Volume: 25, Issue: 1
Page: 151-174
2023

International Journal of Science and Business

Journal homepage: ijsab.com/ijsb

Effect of Health Care Expenditures on Child Mortality Rates: A Case Study of Sub-Saharan Africa

Khisa Wekulo Eugine, Xie Yuantao, & Muyundo Calvin Mukumbi

Abstract

In the process of trying to reduce the risk of child mortality across the world, financing is crucial in the delivery of positive results. This research was carried to evaluate how healthcare expenditures affect child mortality rates in Sub-Saharan Africa (SSA). Some researchers on this topic have claimed healthcare expenditure has an influence on child mortality while others differ with the ideas. This research divided healthcare expenditure into public, private, and total healthcare expenditures and analyzed them differently on how they affect child mortality. Additionally, it employed panel data for 32 SSA states instead of 45 states due to data availability. The data utilized was from the World Bank's Development Indicators from 2005 to 2016. The data for under-five and infant mortalities were used to represent child mortality rates. The result from the panel linear regression showed that healthcare expenditure has a significant effect on child mortality rates. The elasticity estimation results indicate public and total expenditures are more significant and have high effects on child mortality rates than private expenditure. The findings from the study suggest that healthcare expenditure reduces child mortality rates but after some time to deliver the right as financing is a time dimensional variable. The study recommends that the healthcare expenditure in the health sector in SSA should be continuous and done in effective ways to reduce child mortality rates.

IJSB
Accepted 23 June 2023
Published 26 June 2023
DOI: 10.58970/IJSB.2192

ISSN: 2520-4750 (Online) 2521-3040 (Print)

Keywords: *Healthcare expenditure, Child mortality rates, Public healthcare, Private healthcare, and Sub-Saharan African.*

About Author (s)

Khisa Wekulo Eugine (corresponding author), Masters of Finance, Actuarial Science and risk Management, University of International Business and Economics (UIBE), Beijing, China.

Prof. Xie Yuantao, Executive Dean, School of Insurance and Economics, Professor of Statistics and Actuarial Science, University of International Business and Economics (UIBE), Beijing, China.

Muyundo Calvin Mukumbi, PhD Candidate, School of Insurance and Economics, University of International Business and Economics (UIBE), Beijing, China.

Introduction

The improvement of the health sector in any particular nation is managed effectively when there are enough resources in place. The structure and management of the health sector might not be the same but the results are close. The expenditure can be initiated by the public sector, private sector or together (public and private) towards achieving a certain target. The health expenditure in the SSA is done differently due to different government structures and policies. Nonetheless, the guidance given by the United Nations namely; Millennium Development Goals (MDGs) and Sustainable Development Goals (SDG) have given a road map that the nations follow. SDG 3 which talks about "*ensure healthy lives and promoting well-being for all at all ages*," is the pillar of the health sector across the globe. Child mortality and other related health topics are discussed under SDG 3. According to the WHO report of 2015, an increase in healthcare expenditure has an impact on the reduction of child mortality rates. However, this is achievable with the help of other factors like the reduction of corruption, good governance, education level, employment status, and heads of family income. Due to the ineffectiveness of SSA countries in implementing the development goals, the region has remained behind in child mortality rates compared to other regions.

Child Mortality Rates

A child is considered to be a person who is below the age of 15 years and cannot make decisions alone. They require the guidance of an adult to help and protect them. The mortality rate, on the other hand, means "the death toll in particular areas or group expressed to the total population of the area or group; expressed per 1000 per year" (Our World in Data, 2016). Therefore, child mortality rates indicate "the death of children between the points of birth and exactly five years, that is, the probability of 1000 live births that a newborn will die before they reach the age of five" (WHO, 2019). "Infant mortality is the number of death of children under the age of 1 year per 1000 live births" (Our World in Data, 2016). Starting in 1990, the United Nations came up with the MDGs to ensure the world works towards reducing child mortality by two thirds before the year 2015 (United Nation, 2014). In SSA, many nations are underdeveloped both economically and politically. This makes it hard for the government to come up with good measures to help its citizens. That was one of the reasons the United Nations came up with the MDGs to help them formulate their policies.

The MGDs on child mortality was aimed at reducing CM to 33 per 1000 live births across the globe by 2015. However, the child mortality disparity is still high in the SSA compared to their counterparts in Europe. The probability of a child dying when they are less than 5 years is higher than when they are above. WHO 2017 report indicates that 74 per 1000 live births do not survive before five years in the African region. However, from a global perspective, under-five mortality is showing a decreasing trend from 2015 to 2017 than it was in the 1990s. This has made many developing countries like those in SSA to enroll in the Sustainable Development Goals 3 (SDGs). The SDG targets are to have 25 or fewer deaths per 1000 live birth across the world by 2030. They believe the goal can be achieved to make the world sustainable and economically vibrant by eradicating or reducing child mortality.

The SSA countries still experience the challenge of not getting the right expertise to help them. For example, diseases like malaria, polio, diarrhea, measles, respiratory diseases, and malnutrition which were affecting children during the MDGs are still rampant in some countries today (Farag, et al., 2013). Additionally, cases of wars in zones like in Somalia, South Sudan have led to child mortality rates remaining high thus hindering the set targets. During the "the high-level political forum" in 2017, SSA and South Asia showed high disparities of UCMR ranging from 2 to 157 deaths per 1000 live births. Additionally, the social determinates

greatly impacted on the survival of the child. Forum indicated that the poorest households are nearly twice to die before the age of five. The case was 2.8 likely in the situation where the mother lacked education. The stark difference makes it essential in considering all the multi-sectoral approaches in combating reaming child mortality in SSA (2017 HLPF Thematic Review of SDG).

Healthcare Expenditures

Health care expenditure is carried out by various groups who want to fulfill and get certain targets in the health sector. The expenditure can be in various forms; being spent by an individual, groups, nations or governments, private or public organizations, and donors among others. The health cost might not be covered sometimes directly by one individual but in partnership with others like in the case of insurance companies. The purpose of the spending is to ensure quality healthcare and services are received by human beings. The expenditure can be a group in different forms according to the institution. This might include public expenditure, private expenditure, and gross/total expenditure (Stepovic, 2019).

Public Healthcare Expenditures

Public health care expenditures (PuH) are the costs that are mostly carried out by the government in activities that work towards healthcare development. It starts with the government's annual budget estimates on the health expenditure per financial year. Based on the World Bank report (2017), many of the SSA countries are increasing their healthcare yearly compared to developed nations. This can be traced back to the year 2001 on the Abuja declaration. The purpose of the declaration was to ensure the SSA countries increase their public healthcare expenditure as a way of improving service delivery (Scholastica, et al, 2015). Researches done on PuH effect on child mortality in the past have been indecisive. According to Anyanwu and Erhijakpor (2007) and Novignon, et al. (2012) found that increasing health expenditure in SSA would expressively reduce CMR. Other studies carried in other regions concur with their findings. On the other hand, some studies have found an insignificant link between PuH and the reduction of child mortality rates. Gupta, et al. (1999) and Yaqub, et al., (2012) are the few who didn't find the significance between the two. This makes the issues of public health care expenditure remaining unsolved.

However, poor governance has been the reason why many public health expenditures do not meet set targets. Those in governance use the opportunity to enrich themselves at the cost of the taxpayers making it hard for the resources to be used as expected. For instance, the Kenya government bought clinic containers which were to help children and pregnant mothers in 2014. However, the container stuck at the port due to misappropriation and low-quality products delivered. The containers never served the purpose required while the government had already spent the money. According to Rajkumar and Swaroop (2008), the ineffectiveness of the PuH is caused by poor governance and embezzlement of funds. It's one of the factors the SDG 3 will be hard to be achieved as it was the case in the MDG (WHO, 2019). Having good governance and reduction in corruption among the SSA states, public health expenditure will deliver the required results of reducing child mortality rates.

Private Healthcare Expenditures

The private sector has a vital part in ensuring the CMR are reduced in SSA. The sector is considered to be the better option as public healthcare expenditures are mismanaged by those in governance. The private healthcare expenditure can be in the form of donors, private institution or individuals who want to improve the health sector. The funds in the sector have been always increasing due to the need for research and better options from the citizens.

According to Wexler, et al. (2013), "the donors' funds had increased from US$ 1.4 billion in 2002 to US$8.7 billion in 2010". Private healthcare expenditure has been good in places where preventable diseases like malaria are rampant. According to the United Nations WHO (2017), private healthcare expenditure has been providing a pivotal role in decreasing child mortality by assisting in the prevention of diseases like pertussis, cholera, HIV/AIDS and other related diseases.

