive and give birth to a healthy baby. During this period, an opportunity to recognize mothers at risk is possible and lethal complications avoided. Also in ANC, screening for STDs especially HIV infections are done thereby giving the baby a chance to avoid contagion by Prevention of mother to child transmission through ARV (Olusegun et al. 2012).

2.2 The Concept of Health Expenditure

Government expenditure according to Aluthge, Jibril and Abdu (2021) is an important instrument utilized in the process of development. It plays a pivotal role in the functioning of any economy at almost all stages of growth and development. Most developing and developed countries today use public expenditure to improve income distribution, direct the allocation of resources in desired areas, and influence the composition of national income. According to the Organization for Economic Cooperation and Development (OECD) (2015), Health expenditure is the sum of expenditure on activities such as the application of medical, paramedical and nursing knowledge and technology with the goal of promoting health status. They further explain that, health expenditure measures final consumption of health goods and services plus capital investment in health care infrastructure (OECD, 2012). Similarly, WHO (2010) sees health expenditure as the expenditure that covers the provisions of health services (preventive and curative) family planning activities, nutrition activities and emergency aid designated for health. It is also seen as the sum of general government health expenditure and private health expenditure in a given year. WHO (2006). The Health Account (2016) notes that, health expenditure refers to the out lays of medical care, prevention, promotion, rehabilitation, community health activities, health administration and regulation and capital formation with the predominant objective of improving health. Health expenditure encompasses both private and public disbursements on health. When it is public, the government is involved in providing goods and services to the public and when it is private, it is the process organizations and individuals pay for health services rendered. That is why it is seen as the general spending on health by either public or private in order to improve health.

In the economic literature, conceptualization of government health expenditure is subdivided into private and public health expenditure. The private health expenditure according to WHO (2010) refers to health expenditure that involves out-of-pocket spending, private insurance, charitable donations and direct service payments by private cooperation. Private expenditure avers by OECD (2010) also includes out-of-pocket payments, charities and occupational healthcare. In Nigeria, research by WHO (2014) reveals that private health is largely made up of out-of-pocket expenditure of about 96% in 2012 and 2013.Out-of-Pocket expenditure on health defined by WHO (2006) as the direct outlays of household made to practitioners and to suppliers of pharmaceuticals, therapeutic appliances and other goods and services. It comprises

cost sharing, self-medication and other expenditure paid directly by private household (OECD, 2015). Out-of-pocket payment in the opinion Olatunde (2012) has to with payment for healthcare at the point of service, also known as user fees. Low government spending in health implies that a substantial proportion of health care expenditure are borne by users through out-of-pocket payment. The worst possible option for the poor and the vulnerable people in Nigeria is for them to rely on out-of-pocket expenditure. However, the public health expenditure, according to WHO (2010) refers to as expenditure which includes recurrent and capital spending from government budget, external grants and social or compulsory health insurance. Public health expenditure refers to expenditure incurred by public funds, which are states, regional, local government bodies and social security schemes (OECD, 2015).

2.3 Trends in Child Mortality

Nigeria has the highest absolute number of newborn deaths in Africa, with 255,500 of the 912,000 neonates who die annually in Africa. About 5.9 million babies are born in Nigeria every year, and nearly one million children die before the age of five years. One quarter of all under-five deaths are newborns which accounts for 241,000 babies' death each year (Federal Ministry of Health, 2011). Despite the progress in reducing child mortality over the past decades, an estimated 5.4 million children under age 5 died in 2017- roughly half of them in Sub-Saharan Africa (UNICEF, 2018). Mortality indices for Nigeria's under-five years old are among the global worst. Rural areas recorded higher mortality rates than urban centers. In 2008, infant mortality rate was 70 deaths per 1,000 live births in the urban centers and 96 deaths per 1,000 rural live births. Also, child mortality was 191 deaths per 1,000 live births in the rural areas as against 121 deaths per 1,000 live births in the urban area (NDHS, 2015).

