Chapter One

Introduction

1.1 Background to the Study

Economic growth results from improving a country's human capital through technological advancement, development of efficient and effective production methods, as well as improvements in education and health. Prior to the introduction of the human capital theory in the 1960s, the growth theory only recognized physical capital as the most significant input into the output produced. The health and education of the labour force were recognized as significant inputs in production. Human capital is recognized as a key driver of economic growth and development in both developed and developing nations.[1] It is well known that a healthy worker contributes more to production and increases productivity more than a sick worker because they are more physically and mentally fit, proving that there is a beneficial interaction between a worker's health and his or her productivity[2]. Health, education, training, migration, and other investments that increase an individual's productivity are all included in the economic view of human capital [1, 2.] Additionally, increased investments in human capital (education, health, and training, etc.) from institutions in the public and private sectors can directly relate with increased productivity[1].

Examining the health of the labour force, which, without a doubt, determines the degree of labour productivity, is relevant to consider the status of human capital in coordinating resources to achieve economic growth. Increased prevalence of unhealthy people in the labour force causes economic growth of developing nations with labour-based economies to lose workers and reduce productivity[3]. Before human capital can boost growth, both market and non-market activities necessitate a healthy lifestyle. This study focused on health because it serves as a foundation for

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other forms of human capital such as education, skills, and training. Health, like education, is critical to human capital development.

In developing nations, labour is used more frequently than capital. It is a factor of production that involves a person's physical and mental health. To achieve development, a reasonable amount is expected to be spent on the economy's health care sector in accordance with United Nations and World Health Organization benchmarks for citizens. Healthcare expenditure is becoming increasingly important in terms of producing healthy time or maintaining long-term human capital. Statistics show that a country's level of development is linked to how much it spends on health care and that the health of the population and their level of education affect how productive they are at work [4,5].

Following the endogenous growth revolution, human capital entered the growth framework and now recognized as one of the key drivers of economic growth which is the essence of having highly skilled human capital grows as nations transitioned to knowledge-based economies [2,6]. Therefore, the population must be in good health in order to use a nation's manpower and resources to tap into its other resources (that is, harness other resources of a nation).

The state of health of the population has a substantial impact on productivity because only a healthy labour force can significantly increase production and the level of national output. This makes a country's citizens' health essential, and as a result, provision of health should be one of government's top priorities because it has a positive impact on economic growth, which is one of the macroeconomic goals of every government [4]. Governments must provide adequate social and health programmes in order to fulfil obligation to care for the health of their citizens. In a nation where human capital is accumulated, the government has a significant impact on healthcare expenditure[2]. It is important to keep in mind that building up human capital is essential for

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endogenous growth, which is necessary to increase capital accumulation for raising healthcare expenditures in a nation[7].

Increasing healthcare expenditure have a positive impact on economic growth, which implies that decrease in economic growth has a negative impact on healthcare expenditure. As a result, health care expenditure significantly contributes to economic growth [8, 9]. Without a doubt, a country's economic performance can be significantly impacted by its healthcare expenditure. For instance, raising health care expenditure increases social security, safety, and welfare, which boosts labour productivity [10]. Investment in human capital is measured by healthcare expenditure. Building a population's human capital requires intentional expenditure on healthcare and education in the hopes that this will lead to competence and long-term output from a population that is healthy and long-lived, which will then translate to productivity, income growth, and development [11, 12].

Given the significance of healthcare in the growth and development agenda and the contribution of healthcare expenditure to the system that supports it, economists in the twenty-first century have made significant efforts to analyze the contribution of government expenditure on healthcare to the expansion of human capital development and healthcare services[13]. Public health expenditures have been acknowledged as a significant component of fiscal outlays in the majority of developed nations of the world, particularly in light of the various research arguments from economic literature. In particular, they are accountable for the global standard in the health sectors. Interestingly, this argument has not held true for countries in Africa over the past few decades, despite significant public spending in the sector, the continent continues to record the lowest levels of health facilities and services [12].

It is crucial to remember that expenditure on healthcare is an indispensable tool for ensuring the effective and efficient operation of the healthcare system. The quantity and quality of various

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health care services and access to those services, health output, and health outcomes must all improve swiftly, which calls for appropriate health expenditure. The relationship between health outcomes and economic growth may not be direct as suggested by other theories, but it actually mediates through a channel between healthcare expenditure and economic growth. Economic growth is not the only factor that affects healthcare expenditures, health outcomes can also have an impact on or affect economic growth [14].

The percentage of total government expenditure on healthcare that reflects the importance of health in government expenditure. The share of government health expenditure increased steadily in upper-middle and high-income countries from 2000 to 2019, it was 2.5 times larger in high-income countries, at 14%, than in low-income countries, at 5.4% [14]. However, the health priority in lower-middle income nations remained largely unchanged at 6% to 7% of government expenditure, while in low-income nations, there was a decline of 4.2% in 2011 before a recovery to 5.4% in 2019. When compared to high-income countries, where government expenditure accounts for about 70% of health expenditure, low-income countries' out-of-pocket expenditure on healthcare (44%) and foreign aid (29%) were the main sources of funding [14]. With a large percentage of the world's population living below the international poverty line ($1.90 per day), the majority of the extreme poor live in low-income countries with low life expectancy and high mortality rates compared to other regions or income group countries. It can therefore be concluded that health expenditure percentage of GDP has a positive relationship with income level of the countries. The majority of African nations were found to be unable to meet the prerequisites for sound healthcare systems [15].

Reports has it that, the United States has the highest global healthcare expenditure ratio. Additionally, compared to other regions, the Euro Area has a high percentage. Africa and less

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developed nations, on the other hand, have very low health expenditure percentages. The main source of funding for healthcare around the world is government expenditure. Globally, government healthcare expenditure made up 59.7% (59.2%-60.0%) of total health expenditure, but sub-Saharan Africa only saw 34.4% (33.5%-35.2%) of this expenditure [16,17]. While the sub-region received significant attention and funding from external funding due to the devastating effects of the HIV/AIDS epidemic and other diseases beginning in the mid-1990s, recent developments have caused those resources to plateau (a state of little or no change after a period of activity or progress)[18]. Estimates of the costs associated with achieving the health-related Sustainable Development Goals (SDGs) have also re-emphasized the urgency of organizing and utilizing all available resource channels[19].

Statistics shows that, the Economic Community of West African States (ECOWAS) countries clearly fall short of the 15% threshold set by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) in order to achieve both the original Millennium Development Goals (MDGs, 2000-2015) and their successor, the Sustainable Development Goals (SDGs, 2015–2030). In ECOWAS, public healthcare expenditure makes up about 30% of total health expenditure, while private healthcare (out-of-pocket expenditure) makes up the remaining 70% [20].

Economic development and growth, health promotion objectives where health outcomes are integral part are not ends in and of themselves, but rather a precondition for increasing productive output and achieving the goals of economic growth and development [15]. Nations (both developed and developing) have prioritized health promotion interventions through expenditure on health as a means to improve quality health outcomes because of the significance of quality health in economic growth and development agendas. In developed nations, both health expenditure and health outcomes have been rising. Over the past fifty years, the life expectancy has increased by

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about ten years and the infant mortality rate has decreased more than tenfold. The percentage of annual budget devoted to health sector increased from 3% to about 10% during the same time period. Nevertheless, the provision of health services in Africa has occasionally been neglected, endangering national productivity and economic growth (GDP), which could have served as a catalyst for the implementation of formulated economic development policies [14,15].

The average life expectancy for males was 71 years females was 75 years as of 2021 but note, that it varies greatly by continent. For instance, in the developed world, the average life expectancy at birth was 31 years in the early 20th century. With continued advancements in medical treatment and living standards, it has increased to an average of 70 years for male and 75years for female, respectively. Additionally, the average life expectancy in Europe is 81 years for female and 75years for Male. In contrast, the average life expectancy in Africa is 66 years for female and 63 years for male [21, 22.]

In Africa, there were 41.6 deaths per 1,000 live births among infants under the age of one. In comparison to 2000, when approximately 81 newborn infants out of every thousand died before turning one year old, infant mortality on the continent has significantly decreased. Many African countries are among those with the highest infant mortality rates in the world [23]. Additionally, the number of deaths per 1,000 live births decreased from 93 in 1990 to 37 in 2020. Despite this significant advancement, improving child survival is still a pressing concern. Also, in 2020 alone, report have it that, approximately 13,800 under-five died every day, which means that over 5 million children under five years of age died [21,23]. It is evident that developed nations allots a huge amount of their budgets to human capital development, particularly in the area of health care services, as they hold the view that human capital development is a key driver of both economic growth and development of the country than developing nations [24].

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The majority of literatures that have included human capital in growth studies tend to pay greater attention on analyzing the impact of education and health on economic growth, while ignoring the impact of healthcare expenditure. It is only recently that studies have begun to look at health and have attempted to established the relationship between health outcomes and economic growth. The dynamic purpose of this study is to investigate the tripartite relationship among healthcare expenditure, health outcomes and economic growth in ECOWAS.

1.2 Statement of the Problem

Prior to the COVID-19 pandemic, which is still active and evolving, the Ebola virus diseases outbreak in 2014 was the most devastating epidemic in recent times in which 28,625 people were infected and 11,325 died (approximately 40%) and disrupted the healthcare system in ECOWAS.

West Africa, with a population of 367 million, had confirmed 412 178 cases of COVID-19 with 5,363 deaths as of 14 March 2021 compared with the USA which had recorded almost 30 million cases and 530, 000 deaths, despite having a slightly smaller population of 328 million [25].

Despite the measures put in place to protect and improve the health of ECOWAS population such as health infrastructure, intensive care unit, availability of critical medical supplies like laboratory materials, delivery of healthcare services has not always been optimal (of the highest standard or quality) compared to other regions. In spite of the funds allocated into healthcare system, there are still high out-of-pocket costs incurred by the citizens who lacked real financial protection from the regrettable healthcare costs, high reliance on government-owned healthcare facilities, poor integration of private healthcare facilities into the country's health system, lack of awareness and a poor introduction of health insurance. These nations face a number of development challenges, including poor infrastructure, a high mortality rate, unbearable inequality gaps, abject unemployment rates and the poverty trap's vicious cycle.

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The statistical analysis of the overall quality of health care system, including health care infrastructure, healthcare professionals (doctors, nursing staff, and other health workers), competencies cost (USD per capita), quality medicine availability and government readiness displays that ECOWAS scored above 100(Mali 148, Senegal 110, Guinea Bissau 147, Ghana 100, Guinea 139, Nigeria 144, Liberia 141, Niger 153, Sierra Leone 145, Togo 140, Cote d'Ivoire 124, Gambia 116, Burkina Faso 135, Benin 126, when compared with the best health care ten countries that scored out of 100 (South Korea 82.72, Taiwan 86.72, Denmark 80.07, Austria 76.75, Japan 80.49, Australia 78.14, France 80.18, Spain 78.37, Belgium 75.49and United Kingdom 74.83). This implies that the healthcare system in ECOWAS is lagging behind when compared globally[26]

The average current health expenditure percentage of GDP for East Asia and Pacific, Arab World, Euro Area, North America and Sub-Sahara Africa had 6.31%, 4.24%, 9.71%, 14.98% and 5.53% respectively compared to ECOWAS with 5.22% [27.] Also, the average Gross Domestic Product per capita recorded for Arab World was 5695.71, East Asia and Pacific 7749.517, Euro Area 33611.97, North America 52586.16, Sub-Sahara Africa 1512.71 and ECOWAS was 1062.99. The data shows that the Gross domestic product for ECOWAS was lower compared to another region [27.] The average total life expectancy at birth for ECOWAS was 57 years compared to Arab world 70 years, East Asia and Pacific with 73years, Euro Area 80 years, North America 78 years while that of Sub-Sahara Africa 56 years was low compared to that of ECOWAS [27].

Statistics also show that for ECOWAS, the average of under-five mortality rate (per 1,000 live birth) is on the high side 108.789 compared to Arab World 45.68, East Asia and Pacific 24.2, Euro Area 4.43, North America 7.29, Sub-Sahara Africa 107.6 respectively. It can be concluded

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that ECOWAS health outcome indicators above are considerably worse off compared to other regions[27].

The aforementioned factors upset the interest in examining the impact of domestic government healthcare expenditure and private healthcare expenditure in ECOWAS, where healthcare expenditure is still the lowest in the world both as per capita and as percentage of GDP. What impact would it have on the economy growth and health outcomes? In order to determine whether healthcare expenditure and health outcomes are complemented or substituted, the study examined the link effect of healthcare expenditure on health outcomes and economic growth in ECOWAS.

1.3 Research Questions

This study provided solutions to the following research questions

I. To what extent does healthcare expenditure affect health outcomes in ECOWAS?

II. How has healthcare expenditure impacted economic growth in ECOWAS?

III. What is the causal relationship among healthcare expenditure, health outcomes and economic growth in ECOWAS?

1.4 Objectives of the Study

The main objective of this study is to empirically investigate the link among healthcare expenditure, health outcomes and economic growth in ECOWAS. For these broad objectives to be achieved, the specific objectives are to:

i. examine the extent to which healthcare expenditure affects health outcomes in ECOWAS.

ii. estimate the impact of healthcare expenditure on economic growth in ECOWAS.

iii. investigate the causal relationship among healthcare expenditure, health outcomes and economic growth in ECOWAS.

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1.5 Hypotheses

For the purpose of investigating and evaluating the above objectives, the following hypotheses will be formulated to guide the study.

H1: Healthcare expenditure has no significant effect on health outcomes in ECOWAS

H2: Healthcare expenditure has no significant impact on the economic growth in ECOWAS

H3: There is no causal link among healthcare expenditure, health outcomes and the economy growth in ECOWAS

1.6 Significance of the Study

Globally, the development of human capital depends on good health. It is a significant indicator for evaluating standard of living, determining whether a country's national development plan and economic development was successful or unsuccessful. Health service delivery challenges are frequently observed in nations with high human development index (HDI), which are characterized by generally high standards of living, widespread access to affordable education, stable governments, and expanding, robust economies. Within nations with a low HDI, issues relating to human resources (which describe the accumulation of human capital and its effective investment in the development of an economy) receive more attention. Expenditure on healthcare improves the quality of human resources and promotes longevity and a higher life expectancy. Africa's healthcare systems have suffered issues over the years that spanned through institutional, human resource, financial, technical, and political developments.

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This study chooses ECOWAS region because most existing reviewed literatures focused on individual countries, specified group of countries and not ECOWAS. Also, these countries are chosen because they fall under the lower middle-income countries. Therefore, it is imperative to examine the lower middle-income countries separately like ECOWAS nations because it houses 73% of the world's poorest people in the world and major divers of the world's output growth are the low-middle income countries[28].

The study also incorporates the effect of social determinants of health outcomes such as prevalence of diseases (Malaria and HIV prevalence) environmental conditions, preventive healthcare or immunization, population dynamics (age, income, etc.) in the analysis.

With this knowledge, it is essential for the study to add to the knowledge of the policy makers, domestic government official, Health Professionals, Health economist, economist analyst and Ministry of health, the essence of appropriate allocation of total healthcare expenditure (Health Investment) and its impact on health outcomes of the citizens and the economy at large. Also, the study serves as a pointer to the essence of investment in health and increase in budget allocation to health sector and a workable policy to implement relevant policies, programmes and agreements between government and various healthcare workers which is lacking in developing countries which any country that fails to do this, tends to lead to employee industrial action and a periodic refusal to provide healthcare services to the sick. This study serves as a template to help to examine the link among healthcare expenditure, health outcome and Economic growth in ECOWAS.

Also, the findings of the study are relevant to present and future researchers as it serves as a database to the existing body of literature. Finally for the students, the study serves as resource materials that would enlighten issues on health sector happening in ECOWAS.

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1.7 Scope of the Study

This study examined and assessed the relationship among healthcare expenditure, health outcomes, and economic growth in the ECOWAS region, which includes all fifteen (15) member states, Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. These countries are all politically independent, they are connected geographically and culturally, and have similar economic interest.

The study concentrated on the following variables: Life expectancy at birth, Infant Mortality Rate, Maternal Mortality Rate, Under-Five Mortality Rate, Domestic Private Healthcare Expenditure per capita, National Healthcare Expenditure per capita, Domestic Public Healthcare expenditure per capita, External Healthcare expenditure per capita, Gross Domestic Product per capita.

The study uses panel data covering the period 2000 to 2020. The time frame was considered based on the availability of data and the chosen nations represent 100% of the entire population.

1.8 Limitation of the Study

This study investigates the link among healthcare expenditures, health outcomes and economic growth in ECOWAS between the period of 2000 and 2020. The choice of this study period is based on the availability of data from national and international institutions. The secondary source of data employed in this study is not within the control of the researcher. For instance, there is an incomplete data on health professionals and availability of health facilities in WDI, that is, Number of physicians per 1000 people, Number of hospital bed per 1000 per people

1.9 Operational Definitions of Terms

Human Capital: Human capital includes assets like education, training, intelligence, skills, health, and other things employers value such as loyalty and punctuality

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Gross Domestic Product Per Capita: This is the measure of the total output of a country where the Gross Domestic Product is divided by the total population in the country. It is a sign of economic productivity and an indicator of the standard of living.

Health Expenditure: Health expenditure includes all expenditures for the provision of health services, family planning activities, nutrition activities and emergency aid designated for health, but it excludes the provision of drinking water and sanitation.