Furthermore, Africans first ladies of states have come up with initiatives that will help the SSA in reducing child mortality rates. In Kenya, the first lady Margret Kenyatta has initiated Beyond Zero Campaign across the country. The purpose of the program is to deliver mobile clinics across 47 counties so that the mother and child can get quick medical services. According to the ministry of health of Kenya (2016), it showed how the program has been able to assist in reducing CMR in the country, especially marginalized in areas. PrH has been considered to be undertaken in remote areas and to those who are poor. The significance of the private health care expenditure is being felt in the SDG 3 especially in SSA (United Nations, 2017). According to Gupta, et al. (2001), they indicated that PrH has an insignificant effect on child mortality. Nevertheless, some researchers dispute the results. It's, for this reason, I felt it'll be better to examine and get clear findings on the topic.

Total Healthcare Expenditures

Several research studies were done to evaluate the total healthcare expenditure influence on child mortality rates. Gupta et al (1999) found in their research that there was an insignificant relationship between TH and child mortality rates. In another study done by Houweling, et al (2005), shows some significant reduction in the relationship between the two. This has made the results on the total healthcare expenditure inconclusive after several years. The Public-Private Partnership (PPP) is been utilized as the current way of private and public expenditure on healthcare across the world. The strategy is to enable the SSA states to get more funding and expert ideas on how to improve healthcare thus decreasing the rates of IMR and UCMR. According to WHO (2017), TH is increasing especially in developing republics. It had a 6% increase in developing nations compared to 4% in the developed nations.

Research problem

The main challenge of health facilities and physicians is getting the right resources to run their activities. Child mortality relies on the well-being of the health sector in any nation. SSA has many developing countries whose citizens have low financial power to cover their expenditures fully. It's due to financial and economic forces that are affecting child mortality in this region. The healthcare expenditure each year determines how health service delivery will be done in the country. Many types of research have been done on PuH and its bearing on child mortality rates. The results are conflicting making the topic to be inconclusive. For example, Gupta, et al. (1999) found the link between PuH, PrH, and total healthcare expenditure and child mortality rates being insignificant. Nonetheless, Novignon, et al. (2012) among others found there were having a significant relationship. The inconclusively of the topic made me try and analyses the topic to see what will be the findings.

Moreover, I introduced running the models of PuH, PrH, and TH separately under the perspective of corruption, level of education, and immunization. This will give a better view of how the three-affect child mortality in this region. The analysis will be effective in helping get the conclusive results on the topic. Consequently, this study aims at giving new information to literature review by answering the following questions: Does public healthcare expenditure have an influence on child mortality rates in SSA? Does PrH have an effect on child mortality

rates in SSA? Does the total healthcare expenditure have an influence on child mortality rates in SSA? All these to be carried under the perspective of corruption, education, and immunization in the SSA. The results will be analyzed differently on each model and conclusion given on all of them.

Research Objectives

General objective

To examine the effect of healthcare expenditure on child mortality rates in Sub-Saharan Africa (high income and low income together).

Specific Objectives

To examine the effect of PuH on child mortality rates in SSA
To examine the effect of PrH on child mortality rates in SSA
To examine the effect of TH on child mortality rates in SSA

Value of the Study

This study will be effective in helping the SSA countries and other scholars on making policies concerning healthcare expenditure and child mortality. It will contribute to reducing the inconclusiveness that surrounds the topic of healthcare expenditure. The analysis and conclusion will be an eye opener to other studies thus giving alternative solution to this topic. In the learning institutions, the findings can be used for reference by other students interested on the topic. Additionally, the study will be a source of information for the healthcare sector and other stakeholders in the developing countries in SSA. In the health sector, the study will provide the health facilities administrators on how to spend their money effectively. The results from the study will enable health stakeholders to decide how educating the society, giving adequate funds and providing immunization will protect the child. The uniqueness of this study will be providing the best approach between PuH, PrH, and TH can reduce CMR at a good rate in SSA. Also, the discussion on the national and individual approach will be discussed to help in decision making based on this study. Moreover, the risk managers in the government and private sector can learn to see which expenditure framework to use when the resources are limited. Also, the study will contribute to the literature review in three ideas namely, public and private healthcare expenditure and their total and how they influence child mortality. It will open an opportunity for others to carry out more research where necessary.

LITERATURE REVIEW

Theoretical Review

The theoretical review assists in knowing the theories that contribute to the risk of child mortality rates and how is being affected by healthcare expenditure. Various studies have been carried out giving models that can be evaluated or utilized by nations to meet the SGD 3 by 2030. The perspective being taken by various researchers gives different results on how the child mortality is affected by healthcare expenditure in SSA. Some take the government, private, economic, and corruption among other perspectives.

Grossman's Model

Grossman (1972) was concerned about how various individuals were allocating resources to their "health production". He came up with the idea of making the individuals become producers of health by removing the separation of artificial consumption and production. The models add the ideas of individuals investing in education and health as a way of improving their economic status. In his model, he tried to show how the demand for quality health is affected by the amount of productivity and labor force available in the economy. This was

measured in the economy using the rates of mortality and morbidity. Additionally, Grossman (1972) noted that economists dwelt in the demand for healthcare instead they didn't try to consider the costs for demanding health. It's because the conventional demand theories assume that goods and services bought in the market directly enter consumers' utility functions. In treating health as a capital good, Grossman came up this model named after him. In the model, Grossman showed a child at birth has an initial endowment of Health (H) that is added after investment. Therefore, its production will depend on how effective the investment will be done, which can be in the form of waiting time, medical care, exercise among other things. The standard deviation is utilized in the calculation of the stock H through age, carelessness, and diseases. The knowledge utilized in the theory came from the "human capital theory" which argues that individuals invest in themselves. The models prove that a person can live for a long period if they can invest well in their health inputs.

Empirical Review

Healthcare expenditure effect on child mortality has led to many researchers carrying studies and came up with various conclusions. The empirical reviews and theoretical reviews give different updates on healthcare expenditure. According to Kamiya (2010), he found out that government spending in healthcare does not affect child mortality in developing nations. Additionally, in 1999, Filmer and Pritchett in their studies found out that child mortality is not dependent on public healthcare expenditure. Musgrove (1996) in his study, stated that healthcare expenditure does not have a significant influence on CMR. The recent studies of Mukherjee and Kizhakethalackal (2012) and Wilson et al. (2009) in their research indicated that healthcare expenditure was insignificant in the reduction of infant mortality. The budget constraints that affect most of the SSA states, has forced some not to budget for infant immunizations. According to the study done by Menzies et al (2019) on "the efficiency of routine infant immunization services in six countries: a comparison of methods." They concluded that efficiency in good sites will lower cost from 30% to 60%. However, their statement is not affirmative as they add that "effective work with routine reporting data with the simplified method is needed" (Menzies et al, 2019). The efficacy of an investigation could triage low sites to receive administration consideration or employ better appropriate models for other sites. Their efficient of how resources are consumed and services being provided will be determined how efficient the immunization programs will run (WHO, 2019). It indicates how a government or a private entity can achieve effective immunization goals under limited resources to reduce the cases of infant mortality rates. DPT and other vaccination play an essential role in preventing infant diseases. The expenditure on this program as per the Menzies et al (2019), can be effective both in lowering costs and achieving quality results. Furthermore, the WHO Department of immunization, vaccines, and Biologicals carry out studies on the financial requirements for immunization programs across the globe. According to its reports, areas where immunization has received more finances from stakeholders, there is a negative influence on child mortality in that region (WHO, 2014). The financing program in their data indicates if more expenditure is being undertaken by stakeholders, the CMR will reduced each year. It is the reason where over 86% of children born in 2018 are vaccinated thus reducing the mortality rates (WHO, 2018). According to the WHO (2019) expert report. Immunization coverage in SSA has stagnated at 72% exposing the children to sicknesses and outbreaks. It indicated that nearly 31 million under-five children suffer from vaccine-preventable diseases each year. The Addis Declaration on immunization in 2017 by heads of states aimed at ensuring every child get vaccines needed no matter their economic or social status. However, most of the funds for immunization in SSA are from external parties who are donors or other NGO organizations. It indicates clearly of how private health expenditure is playing a better role but it's not effective. According to Dr Richard Mihigo who is the WHO

regional for Africa office, "Governments have a central role to play to fill upcoming funding gaps and ensure immunization programs remain strong and vigilant (WHO, 2019)." Moreover, Gupta, et al. (1999) carried a study in 50 developing nations to see the effect of "total health spending and public spending on primary health care on the under-five mortality rates". They used the Ordinary Least Square (OLS) and 2SLS to analyses their data. They concluded that increasing health care expenditure by 1% reduced the UCMR by 0.97% and 0.95% in developing and transition economies respectively. The result showed that the TH as a percentage of GDP on the nation did not significantly affect UCMR. Additionally, they gave two weaknesses in their study. They indicated said that "there was a non-uniform definition of primary health expenditure among countries. Secondly, the saw a potential correlation between the control variable measles immunization rates and adult illiteracy" (Gupta, et al, 1999). Lastly, the discrepancies in their data let to them using 30 instead of 50 observations as it was in the initial.