The Northwest and Northeast had highest mortality rates in 2014 and 2015 respectively (Aigbe and Zannu, 2015). In 2010, North Central, North East, North West, South East, South South and South West had 77, 107, 91, 95, 84 and 59 children deaths per 1,000 birth respectively (NDHS, 2015). Only South-West recorded reduction (9 percent) in under-five mortality rates over ten years (2005 to 2015). This could derive from urbanization of the Lagos-Ibadan axis, with abundant non-tertiary and tertiary health and educational facilities. Nigeria's under-five mortality ratio is 201 per 1000 life birth (one in five Nigerian children never reaches age five). Infant deaths, which account for half of child mortality increased from what they were in 1990 (WHO, 2017).

The 2018 Demographic and Health Survey maintain that Infant and under-5 mortality rates for the five-year period before the survey are 67 and 132 deaths per 1,000 live births, respectively. The neonatal mortality rate is 39 deaths per 1,000 live births. At these mortality levels, 1 in every 8 Nigerian children does not survive to their fifth birthday.

Childhood mortality rates have declined since 1990. Infant mortality has decreased from 87 deaths per 1,000 live births in 1990 to 67 in 2018. During the same time period, under-5 mortalities has markedly declined from 193 to 132 deaths per 1,000 live births. Neonatal mortality has remained stagnant, from 42 deaths per 1,000 live births in 1990 to 39 deaths per 1,000 live births in 2018.

2.4 Empirical Review

Ogunjimi and Adebayo (2019) researched on Health Expenditure, Health Outcomes and Economic Growth in Nigeria. This study examined the relationship among health expenditure, health outcomes and economic growth in Nigeria for the period between 1981 and 2017. This study adopted the Toda-Yamamoto causality framework to examine these relationships. The Augmented Dickey Fuller unit root test was used to check for maximum order of integration of the variables used in the study and the result was one while the Autoregressive Distributed Lag (ARDL) Bounds test approach to co-integration was used to investigate if a long-run relationship exists among the macroeconomic variables used in the study and the result was in the affirmative. The results of the Toda-Yamamoto causality tests showed a unidirectional causality running from health expenditure to infant mortality while there is no causality between real GDP and infant mortality; a unidirectional causal relationship running from health expenditure and real GDP to life expectancy and maternal mortality; and a unidirectional causal relationship running from real GDP to health expenditure. This study therefore recommended that the Nigerian government should make concerted efforts geared towards increasing the health expenditure at least to meet up with the WHO‟s recommendation that all countries should allocate at least 13 per cent of their annual budget to the health sector for effective funding as this would bring desired health outcomes and employ the use of modern technology and the services of professional health personnel should be sought to combat the high incidence of maternal and infant mortality in the health sector in Nigeria.

Anyanwu and Erhijakpor in 2014 researched on Health Expenditures and Health Outcomes in Africa. The paper provided econometric evidence linking African countries' per capita total as well as government health expenditures and per capita income to two health outcomes: infant mortality and under-five mortality. This relationship is examined, using data from 47 African countries between 1999 and 2004. Health expenditures have a statistically significant effect on infant mortality and under-five mortality. The magnitude of our elasticity estimates are in consonance to those reported in the literature. For African countries, our results imply that total health expenditures (as well as the public component) are certainly important contributor to health outcomes. In addition, we find that both infant and under-five mortality are positively and significantly associated with Sub-Saharan Africa. The reverse is true for North Africa. While ethnolinguistic fractionalization and HIV prevalence positively and significantly affect the health outcomes, higher numbers physicians and female literacy significantly reduce these health outcomes. These results have important implications for attaining the targets envisioned by the Millennium Development Goals.

Bello, et al. (2021) researched on Assessment of the Causes and Predictors of Under-Five Mortality in Nasarawa State. This was a cross-sectional study using secondary data from selected Health facilities in the State. A multi staged sampling technique was used in selecting the health facilities from the three senatorial zones. One local government area (LGA) was selected from each of the zones. The At least, Northern senatorial zone had the least number of LGAs (three) compared with the other two zones which had five LGAs each. The General Hospitals were then selected in the ratio of 2:1:2 based on the last National Population census

delineation for Nasarawa West, North and South respectively. Admission registers and patient folders were used to gather data of all admissions and deliveries in the year 2018. Proforma was completed by the researcher/research assistants in the respective health facilities. Results show that, children below five years of age accounted for three quarter (74.2%) of childhood mortalities. There were slightly more male deaths with a mortality figure of 1.3:1. Under five mortality rate in Nasarawa state is 187 per thousand live births (60.4%). The commonest causes of childhood mortalities are severe malaria, sepsis, diarrhea disease and pneumonia. The predictors of death are duration of illness and number of children. Preventable causes (such as severe malaria, diarrhea and pneumonia) remain the leading causes of deaths.