Domestic Private Healthcare Expenditure: This indicator describes the role of private sector in funding healthcare relative to public or external sources. This indicates how much is funded domestically by the private sector which stems from households, corporations and non-profit organizations. Such expenditures can either be prepaid to voluntary health insurance or paid directly to health care providers

Domestic Public Healthcare Expenditure: This is an expenditure on healthcare incurred by public funds. It is a care provided by State, Regional, Local government bodies and social security schemes or administration

Per capita total expenditure on health: This indicator is defined as the per capita total expenditure on health, expressed at the average exchange rate for that year in US$. It shows the total expenditure on health relative to the beneficiary population, expressed in US$ to facilitate international comparisons.

Out-of- Pocket Health Expenditure: Household out-of-pocket expenditure on health comprise cost-sharing, self-medication and other expenditure paid directly by private households, irrespective of whether the contact with the health care system was established on referral or on the patient's own initiative. This indicator estimates how much are households in each country

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spending on health directly out of pocket. It estimates the share of out-of-pocket payment of total current health expenditures.

Health Outcomes: Changes in health status (mortality and morbidity) that result from the provision of health (or other) services. This means long-term objectives that define optimal, measurable, future levels of health status, maximum acceptable levels of disease, injury, or dysfunction, or prevalence of risk factors in areas such as improving the rate of immunizations for infants and children to ninety percent and controlling and reducing the spread of ailment and that are stated in the public and private health improvement plan.

Life expectancy at birth: Life expectancy at birth is defined as how long, on average, a newborn can expect to live, if current death rates do not change. Life expectancy at birth is one of the most frequently used health status indicators. This indicator is presented as a total and per gender and is measured in years.

Infant Mortality Rate: Infant mortality rate is the number of infant deaths for every 1,000 live births. In addition to giving us key information about maternal and infant health, the infant mortality rate is an important marker of the overall health of a society.

Maternal mortality ratio: is the number of women who die during pregnancy and childbirth, per 100,000 live births. The data are estimated with a regression model using information on fertility, birth attendants, and HIV prevalence

Under-Five Mortality Rate: This is the probability of a child dying between birth and exactly Five (5) years of age, expressed per 1,000 live births.

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Chapter Two

Literature Review

This section presents the review of related concepts, theories, and empirical studies on healthcare expenditure, health outcomes, and economic growth in ECOWAS. Specifically, this section conceptualizes economic growth, health outcomes, healthcare and healthcare expenditure. Also, theories and empirics related to the topic of the study were discussed. Lastly, the gaps in literature reviewed were identified.

2.1 Conceptual Review

2.1.1 Economic Growth

The word "economic" and "growth" are combined to form the concept of economic growth. The management of the production factors is called economics. Growth also refers to an increase in scope, quantity, worth, or power. However, from an economic standpoint, "economic" and "growth" are used together to denote a rise in the average or standard of living for people. Growing the volume of goods and services produced in the economy over time is a consistent process of Growth. It was further highlighted that growth is tied to a sustained quantitative increase in a nation's per capita production along with an increase in labour force and trade volume[1]. This suggests that economic growth is the steady rise in an economy's output, followed by other variables that affect growth including infrastructure development, technical innovation, and human capital development[2].

Economic growth, which is quantified as the percentage rate of growth in the real gross domestic product, is the rise in the market value of the products and services generated by an economy over time after accounting for inflation [3]. Growth is the process of enlarging national economies (the macro-economic indicators), particularly the GDP per capita, in an ascendant but not always

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linear direction, with favorable effects on the economic-social sector, while development demonstrates how growth impacts society by raising the standard of living. Positive, zero, or negative economic growth are all possible. When the yearly average rhythms of the macro-indicators are higher than the annual average rhythms of population increase, positive economic growth is observed. Zero economic growth is reached when the annual average rhythms of growth of the macroeconomic indicators, particularly GDP, are equal to those of population growth. When population growth rhythms are higher than macroeconomic indicator rhythms, negative economic growth is observed[4].

Economic growth is a long-term increase in a nation's capacity to provide its population with an increasing variety of economic products, which indicates that the expanding capacity is dependent on rising technology and the institutional changes it necessitates. For the sake of this study, economic growth is defined as a steady rise in a nation's output and productivity, which indicates an increase in its potential GDP.

In general, there are two key drivers of economic growth: increases in both the workforce's size and productivity (output per hour worked). Either can expand the economy's overall size, but only substantial productivity growth can boost per-capita GDP and income. Another indicator an economy's highest sustainable level of economic activity is potential output or potential GDP. Growth in the potential labor force, which arises from domestic and international migration, and growth in the potential labor productivity, which arises from investments in human capital, are the two main factors that determine potential GDP growth. It is also important to note that improvements in labor quality increase productivity.

2.1.2 Health Outcomes

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Health outcomes are changes in health as a result of behaviors, specific investments, or healthcare interventions. A change in an individual's or a group's health condition that can be attributable to an intervention is measured by health outcomes. By employing precise measurements both before and after treatment, health outcomes of care will be used to assess the effect of the care process or intervention on the patient's life. It shows the current state of a county's health. They use metrics that reflect both the length of life and the quality of life to reflect the physical and mental health of community members. The availability of good jobs, clean water, and cheap housing are just a few of the many factors that affect health and have an impact on health outcomes. Programs and policies that are in place at the municipal, state, and federal levels have an impact on these health issues.

Indicators of health outcomes can be used to track population health. They show how many different factors, including social, environmental, and lifestyle ones that go far beyond the scope of the healthcare system, have contributed in this situation. These measurements have traditionally been primarily dependent on mortality information, such as life expectancy, standard mortality rates, infant mortality, and potential years of life lost. Where we reside, how much money we make, our color and ethnicity, and other factors all have a substantial impact on our health outcomes. Health outcomes are anticipated to improve as health expenditure rises, according to expectations.

2.1.3 Healthcare

One of life's most basic need is good health. For the purposes of this study, we will examine the fundamental ideas of health even as they apply to the context of the topic being studied. Definitions of basic concepts give people a common framework for understanding. Our daily lives revolve around feeling well, and the standard greeting, "How are you?" reflects this. We

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interact with individuals on a daily basis. Rarely a day goes by when we don't think about our health and then ask how the others around us are doing as we go about our everyday lives. However, it goes without saying that different groups and civilizations, as well as individuals and cultures, attempt to interpret the idea of health in various ways.

The quality of human capital, which is a prerequisite for economic progress, is determined by a number of important aspects, one of which is health. Based on this model, developing nations have made an effort to improve human capital by investing in public health, as well as in education and other social services. Human potential is enhanced and improved by education, health care, training, and investment in social services, which has a positive knock-on effect on economic growth [5,6].

People believe that being healthy is crucial for happiness, but how they define health depends on their social experiences, particularly in relation to their age, knowledge, and experiences with disease and other people. People place a high value on health because, unlike material possessions that may be beneficial to people's lives, which can be acquired via the use of money and power, health cannot be purchased. The development and expansion of the economy are fundamentally influenced by health. It is blatantly obvious that productive nations outperform underdeveloped ones [7]. Similarly, health is described as a durable stock that generates healthy time as an output for both market and non-market activities that provide utility and income, respectively [8]. Not just the absence of illness or disability, but also a complete condition of physical, social, and mental well-being is referred to as being in good health. As a result, health is considered as a resource for daily life rather than as the goal of existence [9].

Health drives economic growth and productive capital. A country gains far more from healthy inhabitants since the economy grows more quickly when the population is healthy than when it is

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ill. Furthermore, a country's capacity for growth is influenced by its level of health. In the form of human capital, health is viewed as a productive asset and an engine of economic growth. It is fair to presume that it is an essential component that can promote economic growth and development because it is a crucial predictor of the quality of human capital [10]. In this sense, determining the living conditions of a country or region depends heavily on its health. Health is seen as an input into and result of growth when it is improved in conjunction with other factors such as water, sanitation, and nutrition. Integrated socioeconomic upliftment based on improvements in health status is shown to be a reflection of ongoing development efforts aimed at promoting human welfare.

The term "healthcare" is used broadly to refer to the numerous systems that people rely on to maintain their personal health through treating (or preventing) ailments, injuries, diseases, and other physical or mental impairments. It includes medical practitioners, facilities, dental care, psychology, nursing, physical therapy, occupational therapy, and other professionals [11].

The healthcare process (preventative care measures, safe care, coordinated care, and engagement and patient preferences), access (affordability and timeliness), administrative efficiency, equity, and healthcare outcomes (population health, mortality amenable to healthcare, and disease-specific health outcomes) are all factors that go into determining the quality of healthcare. Access to healthcare is seen by many as a fundamental human right and go into creating the Universal Declaration of Human Rights [12].

The top healthcare nations in the world, according to the Legatum Prosperity Index (LPI) ranking index, are South Korea (82.72), Taiwan (86.72), Denmark (80.07), Austria (76.75), Japan (80.49), Australia (78.14), France (80.18), Spain (78.37), Belgium (75.49), and the United Kingdom (74.83)[13].

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2.1.4 Healthcare Expenditure

The term "health" has several different connotations depending on the context in which it is used and the individuals who use it. On the other hand, expenditure is the act of paying for something, particularly in cash for a good or service. It is well known that increasing population health has a favorable effect on society as a whole by bringing benefits to both people and communities. This shows, on the one hand, how higher human capital contributes to better economic participation, higher individual production, and higher living standards.

Studies have shown that health expenditure is an important factor in determining disparities in health outcomes and, consequently, economic growth. A vital part of the health system, health financing combines the financing and expenditure flows that are tracked throughout the system's functioning, from funding sources to distribution. The final consumption of health care products and services, including individual and group services, is measured by healthcare expenditure [8,14].

As a result, the term "healthcare expenditure" refers to the total amount spent on both public and private health care in a given year, measured in national currency units at current exchange rates. Recurrent and capital expenses from government (central and municipal) budgets, external borrowings and grants (including gifts from non-governmental and international agencies), and social (or mandatory) health insurance funds make up public healthcare expenditure. While out-of-pocket costs, health insurance through a corporation, or payments made directly to the healthcare provider by a household, a business, or a nonprofit organization make up private healthcare expenses [15].

The ultimate consumption of healthcare goods and services as well as capital investments in healthcare facilities designed to improve patient outcomes are measured by health expenditure. Organization for World Health, regardless of the major function or activity of the entity delivering

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or paying for the associated health services, healthcare expenditures are categorized according to their primary or predominant goal of promoting health[16]. Healthcare expenditure is further stated as one of the key determinants of the availability of healthcare facilities, necessities, and services, which in turn contributes to the achievement of good and quality health outcomes [17].

Recurrent and capital expenditures from government (federal, state, and local government) budgets, external borrowing, grants (including contributions from non-governmental and international organizations), and social (or mandatory) health insurance funds are all included in public health expenditure. The sum of governmental and private health expenditure is total health expenditure. However, it excludes the provision of water and sanitation [18]. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency help earmarked for health. In Sub-Saharan Africa [SSA], total health care expenditure, whether public or private, regardless of the source, would dramatically raise the infant death rate and life expectancy at birth [19].

A better state of health will contribute to fewer days missed from work and a lower burden of disease, which translates into lower costs for providing healthcare services, better coverage, and better management of the available resources. Investments in worker health are anticipated to improve and enrich the population's human capital and ultimately increase output [20]. Investment in health at the individual level, provision of healthcare infrastructure and the improvement, including healthcare personnel, constitute health investment. Hence, making available the healthcare facilities and personnel whereas individuals utilize these facilities improves their health status.

2.2 Theoretical Review

2.2.1 Theory of Healthcare Supply

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The burden of disease in some low-income regions, especially sub-Saharan Africa, stands as a stark barrier to economic growth and therefore must be addressed frontally and centrally in any comprehensive development strategy. Public health programs or the provision of "free" health services tend to redistribute resources toward the poor [21]. The theory of healthcare supply in its perspective under sees the divergence in the organization and behavior of hospitals which is different from the usual theory of supply. Like in the normal market structure (perfect competition), where both sellers and buyers have complete information about the market or product, in this case, the consumer lacks complete knowledge in the healthcare market which thereby gives the producer the monopoly power in such a market.

A scholar examined the theory of non-profit making hospital behavior and suggested that non-profit making hospitals maximize both quantity and quality in light of zero profit. And the discovery from the study was that the production is either for pure profit or pure patient welfare motivation. And the conclusion from the study is based on the fact that the decision-makers of the hospitals are assumed to have two major objectives which they aim to achieve: these are the quantity and quality of healthcare delivered [22]. Furthermore, that the demand curve for healthcare shifts upwards as the quality rises because quality healthcare is of a greater significance to the consumer, as individual needs the supply of healthcare he can trust and only the non-profit hospitals can provide such services as maintained [23].

In the same view, it was posited that non-profit making hospitals compete for public goodwill which is demonstrated in their provision of healthcare to poor or indigent patients. These hospitals show no change in their operation margin even when faced with profit competition; which implies that non-profit hospitals pursue output maximization. Thus, the non-profit-making hospitals measure the quantity in the number of cases treated but much more concerned about the quality in

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the type of healthcare given to patients. In that, the operation of non-profit hospitals, quality is an important factor. This implies giving the patient the best treatment which means giving the very best quality of input, especially a doctor committed to having the best interest of the patient at heart [24,25,26].

2.2.2 Theory of Healthcare Demand

The demand theory is predicated on the idea that a person is capable of rationally selecting amongst various bundles of commodities and services in order to maximize his utility. The consumer's knowledge of their real state of health and the impact of an alternative treatment on that state is likely to diverge from the traditional assumption of the consumer's theory in this case, where the idea of demand in the health market is different from that of the ordinary market (theory of demand). The information and freedom that the consumer in the regular market demonstrates are not available to the consumer in the health market. Human capital is a resource whose stocks rise as a result of increased health, education, and learning/training practices. Sustainable growth depends on these factors.

A study simulated the actions of utility-maximizing people whose healthcare costs are covered by a straightforward insurance policy. The customer is covered for a set percentage of healthcare in their appraisal of the demand for healthcare [27].

Using CP_u per unit of healthcare

Where C = proportion of the cost of care.

P_u = market prices

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For each unit of healthcare, it was explained that a consumer requires an input of time (t) valued at an opportunity cost (W) per unit.

Therefore, they arrived at the total cost of healthcare as;

$CP_u + W_t$ per unit of time and the demand for healthcare is given by;

$Dh = f(CP_u + W_t)$. where;

Dh = demand for health

CP_u = money cost of health care

W_t = time cost of healthcare

The relationship between the amount of healthcare that is needed and its cost is the focus of the field of health care demand. The theoretical discoveries of Grossman are largely responsible for the current advancements in healthcare demand research. The main tenet of Grossman's argument is that the demand for healthcare is derived. In his research, he made the underlying assumption that an individual's state of health is endogenous and is dependent on the resources allotted to its creation and upkeep. Since it affects how much time an individual has to devote to the creation of other goods and services, health is expected as a factor in the direct utility function of the person as both a source of benefit in and of itself and as capital or investment good.

The demand for health emphasizes the fact that in addition to price, there are many other elements that affect the shadow price of health, such as the impact of consumer time and insurance. In general, the demand for healthcare suggests that if healthcare costs are reduced, this would also affect consumer demand for healthcare. This means that when the cost of healthcare in a country's economy declines over time, the demand for healthcare among its citizens will rise above what it was at the period when the cost of healthcare was high. Additionally, as a result of cost-saving

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measures taken by policy execution, an economy's expenditure on the population's health rises in proportion to the population's increased need for healthcare. A conclusion was that good health is a reliable investment that yields a good time. This theory is very significant since it supports the study and shows the value of government expenditure on health.

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2.2.3 Grossman Human Capital Model

The model's main premise is that health can be thought of as a long-lasting capital stock that generates an output of healthy time. The model is comparable to those that have been used to calculate wage rates to account for human capital. It is assumed that people have an initial stock of health that wears out (depreciates) with age and can be increased through investment; in other words, the stock of health (H) provides opportunities for utility and/or production. Health lasts for several periods of time but needs investment because it wears out (depreciates). Individual activity has an impact on one's health status and lifespan in this paradigm. Stocks of knowledge and health both impact market and non-market productivity, as well as the overall time required to produce goods and wages.

"Gross Investments in health capital are produced by household production function whose direct inputs include time of consumer and market goods such as medical care, diet, exercise, recreation and housing. The level of health of an individual is not exogenous but depends on the resources allocated to its production".

Diet, exercise, and routine doctor visits can all help people improve their health, but they all take time and money. Therefore, it is not ideal to devote all of one's time to improving one's health

because doing so (i)would prevent people from working and earning money to buy products and services during their lives, and (ii) would prevent them from having leisure time to enjoy it. Individuals will inevitably choose between leisure time and purchasing other things over time and money spent on medications, doctor appointments, etc. Additionally, the amount of health investment that can genuinely have a long-term impact probably has a finite upper limit.

This model concludes that productivity is unaffected by health is an intriguing one since it makes the unusual assumption that productivity and wage rates are affected by human capital rather than health, which in this model simply impacts working hours per day.

In the Grossman model, health plays the role of a consumption good that directly affects the utility function for each period. Health also plays the role of an input into production because it is utilized to create productive time, which is then used to produce. Health is a type of capital; it builds up and can depreciate over time. The model makes the following predictions: First, more money will be spent on medical supplies and services. According to the model, people will invest more in health-related activities and medications as they get older because they anticipate that health stock may decline more quickly as people age. Second, the model predicts that high-wage earners will spend more on medical supplies and services than on time to improve their health. A greater ideal stock of health would be required if education increases the efficiency with which gross investments in health are produced.

The Grossman model is crucial for highlighting the difference between demand for health and demand for healthcare as well as for illuminating the fact that health is both an investment and a consumption good [28].