In the research shepherded by Novignon et al. (2012), the immunization had a negative coefficient on child mortality rates. The research concludes that the immunization by the SSA nations will lead to a decrease in CMR. It is because some of the expenditure does not focus on the risk of the reduce CMR but individual benefits due to corruption. Also, Asrat et al (2017) indicated that immunization in remote areas of Ethiopia was low leading to high CMR. Full immunization in these regions showed to have significance with education level (gross), maternal healthcare, and place of delivery. Inadequate awareness on the part of the government to sensitive its citizens makes it hard to reduce CMR in this region. Another study was done by Nyamuranga et al (2019) on PuH and CMR in southern Africa indicated that PuH has a "statistically significant effect on reducing infant and under-five mortality rates". The study used panel data for developing nations and mostly on the Southern African Development Community (SADC). The study indicates that immunization and female literacy gives a significant contribution towards preventing child mortality rates. In another research, Gupta, et al. (2001) studied separately "the public and private health expenditure on under-five mortality rates on poor and non-poor households in 70 nations". In their study, they concluded that an increase in public healthcare expenditure 1% percent reduced UCMR between 0.3% and 0.32% in poor households. However, PrH had an insignificant effect on child mortality. In the case of non-poor households, the study indicates that public expenditure reduced child mortality by 0.23% while private health expenditure with a range of 0.28% to 0.43%. It is the same scenario with the study carried out by Houweling, et al. (2005).

In the study carried out by Gottret and Schieber (2006) where they used OLS and Heteroscedastic OLS "to *investigate the relationship between government health expenditure and under-five mortality rates for 113 countries.* The results showed that a 1% increase in PuH reduced child mortality by 0.17%." However, under the controlled endogeneity the results were having a range from 0.34% to 0.4% which indicates a weak link. In some situations where corruption was introduced as a control variable as in the study of Gupta, et al. (2000), they found to have high child mortality rates in areas where the level of corruption was high. They concluded that lowering the level of corruption will help in reducing child mortality rates. Moreover, the corruption index in SSA has been high which is affecting the total health expenditures. An increase in the corruption index by 1%, the under-five child mortality will reduce by around 0.11%. However, if the total health spending is done without evaluating the effect of corruption, the under-five mortality rates will be reduced by 0.1% (Scholastica, et al. 2015). Corruption as the control variable has some impact on the total spending effect on the under-five child mortality in SSA. Also, according to Anyanwu and Erhijakpor (2007) and Farag, et al. (2013), they found that "a 1% increase in the total health expenditure has a significant

effect on the under-five child mortality rate". The studies differ with that carried out on the total health expenditure by Gupta, et al (1999). They established a positive and insignificant effect of TH on UCMR. In the study done by Piabuo et al (2017) on healthcare expenditure and economic growth on some selected SSA states. They indicated that health expenditure gave a positive and significant effect on economic growth. They indicated that states that implemented the Abuja declaration of 15% of government expenditure to go on healthcare had 0.38units reduction unlike those that did not at 0.3 units. The study indicates that public expenditure will achieve better results if the government implements all the social-economic and political factors effectively. The Abuja declaration would have delivered quality results if the nations in SSA fully implement it. The level of corruption would have reduced and the health sector has better service delivery to all people (Piabuo et al, 2017). Muluye et al. (2012) in his study on investigating the socioeconomic, demographic, and environmental factors affecting infant mortality rates in Ethiopia. They found that infant mortality was high during the first year after birth. The hazard rate was higher in infants than those above one year. They employed Kaplan Meier and Cox proportional regression models in their study.

Additionally, McGuire et al. (2002) while evaluating the impact of GDP per capita, income inequality, culture, and geographical location, provision of essential services, and democratic experiences on variation in under-five mortality rates among 92 developing nations. He concluded that female getting education as well as improved access to the maternal and child healthcare, they have a significant effect on UCMR and IMR levels. Also, gross domestic product per capita, impartiality in income, and cultural values were established to have an effect on child mortality outcomes. In the study of Akinlo et al (2019), they found out that government spending does not affect under five and infant mortality. They indicate due to high level of corruption and fungibility of the public health expenditure in SSA, states are the cause of delayed improvements. Novignon et al. (2012) in their study on healthcare expenditure for both public and private in 45 SSA countries. They concluded that expenditure has a significant relationship with child mortality rates. In this study, the public, private, and total healthcare expenditures had a significant influence on IMR and UCMR. They indicated that "health expenditure had a positive influence and significant as the relationship was consistent and significant for all the various variables model specifications used in the analysis" (Novignon et al. (2012). This was the same with the study done by Nixon and Ulmann (2006). The TH has an effect on giving longevity of life expectancy of an infant as well as reducing their morality. The study done by Ray et al (2019), give a clear explanation of how TH is a better way to reduce infant mortality rates. In their study, they employed the dynamic panel model estimator which showed that PuH are generally more significant to promoting quality health care than PrH. Nonetheless, they indicated that the health effects are not as great as primary education effects. Lastly, their research showed that the estimators gave them a new and valued evidence on health expenditure influence towards the life expectancy and IMR on a global sphere. It didn't give the anticipated robustness of the study (Ray et al, 2019).

Moreover, Nketiah-Amponsah (2019) carried a study on "the impact of health expenditures on health outcomes in Sub-Saharan Africa." The study investigates the outcomes on life expectancy, maternal mortality, and UCMR. It was established that health expenditure exerts a positive and significant impact on all three health outcomes. An increase in the health expenditure per capita by 1% in this study lead to a 0.5% reduction in UCMR. The study gave a final suggestion that "a steady increase in health expenditures over time tends to improve the health outcomes in SSA" (Nketiah-Amponsah, 2019). The issues if healthcare expenditure is a challenge on some nations on how they deal with it based on their GDP. The huge historical and some current recession in many of the SSA nations has made the disposable GDP to be a

challenge. The healthcare expenditure in this sector remains a challenge based on the country's health financing, its establishment and provision in the amount to be invested in health. In the process of government making an informed decision on healthcare expenditure, it needs to consider other factors that affect it and how to avoid more leakages. GDP growth in some nations determines the survival of sectors and health is one of them (Stepovic, 2019).

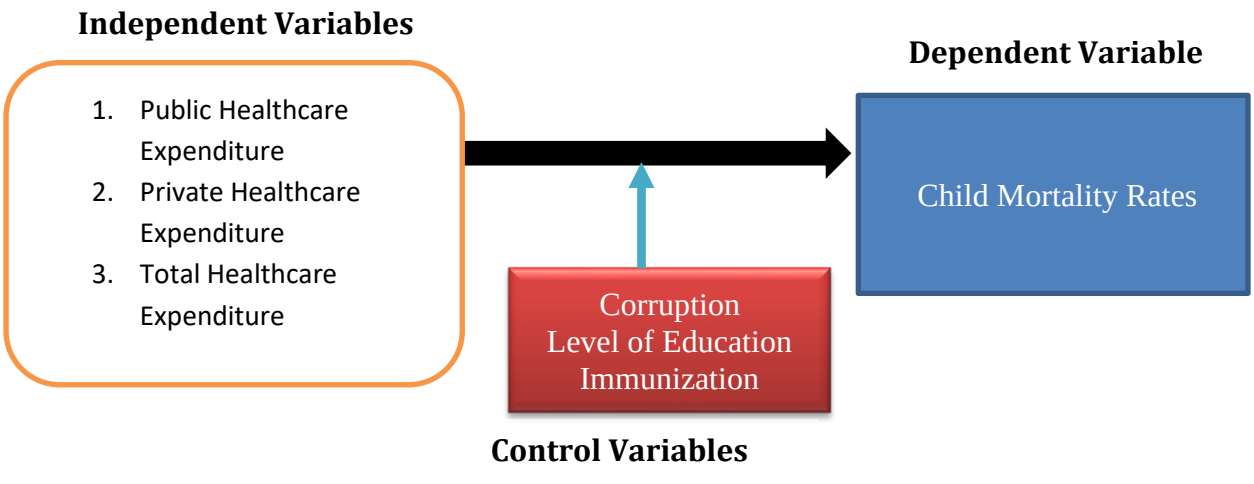
Summary of the Literature Review

The literature review gave different perspectives by scholars on the healthcare expenditure effect on child mortality rates. Some indicated that there is an insignificant effect between health care expenditure and CMR (Kamiya (2010), Houweling, et al. (2005), and Nketiah-Amponsah (2019) among others). In other studies, it was indicated that there was a significant relationship between healthcare expenditure and child mortality rates (Novignon et al. (2012), Ray et al (2019) and Farag, et al. (2013) among others). This gives inconclusive results on the topic. The issues if healthcare expenditure is a challenge on some nations and on how they deal with it is based on their GDP. The huge historical and some current recession in many of the SSA nations has made the disposable GDP to be a challenge (Stepovic, 2019). The healthcare expenditure in this sector remains a challenge based on the country's health financing, its establishment and provision in the amount to be invested in health. In the process of government making an informed decision on healthcare expenditure, it needs to consider other factors that affect it and how to avoid more leakages. GDP growth in some nations determines the survival of sectors and health is one of them (Stepovic, 2019). Based on the literature review, this research will try to carry out a study on the health care expenditure and its effect on child mortality rates by incorporate control variables of corruption, education level, and immunization. The control variable will be introduced in public expenditure, private expenditure, and total expenditure to see their effect on child mortality rates in SSA. It's because the above studies did not study the three models equation separately under specific control variables. Also, the research will deal infant mortality and under-five mortality separately each being tested under PuH, PrH, and TH. The conclusion will be based on the total finding from each model hence testing if the results concur with some literature studies or it has a new perceptive. It will give an opportunity to have different perspectives and solutions on the topic.