Yaya, et al. (2017) conducted a research on Prevalence and determinants of childhood mortality in Nigeria. Data was obtained from Nigeria DHS, 2013. The study outcome variable was the total number of children lost by male partners and female partners respectively who were married. The difference between the numbers of child births and the number of living children was used to determine the number of children lost. Study variables were obtained for 8658 couples captured in the data set. Descriptive statistics were computed to examine the presence of over-dispersion and zero occurrences. Data were analyzed using STATA Software version 12.0. Zero-inflated negative binomial (ZINB) regression analysis was carried out to determine the factors associated with childhood mortality. Results of ZINB were reported in terms of IRR and 95% Confidence Interval (CI). Results shown that the age (mean ± std.) of male and female participants were 36.88 ± 7.37 and 28.59 ± 7.30 respectively. The data showed that 30.8% women reported loss of children and 37.3% men reported the same problem. The study revealed age (years), region, residence, education, wealth index, age at first birth and religion of father and mother as factors associated with childhood mortality. In terms of education, secondary and tertiary educated fathers exhibited 3.8% and 12.1% lower risk of childhood mortality respectively than non-educated fathers. The results showed that the risk of childhood mortality are 26.7%, 39.7 and 45.9% lower among the mothers having primary, secondary and tertiary education respectively than those with no formal education. The mothers living in rural areas experienced 28.3% increase in childhood mortality than those in urban areas, while the fathers in rural areas experienced 33.5% increase in childhood mortality than the urban areas. The risk of childhood mortality was significantly lower in middle, richer and richest (11.1%, 37.5 and 49%) economic quintiles respectively when compared to the risk of childhood mortality with female spouse who are poorest. Similar results were obtained for the fathers, with reduction in the incidence-rate ratio of 3.3%, 20.2 and 28.7% for middle, richer and richest economic quintiles respectively, compared to the poorest status. Furthermore, region and religion were found to be significant factors associated with childhood mortality in Nigeria.

Azuh, and Godwin (2020) researched on Public Health Expenditure and Under-five Mortality in Nigeria: An Overview for Policy Intervention. This study looked at the contribution of the health expenditure by the government on under-five mortality in Nigeria. The autoregressive distribution lag technique was employed in this study in examining the long-run effect of public health expenditure on under-five mortality in Nigeria. Data were sourced from the World Development Indicators for the period 1985–2017. Results from the study showed that though public health expenditure is statistically significant, it showed a positive relationship with the

under-five mortality. The implication of this result is that 1unit increase in public health expenditure would improve increase under-five mortality rate by 1.56 units. However, in the Nigerian context, this can be better explained by the lack of proper health-fund coordination and other factors such as maternal education. Therefore, the study concluded by recommending that proper health-fund coordination should be put in place to ensure that budget allocated to the health sector is being spent properly.

In Azuh et al. the research only focused on public health expenditure but failed to look at its effect on child mortality. Similarly, in Ogunjimi and Adebayo's research, it only looked at the relationship among health expenditure, health outcomes and economic growth in Nigeria but failed to look at how this expenditure positively affect child mortality. Also, Dhrifi's research only considers health-care expenditure not government expenditure. Nwankwo's research only considers government spending on maternal mortality but could not look at child mortality. It is these gaps that this research intends to fill.

3.0 Methodology

In this section, the various sources of data utilized for the study are presented. In addition, the methodology and other estimation procedures are discussed.

3.1 Data and Sources

Data required for the study was sourced from secondary source (time series data) from annual statistical bulletin of National Bureau for statistics, World Health Organization and Central Bank of Nigeria spanning from 1980 – 2021.