2.2.4 Wagner's Theory of Government expenditure

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The law of growing state activities, an essay that concentrated on the analysis of Western Europe's activities at the end of the 19th century, is where the Wagner's theory of government spending got its name from. It was produced by a German economist by the same name. According to the notion, a rise in industrialization and development is correlated with an increase in government spending. According to Wagner, as industrialization progresses, income rises, increasing people's per capita income inevitably. As overall expenditure rises, the proportion of government spending grows invariably as per capital income rises. The rationale behind this is that as society develops, social vices would follow along, increasing the strain on government spending. The theory proposes that during industrialization, the majority of private sector activities will be replaced by public sector activities, which explains why the law cited that "The advent of modern industrial society will result in increasing political pressure for social progress and increased." The state's administrative and defense capabilities will improve as a result. Additionally, as a result of industrialization, the government is required to offer some fundamental needs (which include cultural and welfare services) such education, health care for the elderly or retirees, food subsidies, environmental protection, disaster relief, and other welfare services. Additionally, industrialization results in the consolidation of large businesses into cartels or monopolies. The government must therefore spend more money on social and merit goods to counteract the trend for monopolies in these sectors.

According to theory, the growth in national income serves as an exogenous determinant of government spending. As a result, the model assumes that there is a one-way relationship between government spending and economic growth.

2.2.5 Health Belief Theory

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This theory has been cited as one of the oldest and most important theories in health promotion. It was motivated by a study of the justifications people gave for requesting or rejecting X-ray tests for tuberculosis. Four constructs were first included in the theory:

(1) Perceived susceptibility (an individual's subjective estimation of their risk of developing the ailment, as opposed to the statistical risk)

(2) Perceived seriousness (the seriousness of the condition and its consequences)

3) Perceived obstacles (intervention that will promote and facilitate adoption of certain behavior),

(4) Perceived expenses associated with following the suggested intervention.

The first two constructs are known as psychological illnesses, whereas the second two are motives for intervention-centered treatment. In the 1970s and 1980s, the theory was revised to take into account patients' reactions to symptoms and disease as well as their compliance with prescribed treatments. Preventive healthcare, health promotion, health education, and screening are all included in the theory's directives and interventions. The theory now contains additional units of analysis,

a) such as Age, gender, ethnicity, and occupation are examples of demographic characteristics.

b) socio-physiological elements such socioeconomic standing, personality, and coping mechanisms

c) Perceived self-efficacy, which includes the capacity to engage in the desired conduct

d) signals to action, such as information presented, persuasive communication, personal experience, and health intervention programs that lead to preventative health.

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e) factors that influence health decisions, such as perceived threat and control [30].

Although the theory was initially developed to predict client behaviors who were severely or chronically unwell, it has since been applied to predict general health behaviors (both negative and positive health outcomes). A health-related action or intervention is more likely to be taken when it is judged to be both cost- and outcome-effective [31,32]. The HBT has come under fire because not all health behaviors are the result of conscious or deliberate decision. A specific strategy for change's accompanying concepts is also missing from the HBT [31]. The theory was unable to offer a structural equation expressing how health interventions and health outcomes relate to one another. However, because this study focused on health interventions and health outcomes, HBT only partially applies to it. There are numerous methods by which health interventions can be carried out. Despite this, HBT connected health interventions to screening, education, and preventative care. Government spending, international and private donations, health aid, and other forms of action in the health sector are also possible. These approaches offer patients with access to health infrastructure, medications, and staff training, which results in a decrease or eradication of disease and an increase in overall health outcomes. The analysis of some HBT elements shows that the theory is a viable theory for the investigation.

2.2.6 Intervention-Based Theory

This is a theory of health promotion that consists of three overlapping intervention spheres of activity, such as health education, disease prevention, and health protection. Health education aims to alter people's knowledge, attitudes, and behaviors in a way that promotes positive health outcomes. Disease prevention, which covers primary, secondary, and tertiary prevention, tries to reduce risk factors and lessen the effects of diseases. In order to prevent illness and improve

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wellbeing, health protection places a strong emphasis on financial or legal regulations, rules, and voluntary standards of conduct[33].

The approach highlights that governmental policies, public investment that addresses equitable access to health infrastructure, distribution of pharmaceuticals, employment, education, and health care are all part of protecting people's health. The lack of a comprehensive explanation of monetary or legal constraints and regulations in the theory has drawn criticism. A better mathematical and statistical examination was not possible because the theory could not model its state. The proposition, however, provides support to the study as one of its objectives is to examine the impact of healthcare spending on health outcomes because it tangentially explains the relationship between health prevention (which may be in the form of public spending, foreign and private donation, aid, health-education orientation, etc.) and health outcomes.

2.2.7 Momentum Theory

One of Bonnie Rain Gruber's most current theories in health promotion is called momentum theory (MT). The theory incorporates concepts from the Life Course Development Model, Diffusion of Innovations Theory, Health Belief Theory, Theory of Planned Behavior, Trans-theoretical Theory, Ecological Systems Theory, Salutogenic Theory, and Newton's Second Law of Motion in addition to Fender's Health Promotion Model. The theory's concepts include:

1. momentum
2. Resistance to change
3. Motivating factors for action
4. factors that continuously encourage change
5. factors that aid in overcoming plateaus where change appears to stall

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6. Usual routines.

The quantity and forces necessary to enhance the current healthcare system and build new ones are referred to as momentum. As a result, regularly improving health behaviors and systems includes not only self-sustaining elements but also public, commercial, and international initiatives. Momentum also states that significant effort is needed to start a health system transition in order to guarantee better health results.

Roadblocks to change are anything that hinders, obstructs, or gets in the way of an effective healthcare system. Roadblocks to change include, for instance, the need to change rather than the desire to change, a lack of commitment to public plans and policies, time restraints, and competing objectives that prevent the development of the health system. Other contributing variables include a steadfast reliance on harmful implementation habits, laws, conditions, or policies that harm health or thwart change, environmental or psychological cues that urge one to make unhealthy decisions, and a lack of funds or resources. Those elements that inspire one to start a transformation are known as the "forces that get the ball rolling." Examples comprise:

a) perceived threat to one's health or daily activities that are connected to supporting and maintaining one's current health condition, which are typically paid for out-of-pocket in most cases.

b) support, enthusiasm, or guidance from important others, such as healthcare professionals, non-governmental organizations, the government, or the business sector (foreign or domestic)

c) one's surroundings

d) The distinct advantages of the upgraded health system and the perception of forthcoming advantages that will result from its modifications.

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Factors that assist a person in maintaining behaviors that support their health-related goals are those that offer ongoing motivation for improvement. These factors can be any of the ones mentioned above that set the ball rolling or a sense of purpose, focus, or meaning felt during the change process.

The forces that give motivation to continue on course and persist despite a lack of progress in the following areas are among those that aid a person in getting over the stage where change seems to slow down:

a) Providing an adequate healthcare system

b) a significant financial or emotional commitment to the anticipated transformation

c) enjoyment brought on by the new healthcare system.

Habit patterns, which have an impact on both an individual's health and the overall health system, are attitudes or habits formed via repeated experiences or acquired through one's family or social, cultural, environmental, or economic background. Habitual practices that support or hinder the health system and its effects can be conscious or unconscious.

Momentum theory covers a wide range of health promotion topics. The relationship between government intervention, other types of intervention, and health outcomes is nonetheless partially explained. For instance, it acknowledged public, corporate, and foreign interventions as ways to enhance health systems in its idea of momentum. Health outcomes also increase as a result of improvements made to the health system.

The theory's "roadblocks" idea also acknowledged poor implementation practices, a lack of resources or money, and a lack of commitment to public plans and policies as factors impeding

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health system reform. These gave major weight to public, corporate, and foreign agent spending and interventions as a way to enhance health systems and outcomes.

Momentum theory recognized intervention of various forms (for example, coaching from healthcare providers, non-government organizations, government, private sectors (foreign or domestic), including out-of-pocket expenditure as strong factors that contributes to improvement and PR. Momentum theory (MT), which focused on various types of health interventions and how those interventions might improve the health system and the health outcomes, partially applies to the study under evaluation, just like the Health Belief Theory (HBT) and Intervention-Based Theory (IBT).

Health interventions can be carried out in a variety of ways in practice. For instance, government spending, foreign and private donations, aid, a focus on health education, etc. are all examples of health interventions. Through these measures, patients can access drugs, health infrastructure, seminars and conferences, and training for healthcare professionals, all of which have a significant positive impact on the prevention or cure of diseases as well as the improvement of general health outcomes.

2.2.8 Endogenous Growth Theory

The key tenet of the Endogenous Growth theory is that, unlike land and capital, knowledge is not subject to decreasing returns. This theory is strongly identified with American economist Paul Romer. It is crucial to remember that this knowledge relates to people. According to the notion, people's insatiable wants and desires encourage economic growth and rising productivity. Additionally, it was asserted that the pursuit of profit by individuals will result in a constant rise in Real Gross Domestic Product (GDP) per person. In other words, endogenous growth theory assumes that public desires and needs will sustain economic growth and productivity. Therefore, a

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focus on human development is considered as a fundamental driver of economic development, which emphasizes the significance of government investment in human capital with regard to economic development goals (development of education and health skills). The theory is predicated on the notion that advances in innovation, knowledge, and human capital result in greater productivity, which has a favorable impact on the outcome of the economy. This growth theory differs fundamentally from other growth theories in that it openly attempts to model technology rather than believing it to be exogenous. According to this growth theory, internal economic variables, rather than external ones, are to blame for economic growth.

The ability of an economic organization to use its productive resources more efficiently over time, which is essentially what technological advancement is, is what drives economic growth most often. The process of learning how to operate newly invented production facilities more productively, or more generally, the process of learning how to deal with the rapid changes in the structure of production that industrial progress must imply, accounts for a significant portion of this ability. Growth models that attempted to model technology rather than assuming it to be exogenous created technological changes as an explanatory variable. According to the theory, technological advancement is an essential component of growth and is endogenously determined. Regarding the variables that drive technological advancement, growth is influenced by both human capital and technology[34,35,36].

The amount of people searching for new innovations or technologies and the intensity of their searches determine whether or not they materialize according to the hypothesis. People will opt to increase human capital and look more frequently for new innovations if the profit is significant.

The Economist believed that human capital was a driver of economic growth and that endogenous growth resulted from the non-decreasing marginal return of human capital, whereas Romer

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believes that technological advancement is to blame. Romer adopted an accounting strategy that resulted in the following expression of the aggregate production function:

$$Y = K^{\alpha}(AL)^{1-\alpha}$$

Where, Y = output; k = capital stock; α = share of capital in output; AL = effective labor; 1-α = share of effective labour in output.

The model assumed that research creates technological knowledge. Which is expressed in a simpler form as;

$$dA/dt = \delta HA$$

Where; HA = human capital

δ = is a parameter.

This equation only illustrates how the pace of human capital growth determines the rate of technological advancement. The fact that is positive demonstrates that a country's economy will expand considerably more quickly if its overall stock of human capital is higher.

According to the endogenous growth theory, supporting health services is a crucial component of human capital that will enhance overall economic growth since it will increase both the accessibility of health care for the poor and the utilization of health services in developing countries.

2.3 Review of Empirical Studies

The importance of health to the development and economic prosperity of people and countries is being acknowledged more and more on a global scale. The literature review is organized around empirical studies that looked into three important relationships that will help to shape the study's

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empirical questions. The assessment of the connection between healthcare expenditure and economic expansion opens this section. The review of the relationship between health outcomes and economic growth, the empirical reviews relating the three variables, and the empirical literatures looking into the effect of health expenditures on health outcomes follow.

2.3.1 Healthcare Expenditures and Economic Growth

Both emerging and industrialized nations have extensively studied the connection between public health expenditure and economic growth. The empirical findings typically imply a favorable correlation between health expenditure and economic expansion.

A study looked at the effect of health spending on Nigeria's economic expansion. This utilized the OLS in the same way. Contrary to research that found a substantial and positive association between health care expenditure and economic growth in Nigeria, the study observed a negative influence of total health expenditure on growth[37]. In the same vein, a study that looked at the effect of health expenditure on economic growth over the period of 1985–2009 using ordinary least square (OLS) examined suggests that if funds are properly channeled and appropriate expended to both the recurrent and capital projects in health, the existence of a positive relationship between economic growth and health will be more widened [38].

Using multiple OLS regression, another researcher confirmed the link between health spending and economic growth in Nigeria. The findings indicated that labor force productivity, total health expenditure, and gross capital formation are significant determinants of economic growth in Nigeria, while the life expectancy rate has a detrimental effect on growth for the 1970–2010 study period[39]. The primary finding of the study was that health has beneficial, statistically significant benefits on economic growth. This was determined by estimating the production function of aggregate economic growth as a function of capital stock, labor, and human capital (education,

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experience, and health). The study's flaw, however, is that it did not take into account how health is formed [40].

In order to examine the effect of government expenditure on health on economic growth, a study on the relationship between health and economic growth was carried out for the period of 2004–2015 using an integrated sequential dynamic computable general equilibrium (CGE) model. The reorientation of government spending toward the health sector was found to be crucial in explaining economic growth in Nigeria [41].

Another study that used the Error Correction Model examined the connection between Nigeria's economic growth between 1970 and 2009 and health expenditure. The results showed a statistically significant positive association, whereas the coefficients of the second and third lags are statistically significant negative [42]. Some researchers used the Multivariate co-integration technique to look at the association between healthcare expenditure and economic growth in Nigeria during the same coverage period. The research found at least one co-integrating vector that described the long-term connections between population increase, foreign aid, health expenditure, and economic growth [43].

For the period of 1980 to 2010, some researchers looked at Nigeria's health expenditure and economic growth using the ARDL Bounds test and the Granger causality test. The findings showed that health expenditure and economic growth have a long-term relationship and that there is a unidirectional causal relationship between the two [44].

Using Gross Domestic Product (GDP) as a proxy for economic growth as the dependent variable, a researcher empirically investigated the relationship between government health expenditure and economic growth in Nigeria. To analyze the data, the researcher used an error correction mechanism and Ordinary Least Squares Regression. The findings showed that there is a positive

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and substantial relationship between the dependent and independent variables. In order to maintain sustained economic growth, it was determined that Nigeria needed to enhance the budgetary allocation to the health sector and that the dispersed money needed to be used correctly because it affected the interests of the citizens, particularly those in rural areas [45.]

A study upheld the health expenditure-led growth hypothesis, which states that expenditure on health causes growth, and rejected the feedback hypothesis between public health expenditure and economic growth in Nigeria. the variables were examined using the Granger Causality test and Johansen's cointegration rank test over the period of 1970 to 2013. It was advised that Nigeria should think about boosting budgetary allocation to the health sector and that it should be allocated and used properly [46].

A significant and favorable long-term association between public health expenditure and economic growth was found by other studies using the same methodology and factors. After examining data taken from Central Bank of Nigeria (CBN) Statistical Bulletin and Annual reports for the years 1981 to 2013, the study also recommended that Nigerian policymakers give the health sector more attention, increase its budgetary allocation, and ensure the usage of the allocated fund as transparently as possible [47].

A study reexamined the relationship between public health expenditure and economic growth in Nigeria within the perspective of Wagner's theory of constantly expanding State activities in response to inconclusive arguments on the impact of public health expenditure on economic growth. The study found proof of a long-term link between public health spending and economic expansion. The findings of the Granger-causality test showed that there is a one-way causal relationship between real GDP and health expenditure as a percentage of total government expenditure and population but neither a one-way nor a two-way relationship between public

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health expenditure and GDP. The study suggested that in order to increase funding for the health sector and achieve the necessary impact of health care expenditure on economic growth in Nigeria, health insurance coverage should be expanded to cover more individuals [48].

The co-integration links between economic growth and health care expenditure were also investigated in developing nations between 1990 and 2009 utilizing panel cointegration and causality in VECM framework. The findings showed that there is a short-run causal association between GDP and health care expenditure, as well as a bilateral causal relationship and long-term relationship between economic growth and health expenditure. The study's conclusions showed that, over the long term, income has a significant impact on the increase of health care expenditure in emerging nations. Thus, the notion that health-led growth promotes economic development in poor nations is supported [49]. Similar research was conducted in Cameroon from 1988 to 2013 on how investments in public health contributed to the country's economic growth. Estimates were made using the Vector Error Correction Model (VECM), and the results showed that public health investments only have a long-term impact on Cameroon's economic growth. This suggests that public health investments spur economic growth over the long term by effectively allocating resources. Government expenditure on health should rise to 10% or 15% of the annual budget, as mandated by the African Union and the World Health Organization, respectively. Additionally, there is a need to improve the private sector's delivery of healthcare services and raise the standard of those services [50].

Another study looked at the relationship between health expenditure and economic growth in Algeria from 1960 to 2016. Granger causality and the Autoregressive Vector model were used to analyze the variables. The results demonstrate a short-term positive relationship between health

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expenditure and economic growth, and the study concluded that more investment in the health sector is necessary to raise Algeria's economic growth indicator [51].

Toda and Yamamoto's granger causality test was used by certain researchers in emerging economies in Europe, the Middle East, Africa, and Asia to analyze the relationship between healthcare expenditure and economic growth from 1995 to 2013. The Czech Republic and Russian Federation demonstrated two-way (bidirectional) causality, according to the analysis. While data from Greece, Poland, the United Arab Emirates, China, Indonesia, and the Korean Republic supports the income view over the health view, findings from Egypt, Hungary, the Korean Republic, South Africa, and the Philippines support the health view over the income view. Thus, it was determined that income plays a significant role in explaining the disparity in healthcare expenditure between nations [52].