Research Methodology

Conceptual Framework

The conceptual framework gives an interaction between the child mortality rates and healthcare expenditure under various control variables. It tries to give the summary of the research variable in pictorial figure as indicated below.



Control Variables in the Study

Corruption

Many of the SSA have a challenge in achieving the set targets due to corrupt systems. A study carried out by Rajkumar and Swaroop (2008) indicated that health service delivery fails due to corruption. The cases of embezzlement of funds, buying low-quality health equipment, irregularity in procurement and kickbacks among other fraudulent actions. All these factors are rampant in SSA countries. The Corruption Perception Index (CPI) done by Transparency International showed that the SSA scored 32% which was the lowest compared to other regions (Transparency International, 2019). This despite the SSA nations committing themselves on declaring 2018 as the "*African Year of Anti-Corruption"*. The corruption causes poor service delivery which makes it hard for infants and children to get good prenatal and postnatal care. Corruption is a problem in quality healthcare expenditure thus having negative effects on the health care delivery that affects the child mortality rates.

Level of Education

The performance and great understanding of an individual are better when they get quality education. Families which have received secondary education have low child mortality rates compared to those who don't have an education (Holtz et al, 2013). Also, they understand which healthcare services they can depend on to get treatment. According to WHO reports (2015), child mortality rates are high in areas that women don't receive any education compared to those with education. Additionally, education helps the household avoid germs causing agents in which children are vulnerable. The school enrollment at the primary level will be used to measure the level of education. It's because the primary education is the basic education where everyone gets some learning on various subjects in SSA. It helps in knowing how they're informed to make a certain decision on their expenditure and healthcare of their child.

Immunization

The growth of a child is effective when they're given vaccines to prevent getting some diseases. As per WHO (2018), they define immunization as a process where an individual is given the vaccine to be immune against infectious disease. The vaccine can be in terms of injections, drops or tablets. The funding by many government and private entities support the immunization across the SSA to prevent under-five child mortality rates. According to Uwizihiwe JP (2015), the global immunization goals have lagged in the SSA region which is making it hard to prevent the CMR. The introduction of the Expanded Program of Immunization (EPI) and the National Immunization Program (NIP) by WHO is meant to coordinate the vaccination of children across the globe. Most citizens in the SSA region are poor hence they can't afford these vaccines. Through WHO and other partners, the government tries to give this immunization for free across their country. However, some government official uses the process for political gains which makes it hard for all citizens to get it. For instance, many first ladies have high jacked the process of immunization and other children related processes yet they don't serve all parties of the country due to political interests (Uwizihiwe JP et. al, 2015). In this, the immunization will be used to cage whether the expenditure has a better reflection on the CMR in the SSA. Additionally, the immunization list is long to cover it all. The measles, diphtheria, pertussis, and tetanus (DPT), will be used as the control variables in the three models. These vaccines are essential in the growth and survival of any children. It will offer us a better perspective on the expenditure influence under its control.

Research design

The research design involves a strategy of how to develop a plan or approach to use in collecting data for the research analysis. According to Labaree (2009), a research design is a full strategy a researcher chooses on their work to integrate the various variables of the study in a coherent and logical way. This process will achieve to address the study problem being undertaken. This study employs a descriptive research design in establishing the effect of healthcare expenditure on child mortality rates. In choosing this design, it entails assisting in explaining the relationship on data collected with the reference with a particular timeframe. The healthcare expenditure which is an independent variable in the study will be put under the combination of corruption, level of education, and immunization perspectives to see how it affects the dependent variables CMR. The research will utilize the panel data from the world development indicators in the analysis of the study.

Study Population

A study population is a group of elements, units, people, and any other things that are under investigation on the study problem. The number of the population is essential in helping get high number observation thus improving the scope of the study. The 45 nations in the SSA regions will be our target population in undertaking our study.

Theoretical framework

The study adopted the Fayissa and Gutena (2008) model that is derived from Grossman's (1972) model of health production.

$$H = F\ (x)$$

Researchers have carried out studies to come up with simplified forms of the Grossman model to get the right results. The Grossman model analysis gives the health production at an individual level while this study is trying to analyze the whole health sector. In the Fayissa and Gutena (2008), they gave a simplified equation (1) which represents elements by per capita variable and regrouped into sub-sectors of economics, social, and environmental factors.

$$H\ = F\ (\ Y, S, V)$$

Where "h is the aggregated child outcome, Y is vector of per capita economic variable, S is a vector of per capita social variable, and lastly, V is a vector of per capita environmental factors" (Fayissa et al, 2008).

This can be re written in the following form:

$h = f\ (y_1\ , y_2, \dots y_j; s_1, s_2\ , \dots s_p;\ v_1\ , v_2, \dots v_k)$.

It is therefore indicates that *"h"* child outcome; $(y_1, y_2, \dots y_j) = Y$; $(s_1, s_2, \dots s_P) = S$; $(v_1, v_2, \dots v_k) = V$ and the letter j, p, and k are number of variables in in the subgroups respectively.

According to Novignon and Lawason (2012), the utilization of the assumption from Cobb-Douglas production technology relating to the inputs and outputs can transform the above equation into: $h = \Omega\pi_{yi}^{\alpha i}\ \pi_{sn}^{\beta n}\ \pi_{vf}^{\gamma f}$ where $\alpha i, \beta n, and\ \gamma f$ are the elasticities. The symbol Ω in the equation represents initial health stock and measures its' status if there are no factors affecting it in any way. $\pi_{yi}^{\alpha i}\ \pi_{sn}^{\beta n}\ \pi_{vf}^{\gamma f} - 1\ \times 100$ Utilized in the estimation of the health status of a child in percentage under the economic, social and environmental factors. In taking the logarithm of the equation above, it will be transformed into the equation bellow.

$\ln h = \ln \Omega + \sum \alpha i\ (\ln yi) + \sum \beta n\ (\ln sn) + \sum \gamma f\ (\ln vf)$ (Where i = 1,...,j; n = 1,...,p and f = 1,..., k)

According to the model of Fayissa and Gutena (2008), the inputs in the equation in the health production function may involve the total healthcare expenditure per capita in a specific country. This can be integrated further to private and public elements of healthcare

expenditure. It therefore gives a better opportunity to run three models on the data and evaluate them under the three perspectives well.