An ex-post facto design was employed. The study is designed to incorporate econometric research into the impact of public expenditure on child mortality in Nigeria. The study design warrants exploring the co-integration theory and Bound test to investigate if there is a static long-run equilibrium relationship between public expenditure and child mortality and other independent variables.

3.2 Method of Analysis

The study used econometrics tools in estimation of data collected using economic package of E-view 9 to estimate the data and the results are displayed using tabular form. The study utilized the Autoregressive Distributive Lag (ARDL) Bound test to examine the impact of each independent variable on the dependent variable and the long-run relationship as well as the adoption of correlation matrix. To test the existence or otherwise of stationary in the data, Augmented Dickey-Fuller (ADF) and Philip Perron unit root tests are adopted.

3.3 Model Specification

The model examines the impact of government health expenditure on child mortality in Nigeria. The adopts Adeosun and Faboya (2020) model but with slight modifications. To

empirically examine the influence of government health expenditure, the study employs the following equation:

$$CMT = f\left(CGHE, RGHE, MTL\right) \quad (1)$$

Hence, the mathematical relationship is expressed as follows:

$$CMT = \beta_o + \beta_1 CGHE + \beta_2 RGHE + \beta_3 MTL + \varepsilon_t \quad (2)$$

Where CMT is the child mortality rate. CGHE is capital government health expenditure. MTL is maternal literacy. RGHE is recurrent government health expenditure. where β_0 and β represents coefficients, *t* stands for a time span, and ε indicates the error term.

4.0 Results and Discussion

4.1 Descriptive Statistics

This section offered the descriptive summary in an attempt to explore the statistics features of the data such as minimum and maximum, standard deviation, and mean values. The descriptive features of the variables are depicted in Table 1.

Table 1: *The Description Statistics*

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
CMT	99.62286	97.8	124.8	70.4	19.45157	35
CGHE	0.051995	0.035642	0.335198	-0.11823	0.120087	35
MTL	47.07743	43.79706	64.25449	41.38676	5.356722	35
RGHE	105.1149	40.62	423.33	0.04	128.0331	35

Note: CMT is the child mortality rate. CGHE is capital government health expenditure. MTL is maternal literacy. RGHE is recurrent government health expenditure.

As observed in Table 1, Variables CMT which is the dependent variable, indicate high deviation from the sample mean with a minimum at 70.4 and maximum at 124.8. Variable CGHE as an independent variable, indicates a low deviation from the sample and with minimum at -0.11 and maximum at 0.33. Variable MTL also indicate a moderate deviation from the sample mean and having a minimum at 41.3 and maximum at 64.2. Furthermore, RGHE indicates an average deviation from the sample mean value and having a minimum at 0.04 and maximum at 423.3. All the variables have positive mean values, respectively. Furthermore, the maximum coupled with minimum values for all the variables is also depicted in Table 1.

4.2 Correlation Analysis

As shown in Table 2, the study utilized correlation analysis in an attempt to observe the mutual relationship among the variables.

Table 2: ***Correlation Analysis***

Variables	CMT	CGHE	MTL	RGHE
CMT	1			
CGHE	-0.73172	1		
MTL	-0.58175	0.307191	1	
RGHE	-0.87145	0.459496	0.563244	1

Note: CMT is the child mortality rate. CGHE is capital government health expenditure. MTL is maternal literacy. RGHE is recurrent government health expenditure.

Note: Figures in parenthesis represent probabilities of correlation coefficients

As observed in Table 2, the correlation between MTL and CGHE indicates a weak correlation and positive coefficient. These imply a direct association concerning the two variables. The correlation between RGHE and CGHE indicates an average correlation and positive coefficient. This implies a direct relationship between the variables. Also, the correlation between the RGHE and the variables of MTL appears to be moderate and positive correlation coefficient. These imply a direct association between the variables. Furthermore, all variables indicate a negative coefficient with CMT which is the dependent variable. This implies an inverse relationship between the dependent variable and all the independent variables. All the coefficient of the independent variables falls within the acceptable range of below 10.