Reports have it that only around one-third of total health spending comes from the government. This prompted researchers to examine the factors that influence government health expenditure and the differences between nations in Sub-Saharan Africa between 1995 and 2015. It was found that there are variances across the subgroups and a favorable overall trend in the growth rate of government health expenditure in sub-Saharan Africa. Government expenditure and government health expenditure were also positively correlated. The researchers came to the conclusion that a country's policy decisions have an impact on how much money the health sector receives and provide justification for encouraging domestic government health spending [53].

A study using the dynamic panel threshold approach explored whether the connection between out-of-pocket health expenditure and poverty was dependent on a specific threshold level of out-of-pocket health expenditure from a sample of 145 countries ranging from 2000 to 2017. Results supported the estimated models' findings that, compared to wealthy countries, out-of-pocket

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health expenditure increased poverty in developing nations. The study came to the conclusion that developing countries' healthcare systems should be improved in order to reduce poverty and maintain acceptable levels of out-of-pocket medical expenses[54]. Another study used Mauritian household data to estimate the income elasticity of out-of-pocket healthcare expenditure using an Engel curve framework for the years 1996 to 2017 and a pseudo-panel technique. The finding that out-of-pocket healthcare demand in Mauritius is not a luxury but a need indicates that the income elasticity of out-of-pocket healthcare expenditure is below unity. In spite of the fact that Mauritius offers free universal healthcare, the proportion of out-of-pocket medical expenses in total household expenditure has been rising over time [55].

The analysis of the relationship between health care expenditure and economic growth using the system General Method of Moments (GMM) technique over the period of 1995–2014 revealed that health expenditure has a significant impact on the economic growth of the in Sub–Saharan Africa region. That is, there is a relationship between the two variables that is both positive and statistically significant. The study came to the conclusion that developing effective and efficient health care programs, raising health expenditure, utilizing the youthful population effectively, and improving the climate for foreign direct investment were essential for promoting economic growth in Sub-Saharan Africa [56].

A panel ECM-based Granger causality model was used to further examine the correlation between health expenditure and economic growth in Sub-Saharan African nations from 2008 to 2017. Low-income and middle-income countries were distinguished in the study. It was discovered that when private health expenditure is used as a proxy for health expenditure, it is vice versa when public health expenditure is used as a proxy for health expenditure. In low-

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income countries, there is a unidirectional causality flow from health expenditure to economic growth, but there is no causality in middle-income countries [57].

Using the Panel Autoregressive Distributive Lag (PARDL) technique, research on the relationship between health financing and economic performance (measured by per capita GDP) in the 15 ECOWAS member countries from 1985 to 2017 reveals that both private and public healthcare expenditure were statistically significant for increasing output per capita over time. The study also made note of the implicit effects that other socioeconomic covariates, such as the price level of capital formation and population growth rate, had on output per capita in the Sub-region. All significant stakeholders should devote more time and money to improving it was determined [58].

Health expenditure and Gross domestic product per capita are found to be cointegrated in a panel data analysis for 14 Southern African Development Community (SADC) nations over the period 1995-2012 [59]. Additionally, it has been shown that rising healthcare costs are positively correlated with economic performance, suggesting that a healthy population boosts the nation's economy as a whole. This was discovered by utilizing Visual Analytics to investigate the relationship between public health expenditure and economic performance across the US from 2003 to 2014. The study came to the conclusion that investing wisely in many facets of healthcare will increase income, GDP, productivity, and lessen poverty[60].

Comparative research on the effects of health expenditure was done between the CEMAC sub-region and five other African nations that adhered to the Abuja Declaration. And the findings demonstrated that health spending had a favorable and considerable impact on economic expansion. Additionally, for both sets of countries, there is a long-term correlation between health expenditure and economic growth [61].

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2.3.2 Health Outcomes and Economic Growth

Using data from 170 nations spanning the years 1990–2010, a study explored the relationship between economic growth and mother and child health. It was shown that there is a stronger causal relationship flowing from maternal and child health to GDP than there is between GDP and maternal and child health [62]. While a different study looks at the long-term association between health outcomes and economic growth in Nigeria between 1961 and 2012. The Granger causality test demonstrates a unidirectional causality running from health outcome as measured by life expectancy and crude death rate to economic growth [63]. They discover a long-run relationship between health outcome, as measured by life expectancy and crude death rate measures, and economic growth.

Using the VECM, Granger causality test, and Johansen-Juselius co-integration test, the impact of health on economic growth in Nigeria from 1980 to 2013 was investigated. The Granger causality conclusion shows a one-way association between Nigerian economic growth and health metrics. According to the findings, the government should allocate more money to the health sector, create plans for policing how the money is used, and raise people's understanding of the range of health services that are available [64]. In a similar vein, Co-integration and Granger causality approaches were used to investigate the relationship between health and economic growth in Nigeria from 1995 to 2009. It was discovered that economic growth is ultimately influenced by health indices. The per capita GDP is because of the health indicators [65].

In order to compare the health care systems of the BRICS (Brazil, India, China, Russian Federation, and South Africa) developing countries, a study used the panel data regression with fixed effects model. The findings indicate that while there is a positive correlation between health outcomes and GDP per capita, adult literacy rate, and out-of-pocket spending, there is a negative correlation between health outcomes and age dependence ratio when it comes to environmental

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pollution. Similarly, a favorable relationship between public health spending and infant mortality rate was discovered[66].

The dynamics of economic growth, energy consumption, and health outcomes were examined in a few Sub-Saharan African (SSA) countries using annual data from 1990 to 2014 and a panel vector auto-regression model. The results showed that neither economic growth nor energy consumption was found to have a significant impact on health outcomes. However, in SSA, the cost of healthcare continues to play a significant role in determining health outcomes. There was no proof that the use of energy or economic growth caused the outcome of health, nor was there any proof that any of these factors caused the other. The importance of health expenditures in economic development was the study's main finding[67]. A re-examination of the relationship between health and growth was conducted using an unbalanced panel of 17 advanced economies for the years 1870–2013. In order to account for endogeneity difficulties, the panel generalized method of moments estimator was used. Life expectancy, a proxy for population health, has a positive and significant impact on real per capita income as well as growth. Schooling, a proxy for human capital, and real per capita income both have a positive and significant link. This has the consequence that by concentrating policy attention on population health, per capita income can be increased [68].

2.3.3 Healthcare Expenditures on Health Outcomes

The amount of funds a country invests and spends on health care has a direct correlation with the rate of economic growth. Forecasting a nation's wellbeing in terms of its level of health preparation depends on an understanding of the interactions and underlying relationships between health expenditure and national development.

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Using an autoregressive distributed lag model, an error-correction model, and a time series panel, the study examines the impact of public healthcare expenditure on economic development in South Africa between 1996 and 2016. The empirical results show a positive correlation between public health spending and the country's Human development index. Based on the results, the study came to the conclusion that health investment may boost health workers' salaries and offer better working environments and facilities to save lives [69]. The South Asian Association for Regional Cooperation was the subject of the study, which looked at the relationship between healthcare expenditure (Public, Private, and Total) and health outcomes (Life expectancy at birth, crude death rate, and infant mortality rate) (SAARC).

The study used Fixed and Random effect models for 15 nations from 1995 to 2014 to determine the relationship between healthcare expenditure and health outcomes. The findings showed that healthcare spending greatly decreased newborn death rates. Since private healthcare spending had a bigger impact than public healthcare expenditure, the study came to the conclusion that health spending in SAARC should be increased in order to improve population health. Additionally, it's important to employ public health funding wisely and effectively and to implement the right strategies for enhancing sanitary facilities[70].

Regression analysis was used to investigate the impact of public health expenditure on maternal mortality using data collected from roughly 25 chosen states between 2003 and 2015. It was discovered that public health spending was a key element in lowering the incidences of maternal death using the instrumental variables approach as a panacea to the econometric problem of endogeneity. In order to enhance health outcomes, the study advocated higher expenditure in the health sector[71].

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In a study conducted in Nigeria between 1980 and 2015, the association between life expectancy and government spending was investigated using the Vector Autoregressive Distributive Model (VAR). Results indicate that the growth rate of output had a small but indirect influence on life expectancy. Additionally, factors in control like carbon dioxide emissions and the number of doctors have a big impact on life expectancy. According to the study, government spending on healthcare should be raised, and forestation should be encouraged to minimize carbon dioxide emissions, in order to achieve high and sustainable life expectancy[72].

After conducting a study on health expenditures and health outcomes in Africa and providing econometric evidence linking African countries' per capita total as well as public health expenditures and per capita income to two health outcomes: infant mortality and under-five mortality using data from 47 African countries, it was discovered that healthcare expenditures have a significant impact on infant mortality and under-five mortality. The findings showed that overall health spending is undoubtedly a significant factor in health outcomes. In Sub-Saharan Africa, infant and under-five mortality were found to be positively correlated with health outcomes, while in North Africa, HIV prevalence and ethno-linguistic fractionalization had a positive impact on health outcomes, while higher physician populations and female literacy had a negative impact on health outcomes [73].

Using pooled data from 40 Asian nations, a study used a quantile-on-quantile approach to quantify the impact of healthcare quantiles on economic growth quantiles. According to research, an increase in healthcare spending's quantile does not necessarily mean that the economy would expand faster. Additionally, when the economies of nations experience sustained economic growth, both a positive and negative association between healthcare spending and economic growth will develop[74]. After adjusting for other significant explanatory co-variables like per

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capita income, female illiteracy, and urbanization, an analysis of the relationship between public health spending and infant mortality rate was conducted using a panel data set of Indian states between 1983–1984 and 2011–2012. It was discovered that public spending on healthcare lowers the infant mortality rate, and that female literacy and urbanization also do so [75].

Using time series annual data for 33 years (1981–2013), a study examined the effect of federal government healthcare expenditure on Nigerian economic growth. The ordinary least square method (OLS) of data analysis was used, and the data properties were tested for unit root using Augmented Dickey Fuller. The findings indicate a favorable correlation between economic growth and total government health spending. The causality test reveals a one-way relationship between GDP, ongoing expenses, and overall spending. Therefore, it is advised that the government maintain its investments in the healthcare industry to prevent capital flight[76].

Similarly, using panel estimation to assess 178 nations, a long-run dynamics between health care expenditure and environmental pollution was examined across four worldwide income categories (Low, Low-middle, Upper-middle, and High-Income Countries) from 1995 to 2017. The findings indicated that healthcare spending is a requirement across all income brackets, and they also demonstrated that energy-efficient healthcare services will dramatically lower future costs. According to the report, in order to lessen the effects of pollution, policy-making in the energy and health sectors needs to be coordinated [77].

The impact of healthcare expenditure on economic growth in Nigeria from 1980 to 2016 was examined using the Generalized Method of Moments (GMM), and the results showed that while education spending had a positive significant impact on economic growth in Nigeria, healthcare expenditure had no significant impact. As a result, the report advised that the government reform

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its policies regarding healthcare expenditure and the development of human capital and establish systems for doing so[78].

Recently, researchers looked studied the association between healthcare expenditure and life expectancy in 45 African nations from 2000 to 2015 using the fixed effect method and the two-stage least square technique. The fixed effect method discovered that the amount spent on healthcare is a significant determinant of life expectancy in Africa. It was discovered to have an immense and favorable impact on life expectancy in West Africa, but a considerable and harmful impact in Central and Southern Africa. The two-stage least square method, on the other hand, reveals that healthcare expenditure is a significant predictor of life expectancy in Central Africa, but not in Eastern, Northern, Southern, or Western Africa[79].

According to a study that used fixed and random effects panel data regression models to assess the effects of healthcare expenditure on population health status and to look at the effect by public and private expenditure sources from 1995 to 2010, both public and private healthcare expenditure show a strong positive relationship with health status, though public healthcare expenditure had a relatively higher impact in 44 Sub-Saharan African countries. The analysis's findings showed that healthcare expenditure has a considerable impact on health status by raising life expectancy and lowering death and infant mortality rates [19].

Additional research was done to assess the impact of healthcare expenditure on health outcomes in 45 Sub-Saharan African nations from 1995 to 2018. Fixed effects and the Generalized Method of Moments (GMM) were used in the investigation. The study calculated health care expenditure using three proxies, including total health care expenditure per person, public health expenditure as a percentage of GDP, and private health expenditure. Health outcomes were calculated using the under-five death rate and life expectancy. The findings showed that while total health care

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expenditure per capita increases life expectancy, rising health care expenditure, as measured by total health care expenditure per capita and public health care expenditure to GDP, decreases under-five mortality rates. The report recommends that governments in Sub-Saharan Africa enhance budgetary allotments to the health care sector in order to obtain improved health outcomes[80].

The ARDL estimation technique's analysis of the relationship between health expenditure and health status in Nigeria from 1981 to 2017 reveals a significant negative impact of environmental pollution on Nigerians, with a particular emphasis on the detrimental effects of per capita CO_2 emissions on human health. The findings show that for the previous 37 years, a favorable outcome on health expenditure outcomes was prominent. To preserve a high standard of living, the government should increase funding for the health care industry and keep an eye on environmental degradation[81].

The determinants of public health expenditure in Nigeria were explored empirically using time series data from 1986 to 2010 and error correction techniques to assess the factors that influence public health spending in Nigeria. The results demonstrate that Nigeria's demand for healthcare is price inelastic and that the total population of people aged 14 and under and the proportion of health spending in the country's GDP are the main factors influencing health expenditure. GDP per capita, the unemployment rate, the number of doctors per 1,000 people, the consumer price index, and political instability were all shown to be insignificant. The study therefore suggests that the government establish adequate expenditure on health at all levels (primary, secondary, and tertiary institutions), increase government budgetary allocation to the health sector to the prescribed 15% of its annual budgetary allocation to the health sector, which will make

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government health expenditure to have a robust effect on Nigerians' health status, and form a synergy with the private sector in providing quality healthcare[82].

In a study, the associations between public health expenditure and country-level health outcomes were examined. The results indicated a negative correlation between government health expenditure and infant mortality rate, but a positive correlation between government health spending and life expectancy at birth [83]. Likewise, using the common OLS and Newey-White estimation techniques, the effect of public health expenditure on health status for the years 1990 to 2002 was investigated in Ghana. The data showed that, among other things, public health expenditure accounts for Ghana's decreasing infant mortality rate. Therefore, public healthcare spending is associated with an improvement in health status as measured by a decline in infant mortality[84].

Another study examined the relationship between health expenditure and health outcomes for a sizable sample of Europeans over the age of 50 using individual and regional-level data. The findings demonstrated that changes in the prevalence of chronic diseases are negatively and significantly impacted by health expenditures relative to GDP and health expenditures per capita. After adjusting for real per capita income, literacy level, and female labor market participation, health expenditure also has heterogeneous effects on health outcomes [85].

An Autoregressive Distributed Lag (ARDL) co-integration framework was used to analyze the effects of public health expenditure and governance on health outcomes in Malaysia using data from 1984 to 2009. According to the results of the bounds test, there is a stable, long-term relationship between income level, public health expenditure, corruption, and political stability and health outcomes. Public health expenditure and corruption also have an impact on both the long-term and short-term health outcomes. As a result, the study focused on the significance of

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health programs for raising the standard of living in the nation and lowering or eliminating corruption [86].

An empirical investigation of the long-term link between Nigeria's public healthcare expenditure, institutions, and health sector performance outcome using annual data for the sample period from 1970 to 2011 is another study that employs the co-integration idea. The long-run and short-run coefficients of the health sector were estimated using the autoregressive distributed lag (ARDL) and VECM granger non-causality techniques, and the direction of causality between the variables was confirmed. The outcome demonstrated that there was a stable long- and short-term relationship between the variables. Additionally, all of the model's variables have a causal relationship with the infant mortality rate. This is a significant finding for Nigeria's achievement of the strong human capital required for long-term economic growth[87].

Researchers used time series data from 1981 to 2014 to study the effect of public health expenditure on life expectancy in Nigeria. They used Autoregressive Distributed Lag (ARDL) to identify the long-term relationship between public expenditure on health and life expectancy in Nigeria. The findings indicated that whereas Primary School Enrolment (PSEN) was found to be inconsequential in both the short- and long-term, Primary School Enrolment (PHEXP) and Carbon-dioxide Emission (CAREM) significantly and directly influenced the rate of life expectancy in Nigeria. The study makes several policy recommendations, including that the government increase and restructure the public expenditure allocation to the health sector, implement programs to raise awareness of the impact of carbon dioxide emissions on people's health, and encourage industries to take appropriate action[88].

While examining government expenditure on health and its impact on health outcomes in Nigeria between 1979 and 2012, another study recommended that government should increase and

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restructure the public expenditure allocation to the health sector and introduce programs that will cause awareness regarding the effect of carbon dioxide emissions on individual's health and how industries can deal with it. This study also adopted the vector error correction model (VECM). The results demonstrated that environmental factors, such as carbon dioxide emissions, have an impact on people's health and that public health expenditure has a significant relationship with health outcomes [89].

The results of an investigation of the progressive effects of malaria incidence and expenditure on health outcomes in Nigeria using the ordinary least square (OLS) estimate approach showed that increasing health and educational spending will lower the incidence of malaria [90]. Also, to comprehend the connection between child health outcomes and health spending while examining lag effects, a study was conducted. The findings indicate a favorable and significant correlation between health expenditure and child health outcomes, with public health expenditure being relatively more significant than private expenditure [91].

Important metrics for evaluating the effectiveness of healthcare systems include infant and maternal mortality. The availability, accessibility, and affordability of health care systems for women and children are all factors that the World Health Organization emphasizes as being crucial to lowering preventable mortality through early intervention. The study used panel quantile regression to examine the impact of health expenditure on infant and maternal deaths for the years 2000–2015 across 177 countries, and the results showed that health spending had a negative impact on mortality across all percentiles. According to the study, health expenditure may reduce maternal and newborn mortality in lower- and middle-income nations. In order to achieve the goal of ensuring healthy lives and the wellbeing of people, which is goal 3 of the

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sustainable development goal (SDG), the study highlighted the need for increased health care expenditure, particularly in developing countries [92].