Empirical framework

The study adopted the Baltagi (2008) approach for the estimation of the relationship between healthcare expenditure and child mortality in a panel regression model. It is specified in the following format

$y_{it} = \alpha + x'_{it}\beta + \mu_{it}$ Where $i = 1, \dots N \quad and \; t = 1, \dots T$

In this case, i and t denote the countries in the study as the cross section units and time in the time series form respectively. Also, β is kxl vector, α is a scalar, and X_{it} is the it^{th} observation on the k^{th} explanatory variables. In the ensuring I get the right results in the study, the estimation model is reduced and utilized in the following format.

$$Inh_{it} = \alpha_i + \beta_1 InPuH_{it} + \beta_2 InCor_{it} + \beta_3 InEdu_{it} + \beta_4 InIm_{it} + \varepsilon$$
$$Inh_{it} = \alpha_i + \beta_1 InPrH_{it} + \beta_2 InCor_{it} + \beta_3 InEdu_{it} + \beta_4 InIm_{it} + \varepsilon$$
$$Inh_{it} = \alpha_i + \beta_1 InTH_{it} + \beta_2 InCor_{it} + \beta_3 InEdu_{it} + \beta_4 InIm_{it} + \varepsilon$$

Where by

h = is the child mortality rates outcomes (under-five and infant)
α_i = rate of child mortality without inclusion of independent and control variables
PuH = Public healthcare expenditure
PrH = Private healthcare expenditure
TH = Total healthcare expenditure
Cor = Corruption
Edu = Level of education
Im = Immunization
ε = stochastic error term

The above equation relates the natural log of child mortality h as the dependent variable while the natural logs of public, private, and total healthcare expenditure as the independent variables. Also, the natural logs of corruption, education, and immunization are utilized as the control variable to help understand the impact and significant health expenditure has on child mortality. Lastly, **ε** is the error term represented in each model. Additionally, the process of selecting education, corruption, and immunization was based on analysis the results in at least all perspective of the factors affecting child mortality. Education is the key factor in decision making as well on how childcare can be undertaken to reduce mortality. According to Andriano et al (2019), they indicate more education reduce mortality between 10% to 16% especially maternal education. The immunization is to prevent diseases among infant and under-five children. Corruption in the SSA is high and it affects the expenditure as more funds are channeled in other purpose instead of service delivery. The economies of health depend on how it money is spend thus combination will assist in evaluating how all those factors affect child mortality. This might not cover all factors but it entails the core variables in the model can give reliable feedback on CMR. Lastly, the availability of data made me to select these variable as well as previous research to see if my views are different from their studies.

Data collections

The process of data collection in the research process will define the methods and tools the researcher requires to employ. It is normally attributed to the objectives, design, and expected data and how to utilize all tools to achieve quality data. In this research, panel data was collected and utilized. “Panel data is data collected from a number of observations overtime on a number of cross-sectional units like governments, firms, or individuals” (Moffatt, 2020). This

study collected data involving 45 sub-Saharan Africa nations for a period of 12 years from 2005 and 2016. However, after data screening and evaluation, I did settle on 32 countries due to the availability of data. The countries in these regions are mostly developing thus making them have the same economic status.

Data Analysis, Findings, and Interpretations

Data analysis

Table 4.2 Descriptive data summary

Variable	Obs	Mean	Std. Dev.	Min	Max
Inch	384	4.467719	.3916887	3.034953	5.145749
InInf	384	4.050393	.3352856	2.879198	4.682131
InPu	384	2.256539	.9592777	-.7512596	4.690854
InPr	384	2.791453	.7877747	.495635	4.379923
InTo	384	3.650243	.6154494	1.890184	5.229333
InCPI	384	1.093555	.1631063	.6931472	1.410987
InEdu	384	4.609859	.2084485	3.8786	5.006008
Indpt	384	4.309085	.3094699	2.079442	4.59512
InML	384	4.292298	.2596033	3.044523	4.59512

The data analysis was done to outline and give the results from the three models. The process of analysis consisted of running data through Stata 13 and the results used to explain the objectives of the research as well as answering study questions. The data analyzed in this study was from World Bank development indicators for a period of 12 years from 2005 to 2016. Additionally, SSA has 45 countries but in the analysis, we only used 32 countries. This made the number of observations for the study to reduce but it's still okay to deliver good results. Moreover, the decision of using data in that period and countries was its availability. The panel data was then analyzed by the utilization of random effect and fixed effect of each model. From the analysis, the F-test probability values in the model are used to confirm the joint significance in the model. Additionally, the R-squared values of within, between, and overall in all models of random and fixed effects indicate that models have best fits that can be relied on. Moreover, due to heteroscedasticity in the panel data used in the study, the robust standard error was utilized to remove it across all the models. Furthermore, the Hausman test (Chi2 (5) =42.01 and Prob>chi2 = 0.0000) carried indicates the fixed effect model is the best choice to use in the study. Therefore, the result from all the models of random and fixed effects was displayed but the interpretation was based on the fixed-effect model. The control variables in the analysis included education, corruption, and immunization. Puh, PrH, and TH are the independent variables that will be analyzed differently thus giving each explanation on each model. Additionally, the model of under-five and infant were run differently and analyzed differently before giving one conclusion on all the results.

Data Findings

In the process of carried out the analysis of the study, there was need to test endogenous in the data. As it is known, some variable like health expenditure is affected by the environmental, political factors among others which made it necessary to evaluate. The result from the Durbin score and Wu-Hausman indicated there was not endogeneity. It lead to run the data in a linear model under the robustness to control the heteroscedasticity.

Findings of Under-five Child Mortality Rates (UCMR)

The analysis was carried in three models where model 1 is for PuH, model 2 for PrH, and model 3 for TH as indicated in the tables.

Public healthcare expenditure

The regression results from the study on the effect of PuH on child mortality are indicated in the table below.

Table 3.1 PuH under-five mortality rate results

VARIABLES	Model 1(F.E) Inch	Model 1 (R.E) Inch
InPu	-0.141***	-0.139***
	(0.0482)	(0.0439)
InCPI	0.528**	0.385*
	(0.219)	(0.214)
InEdu	-0.602***	-0.556***
	(0.206)	(0.190)
Indpt	-0.231*	-0.252**
	(0.128)	(0.126)
InML	-0.0574	-0.0795
	(0.176)	(0.172)
Constant	8.224***	8.353***
	(0.904)	(0.792)
Observations	384	384
Number of id	32	32
R-squared	0.327	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

NOTE: In all the tables; **F.E** = Fixed Effect and **R.E** = Random Effect

From the results above, the public healthcare expenditure had a negative influence on child mortality rates under fixed and random effect models. In the fixed effect, the PuH had an elasticity estimation effect of -0.141 while in the random effect it had -0.139. In both models, the results were significant at 1 percent level. It gives a clear estimation per the expectations of the study. In the cases of the control variables, their effect was different from one variable to the other. Corruption gave a positive effect on UCMR as per the expectation. It had an elasticity estimate of 0.52 at 5 % significance and 0.38 at 10% significant in fixed and random effect models respectively. Education had a negative effect on CMR in all the models. It gave a negative elasticity estimation of -0.60 and -0.55 at a 1% significance level in fixed and random effects respectively. On the immunization part, the DPT had a negative effect on CMR. It had an elasticity estimation of -0.23 and -0.25 at a 10% significance level in fixed and random effect respectively. On the other side, measles had a negative elasticity estimation of -0.05 and -0.07 but not significant at any level in both fixed and random effect respectively.

Private healthcare expenditure

The results for PrH indicated below

Table 3.2 PrH under-five mortality rate results

VARIABLES	Model 2 (F.E) Inch	Model 2 (R.E) Inch
InPr	-0.140**	-0.122**
	(0.0654)	(0.0534)
InCPI	0.455*	0.275
	(0.264)	(0.266)
InEdu	-0.565**	-0.547***
	(0.212)	(0.195)
Indpt	-0.228*	-0.244*
	(0.131)	(0.131)
InML	-0.113	-0.149
	(0.164)	(0.163)
Constant	8.439***	8.719***
	(0.910)	(0.811)
Observations	384	384
Number of id	32	32
R-squared	0.269	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In the results produced in the fixed-effect model, the private health care expenditure showed a negative coefficient on child mortality rates as expected and it's significant at 5%. The results indicate that at a 5% percent significance level, PrH will have a negative elasticity estimate of -0.140 on UCMR while in the case of a random effect it was at -0.122. Corruption showed a positive coefficient and not significant as expected in the study. Education had an effect on UCMR showing an elasticity estimate of -0.54 at 1% level significance in fixed effect. The immunization of DPT had a negative coefficient as expected and an impact of -0.24 on UCMR. However, the immunization of measles had a negative influence on the UCMR but insignificant. All the variables had expected signs on their coefficients.

Total healthcare expenditure

The results for model 3 are indicated below

Table 3.3 TH under-five mortality rate results

VARIABLES	Model 3 (F.E) Inch	Model 3 (R.E) Inch
InTo	-0.359***	-0.332***
	(0.0520)	(0.0495)
InCPI	0.441**	0.333
	(0.210)	(0.210)
InEdu	-0.388**	-0.387**
	(0.187)	(0.175)
Indpt	-0.244**	-0.263**
	(0.107)	(0.108)
InML	0.0288	-0.00364
	(0.130)	(0.130)
Constant	8.013***	8.247***
	(0.786)	(0.725)
Observations	384	384
Number of id	32	32
R-squared	0.427	

Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

The results showed a negative influence of TH and CMR. The relationship of TH was significant in fixed and random effects models at a 1 percent level of significance. In this model, the TH has an elasticity estimate impact on the child mortality rate of -0.359 in the fixed model and -0.332 in the random model. It indicates an increase in TH will have a negative effect on the UCMR in SSA.