The study investigates the presence of unit root in the series by utilizing Augmented Dickey-Fuller approach. The results are presented based on level (constant, constant, and trend), and first difference (constant, constant, and trend).

Table 3: *Augmented Dickey-Fuller Unit Root Test*

Variables	Level	First difference	Order of integration 0 or I
CMT	-4.0853***	-4.0937***	I(0)
RGHE	-0.1950	-5.3440***	I(I)
MTL	-3.0983**	-5.2021***	I(0)
CGHE	-2.4357***	-0.0402*	I(0)

Note: CMT is the child mortality rate. CGHE is capital government health expenditure. MTL is maternal literacy. RGHE is recurrent government health expenditure.

*Note: ***, **, * denotes the level of significance at one percent, five percent & ten percent, respectively.*

Source Authors' computation, 2021.

The results reveal that variables of CMT, MTL and CGHE are all stationary at level constant whereas, the variables of RGHE indicate the presence of unit root at the level. Furthermore,

the variable of RGHE is found to be stationary at the first difference (constant). Using the Augmented Dickey-Fuller unit root technique.

4.3 The Optimal ARDL Model.

Based on the unit root results, which indicate that the series are integrated at both level and first difference. These imply that the model has an amalgamated order of integration, which suggests the utilization of the ARDL Bound approach. The appropriate lag selection for the dependent and independent variables is to be determined first. The optimal lag selection based on the ARDL Bound method is automatically specified following the Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC), as observed in Table 4.

Table 4: *The Optimal ARDL Model*

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
CMT(-1)	2.466248	0.179589	13.73270	0.0000
CMT(-2)	-2.217956	0.486556	-4.558481	0.0007
CMT(-3)	1.046059	0.506556	2.065041	0.0612
CMT(-4)	-0.404634	0.210465	-1.922572	0.0786
MTL	-0.007628	0.005570	-1.369393	0.1960
MTL(-1)	-0.001575	0.008031	-0.196148	0.8478
MTL(-2)	-0.001310	0.008139	-0.160911	0.8748
MTL(-3)	-0.022684	0.006424	-3.531188	0.0041
CGHE_GDPI	-3.752653	0.656813	-5.713427	0.0001
CGHE_GDPI(-1)	-1.911642	0.414816	-4.608404	0.0006
CGHE_GDPI(-2)	0.938683	0.330572	2.839575	0.0149
CGHE_GDPI(-3)	-0.912220	0.370015	-2.465359	0.0297
CGHE_GDPI(-4)	-2.255120	0.631259	-3.572417	0.0038
RGHE	0.001942	0.000634	3.062039	0.0099
RGHE(-1)	-0.005480	0.001008	-5.434673	0.0002
RGHE(-2)	-0.002155	0.000862	-2.499910	0.0279
RGHE(-3)	-0.002274	0.000802	-2.835185	0.0150
RGHE(-4)	-0.004765	0.000949	-5.020117	0.0003
C	14.46504	2.706060	5.345427	0.0002

R-squared	0.999994	Mean dependent var	96.39677
Adjusted R-squared	0.999985	S.D. dependent var	18.29500
S.E. of regression	0.070251	Akaike info criterion	-2.196760
Sum squared resid	0.059222	Schwarz criterion	-1.317864
Log likelihood	53.04978	Hannan-Quinn criter.	-1.910262
F-statistic	113033.3	Durbin-Watson stat	2.478917
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection

4.4 The ARDL Bounds Test

As observed in Table 2, the unit root estimations result for variables in model one, the variables are integrated of different order i.e. stationary at a level and first different I(0) and I(1). Based on the unit root result, the study utilized ARDL Bound in an attempt to explore the likelihood of the presence (or otherwise) of a long-run association between the variables. Having utilized the ARDL Bound technique, the cointegration test does not apply.

Table 5: *ARDL Bounds Test*

Test Statistics	**Value**	**K**	**Significance**	**I_0**	**I_1**
F-Statistics	8.980491	3	10%	2.72	3.77
			5%	3.23	4.35
			2.5%	3.69	4.89
			1%	4.29	5.61

As observed in Table 5. The Bound test results in Table 5 the F-statistics estimate (value) is compared with the upper Bound value at a 5% critical level. The result indicates the presence of a long-run association within the model.