For eight East African nations between 2000 and 2014, another study looked at the connection between overall healthcare and health outcomes. They discover that a 10% rise in healthcare spending is linked to a 5.4, 6.6, and 2.9 reduction in newborn deaths, under-five deaths, and neonatal deaths, respectively [93].

The impact of public health expenditure on health outcomes (measured by birth weight and infant death rates) in Nigeria was examined in a study. The findings demonstrate a long-term equilibrium relationship between public health expenditure and health outcomes, demonstrating that rising public health expenditure raises life expectancy and lowers infant mortality rates while also having a significant impact on urban population and HIV prevalence rate. However, per capita income in Nigeria has no bearing on health outcomes. According to the study, public health expenditure is still crucial for enhancing health outcomes in Nigeria [17].

Similarly, to demonstrate a long-term link between the variables, the effect of government health spending on health outcomes in Nigeria was investigated using the Engel-granger cointegration test. The findings indicate that government health expenditure per person has a positive link with neonatal, child, and infant death rates in Nigeria, whereas private health expenditure, the number of doctors, and life expectancy have a negative relationship with these rates. This suggests that the private sector has more of an impact on health outcomes than the public sector, which means that health services in Nigeria will be expensive. Based on these findings, the report proposed that, in order to enhance health outcomes in Nigeria, government funding be carefully regulated, the private sector be given subsidies, and the working conditions of health professionals be improved [94].

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The general public health was seriously threatened by the OECD countries' recent rapid economic growth and environmental pollution. Thus, using data from 28 OECD economies from 2002 to 2018, a thorough analysis of environmental pollutants, economic growth, and public health was conducted. It was found using panel fully modified least squares and the panel vector error correction model that there is long-run causality from renewable energy and carbon dioxide (CO_2) emissions to healthcare expenditure, and that there is a positive and significant relationship between renewable energy and healthcare expenditure. Therefore, it was determined that investing in renewable energy will result in lower air pollution, better healthcare, and a boost to the economy[95].

In order to improve health outcomes, the Sub-Saharan African (SSA) nations have consistently increased health expenditure throughout the years. Despite this, health outcomes have only slightly improved, which prompted researchers to look into how health spending affects health outcomes in a sample of 40 sub-Saharan African (SSA) nations. Health expenditure has a considerable but inelastic impact on health outcomes in SSA, lower death rates, and increase life expectancy at birth, according to the study, which employed the Grossman Human Capital Model on the demand for health and Fixed Effect for the analysis. The study came to the conclusion that SSA nations should make intentional efforts to raise public health expenditure in order to reduce the burden of private health expenditures on individuals as well as make efforts to increase health expenditure in order to improve health outcomes. lowering out-of-pocket medical costs [96].

Using pairwise correlation and pooled regression techniques, the private, public, and public-private healthcare sectors of West Africa were examined over a 16-year period (1999–2014). The results showed a positive correlation between healthcare expenditure and life expectancy for the public healthcare sector, but a negative correlation for the private healthcare sector. In contrast to

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other healthcare sectors that are still pricey and out of the reach of the general public, the study advised government, policy, and decision-makers to concentrate on boosting the expenditure on the public healthcare system[97].

Another study examined the impact of health expenditure on health outcomes measured by life expectancy, under-five mortality, and maternal mortality across 46 sub-Saharan African nations between 2000 and 2015. According to research, the region's health expenditure is significantly influenced by factors including the gross domestic product (GDP) per capita, the number of physicians per 1,000 people, the population's age over 65, and the death rate for children under the age of five. Similarly, it was discovered that health expenditure had a favorable and significant impact on all three health outcomes. Based on the findings, it was hypothesized that Sub-Saharan Africa's health results tend to improve as healthcare expenditure steadily rises over time.[98]

A recent study used Ordinary least square (OLS) regression to examine the factors influencing health expenditure in 163 nations from 2010 to 2016. The results demonstrate that health expenditure grows when income, the number of people over 65, the unemployment rate, and urbanization rise, while inflation has no statistical impact on health expenditure. The study found that developing strategies to alter people's lifestyles to avoid unemployment, distributing health resources to urban and rural populations fairly, and reducing chronic diseases are crucial for improving health outcomes [99].

After examining the impact of revenue and capital components of public health expenditure on health outcomes (Infant, Child and Neo Natal Mortality Rate, Total Fertility Rate, Children Born Underweight (%), and Tuberculosis), additional findings showed a long-term effect of public

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health expenditure in improving health outcomes. To analyze the information gathered at the State level from India 100, the study used structural equation modeling and casual models [100].

Other scholars go beyond causality tests to take into account cointegration in the link between health expenditure and GDP, and they demonstrate that between 1990 and 2009, in developing nations, economic growth and health expenditure had a bidirectional causation and long-run relationship [101]. In the same vein, a panel data analysis for 14 SADC countries from 1995 to 2012 showed that health expenditure and GDP per capita are cointegrated [102].

Panel Fully Modified Least Square (FMOLS) was used to analyze the long-term relationship between public health expenditure and the under-five mortality rate in 15 West African countries between 1991 and 2015. Based on the findings, long-run relationship between per capita health expenditure and under-five mortality rate is confirmed. Additionally, the rate of under-five mortality is significantly influenced by public health expenditure. Thus, it was concluded that a rise in health spending across West African nations would result in a considerable decline in the infant death rate in the area. Furthermore, it is claimed that immunization, female literacy rates, and institutional quality are crucial for lowering the region's under-five mortality rate. Additionally, the governments of West African nations ought to increase the rate at which they spend on health care[103].

Findings show that out- and in-patient care in public hospitals under the "free healthcare policy" is positively correlated with household out-of-pocket healthcare expenses, placing a significant financial burden on families. The study used a double-hurdle model to examine the relationship between healthcare utilization and out-of-pocket healthcare expenses at the household level. It was advised to implement governmental policies to enhance the monitoring system for the private healthcare sector while maintaining the sustainability of the free healthcare program [104].

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Using the ARDL paradigm, the impact of government health expenditure on maternal health outcomes in Nigeria from 1980 to 2018 was investigated. The findings demonstrated that in the short run, government health expenditure, the number of doctors per thousand, and GDP per capita significantly reduced maternal mortality rate, while in the long run, government health expenditure, female school enrollment, and GDP per capita significantly reduced maternal mortality ratio [105]. Another study used the autoregressive distribution lag technique to look at the long-run effects of public health expenditure on under-five mortality in Nigeria for the years 1985 to 2017. The results of the study revealed that public health expenditure is statistically significant. It had a positive correlation with under-five mortality, suggesting that raising public health expenditure would raise the rate of under-five death [106].

Using the ARDL, the Error Correction model, and the Granger causality test, some researchers looked at the effect of public health expenditure on health outcomes in Nigeria from the years 1981 to 2018. Granger causality test results show unidirectional causality between public health expenditure, private health expenditure, foreign assistance on health, health education, and newborns protected against tetanus. Error Correction Mechanism results were negative and statistically significant over the long term. As a result, it was determined that both public and private health expenditure help to enhance health outcomes in Nigeria [107].

With a panel data of 32 Sub-Saharan African nations from 2000 to 2015, the impact of governance and health expenditure on infant mortality was also investigated. This was done using the Generalized Method of Moment. This study's findings demonstrate that health spending and governance do not directly affect infant mortality. They are significant and have a negative association with infant mortality, which suggests that the administrative strength of nations can account for the efficacy of health expenditures. According to the report, governance needs to be

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continually improved to produce results in the area of health. Additionally, create policies that directly address health issues rather than using deceptive means [108].

2.3.4 Healthcare Expenditure, Health Outcomes and Economic Growth

A vector autoregressive (VAR) model approach was used in an empirical study to examine the relationship between life expectancy, public health expenditure, and economic growth in Nigeria. The results showed that health expenditure and GDP are better predictors of life expectancy at birth in Nigeria, and the results of the causality tests showed that there is no bi-directional causality flow between life expectancy and public health expenditure, life expectancy and GDP, while there is between life expectancy and public health expenditure. According to the study's findings, government spending on public health will promote economic growth [109]

After analyzing the relationship between healthcare expenditure, health outcomes, and economic growth in Nigeria using Toda and Yamamoto causality method for the period of 1970 to 2013. Some other scholars came to the same conclusion that government health expenditures do not directly influence economic growth, but rather indirectly through health outcomes such as mortality rate and life expectancy[110].

In a study conducted in Nigeria between 1999 and 2012, the association between healthcare costs, health status, and national productivity was demonstrated. The study employed secondary data to run regression analyses and questionnaires to collect data. In Nigeria, there was little evidence of a causal connection between the factors. Nigeria needs to invest in health research and innovation, it was determined [111].

In order to analyze the data, vector autoregressive, impulse response functions, and forecast error variance decomposition functions were used. The effects of health expenditure and health status

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on economic growth in Nigeria were explored. The results showed that government expenditure on health care has a little effect on economic expansion. Both considerable positive and negative effects of infant mortality rates on economic growth are evident. The study came to the conclusion that, in order to achieve sustainable economic growth, the government should double its health care expenditure and be prepared to retain the current public health services, which will promote economic growth and improve health status [112].

In order to examine the relationship between health expenditure and economic growth in 47 African countries, environmental quality with three proxies (carbon dioxide, nitrous oxide, and methane emission) was used. Both static (pooled OLS and fixed/random effect) and dynamic (system GMM) estimation methods were used to analyze the data from 2000 to 2018. It was shown that there is a strong correlation between environmental quality and medical costs. The three environmental quality indicators with the greatest impact on healthcare expenditure were carbon dioxide emissions and economic growth, which together raised health expenditure significantly across the five African areas (North Africa, East Africa, Central Africa, West Africa and Southern Africa). The study came to the conclusion that excellent health is a need and that rising health costs are a result of declining environmental quality. Maintaining the Sustainable Development Goal Clean energy policies that focused on minimizing environmental pollution is necessary in order to achieve equitable and sustainable economic growth (SDG) [113].

A panel data regression methodology was used by some researchers to examine the connection between health expenditure, health outcomes, and economic growth in 48 African nations between 2000 and 2015. It was discovered that while life expectancy at birth is positively correlated with economic growth in Africa, maternal, newborn, and child mortality rates are all adversely and significantly correlated with economic growth. Similar to this, health spending has

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beneficial and economically significant direct and indirect benefits on economic growth. In Africa, education, particularly female education, emerges as a significant predictor of both economic growth and health outcomes. The policy implication of this is that in order to improve health outcomes and gain access to the beneficial externalities that promote economic growth, the government should try to spend more money more wisely on the entire health system [114].

To assess the total, public, and private health expenditure and economic growth of emerging nations (India, China, Brazil, Turkey, Russia, Mexico, and Indonesia) between 1996 and 2016, Pedroni panel cointegration method and Dumitrescu Hurlin panel causality analysis was used. The findings showed a long-term link between total and public health spending and economic growth, with private health care spending contributing negatively to economic growth. The private healthcare industry has a very small effect on economic expansion. Therefore, the study came to the conclusion that the private sector needs to advance and reconsider [115].

In Nigeria, between 1981 and 2017, a study using the Toda-Yamamoto causality framework examined the relationship between health expenditure, health outcomes, and economic growth. The findings revealed a one-way causality from health expenditure to infant mortality, health expenditure and real GDP to life expectancy and maternal mortality, real GDP to health expenditure, but no causal relationship between real GDP and infant mortality. According to the result analysis, the government must work to increase health expenditure at least to comply with the World Health Organization's recommendation that all nations devote at least 15% of their annual budget to the sector for effective funding in order to achieve desired health outcomes. The government must also use professional medical staff and modern technology to lower the high incidence of maternal and infant mortality[116].

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Similar to the previous study, a subsequent one examined the causal relationships between public health expenditure, health status, and economic growth in Nigeria from 1981 to 2018. The Toda-Yamamoto causality test results show that there is no causal relationship between health expenditure and health status, but there is a causal relationship between health status and economic growth. It was determined that better national health policies and programs, such as mandatory national health insurance, are required in order to address the most pressing issues in the health sector; otherwise, attempts to spur economic growth by enhancing health outcomes through public spending will fail.[117].

More on this, another scholar utilized Ordinary Square Least and granger causality test to evaluate the link between life expectancy, public health expenditure and economic development in Nigeria during the period of 1995-2017. The OLS findings indicated that both government expenditure on health and life expectancy impacted favorably and considerable on GDP. The granger causality test demonstrates unidirectional association between life expectancy and GDP and between life expectancy and health care expenditure, there is bidirectional relationship but between health expenditure and GDP, there was no causation. The study stated that, there should be increase in expenditure on health so as to improve the health status of individuals in terms of their life expectancy[118].

Some researchers used the Granger causality test from the years 1989 to 2018 along with Pesaran's Autoregressive distributed lag approaches to conceive the hypothesis. The findings showed that real GDP has a strong and substantial positive association with both health spending and life expectancy as well as a strong and significant negative link with death rate. The findings of the Granger causality test indicate that there is no causal relationship between the variables. The study demonstrated the impact of Nigeria's high life expectancy and mortality rate on the

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encouragement of economic growth. As a result, the study suggested that the government invest in the development of its human capital and health sector [119].

2.4 Conceptual Framework

The study developed a conceptual framework connecting healthcare expenditures, health outcomes, and economic growth as shown in Figure 2.1. The chart demonstrates that national healthcare expenditure—both private and public healthcare expenditure are significant contributors to production growth. This emphasized the significance of developing human capital for achieving enhanced economic growth in any economy. Along with other crucial elements like technology and innovation, the endogenous growth theorists place a strong focus on the value of human capital investment as a driver of economic growth. According to a school of thought, a country's long-term pace of output growth is dependent on the policy decisions made by the government at the national level. Every economy is impacted by healthcare expenditure because it slows the diminishing return to scale of capital production. Similar to how better healthcare facilities and services in both the public and private sectors increase human health outcomes in terms of low rates of mortality (infant, child, and maternal) and high life expectancy.

The conceptual framework demonstrates a bi-causal relationship between economic growth and health outcomes. Studies have indicated that better labor productivity, rising labor supply, skill development through high-quality education and training, and investments in physical and intellectual capital are the four pathways through which both health and economic output interact. First, it is assumed that a healthy society will improve production output per hour, according to the channel of labor productivity. Individuals with better physical and mental health would therefore be more productive.

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Additionally, these people would employ technology, machines, and equipment more effectively. Theorists identified two effects of health on labor supply: income effects and substitution effects. The income effect postulates that people choose to work longer hours to make up for lost income when they have bad health and low salaries, which in turn increases the labor supply. This is understandable if the social benefit system does not actively mitigate the impact of poor productivity on predicted lifetime income. The substitution effect, on the other hand, suggests that when low productivity brought on by poor health results in low wages, workers would respond by working fewer hours. It implies that there will be a restricted supply of labor while employees pursue leisure.

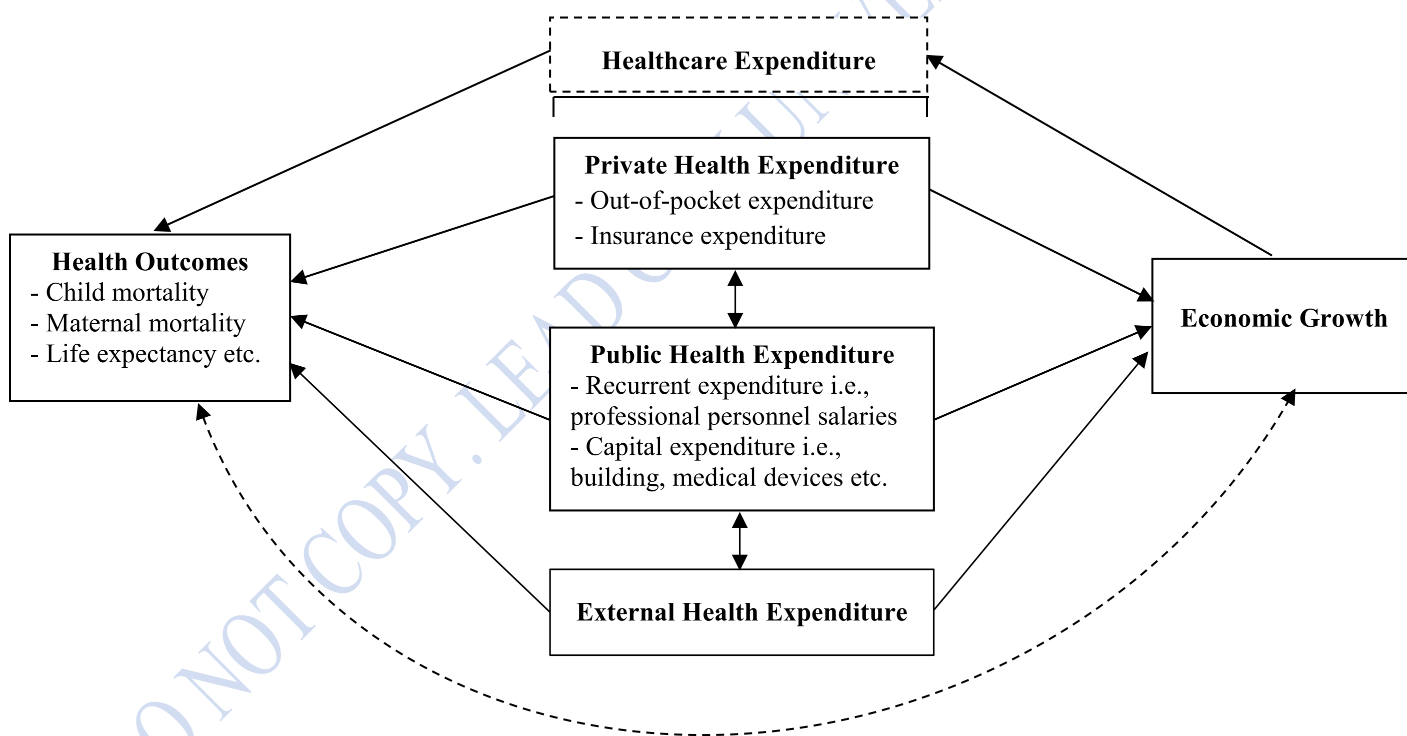

Figure 2.1: Conceptual Links among Healthcare Expenditure, Health Outcomes and Economic Growth
Note: The broken and solid lines indicate bi- and uni- causal relationships.