The control variable of corruption gave a positive elasticity estimate of 0.44 as expected but not significant. Education was significant at a 5 percent level with a negative elasticity of -0.38. It was the same case in the immunization of DPT that had an elasticity estimate of -0.24 at a 5% level. All under the fixed effect model. However, measles had an inconsistent effect on this model. Under the fixed effect model, the variable had an elasticity estimate of 0.028 while in the random effect it had a negative elasticity estimate of -0.003. In both models, it was insignificant.

Findings of Infant Mortality Rates (IMR)

In the carrying out of the analysis, the data was run in both the fixed effect model and random effect model. However, the result used in the explanation here mostly are based on the fixed effect model unless otherwise stated.

Public health care expenditure

The table below gives the fixed and random effects results on PuH and Infant mortality

Table 3.4 PuH infant mortality rate results

VARIABLES	Model 1 (F.E) InInf	Model 1 (R.E) InInf
InPu	-0.114***	-0.113***
	(0.0383)	(0.0352)
InCPI	0.413**	0.298*
	(0.176)	(0.174)
InEdu	-0.475***	-0.433***
	(0.156)	(0.146)
Indpt	-0.200*	-0.215**
	(0.0985)	(0.0965)
InML	-0.0321	-0.0484
	(0.139)	(0.135)
Constant	7.045***	7.108***
	(0.683)	(0.612)
Observations	384	384
Number of id	32	32
R-squared	0.337	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The PuH showed a negative relationship with IMR. It gave an elasticity estimation of -0.11 at a 1% significance level. Corruption indicates a positive elasticity estimation of 0.41 at a 5% significance level. On the other hand, education showed a negative elasticity estimation of -0.47 at a 1% significance level in this model. In the immunization, DPT had a negative elasticity estimation effect on IMR of -0.20 at 10% significant. Measles had a negative elasticity estimation of -0.03 but it was insignificant.

Private health care expenditure

Table 3.5 PrH infant mortality rate results

VARIABLES	Model 2 (F.E) InInf	Model 2 (R.E) InInf
InPr	-0.119**	-0.105**
	(0.0516)	(0.0437)
InCPI	0.355	0.213
	(0.215)	(0.220)
InEdu	-0.442**	-0.418***
	(0.166)	(0.156)
Indpt	-0.199*	-0.210**
	(0.0986)	(0.0977)
InML	-0.0753	-0.101
	(0.128)	(0.126)
Constant	7.211***	7.378***
	(0.703)	(0.645)
Observations	384	384
Number of id	32	32
R-squared	0.281	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In this analysis, the results showed that PrH has a negative influence on infant mortality rates. The results show PrH has a negative elasticity estimation of -0.10 at a 5% significance level. Corruption gave the expected results of a positive impact on IMR by giving an elasticity estimation of 0.21 but not significant. The other control variable had a negative influence on the IMR. Education had a negative link with the infant mortality at an elasticity estimation of -0.41 at 1 percent significance level. Immunization had a negative effect on IMR where DPT had an elasticity estimation of -0.21 at a 5% significance level while measles had -0.10 but insignificant.

Total healthcare expenditure

The table below gives the fixed and random effects results on TH and Infant mortality

Table 3.6 TH infant mortality rate results

VARIABLES	Model 3 (F.E) InInf	Model 3 (R.E) InInf
InTo	-0.289***	-0.271***
	(0.0405)	(0.0392)
InCPI	0.343*	0.256
	(0.169)	(0.171)
InEdu	-0.303**	-0.293**
	(0.141)	(0.135)
Indpt	-0.211**	-0.223***
	(0.0792)	(0.0787)
InML	0.0370	0.0144
	(0.102)	(0.101)
Constant	6.877***	7.010***
	(0.577)	(0.546)
Observations	384	384
Number of id	32	32
R-squared	0.440	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The analysis of the total healthcare expenditure on infant mortality rates gave expected negative results. The total healthcare expenditure had an elasticity estimation of -0.28 at a 1 percent significance level on the impact of IMR. This suggests that a 1% increase in TH will be able to reduce the IMR by 0.289 percent. Corruption, on the other hand, has a positive influence of 0.34 elasticity estimation at a 10% significance level. Education and DPT showed a negative relationship with IMR 5% significance level where -0.30 and -0.21 were the figures respectively. However, the measles gave an inconsistent result which was not significant in any of the random and fixed-effect models. In the fixed model, it gave a positive influence on infant mortality rates of elasticity estimation 0.03. In the random model, it showed a negative effect of elasticity estimation -0.07 but not significant at all levels.

Interpretation of the findings

Public healthcare expenditure

From the research findings above, public healthcare expenditure plays an essential role in the reduction of UCMR. Based on the result, a 10% increase in the public healthcare expenditure will imply a 1.40 percent reduction of UCMR. In the situation where the increase continues each financial year, the PuH will reduce UCMR. Moreover, in the situation of infant mortality, a 10% increase will lead to a 1.14 percent reduction in IMR. It gives hope for the SSA nations to ensure the PuH is utilized in reducing the risk of child mortality. Additionally, the R squared results indicated that 33.7 and 32.7 percentages in the UCMR and IMR can be influenced by the PuH. Additionally, the PuH results are statistically significant thus indicating its influence on the child mortality rates is immense.

Private healthcare expenditure

In the study, the PrH does not give statistically significant results in all the models of the UCMR and IMR. In this study, the increase in the PrH will have a minimal reduction in child mortality compared to the PuH. For instance, a 1% increase in the PrH will lead to a 0.140% reduction of the UCMR while in IMR at 0.119% (at 5 percent significance). The private entity in the SSA is run by volunteers which in the long run are helping reduce the risk of child mortality. In this model, we estimate that 26.9% of child mortality will be influenced based on the R squared figure.

Total healthcare expenditure

The result of TH was statistically significant at the 1% significance level. The result showed the total expenditure has a negative effect on the child mortality rates in SSA. The combination of the private sector and the public sector will assist in reducing child mortality. At a 10 percent increase in the TH in the SSA, the child mortality rates will be reduced by 3.59% and 2.89% UCMR and IMR respectively. The percentages of the two are higher compared to the PuH and PrH. The joint financing in healthcare by SSA will have a greater impact than single input done by the government or private sector. Moreover, TH can influence 44% UCMR and 42 percent of the IMR which is a better percentage that brings close to the medium mark. Therefore, the result indicates that the risk of child mortality can be reduced if TH is increased effectively.

Discussion, Conclusion, and Recommendations

Introduction

In this chapter, the results from chapter four are discussed and an opinion given based on the objectives of the research. The final outcomes from the research directed the conclusion and its recommendations. Also, this chapter will give limitations to the study and areas where future studies can be carried concerning the topic.

Discussion

In this study, the result gave a better understanding of health care expenditure. The general results suggest that the healthcare expenditure in SSA had a significant influence on reducing child mortality rates. The effect runs across all the models that were employed in the study either UCMR or IMR. The analysis implied that more health expenditure in the SSA region will help in delivering universal goals of reducing child mortality rates. Additionally, these results conform to studies carried by various researchers like Novignon and Lawason (2012). Based on the outcome of the result, more spending in the health sector as done in other sectors will bring CMR down. Additionally, a health facility can try to evaluate how to plan for their health expenditure during difficult times. The constraints in budgets make it hard for some health facilities as well as individual to give quality services to the children. According to the statement of WHO (2019), the reduction in vaccine availability in SSA states is caused by a lack of funds as well as mismanagement of those that are available. The achievement in reducing child mortality rates needs effective planning from an individual level up to the national level. The lack of connection between the PuH and PrH sectors adds more burden to the problem. Furthermore, corruption affects the delivery of quality healthcare among the SSA states. An increase in corruption has a long effect on the delivery of health services which increases CMR. The fight against corruption and improved transparency will make the risk of child mortality to reduce. This indicates that poor resource management makes it impossible for the SSA to reduce corruption which would assist in reducing CMR. Also, the impact of healthcare expenditure on child mortality is not immediate but takes time to reduce that risk. The results were for 12 years yet the impact in the region is lower than expected. The delay in reducing CMR is based on poor government policies and inadequate or mismanagement resources that are available. Moreover, due to the time dimension being involved in the process. The SSA developments in the health sector will not give one-off results but after some time. However, the process should ensure the spending in healthcare does not stop but be a continuous process to reduce the CMR.