4.5 The Long-Run Estimates

Based on the results of the Bound test which indicate that the variables are cointegrated as observed in Table 5. Below are the long-run coefficient results of the ARDL method presented in Table 6.

Table 6: *The ARDL Long Run Cointegration*

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
CGHE	-71.569926	4.640939	-15.421433	0.0000
RGHE	-0.115446	0.005931	-19.464261	0.0000
MTL	-0.301018	0.050674	-5.940242	0.0001
C	131.162849	2.136717	61.385235	0.0000

Note: CMT is the child mortality rate. CGHE is capital government health expenditure. MTL is maternal literacy. RGHE is recurrent government health expenditure.

*Note: *** and ** denote the level of significance at one percent and five percent, respectively.*

Source: Authors' computation, 2021

The results on capital government health expenditure reveal a negative and significant coefficient at one percent significant level. This means that a unit rise in capital government health expenditure leads to -71.5 decrease in child mortality in Nigeria in the long run. These imply that capital government health expenditure retard child mortality in Nigeria. The study lends support studies by Adeosun and Faboya (2020), Barenberg, et al. (2017), Oladosu, et al. (2022), Pena-Boquete, et al. (2022) who all reported negative impact of public health expenditure on child mortality. This result is in disagreement with studies by Akinlo and Sulola (2019), Forbes and McGregor (1984), and Bokhari, F. A. S., Gai, Y., & Gottret, P. (2006) who all reported positive impact of public health expenditure on child mortality.

The estimation results on recurrent government health expenditure indicate a significant and negative coefficient. Meaning that one percent boost in recurrent government health expenditure results in a -0.12 percent decrease in child mortality. This implies that recurrent government health expenditure decreases child mortality. The result is consistent with studies by Nicholas, et al. (2016), Rezapour, et al. (2019) and Owusu, et al. (2021) who all found negative effect of government health expenditure on child mortality. The result is inconsistent with studies by Nathaniel and Khan (2020) who found positive effect of government health expenditure on child mortality.

The estimation result on maternal literacy indicates a negative and significant coefficient at one percent significant level. This means a unit increase in maternal literacy results in an -0.30 percent decrease in child mortality in Nigeria. These imply that maternal literacy reduces child mortality in Nigeria in the long run. The result is consistent with studies by LeVine and Rowe, (2009), Wu, (2022), Blunch (2013) and Buor, D. (2003) who all found a negative impact of maternal literacy on child mortality.

The short-run estimation coefficients are depicted in Table 6. The short-run estimation presents the convergence condition of the model to the equilibrium position. The conditions for the convergence ECT to the equilibrium is that the cointegration equation coefficient must be less than one, negative and significant. As observed, the coefficient of ECT is significant, less than one, and negative. These imply that the speed of adjustment for Nigeria back to equilibrium position is 11%.

Table 7: *ARDL Short Run Cointegration*

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(CMT(-1))	1.576531	0.172526	9.137941	0.0000
D(CMT(-2))	-0.641425	0.323333	-1.983791	0.0706
D(CMT(-3))	0.404634	0.210465	1.922572	0.0786
D(MTL)	-0.007628	0.005570	-1.369393	0.1960
D(MTL(-1))	0.001310	0.008139	0.160911	0.8748
D(MTL(-2))	0.022684	0.006424	3.531188	0.0041

D(CGHE_GDPI)	-3.752653	0.656813	-5.713427	0.0001
D(CGHE_GDPI(-1))	-0.938683	0.330572	-2.839575	0.0149
D(CGHE_GDPI(-2))	0.912220	0.370015	2.465359	0.0297
D(CGHE_GDPI(-3))	2.255120	0.631259	3.572417	0.0038
D(RGHE)	0.001942	0.000634	3.062039	0.0099
D(RGHE(-1))	0.002155	0.000862	2.499910	0.0279
D(RGHE(-2))	0.002274	0.000802	2.835185	0.0150
D(RGHE(-3))	0.004765	0.000949	5.020117	0.0003
CointEq(-1)	-0.110283	0.020455	-5.391521	0.0002

NOTE: ***, **, and * denotes the level of significance at one percent, five percent, and ten percent, respectively.