Human capital theory made the claim that an educated person or society is more productive and earns a higher or respectable income. It was derived from the education and training channel. A healthy individual has a better chance of attaining a higher education level and experiences less

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absence or dropouts from school. Children that have better nutrition will increase an economy's production productivity in the future. Finally, an economy's health affects not only the level of income but also the distribution of income among consumption, savings, and investment. People in good health have a higher saving ratio than those in poor health because they have a longer time horizon.

2.5 Theoretical Framework

The study bases its explanation of the relationship among healthcare expenditures, health outcomes, and economic growth on the theoretical bedrock of the endogenous growth model. Paul Romer created the theoretical foundation for the endogenous growth model while highlighting the significance of human capital development for long-term economic growth. Theoretically, capital encompasses information, skills, and experience that are held by the labor input as well as physical capital. As a result, both physical capital and human capital are seen to influence growth. Knowledge, skills, abilities, and experience, which make up the human capital component, are produced through education and health. In this way, a model of endogenous growth was developed to take into account the importance of human capital in terms of health as a factor in determining growth.

The endogenous model presupposes that a key input in a neoclassical production function is human capital. In a similar vein, human capital (such as health and education) can be viewed as a distinct input or labor augmentation in the production process. Given the level of technology in the economy, improvement in capital accumulation (both physical and human) is the cause of production growth. It was emphasized that human capital in the form of health investment or

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expenditure is significant in explaining growth by incorporating human capital accumulation into the endogenous growth model [120].

The endogenous growth model is represented as follows:

$$Y_{it}= \alpha_0 + \alpha_k X_{it} + \sum Z_{it} + v_t \qquad (2.1)$$

Where: Y_{it} represent output (a measure of economic growth) in country i, at time t, X_{it} represent vector of human capital investment variable (Healthcare expenditure), Z_{it} represent a number of control variables.

Human capital, on the other hand, has rising rates of return. The returns to capital are continual, and economies never achieve a stable state. Since investing in human capital takes the form of both physical and intellectual capital, it depreciates, as shown by the equation $\alpha+\beta+1-\alpha-\beta=1$, which denotes a continuous return on investment.

2.6 Summary of Gaps in Literature Reviewed

There is evidence suggesting a positive relationship between health outcomes and economic growth across geographies, and health is both a cause and a result of economic progress. However, based on recent data and a variety of health indices, the majority of the literature evaluated has not yet found enough cross-country empirical evidence on the relationship between growth and health in ECOWAS countries or even in Africa. African studies already in existence have not adequately addressed country-specific traits, although certain cross-country studies already in existence are focused on particular subregions of Africa.

The majority of existing literatures neglect the impact of socioeconomic determinants on health outcomes, including population dynamics (age, income), environmental factors like clean water and sanitation, etc., the prevalence of particular diseases, preventive healthcare, etc.

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Given the aforementioned, this study used recent data and a panel data approach to investigate the impact of healthcare expenditure on health outcomes and economic growth in ECOWAS.

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Chapter Three

Methodology

In this section, the study presents the methodology used to achieve the objectives of this study in conjunction with the model specification, theoretical expectation, estimation method and data source and description.

3.1 Model Specification

3.1.1 Model Estimating the Effect of Healthcare Expenditure on Health Outcomes in ECOWAS

Following the theoretical framework and conceptual framework in the previous chapter and the specification from existing literature[1,2]. The health production function of this study is specified as:

$$H = F(Y, S, V, D) \quad (3.1)$$

Where H represent a vector of health outcomes (that is, Life expectancy, Under-five mortality, Maternal Mortality, Infant Mortality), Y represent a vector of per capita economic variable, such as private, public, national and external healthcare expenditure per capita, S represent a vector of social variables, which includes education (Primary school enrollment) and age structure of the population, V represent a vector of environmental factors (sanitation, prevalence of malaria and HIV and access to water), D represent a vector of health service utilization variables, preventive healthcare services (immunizations).

In an econometric form, equation (3.1) is specified in a panel analytical standard as:

$$\text{In}h_{it} = \beta_0 + \beta_1 InHE_{it} + \beta_2 S_{it} + \beta_3 V_{it} + \beta_4 D_{it} + u_{it} \quad (3.2)$$

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Where h_{it} represent Health outcome (proxy with Life expectancy at birth (LEB), Under-five mortality rate (U5MR), Maternal Mortality rate (MMR) and Infant Mortality rate (IMR), HE represents Private healthcare Expenditure, Public Healthcare Expenditure, National Healthcare Expenditure, and External Healthcare Expenditure respectively. β_1 denotes the coefficients of the explanatory variables to explain the effects of one unit or percent change in the respective variable on health outcomes holding other variables constant. β_0 denotes the intercept terms in the equations, u_{it} represent the error term.

3.1.2 Model Estimating the Impact of Healthcare Expenditure on Economic Growth in ECOWAS

Following the theoretical framework developed in the previous chapter and the adaption of model of previous studies, this study used the dynamic panel model to specify economic growth as a function of health expenditure (as human capital investment) as[3,4,5]:

$$GDPPC_{it} = \alpha_0 + \alpha_k X_{it} + \sum Z_{it} + v_t \qquad (3.3)$$

Where: $GDPPC_{it}$ represent Per capita income in country i, at time t, X_{it} represent vector of human capital investment variables (Public healthcare expenditure (puhe), Private healthcare expenditure (pvhe), National healthcare expenditure (nhe) and External healthcare expenditure (exhe) respectively. Z_{it} represent a number of control variables: Gross fixed capital formation per capita (gfcfpc), Inflation (inf) (measured by annual growth of consumer price index), Total trade per capita (tradepc) and structure of the population growth rate (PGR) that captures the demographic tendency.

Considering all the variable explained above, the panel model is explicitly expanded into:

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$$In\ (GDPPC)_{it} = \lambda_0 + \lambda_1 lnHE_{it} + \lambda_2 lnGFCF_{it} + \lambda_3 PGR_{it} + \lambda_4 INF + \lambda_5 TRADEPC_{it} + \rho_i + v_{it} \quad (3.4)$$

Where: $GDPPC_{it}$ represents output per capita in country i, at time t, HE_{it} represents a vector of healthcare expenditures per capita in country i, at time t (Private, Public, National and External), $GFCF_{it}$ represents Gross fixed capital formation country i, at time t, PGR_{it} represents population growth rate, country i, time t, TRADEPC represents the total trade per capita, INF represents Inflation measured by annual growth of consumer price index, ρ_{it} represents country and period-specific effects. λ_0 represents the intercept, v_{it} represents the stochastic error terms.

3.1.3 Model Estimating the Causal Link among Healthcare Expenditure, Health Outcomes and Economic Growth

Granger causality model within a panel data framework is adopted in this study to achieve the objective three (3)

$$\Delta Y_{it} = \alpha_{it} + \xi_1 ECT_{it} + \sum \beta_{11i} \Delta Y_{it} + \sum \beta_{12i} \Delta HE_{it} + \sum \beta_{13} \Delta HO_{it} + u_{1it} \quad (3.5)$$

$$\Delta HE_{it} = \alpha_{it} + \xi_2 ECT_{it} + \sum \beta_{21i} \Delta Y_{it} + \sum \beta_{22i} \Delta HE_{it} + \sum \beta_{23} \Delta HO_{it} + u_{2it} \quad (3.6)$$

$$\Delta HO_{it} = \alpha_{it} + \xi_3 ECT_{it} + \sum \beta_{31i} \Delta Y_{it} + \sum \beta_{32i} \Delta HE_{it} + \sum \beta_{33} \Delta HO_{it} + u_{3it} \quad (3.7)$$

Where Y represent Gross Domestic Product Per Capita, HE represents Healthcare expenditure, HO represents Health outcomes, Δ represents first difference operator term, ECT represents Error correction term, i represents individual country, t represents time and u represent error time.

3.2 Theoretical Expectation

Healthcare expenditure is an inflow of fund into health and it is expected to have a negative effect on Infant mortality, Under-five mortality and Maternal mortality and a positive effect on Life expectancy at birth. This implies that an increase in healthcare expenditure is expected to broaden

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the access to healthcare and services which help to reduce mortality rates and improve Life expectancy. Therefore, increasing healthcare expenditure should improve the health outcomes or status of the citizens and foster economic growth and development.

Based on existing literatures, mortality rate is higher among rural, low-Income households than the urban households due to access to better health facilities in the metropolitan areas or cities. Private cost of health such as transportation for instance may also be lower for urban household because of proximity, therefore, the study presumes that urbanization will have a negative relationship with the health outcomes. Per Capital Income is a proxy for Socio economic status. As Per Capita income increases, health status of the population increases which implies that Increase in Income will have a high tendency to reduce Mortality rates and lead to longevity. Hence, it is expected that the impact of income on health will work through many indirect channels such as higher income will lead to better nutrition, ability to pay for health care and services, better education and better sanitation.

One of the major sicknesses that is peculiar in Africa is Malaria which is capable of terminating if not treated and monitored properly. This is expected to increase the rate of mortality both in infants and women. Also, HIV prevalence is an epidemic that reduces the health status, life span of individuals. This virus renders human immune systems weak and vulnerable due to the death and loss of anti-bodies in the cells which leads to the enhance of various diseases and deterioration in health outcomes thereby reduces life expectancy. This is expected to have a negative impact on health outcomes, that is, Malaria and HIV prevalence reduced Life expectancy and increase mortality rates.

Similarly, at the end of the estimation, it is expected that the result will show a positive relationship between Gross Domestic Product per capita (Dependent variable) and healthcare

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expenditures (Independent Variables), it is expected that the result will show a direct impact between healthcare expenditures and life expectancy at birth. Also, it is expected that healthcare expenditures will reduce mortality rates.

3.3 Description and Measurement of Data

Secondary data is mainly used for this study and panel data set which includes fifteen (15) member countries of Economic Community of West Africa States (ECOWAS) in the Western Africa Region. The list of member countries includes Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo between 2000 and 2020. There are two reasons for selecting these countries. The countries form a group of low human development countries except Cape Verde and Ghana that falls within medium human development and region in Africa with similar economic policies. Also, the countries have a common interest to pursue and achieve both Millennium Development Goals (MDG) and the Sustainable Development Goals (SDG).

The sources, measurement and description of variables are presented in Table 3.1.

Table 3.1: Data Description, Measurement and Sources

S/N	Variables	Description	Measurement	Data source
1	*CHEPC*	The current healthcare expenditure per capita is the measure to compare expenditure levels between countries expressed at the average exchange rate of that year in US dollars	It is measured in billions of US dollars	World Development Indicator (WDI) 2020, World Health Organization (WHO) 2022
2	*PVT-D%CHE*	Domestic Private healthcare expenditure as percentage of current healthcare expenditure, share of current healthcare expenditures funded from private sources (household, corporation and non-profit organization)	It is measured in percentage	World Development Indicator (WDI) 2020, World Health Organization (WHO) 2022

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3	*PUB-D%CHE*	Domestic Public healthcare expenditure expressed as percentage of current healthcare expenditures incurred by public funds (State, region, government bodies and social security schemes)	It is measured in percentage	World Development Indicator (WDI) 2020, World Health Organization (WHO) 2022
4	*NHE*	National Healthcare Expenditure represents the amount spent on healthcare and related activities such as private and public health insurance, health research and public health activities.	It is measured in percentage	World Development Indicator (WDI) 2020, World Health Organization (WHO) 2022
5	*EXHE*	External healthcare expenditure represents the share of current health expenditures funded from external sources.	It is measured in percentage	World Development Indicator (WDI) 2020, World Health Organization (WHO) 2022
6	*LEP*	Life Expectancy at birth, the average number of years of life a person who has attained a given age can expect to live. It is expressed using period current life tables.	It is measured in years	World Development Indicator (WDI) 2020, World Health Organization (WHO) 2022
7	*MMR*	Maternal Mortality rate, the number of women who die from pregnancy related cause while pregnant or within 42 days of pregnancy termination	It is measured per 100,000 live births	World Development Indicator (WDI) 2020, World Health Organization (WHO) 2022
8	*GDPPC*	Gross Domestic Product per capita of a country in a particular year using constant 2015 US Dollar divided by population purchasing power parity. It measures the economic output of a nation per person.	It is measured in percentage	World Development Indicator (WDI) 2020
9	*IMR*	Infant mortality rate, the number of infant or child deaths for every 1,000 live births	It is measured per 1,000 live births	World Development Indicator (WDI) 2020, World Health Organization (WHO) 2022
10	*UMR*	Under-five mortality rate, the probability of a child dying between birth and exactly five (5) years of age	It is measured per 1,000 live births	World Development Indicator (WDI) 2020, World Health Organization (WHO) 2022

Source: Author (2022).

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3.4 Estimation Techniques

To offer comprehensive information on the key variables and unravel the details needed to give background hints on their characteristics, the study used description analysis and correlative analysis such as a measure of dispersion which includes the graphical analysis, mean, median and measure that includes standard deviation and covariance.

3.4.1 Pre-estimation Tests

The pre-estimation tests were on cross sectional dependence, panel unit root test and panel cointegration test. The cross-sectional dependence is to check whether all variables in the same cross section are correlated. The panel unit root test was used to check if the variables are stationary. The primary objective of using a cointegration structure is to determine whether the variables under consideration have a long-run relationship. At level, they are nonstationary, but at first difference, they become stationary and the cointegration test checks if the variables have long run relationships.

3.4.1.1 Cross Sectional Dependence

This is explaining the interdependency of variables of interest between cross-sections and it is attributed to the effect of some unobserved common factors, common to all variables affecting each of them in different ways. The cross-sectional dependence (CD) test from Pesaran is used to further the analysis of the study. To guarantee accurate estimates and estimator effectiveness, the CD test is crucial [6,7]

3.4.1.2 Panel Unit Root Tests

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For the classical regression model, both dependent and independent variables need to be stationary, meaning they should have zero mean and finite variance. The panel unit root test is carried out to avoid spurious results. Stationarity is a state in which the regressor parameters (mean and standard deviation) do not change over time. The study carried out three (3) Panel unit root tests (i) Im, Pesaran and Shin (IPS) (ii) Levin, Lin and Chin (LLC) and Breitung (Breit) in order to identify the order of integration of the variables. [8,9,10]

3.4.1.2 Panel Cointegration Tests

Cointegration tests were carried out on all the variables identified in the study to ensure that there is a relationship among the variables. A co-integration test is necessary to determine the likelihood of a long-run relationship after the variables are stationary. The study employed Kao residual co-integration test in order to ascertain the authenticity of the results and conclusion. The cointegration test by Kao was used in this study to look for co-integration between the variables. [11,12]

3.4.2. Pooled Mean Group

Based on stationarity of the variables and the presence of cross-sectional dependence necessitate the use of Pooled Mean Group (PMG) estimator. The method is a hybrid estimator that combines pooling and averaging. It allows short-run coefficients, adjustment speeds, and error variances to differ across countries while imposing common long-run coefficients. It is important to note that Pesaran, Shin, and Smith propose estimating procedures, the Mean Group (MG) and the Pooled Mean Group (PMG), that allow for greater parameter heterogeneity in growth regressions. The estimator is best suited for panels with high T and N. It does not force slopes to be the same in the short term, and it allow things change [13].

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The Pooled Mean Group (PMG) estimator takes into account a lower degree of heterogeneity because it imposes homogeneity in the long run coefficients while still allowing for heterogeneity in the short run coefficients and error variances. The basic assumptions of the PMG estimator are: the error terms are serially uncorrelated and distributed independently of the regressors, i.e., the explanatory variables can be treated as exogenous; ii) there is a long-run relationship between the dependent and explanatory variables; and iii) the long-run parameters are the same across countries. This estimator is also adaptable enough to allow for long-run coefficient homogeneity across a single subset of regressors and/or countries. A likelihood ratio test or a Hausman test can also be used to compare the suitability of the PMG estimator to the MG estimator based on their consistency and efficiency properties [13].

3.4.3 Panel Granger Causality Test

The study examined the causal relationship among healthcare expenditure, health outcomes and economic growth in ECOWAS, employing Granger causality test which is an estimation approach employed to investigate if a variable *x* is the cause of the variable *y*. Hence, when the past values of variable *x* assist to predict the present values of variable *y*, then the variable *x* can be regarded as the granger cause variable *y*. When the co-integrating of the indices is ascertained through the Panel co-integration test in models, the method of Panel Granger Causality Test can be used based on the VECM to examine the causality between the dependent and independent variables. Thus, VECM is usually utilized to evaluate the short-run causality based on the F-statistics values and the long-run causality based on the Error Correction Term ECT (-1).[14] The bivariate VECM is written for Dependent variable (Y) and Explanatory variables (*X*) as:

$$\Delta Y_{it} = \pi_{1it} + a_{1it} ect_{it-1} + \sum_{p=1}^{P} \theta_{1it} \Delta Y_{it-p} + \sum_{p=1}^{P} \theta_{2it} \Delta X_{it-p} + u_{1it}$$

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$$\Delta X_{it} = \pi_{2it} + a_{2it} ect_{it-1} + \sum_{p=1}^{P} \theta_{1it} \Delta Y_{it-p} + \sum_{p=1}^{P} \theta_{2it} \Delta X_{it-p} + u_{2it}$$

Where: Δ denotes the first difference; *p* represents the optimal lag length; and ect_{it-1} stand for the error correction term in the cointegration test. The tests of causal relationship have different results for the multivariate VECMs.