The results from the models 1, and 2 indicate that more spending in the public healthcare expenditure will give better result in reducing CMR. This is visible in all the models of UCMR and IMR. The results agree with work done by Anyanwu and Erhijakpor (2009) among others. The public investment in the health system should include everyone hence chances of delivering universal results are high. Moreover, education is essential in delivering services. The more a nation is educated, the lower rates of child mortality are reported. In this study, the education showed a significant influence on CMR indicating it's a better pillar in assisting reduce CMR. Also, private healthcare expenditure is not relatively significant when compared to public healthcare expenditure. The government commitment in the various declaration and WHO commitments can play an essential role in reducing CMR. The fail in achieving the MDGs in 2015 is a better indication of how the SSA fails to work towards reducing CMR. It is the same with the low implementation of SGD 3 in many states in the SSA. Moreover, many nations are faced with challenges of poor medical services, structural development, inadequate professional health practitioners, and mismanagement of resources among others thus making it impossible to reduce CMR. It is the reason why public healthcare expenditure has a highly significant and influence on CMR as it affects many policies than private. The increases in the private healthcare expenditure in terms of donations, grants, and aids among others have contributed to a reduction in the CMR. Based on the results, the PrH is growing in reducing the risk of CMR. The free maternal care, immunization, and community education program have enabled the PrH to assist reduce CMR. This is commonly in marginalized areas of most SSA nations. The total healthcare as a unit has a significant influence on the long-run reduction of child mortality rates. The SSA states need to consider their investment in healthcare especially

the public and encourage private sectors to support it. A continuous process gives the best results after time. The risk of child mortality can be reduced based on policy implementation and financial support.

The expenditure from individuals or institutions which consist of part of the PrH in this study needs to decide which strategy is best in reducing expenditure but getting quality results. The reduction in mortality by the private sector is not technically significant in the SSA. However, an individual should understand which measures to take to prevent infections among the child. The introduction of parental care concerning child healthcare can be a better weapon in ensuring the reduction of CMR. For example, individuals from pastoralist communities and those in war zone areas in SSA nations experience challenges in getting care for their children. The government can be the solution in these zones to give immunization and other childcare as they are the most vulnerable people. PrH cannot deliver many results as they don't have high authority like the government.

However, the challenge that makes health expenditure to fail in reducing child mortality is the political factors. Many governments in the SSA don't want to build good health facilities and help the needy. The health expenditure is mismanaged through corruption, buying fake products or even making access to basic healthcare is a challenge. This can be seen in many governments on how they have failed to deliver the universal health coverage and making dispensary available even in remote areas. For instance, in Kenya, the government has made child healthcare free but their no medicine, health practitioners, and accessibility to a facility by her citizens. Diseases like polio are affecting children yet there is a need to have vaccines available at all times. It is one of the factors that show how health expenditure has failed to some extent to reduce child mortality. The poverty level is factors that make it difficult for under-five and infant mortality to increase. The children are malnourished hence their immunity being weak thus they're easily affected by any diseases. Therefore, TH has a better chance to reduce CMR only are other factors are utilized to reduce these constraints.

Finally, the healthcare expenditure affects child mortality because the resources from the government and other private sector work to get a better outcome in the health sector. A child will die if there are no health practitioners to help them or the mother has no knowledge of how to take care of them. Also, they might not get good services in health facilities they visit due to inadequate medicine and personnel. The health expenditure needs to be used in helping buy medicine, built good facilities, pay practitioners, among other things. In the long run, the results will be felt among government and individuals hence reducing the child mortality below the set SGD 3 (WHO, 2018)

Limitations

The process of carrying out this study was limited in some ways. To start with, the lack of data on some countries made the study settle on 32 states yet the region has 45 countries. This became a challenge as some nations were having data only for a certain variable and not others or having data on all variables but missing in certain years. This makes it harder to collect data and use it in the study. There is a need to make the countries in this region become more transparent and share their statistical data to help various research that might be essential to them. Moreover, healthcare expenditure needs to be specified in the categories of infrastructure, medications, and health practitioners among others. However, this was not the case hence it became difficult to get that data thus utilizing it as a general unit. It might not give the required result on which part of the healthcare expenditure might need more funds or less

to reduce child mortality rates. The future researchers might look at this problem and work on them when carrying out their studies.

Conclusion

From the analysis and discussion of the results, it's essential to note that the CMR in SSA can be reduced by an increase in healthcare expenditure. The increase in the expenditure should not be a one-time process but continue in the long run. Moreover, public healthcare plays a significant role as it has a negative influence on the reduction of CMR. The SSA nations need to works in investing in public health as it is the pillar of many systems in healthcare. Moreover, the private healthcare expenditure assists in the reduction of child mortality rates but a lower level compared to the PuH and TH. Nonetheless, it's able to bring some changes if incorporated with other measures in the economy. It essential for the governments in this region to invest more in public healthcare and try to utilize the small percentage in the private sector. Additionally, the health expenditure should be set at a minimum level or a percentage of the total at each financial year to prevent inconsistency in financing it. As it indicated, the speed of getting the result from health expenditure is not immediately but take time when the financing is continuous. The set limits will guide on how the sector will be assured of receiving money thus no project stalling in the situation when sponsors or donors stop assisting the government. The private sector is mostly made up of an organization or individuals who is willing to fund the health sector. The creation of kit funds that willing individuals at all levels of the society can contribute any amount towards the cause of funding the health sector. It will reduce CMR at a higher level. It is because private entities just sponsor a project or task within a short period and cannot be able to sustain it for a long period due to financial constraints. The approach can be done from a communal level thus ensuring the communities' under-five children get services from the facility. It will enable reduce infant and under-five mortality in the communities thus enabling reduce the level CMR in the SSA region. Corruption is part of the main reason why mortality is still high in this region. The SSA government needs to fight corruption and mismanagement of resources in the health sector. Education plays an essential role in helping the communities and citizens in this region to understand how to care for their children. The education makes them know when to visit health facilities for child treatment and vaccinations at the right time. Furthermore, children need to eat a balanced diet that is not easily available in many communities in the SSA region. To help solve this problem, the entities of the government and the private can work together to improve the level of income in this region so that they can buy healthy foods for the child. Additionally, improved education in food nutrition will give parents an opportunity to know which foods to buy for a child to get nutrients and at which stage in their growth. Lastly, the government should try to fulfill their commitments on various healthcare policies put in place by WHO and themselves. Inadequate implementations of policies like SDG 3 that about healthcare, become a challenge on healthcare expenditure to help fight CMR. The political stability in the region influences the healthcare expenditure each year making it difficult to achieve expected results. Therefore, it's worth noting that effective healthcare expenditure in SSA will help in reducing the risk of child mortality rates.

Recommendations

The study recommends that the SSA region should try to implement the policies put in place for delivering quality healthcare. The child mortality is becoming high each time due to the lack of health facilities, practitioners, and knowledge among other factors. As the governments in these regions, they should finance the sector even with the help of the private sector towards reducing child mortality. The public healthcare sector should be financed increasingly on a continuous basis but strategic measures put in place to avoid losing the fund. The study

recommends that good fights against corruption and transparency measures should be employed in SSA countries. It will enable the government to reduce losing funds in the cases of corruption which has become a challenge to many states in the region. Also, the building of functional health facilities countrywide in this region will enable an easy and faster check of the child. Mortality increase when there is no quality care or funds set aside might be used on other unnecessary things. Furthermore, health education on maternal care and child care should be introduced at the community level especially those in marginalized areas. It will give a better understanding of how to care for the child to avoid contacting more diseases. Lastly, avail funds to make child treatment and care in health facilities free. This will attract everyone especially those living in poverty to give treatment to their infant or child. Lastly, the study recommends that a minimum percentage of the national financial budget should be set aside to fund the health sector. The region population is growing meaning the birth rate is increasing yet the funding is still the same or fluctuating in some countries. It might be the reason why some health facilities and practitioners feel strained to deliver quality services to the child. Child mortality rates will reduce when health expenditure is carried out at a national level and policies set are working towards national health policies as well as SDGs.

Suggestion for future research

There is a need for more work to be done in the area of child mortality in the SSA region from the governments up to their citizens. This can be done in various approaches and fields to ensure the risk of child mortality rates reduced. Furthermore, the researcher can try to undertake studies per individual states to enable them to know more about how healthcare expenditure affects the CMR in the country. Finally, some can undertake studies to try to carry out this study using primary data in each state to see if the result will be the same. It'll be essential for stakeholders in SSA and other parts to make the right decision on how to reduce child mortality rates.