Source Authors' computation, 2021.

As observed in Table 7. In the short run, the estimation result of maternal literacy indicates a significant and positive coefficient explained by lag 2. This means that a one-unit increase in maternal literacy results in a 0.02 percent decrease in child mortality in Nigeria. These imply that an increase in maternal literacy increases child mortality in Nigeria. Also, the estimation result of capital government health expenditure indicates a negative and significant coefficient explained by one-years lagged. This means that a one percent increase in capital government health expenditure results to -3.7 percent decrease in child mortality in Nigeria in the short run. These imply that capital government health expenditure reduces child mortality in Nigeria. The result of recurrent capital government health expenditure indicates a positive and significant coefficient. This means that a one percent increase in recurrent capital government health expenditure results to a 0.002 percent rise in child mortality in Nigeria in the short run. These imply that recurrent capital government health expenditure accelerates child mortality in Nigeria in the short run.

4.6 Discussion of Findings

As observed in Table 2, the unit root estimations result for variables in model one, the variables are integrated of different order i.e. stationary at a level and first different I(0) and I(1). Based on the unit root result, the study utilized ARDL Bound in an attempt to explore the likelihood of the presence (or otherwise) of a long-run association between the variables. Having utilized the ARDL Bound technique, the cointegration test does not apply.

The results on capital government health expenditure reveal a negative and significant coefficient at one percent significant level. This means that a unit rise in capital government health expenditure leads to -71.5 decrease in child mortality in Nigeria in the long run. These imply that capital government health expenditure retard child mortality in Nigeria. The study lends support studies by Adeosun and Faboya (2020), Barenberg, et al. (2017), Oladosu, et al. (2022), Pena-Boquete, et al. (2022) who all reported negative impact of public health expenditure on child mortality. This result is in disagreement with studies by Akinlo and Sulola

(2019), Forbes and McGregor (1984), and Bokhari, Gai and Gottret (2006) who all reported positive impact of public health expenditure on child mortality.

The estimation results on recurrent government health expenditure indicate a significant and negative coefficient. Meaning that one percent boost in recurrent government health expenditure results in a -0.12 percent decrease in child mortality. This implies that recurrent government health expenditure decreases child mortality. The result is consistent with studies by Nicholas, et al. (2016), Rezapour, et al. (2019) and Owusu, et al. (2021) who all found negative effect of government health expenditure on child mortality. The result is inconsistent with studies by Nathaniel and Khan (2020) who found positive effect of government health expenditure on child mortality.

The estimation result on maternal literacy indicates a negative and significant coefficient at one percent significant level. This means a unit increase in maternal literacy results in an -0.30 percent decrease in child mortality in Nigeria. These imply that maternal literacy reduces child mortality in Nigeria in the long run. The result is consistent with studies by LeVine and Rowe, (2009), Wu, (2022), Blunch (2013) and Buor, D. (2003) who all found a negative impact of maternal literacy on child mortality.

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5.0 Conclusion

In conclusion, the study examined the impact of government health expenditure on child mortality in Nigeria. Furthermore, it investigates the capital government health expenditure on child mortality in Nigeria. It also examines the government recurrent health expenditure on child mortality and finally, the study examine the impact of Maternal literacy. The chapter provides a summary of the findings, policy implication, limitations and recommendations for future study.

6.0 Recommendations

Results of our research reveal that government investment on healthcare has a greater influence on the growth and development of any economy of world, but our research is centered on Nigeria. This implies that the absence of good health investment can affect the quality of life in a country. The outcome reveals that capital government health expenditure is critical to improving the quality of life. Therefore, government should increase its capital health expenditure in order to reduce mortality rate in the country. Recurrent government public health expenditure should be enhanced, in order to motivate all health personnel in giving their full commitment. Maternal literacy as an important factor in reducing child mortality, should be enhanced through increasing government support in Girl-Child Education throughout the country.

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