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Chapter Four

Results and Discussion of Findings

This chapter of the study covers the detailed empirical and econometric analyses of healthcare expenditure, health outcomes and economic growth in ECOWAS between 2000 and 2020. This analysis was carried out based on the formulated conceptual framework, theoretical framework and specified empirical models in the previous chapter. The data used for analyzing the relationship among healthcare expenditure, health outcomes and economic growth are presented in the Appendix. The remaining sections in this chapter are divided into three sessions. The descriptive analysis of the economic variables was presented in the first section. The second part of the chapter provides the empirical results according to the specific objectives. Discussion of findings was presented in the last section of the chapter.

4.1 Presentation of Data

The data used for analyzing Healthcare Expenditure, Health Outcomes and Economic growth in ECOWAS between 2000 to 2020 is presented in the Appendix. Likewise, the detailed estimated results for the whole test carried out in this study are presented in the Appendix accordingly under different sections

4.2 Descriptive Analysis

This section presents descriptive analysis of the variables used in analyzing the effect of healthcare expenditure on health outcomes and economic growth in ECOWAS. The summary statistics of the outcome variables, explanatory variables and controlling variables are presented in Table 4.1. showing the mean, standard deviation, maximum, minimum. The table displayed skewness that that measures the asymmetry of the distribution and the value can be interpreted in

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three ways, it can either be negative value which indicates that the tail is on the left side of the distribution which extends towards more negative values or positive value, indication that the tail is on the right side of the distribution, which extends more to the positive value. it can also be that there is no skewness in the distribution at all, this is known as zero value. Also, kurtosis was presented, which described the degree to which variables cluster in the tails (ends of the distribution) or the peak (tallest part of the distribution) of a frequency distribution. Distributions with negative kurtosis or less than 3 are said to be ***platykurtic*** while distributions with positive kurtosis or greater than 3 are called ***leptokurtic***. Likewise, Table 4.2 presents the average value of each country in ECOWAS.

The descriptive statistics report from 2000 to 2020 indicated the health outcome variables which are Life expectancy at birth (total)years (LEP), Maternal mortality rate (MMR) (modeled estimate per 100,000 live births) Infant mortality rate per 1000 live births (IMR) and Under-five mortality rate per 1000 live births (U5MR). The mean value of Life expectancy at birth (LEP) is 58years, the maximum and minimum values are 73years and 39years respectively.

For In-depth analysis, table 4.2 presents the average values of each member state of ECOWAS. From the table, the average value of Cabo Verde with respect to Life Expectancy at birth is 71years being the highest value directly followed by Senegal (64years), Ghana (61years) while Sierra Leone has the least value of 49 years for Life Expectancy at birth. The Maternal Mortality Ratio (MMR) mean value is 652 deaths per 100,000 live births while the maximum value is 2,480 deaths per 100,000 live births and the minimum value is 58 deaths per 100,000 live births. The countries with the highest maternal mortality ratio are Sierra Leone (1506.67) death per 100,000 live births, Nigeria (1015.43) death per 100,000 live births and Guinea- Bissau (850) death per

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100,000 live births whereas the lowest mortality is in Cabo Verde (76) death per 100,000 live births.

The mean value of Infant mortality rate (IMR) and Under-five mortality rate (U5MR) are 67.1 and 107.11 deaths per 1000 live births. The maximum values are 12.2 and 14.2 deaths per 1000 live birth respectively. Sierra Leone recorded the highest average number of Infant and Under-five mortality rate (108.4 and 164) followed by Nigeria (88 and 141.4) death per 1000 live births and the nation with the lowest rate is Cabo Verde at 21 and 25 deaths per 1000 live births.

The summary statistics show that all health outcome indicators are positively skewed (skewed to the right). Also, maternal mortality ratio is highly peaked (leptokurtic) while Life expectancy at birth, Infant mortality rate and Under-five mortality rate are not normally distributed (platykurtic).

The mean of Gross domestic product per capita in ECOWAS is US$1070.90 million with the maximum and minimum values of US$ 3482.50 million and US$ 364.02 million respectively. Among the member states in ECOWAS, the top four countries with the highest value of GDP are Cabo Verde (US$ 2,803.02 million), Nigeria (US$ 2,221.08 million), Cote d'Ivoire (US$ 1808.27 million), and Ghana (US$ 1498.03 million) and the least nations with the Gross Domestic Product to per capita are Togo (US$ 526.54 million) and Niger (US$ 451.09 million).

Concerning Public healthcare expenditure and Private healthcare expenditure, the average means stands at US$ 14.4 million and US$ 24.96 million respectively, in that order, the maximum values are US$ 116.99 million and US$ 80.29 million and the minimum values are US$ 1.13 million and US$ 3.48 million. From table 4.2, Cabo Verde has the highest public healthcare expenditure with the average value of US$ 90.13 million and the least value of US$ 3.52 million is recorded for Guinea while the top countries with the highest average value of private healthcare expenditure

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per capita are Nigeria and Cote d'Ivoire with US$ 49.84 million and US$ 49.50 million respectively while the Gambia has the least value of US$ 7.32 million.

Furthermore, table 4.1 shows the average domestic national healthcare expenditure of countries standing at US$ 48.43 million with maximum and minimum values at US$ 191.28 million and US$ 7.54 million respectively. Cabo Verde contributes more nationally into the healthcare of the nation with the value of US$ 138.16 million and the lowest country with the least contribution of US$21.77 was recorded for Niger.

The mean average for external healthcare expenditure stands for US$ 9.02 million with a maximum of US$ 74.70 million and US$ 1 million as the minimum value. Amongst the ECOWAS member states, the Gambia has the highest external contribution of US$ 22.73 million into the healthcare system while Senegal, Togo and Niger recorded the lowest value of healthcare expenditure externally US$ 5.44 million, US$ 3.53 million and US$ 2.87 million correspondingly.

From the table 4.1, the summary statistics showed that Gross domestic product per capita and health care expenditures (National, Private, Public and External) are rightward skewed. Regarding the Kurtosis reports for gross domestic product per capita and healthcare expenditures, national health expenditure per capita, public healthcare expenditure per capita and external healthcare expenditure per capita, are found leptokurtic while Gross domestic product per capita and Private healthcare expenditure are platykurtic.

The incidence of HIV (1 per 1000 uninfected population) and the annual percentage of population growth in ECOWAS revealed the mean values of 0.92% and 2.70% with maximum values of 3.85%, 5.36% and minimum values of 0.05% and 1.09% respectively. The member states of ECOWAS with highest incidence of HIV are Guinea-Bissau (2.20%) followed by Cote d' Ivoire (1.50%) and Togo (1.32%), the least recorded is for Senegal with 0.28% while no record was for

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Cabo Verde. Niger has the highest annual percentage of the population growth of 3.79%, followed by Mali (3.06%) and The Gambia has 3.04% while Cabo Verde has the least average of annual population growth with 1.33%.

The summary statistics of the controlling variables are reported in table 4.1. The average mean of Immunizations (DPT, Hep B and Measles) stands at 74.6%, 73.9% and 71.9% respectively, the maximum value in ECOWAS is 99% for the three (3) immunizations considered in this study while the minimum values are 25%, 10% and 30% respectively. Also, the mean of the people using at least basic drinking water services and sanitation services are 64.1% and 24.9%. The maximum is 88.8% and 79.1% and with the minimum of 36.9% and 5.20%. The average of female with prevalence of HIV between the age of 15-24 in ECOWAS is 95%, the maximum and minimum values are 4.4% and 0.1% respectively.

Gross Fixed Capital Formation and Trade mean value at per capital are US$ 191.3 million and US$ 702.9 million. The maximum values stand at US$ 750 million and US$ 687.9 million respectively, the Gross fixed capital formation minimum values are US$ 23.9 million while Trade per capita has no minimum value.

The mean of incidence of malaria and tuberculosis in ECOWAS shows 320.9 per 1000 which indicates that 320.9 average of the population are at risk of malaria in ECOWAS and 167.8 per 100,000 has tuberculosis in ECOWAS. The maximum values are 603.21 and 367 respectively while the minimum stands for 0.008 and 36.

As for female primary school enrollment in ECOWAS, their average, maximum and maximum are 86.6%, 145.6% and 26% correspondingly. The population of age structure of 15-64 (% of total population and female population and 65 and above (% of total population and % of female population) stands the mean value of total population 53.4% and 53.9% female population of ages

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15 – 64years; maximum of 67% and 66%, minimum of 47% and 48% respectively. While 3% and 3.4% are the mean value recorded for the ages 65 and above (both for the % of total and female population) with the maximum value of 6% and 7% and minimum of 2.4% and 2.6% in ECOWAS. The annual average of inflation in the region is 5.6% while maximum and minimum are 42% and -4% respectively.

The skewness and kurtosis from table 4.1, showed that immunizations (DPT, Hep B3 and Measles), incidence of malaria (per 1000 population at risk), people using at least basic drinking water services (7% of population) and female primary school enrollment (% gross) are leftward skewed (negatively skewed) while other variables are skewed to the right (positively skewed). And Trade per capita, Inflation, Population ages (15 – 64) and (65 – above) (% of female and all population), Incidence of HIV and percentage of female with prevalence of HIV are highly peaked (leptokurtic) and the remaining indices (Immunizations (DPT, Hep B3 and measles), Incidence of malaria and tuberculosis, people using at least basic drinking water services and sanitation services, female primary school enrollment and Gross fixed capital formation per capita are platykurtic.

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Table 4.1: Descriptive Statistics

Signs	Variables Measurements	Mean	Std. Dev.	Max.	Min.	Kurtosis	Skewness	Obs.
Outcome Variables								
lep	Life expectancy at birth, total (years)	57.459	6.125	73.166	39.441	0.444	0.241	315
mmr	Maternal mortality ratio (modeled estimate, per 100,000 live births)	652.025	351.367	2480	58	4.675	1.478	315
imr	Mortality rate, infant (per 1,000 live births)	67.048	24.053	138.1	12.2	0.180	0.166	315
u5mr	Mortality rate, under-5 (per 1,000 live births)	107.11	43.072	224.9	14.2	-0.002	0.176	315
gdppc	GDP per capita (constant 2015 US$)	1070.9	713.96	3482.5	364.02	1.317	1.481	315
Main Explanatory Variables								
nhe	Current health expenditure per capita (current US$)	48.43	33.88	191.28	7.544	4.988	2.034	315
puhe	Domestic general government health expenditure per capita (current US$)	14.44	22.18	116.99	1.126	10.699	3.326	315
pvhe	Domestic private health expenditure per capita (current US$)	24.96	15.79	80.29	3.479	0.183	0.938	315
exhe	External health expenditure per capita (current US$)	9.024	8.449	74.70	0.452	15.984	3.076	315
Control Variables								
im_dtp	Immunization, DPT (% of children ages 12-23 months)	74.62	17.42	99	25	-0.242	-0.764	315
Im_hepB3	Immunization, HepB3 (% of one-year-old children)	73.86	20.17	99	10	1.311	-1.304	315
Im_ms	Immunization, measles (% of children ages 12-23 months)	71.94	16.02	99	30	-0.587	-0.429	315
Ihiv	Incidence of HIV, all (per 1,000 uninfected population)	0.918	0.699	3.85	0.05	3.592	1.667	294
f_hiv15_24	Prevalence of HIV, female (% ages 15-24)	0.945	0.664	4.4	0.1	3.319	1.222	315
Inc_mal.	Incidence of malaria (per 1,000 pop.at risk)	320.9	148.5	603.21	0.008	-0.185	-0.812	313
Inc_tb.	Incidence of tuberculosis (per 100,000 people)	167.8	97.05	367	36	-0.920	0.486	315
Bw	People using at least basic drinking water services (% of population)	64.1	11.917	88.77	36.85	-0.711	-0.122	315
Bs	People using at least basic sanitation services (% of population)	24.9	16.079	79.12	5.197	0.562	1.132	315
p15_64	Population ages 15-64 (% of total population)	53.4	3.371	67.13	47.18	4.053	1.413	315
f_ p15_64	Population ages 15-64, female (% of female population)	53.9	3.019	65.99	47.78	3.636	1.232	315
p65ab	Population ages 65 and above (% of total pop.)	3.035	0.617	5.673	2.407	7.444	2.641	315
f_p65ab	Population ages 65 and above, female (% of female population)	3.377	0.833	6.661	2.582	6.739	2.577	315
f_psch	School enrollment, primary, female (% gross)	86.59	21.77	145.59	25.99	-0.159	-0.175	296
Pgr	Population growth (annual %)	2.679	0.612	5.363	1.094	1.917	0.250	315
Gfcfpc	Gross fixed capital formation per capita (constant 2015 US$)	191.3	149.9	750	23.91304	1.422	1.425	255
Inf	Inflation, consumer prices (annual %)	5.631	6.788	41.51	-3.503	5.832	1.992	303
Tradepc	Trade per capita	702.9	687.9	4036.403	0	7.506	2.661	293

Note: Std Dev. - standard deviation; Max. - maximum; Min. - minimum; Obs. - observation.
Source: Author's computation (2022)

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Table 4.2: Average of Healthcare Expenditure, Health Outcomes and Economic Growth (2000-2020)

S/N	Country	Life expectancy at birth, total (years)	Maternal mortality ratio (modeled estimate, per 100,000 live births)	Mortality rate, infant (per 1,000 live births)	Mortality rate, under-5 (per 1,000 live births)	GDP per capita (constant 2015 US$)	Current health expenditure per capita (current US$)	Domestic general government health expenditure per capita (current US$)	Domestic private health expenditure per capita (current US$)	External health expenditure per capita (current US$)	Incidence of HIV, all (per 1,000 uninfected population)	Population growth (annual %)
1	Benin	58.98	459.71	70.02	109.89	1024.48	28.13	6.61	14.42	7.09	0.606	2.849
2	Burkina Faso	56.62	394.81	70.16	127.02	587.40	29.22	9.90	11.38	7.94	0.493	2.936
3	Cabo Verde	71.14	75.57	20.80	24.72	2803.02	138.16	90.13	37.83	10.20	n.a.	1.331
4	Cote d'Ivoire	53.24	679.67	75.70	108.54	1808.27	69.21	12.12	49.50	7.59	1.468	2.371
5	Gambia, The	59.41	701.67	46.66	76.52	700.17	36.51	6.46	7.32	22.73	1.281	3.037
6	Ghana	60.78	353.43	47.26	69.59	1498.03	60.51	24.90	27.63	7.98	1.065	2.390
7	Guinea	56.53	793.71	76.86	122.22	741.26	28.84	3.52	19.46	5.85	0.818	2.328
8	Guinea-Bissau	54.59	849.57	75.05	119.15	590.57	43.45	7.75	23.76	11.93	2.195	2.447
9	Liberia	58.81	751.86	80	112.96	666.41	43.26	5.27	25.43	12.55	0.754	2.989
10	Mali	54.66	664.33	77.94	133.51	714.95	28.78	6.60	14.24	7.94	0.597	3.063
11	Niger	56.93	656.43	65.94	134.50	451.09	21.77	6.33	12.57	2.87	0.173	3.786
12	Nigeria	50.71	1015.43	87.46	141.42	2221.08	66.90	11.22	49.84	5.84	0.724	2.606
13	Senegal	63.64	435.48	44.68	72.75	1179.02	47.38	14.51	27.42	5.44	0.283	2.664
14	Sierra Leone	48.51	1506.67	108.37	163.89	550.67	52.38	5.60	30.92	15.85	1.078	2.766
15	Togo	57.33	442.05	58.82	89.98	526.54	31.91	5.70	22.68	3.53	1.318	2.615

Source: Author’s computation (2022)

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Figures 4.1 to 4.5 shows the time-series plots of healthcare expenditures, health outcomes and Gross Domestic Product of ECOWAS members. Specifically, Figure 4.1, shows the trend movement of Income per Capital and healthcare expenditure (Private, Public, National, and External) in ECOWAS. Figure 4.2 reveals the plots of Life Expectancy at birth and healthcare Expenditure. Figure 4.3, displayed the flowchart of maternal mortality rate and healthcare expenditure. The trend movement of Infant mortality rate, Under-five mortality rate and healthcare expenditures are explained in Figure 4.4 and Figure 4.5 respectively.

In Figure 4.1, National healthcare expenditure and External healthcare expenditures slopes upwardly from 2000 to 2012 and falls from 2013 to 2017, the series rose up in 2018 and in 2019 to 2020, there was a gradual decrease. The trend of public healthcare expenditure from 2000 to 2002 fluctuated but a steady increase was observed from 2003 to 2006. There was a fluctuation throughout the period of 2007 to 2012. By 1 percent Public healthcare expenditure increased in 2013 and dripped down in 2014 to 2016 at 1percent, increased in 2017 by 3 percent but gradually falls for the remaining periods. Likewise, the Private Healthcare Expenditure movement grew gradually from the beginning to 2014, but slightly moved downward within 2015 to 2017 and for the years left sloped upwardly.