References

Akinlo, A. E., & Sulola, A. O. (2018). Health care expenditure and infant mortality in sub-Saharan Africa. *Journal of Policy Modeling*, *41*(1), 168–178. https://doi.org/10.1016/j.jpolmod.2018.09.001

Andriano, L., & Monden, C. W. S. (2019). The causal effect of maternal education on child mortality: Evidence from a quasi-experiment in Malawi and Uganda. *Demography*, *56*(5), 1765–1790. https://doi.org/10.1007/s13524-019-00812-3

Baltagi, B. H., & Moscone, F. (2010). Health care expenditure and income in the OECD reconsidered: Evidence from panel data. *Economic Modelling*, *27*(4), 804–811. https://doi.org/10.1016/j.econmod.2009.12.001

Berger, M. C., & Messer, J. (2002). Public financing of health expenditures, insurance, and health outcomes. *Applied Economics*, *34*(17), 2105–2113. https://doi.org/10.1080/00036840210135665

Bokhari, F. A. S., Gai, Y., & Gottret, P. (2007). Government health expenditures and health outcomes. *Health Economics*, *16*(3), 257–273. https://doi.org/10.1002/hec.1157

Crémieux, P.-Y., Meilleur, M.-C., Ouellette, P., Petit, P., Zelder, M., & Potvin, K. (2005). Public and private pharmaceutical spending as determinants of health outcomes in Canada: Drug Spending and Outcomes. *Health Economics*, *14*(2), 107–116. https://doi.org/10.1002/hec.922

Farag, M., Nandakumar, A. K., Wallack, S., Hodgkin, D., Gaumer, G., & Erbil, C. (2013). Health expenditures, health outcomes and the role of good governance. *International Journal of Health Care Finance and Economics*, *13*(1), 33–52. https://doi.org/10.1007/s10754-012-9120-3

Filmer, D., & Pritchett, L. (1999). The impact of public spending on health: does money matter? *Social Science & Medicine (1982)*, *49*(10), 1309–1323. https://doi.org/10.1016/s0277-9536(99)00150-1

Grossman, M. (2017). 1. On the concept of health capital and the demand for health. In *Determinants of Health* (pp. 6–41). Columbia University Press.

Gupta, S., & Verhoeven, M. (2001). The efficiency of government expenditure: experiences from Africa. *Journal of Policy Modeling*, *23*(4), 433–467. https://doi.org/10.1016/s0161-8938(00)00036-3

Kamiya, Y. (2010). Determinants of health in developing countries: Cross-country evidence. *Osaka School of International Public Policy (OSIPP) Discussion*.

Kazembe, L., Clarke, A., & Kandala, N.-B. (2012). Childhood mortality in sub-Saharan Africa: cross-sectional insight into small-scale geographical inequalities from Census data. *BMJ Open*, *2*(5), e001421. https://doi.org/10.1136/bmjopen-2012-001421

Mejía-Guevara, I., Zuo, W., Bendavid, E., Li, N., & Tuljapurkar, S. (2019). Age distribution, trends, and forecasts of under-5 mortality in 31 sub-Saharan African countries: A modeling study. *PLoS Medicine*, *16*(3), e1002757. https://doi.org/10.1371/journal.pmed.1002757

Menzies, N. A., Suharlim, C., Resch, S. C., & Brenzel, L. (2020). The efficiency of routine infant immunization services in six countries: a comparison of methods. *Health Economics Review*, *10*(1), 1. https://doi.org/10.1186/s13561-019-0259-1

Micah, A. E., Chen, C. S., Zlavog, B. S., Hashimi, G., Chapin, A., & Dieleman, J. L. (2019). Trends and drivers of government health spending in sub-Saharan Africa, 1995-2015. *BMJ Global Health*, *4*(1), e001159. https://doi.org/10.1136/bmjgh-2018-001159

Moffatt, M. (2004, June 21). *The definition and relevance of panel data in economic research*. ThoughtCo. https://www.thoughtco.com/panel-data-definition-in-economic-research-1147034

Mukherjee, D., & Kizhakethalackal, E. T. (2013). Empirics of health-aid, education and infant mortality: a semiparametric study. *Applied Economics*, *45*(22), 3137–3150. https://doi.org/10.1080/00036846.2012.699186

Nixon, J., & Ulmann, P. (2006). The Relationship between Health Care Expenditure and Health Outcomes: Evidence and Caveats for a Causal Link. *The European Journal of Health Economics*, *7*(1), 7–18.

Nketiah-Amponsah, E. (2019). The impact of health expenditures on health outcomes in sub-Saharan Africa. *Journal of Developing Societies*, *35*(1), 134–152. https://doi.org/10.1177/0169796x19826759

Nyamuranga, C., & Shin, J. (2019). Public health expenditure and child mortality in Southern Africa. *International Journal of Social Economics*, *46*(9), 1137–1154. https://doi.org/10.1108/ijse-12-2018-0643

Piabuo, S. M., & Tieguhong, J. C. (2017). Health expenditure and economic growth - a review of the literature and an analysis between the economic community for central African states (CEMAC) and selected African countries. *Health Economics Review*, *7*(1), 23. https://doi.org/10.1186/s13561-017-0159-1

Pyatt, G., & Becker, G. S. (1966). Human capital: A theoretical and empirical analysis, with special reference to education. *Economic Journal (London, England)*, *76*(303), 635. https://doi.org/10.2307/2229541

Ray, D., & Linden, M. (2020). Health expenditure, longevity, and child mortality: dynamic panel data approach with global data. *International Journal of Health Economics and Management*, *20*(1), 99–119. https://doi.org/10.1007/s10754-019-09272-z

Stepovic, M. (2019). GDP Growth and Health Care Expenditures Worldwide. The Open Pharmacoeconomics and. *Health Economics Journal*, 9–18.

Uwizihiwe, J. P. (2015). 40th anniversary of introduction of expanded immunization program (EPI): A literature review of introduction of new vaccines for routine childhood immunization in sub-Saharan Africa. *International Journal of Vaccines & Vaccination*, *1*(1). https://doi.org/10.15406/ijvv.2015.01.00004

Van Malderen, C., Amouzou, A., Barros, A. J. D., Masquelier, B., Van Oyen, H., & Speybroeck, N. (2019). Socioeconomic factors contributing to under-five mortality in sub-Saharan Africa: a decomposition analysis. *BMC Public Health*, *19*(1), 760. https://doi.org/10.1186/s12889-019-7111-8

WHO. (2014). *Immunization costing and financing: A tool and user guide for comprehensive Multi-Year Plan (cMYP). Immunization financing, supply and procurement*.

World Health Statistics 2018: Monitoring health for the SDGs. (2018). World Health Organization.

Appendix

1. Variables definitions

Variable	Descriptions
Under-five child mortality rates (UCMR)	Mortality rate, under-5 (per 1,000 live births)
Infant mortality rates (IMR)	Mortality rate, infant (per 1,000 live births)
Total healthcare expenditure (TH)	Current health expenditure per capita (current US$)
Public healthcare expenditure (PuH)	Domestic general government health expenditure per capita (current US$)
Private healthcare expenditure (PrH)	Domestic private health expenditure per capita (current US$)
Corruption (Cor)	CPIA public sector management and institutions cluster average (1=low to 6=high)
Education (Edu)	School enrollment, primary (% gross)
DPT immunization (DPT)	Immunization, DPT (% of children ages 12-23 months)
Measles immunization (ML)	Immunization, measles (% of children ages 12-23 months)

2. Correlation

Correlation between variables: Inch InInf InTo InPr InPu InCPI InEdu Indpt InML (obs=384)

	Inch	InInf	InTo	InPr	InPu	InCPI	InEdu	Indpt	InML
Inch	1.0000								
InInf	0.9762	1.0000							
InTo	-0.3501	-0.3134	1.0000						
InPr	-0.0847	-0.0752	0.7723	1.0000					
InPu	-0.4039	-0.3939	0.8616	0.5437	1.0000				
InCPI	-0.3945	-0.4511	0.2535	-0.0440	0.3648	1.0000			
InEdu	-0.3669	-0.2892	0.1662	-0.1177	0.1728	0.0787	1.0000		
Indpt	-0.5668	-0.5639	0.0850	-0.1278	0.1173	0.4785	0.2967	1.0000	
InML	-0.5732	-0.5724	0.1181	-0.1648	0.1626	0.4873	0.2759	0.9349	1.0000

3. Hausman test

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
InTo	-.4983273	-.331562	-.1667653	.0495049
InCPI	.421516	.3332774	.0882386	.0326384
InEdu	-.387695	-.3874943	-.0002006	.0206046
Indpt	-.2460952	-.2625297	.0164345	.
InML	.045258	-.0036351	.0488931	.

b =	consistent under Ho and Ha; obtained from xtreg
B =	inconsistent under Ha, efficient under Ho; obtained from xtreg
Test:	Ho: difference in coefficients not systematic
	chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
	= 42.01
	Prob>chi2 = 0.0000
	(V_b-V_B is not positive definite)

Cite this article:

Khisa Wekulo Eugine, Xie Yuantao, & Muyundo Calvin Mukumbi (2023). Effect of Health Care Expenditures on Child Mortality Rates: A Case Study of Sub-Saharan Africa. *International Journal of Science and Business, 25*(1), 151-174. doi: https://doi.org/10.58970/IJSB.2192

Retrieved from http://ijsab.com/wp-content/uploads/2192.pdf

Published by

IJSAB International