For Burkina-Faso, the National Healthcare Expenditure and Private Healthcare Expenditure sloped upwardly from 2000 to 2013. A gradual fall was observed within 2014 to 2015 for National healthcare expenditure and 2014 to 2016 for Private Healthcare Expenditure and both steeped in 2016 and 2017 respectively. The series dropped in 2018 and later streams upward for the years left. Also, Public healthcare expenditure trend upward from 2000 to 2004, dripped in 2005 and streamed upward within 2006 and 2009. From 2010 to 2012, the variable fluctuated, inclined in 2013 to 2014 and dropped at 3% in 2015. During 2016 and 2017, the variable steeped

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upward, afterward, slide downwards for the remaining periods. As for External healthcare expenditure, it slides up for 2000 to 2007, dripped within 2008 to 2009, fluctuated from the periods of 2010 to 2012, later declined greatly in 2013 through the periods left.

For Cape Verde, the healthcare expenditure variables slope steeply upward at the beginning of the period to 2013 and 2014 respectively. In 2015, the four variables slide downward and streams up 2016 to 2018 and later declined for the remaining years. National healthcare expenditure and Private healthcare expenditure slide up from 2000 to 2008, slides down in 2009 in Cote d'Ivoire, between 2010 and 2015, the two variables dropped from 2014 and 2015. There was a steeply downward movement at 18% and 13% respectively, then slanted upward for the remaining periods except for Private healthcare expenditure that declined in 2019 to 2020 and external healthcare expenditure fluctuated throughout the periods while public healthcare expenditure progressively increased from 2013 till 2020.

The trends of National and External healthcare expenditures for The Gambia moved in a fluctuated manner throughout the periods. Likewise, Public and Private healthcare expenditure moved in the same unstable manner. For Ghana, the healthcare expenditure variables slope upward for some years. National healthcare expenditure dripped drastically between 2014 to 2017, streams upward in 2018, later decline in 2019 to 2020. Public and Private healthcare expenditures slide downward in 2012 and sloped up in 2013, later the trend dropped in 2014. Public healthcare expenditure streams up from 2018-2020 while Private healthcare expenditure sloped upward from 2017-2018 and decline in 2019-2020. The External healthcare expenditure declined in 2007, slide up from 2008 to 2011, dropped in 2012 and 2014, steeped upward in 2013 and 2015 but fell drastically in the remaining years.

As for Guinea, the National healthcare expenditure and Private healthcare expenditure trend movement fluctuated from the beginning but in 2004-2006, a downward slide was observed,

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later rose up in 2007-2009. The variables dripped downward in 2010 to 2011, streamed upward in 2012 through to 2015. Both series declined in 2016 but tilted upward for the remaining years. The External healthcare expenditure slant upwardly from 2000 to 2003, dripped down in 2004, steeps upward in 2007 till it dropped by 1% in 2012, later pitched up within 2013 to 2016. In 2017, a drastic decline of about 7% was observed, then moved upward for the remaining periods while public healthcare expenditure slight upwardly from 2000-2004, fluctuate between 1% increase and decrease from 2005 to 2016 but for the remaining periods the trend moved steadily upward.

It was observed in Guinea Bissau, that the trend for National healthcare expenditure and External healthcare expenditure fluctuated throughout the periods. Also, Public healthcare expenditure trend was unstable but falls drastically from 2010 till 2020. While the Private healthcare expenditure slopes upward from the beginning to 2008, dropped in 2009 and steeped upward for the remaining periods. As for Liberia, the public healthcare expenditure fluctuated throughout the periods, the Private healthcare expenditure trend downward from 2001 to 2003, dripped upward in 2004, sloped downward in 2006, steeped up at 10% in 2007, within 2008 and 2009, private healthcare expenditure recorded 3 to 4 per cent decline. The trend slides upward in 2010 to 2015, then gradually declined throughout the periods. External healthcare expenditure streams upward from 2000 to 2013, dropped down in 2014, rose up in 2015 and drastically slopes downward for the remaining periods. Likewise, the National healthcare expenditure declined in 2001 but plunged up from 2004 to 2015, later slant down for the remaining periods.

In Mali, National, Public and Private healthcare expenditure seeped down in 2001, streamed upward from 2002 to 2008. Public healthcare expenditure declined in 2009, slide upwardly in 2011, dropped by 2% in 2012 and fluctuated between 2013 and 2015, then gradually inclined for the remaining periods. The National health expenditure slanted downward within the period of

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2010-2012, slide upward in 2013 and 2017-2020 but declined in 2015 to 2016. The Private healthcare expenditure declined from 2010 till 2020 while External healthcare expenditure increased from the beginning till 2014 then slide downward for the remaining periods.

The National, Private, External and Public Healthcare Expenditure in Niger sloped up from 2000 but in 2009, National, External and Public healthcare expenditure dips and grew in 2011 and dropped in 2012. Within 2013 and 2015, National healthcare expenditure streamed upward, public healthcare expenditure declined in 2014 to 2016 and both variables (NHE & PUHE) sloped upward for the remaining years. While External healthcare expenditure dipped upward in 2013, sloped downward in 2016 and fluctuated for the remaining periods. In Nigeria, the trend movement of National and Private healthcare expenditure sloped upwardly from the beginning to 2008, sloped down in 2009, slide upward in 2010 and dips upward in 2014, sloped downward gradually in 2015 to 2018, then inclined for the remaining periods while External and Public healthcare expenditure sloped upward from the beginning. External healthcare expenditure dips from 2015 to 2018 while public healthcare expenditure plunged down in 2009, steeped upward till 2015, drops in 2016 to 2017 and both variables slope upwardly for the remaining periods.

The National and Public healthcare expenditure plunged upward same as Private healthcare expenditure for the first five periods in Senegal. The three (3) variables declined in 2005, 2007 and 2004 respectively and streamed upward in 2006. Private and Public healthcare expenditure slide downward in 2014. Public healthcare expenditure inclined gradually for the remaining periods. Within 2017 to 2018, Private healthcare expenditure slide up and declined in 2019 to 2020 while National healthcare expenditure grew from 2016 to 2018 and plunged down in 2019 to 2020.

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The trend of National health expenditure sloped upward in Sierra Leone from the beginning and a drastic increase was observed in 2013 to 2014, steeped downward from 2015 till the end of the periods. Private healthcare expenditure sloped upward from 2000 to 2009, falls in 2010, steeped up in 2011 to 2014 and gradually plunged down from 2015 till end of the period. The External healthcare expenditure incline upward and also from the beginning of the period till 2011 and dripped down in 2012, steeped upwardly in 2013 to 2014 at 50 percent, then gradually slides down for the remaining years while public healthcare expenditure movement was unstable throughout the periods.

In Togo, the trend of National healthcare expenditures and Private healthcare expenditure trends in the same manner. The variables gradually slope upward from 2000 to 2014, dripped downward within 2015 and 2016, inclined in 2017 and 2018 and later plunged down for the remaining years. From 2000 to 2012, Public healthcare expenditures steeped upwardly and become unstable for the remaining periods while External healthcare expenditure slide upwardly from the beginning to 2009, declined at 2 percent in 2010, slides up at the same percent in 2011 and within 2016 to 2017, later dips down in 2018 to 2020.

Similarly, Fig. 4.1, reveals the income per capita of ECOWAS members. Benin has its trend fluctuated from the beginning of the period but maintains a steady upward movement from 2016 to 2020. For Burkina-Faso and Nigeria, the trend gradually slopes upwardly from the beginning, but declined in 2020 for Burkina-Faso while Nigeria declined from 2015 to 2020. Cabo Verde sloped upwardly from the beginning, fluctuated between 2009 to 2015, gradually sloped up in

2016 and steeped up in 2019 but later dips in 2020. As for Cote d'Ivoire, the series movement sloped downward from the beginning and unstable for few years, moved up between 2008 and 2010, dropped down in 2011. The trend slides up from 2012 to 2019 and declines in 2020. The Gambia trend moved in a zigzag pattern throughout the understudied periods while the trend

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flow for Ghana slope upwardly at a steady rate from the beginning, steeped up in 2010 but dropped down in 2020. Guinea trend fluctuated from the beginning rose up in 2007 gradually, steeped upwardly from 2011 till the end of the periods.

In Guinea Bissau, the series steeped down and unstable till 2006, steeped up from 2007 to 2011 and recorded unstable movement for the remaining period. Meanwhile, the trend of Liberia dropped in 2001, rose up at 10% in 2002 but slide downward at about 250% in 2003, slide up in 2004, then declined in 2018 till the end of the periods. As for the remaining countries their income trend slope differently for the periods under studies in Fig. 4.1.

Concerning the trend of Life expectancy at birth (Fig. 4.2) for the ECOWAS members, all slopes upwardly but at different percent. Cabo Verde records the highest life expectancy at 73 years while Nigeria and Sierra Leone recorded the lowest at 55 years. Fig. 4.3 reveals the maternal mortality rate (deaths due to complications from pregnancy or child birth). An upward movement was observed in the first three years (2000 – 2001) for Cote d'Ivoire and within 2009 to 2013 which later dripped down gradually. Same as Guinea, the series steeped upwardly from the beginning, slide down in 2004, plunged up in 2014 and later declined for the remaining periods. Also, in Liberia, the series slide up from 2000, steeped upwardly in 2002, also in 2014 – 2015 and gradually declined for the remaining years. As for Mali, it was observed that the series slides upward within 2011 – 2014 and gradually fell for the remaining years. An upward movement was observed also

in Togo during 2005, later declined gradually for the remaining periods. Meanwhile, in other countries, the series declined gradually from the beginning and plunged down along the periods at different rate.

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Fig. 4.4, reveals the infant mortality rate (number of infant deaths for every 1000 live birth) in ECOWAS. The series movement was the same for all the countries but at different rates. The series slides downward and plunged down drastically, the same was observed in the trend for Under-five mortality rate shown at Fig 4.5 among the ECOWAS members.

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4.3 Test of Hypotheses

This section presents the empirical results regarding the specific objectives in the following three sub-sections. Before the presentation of results of the stated specific objectives, pre-estimation test such as correlation analysis for the detection of multicollinearity problem, scattered charts, unit roots and cointegration are examined to decide the appropriate estimation techniques for each objective. The estimation outcomes are presented in the following sub-sections.

4.3.1 Analysis of the First Objective

In this sub-section, the study reports the empirical outcomes relating to the effect of healthcare expenditures on health outcomes in ECOWAS.

4.3.1.1 Correlation Analysis and Scatter Plots

The correlation analysis shows the degree of linear relationship among the variables which can either be positive or negative. The value of correlation coefficient lies between -1 and 1. Also, the correlation analysis is meant to offer a glimpse at the nature of the relationship among the variables in the model and be able to observe if there could be any multicollinearity problems among the variables.

Table 4.3 presents the correlational coefficient of the variables relating to the link between healthcare expenditures and health outcomes in ECOWAS. The coefficient of correlation result shows that healthcare expenditures (National, Public, Private and External) have positive relationship with Life expectancy at birth (lep) but the positive relationship with Private healthcare expenditure (pvhe) and External healthcare expenditure (exhe) is weak. National, Public and Private healthcare expenditure have a negative link with Maternal mortality rate,

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Infant mortality rate and Under-five mortality rate while External healthcare expenditure shows a weak positive relationship with Maternal mortality rate (mmr) but a negative relationship with Under-five mortality rate (u5mr) and Infant mortality rate (imr). Also, a negative relationship exists between Maternal mortality rate (mmr), Infant mortality rate (imr) and Under-five mortality rates (u5mr) with Life Expectancy at birth (lep).

Regarding the controlling variables, table 4.3, shows that Immunization (DTP, HepB3 and measles) have strong positive relationship with Life Expectancy at birth (lep) and a negative link with Maternal mortality rate (mmr), Infant mortality rate (imr) and Under-five mortality rate (u5mr). Incidence of HIV (ihiv), Prevalence of HIV ages 15 – 24 (f_hiv 15 – 24), Incidence of malaria (Inc_mal) and Incidence of tuberculosis (Inc_tb) has a negative correlation with Life Expectancy at birth (lep) but positively with Maternal mortality rate (mmr), Infant mortality rate (imr) and Under-five mortality rates (u5mr).

People access with basic water and sanitation, population of ages 15 – 64, (total and female), population of ages 65 and above (total and female), and female primary school enrollment has a positive link with Life Expectancy at birth while a negative link exist with Maternal mortality rate, Infant mortality rate and Under-five mortality rate. It is imperative to note that the following economic indices, Immunization DTP, population ages 15 – 64, Infant mortality rate and population ages 65 and above with correlation coefficient of 0.933, 0.985, 0.954 and 0.969 were not considered in the same empirical model for the estimation. Hereafter, the problem of multicollinearity is avoided in the empirical analysis.

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Table 4.3: Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
lep	-0.822	-0.936	-0.923	0.525	0.657	0.108	0.181	0.626	0.444	0.583	-0.486	-0.592	-0.642	-0.441	0.664	0.584	0.507	0.556	0.526	0.559	0.428
mmr(1)	1	0.836	0.764	-0.320	-0.497	-0.007	0.034	-0.538	-0.290	-0.467	0.315	0.397	0.352	0.648	-0.499	-0.359	-0.351	-0.383	-0.315	-0.355	-0.260
imr(2)		1	0.954	-0.501	-0.602	-0.130	-0.187	-0.688	-0.446	-0.623	0.380	0.552	0.654	0.466	-0.654	-0.611	-0.462	-0.502	-0.361	-0.381	-0.366
u5mr(3)			1	-0.575	-0.602	-0.258	-0.245	-0.718	-0.425	-0.648	0.289	0.409	0.651	0.333	-0.750	-0.606	-0.579	-0.609	-0.428	-0.426	-0.542
nhe(4)				1	0.845	0.747	0.395	0.371	0.272	0.383	-0.097	-0.208	-0.517	0.001	0.581	0.626	0.784	0.748	0.604	0.621	0.371
puhe(5)					1	0.359	0.092	0.395	0.295	0.439	-0.182	-0.351	-0.581	-0.272	0.519	0.637	0.759	0.748	0.780	0.819	0.294
pvhe(6)						1	0.183	0.040	-0.034	-0.003	-0.059	0.091	-0.221	0.257	0.341	0.316	0.514	0.459	0.215	0.184	0.254
exhe(7)							1	0.375	0.381	0.388	0.007	-0.081	-0.147	0.239	0.331	0.248	0.190	0.178	-0.027	-0.005	0.252
im_dtp(8)								1	0.678	0.933	-0.122	-0.234	-0.406	-0.247	0.499	0.341	0.390	0.385	0.208	0.230	0.414
im_hepb3(9)									1	0.714	-0.201	-0.296	-0.343	-0.079	0.363	0.238	0.254	0.259	0.089	0.122	0.162
im_ms(10)										1	0.007	-0.187	-0.387	-0.149	0.486	0.346	0.397	0.385	0.231	0.259	0.347
ihiv(11)											1	0.843	0.066	0.504	-0.043	-0.259	0.168	0.128	0.028	-0.046	-0.031
f_hiv15-24(12)												1	0.380	0.501	-0.193	-0.511	0.004	-0.047	-0.230	-0.273	-0.001
inc_mal(13)													1	-0.049	-0.502	-0.604	-0.480	-0.549	-0.490	-0.489	-0.355
inc_tb(14)														1	-0.105	-0.266	0.030	0.026	-0.130	-0.169	-0.065
bw(15)															1	0.706	0.571	0.586	0.446	0.393	0.386
bs(16)																1	0.429	0.438	0.454	0.430	0.170
p15-64(17)																	1	0.985	0.591	0.627	0.592
f_p15-64(18)																		1	0.605	0.648	0.595
p65ab (19)																			1	0.969	0.351
f_p65ab (20)																				1	0.346
f_psch (21)																					1

Note: lep – Life expectancy at birth (total years) ; mmr – Maternal mortality rate (per 100,000 live birth); imr- Infant mortality rate (per 1,000 live births); u5mr-Under-five mortality rate (per 1,000 live birth); Public healthcare expenditure per capita; pvhe- Private healthcare expenditure per capita; exhe – External healthcare expenditure; im_dtp – Immunization, DPT (% of children ages 12-23 months); im_hepb3 - Immunization, HepB3 (% of one-year-old children); im_ms - Immunization, measles (% of children ages 12-23 months); ihiv- Incidence of HIV, all (per 1,000 uninfected population); f_hiv15-24 - Prevalence of HIV, female (% ages 15-24);inc_mal - Incidence of malaria (per 1,000 population at risk); inc_tb - Incidence of tuberculosis (per 100,000 people); bw- People using at least basic drinking water services (% of population); bs - People using at least basic sanitation services (% of population);p15-64 -Population ages 15-64 (% of total population); f_p15-64 - Population ages 15-64, female (% of female population); p65ab - Population ages 65 and above (% of total population); f_p65ab- Population ages 65 and above, female (% of female population),f_psch- School enrollment, primary, female (% gross).
Source: Author's computation (2022).

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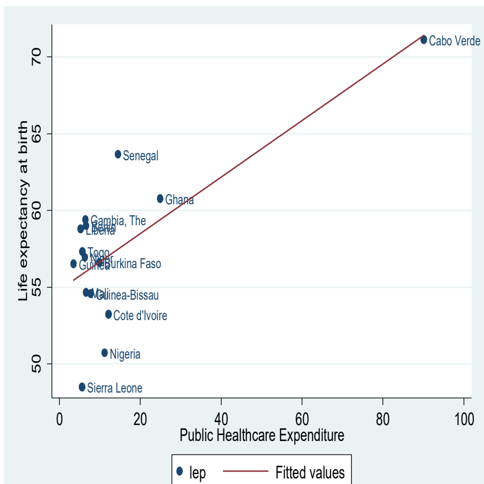

Fig. 4.6a: Scatter chart of public healthcare expenditure and life expectancy

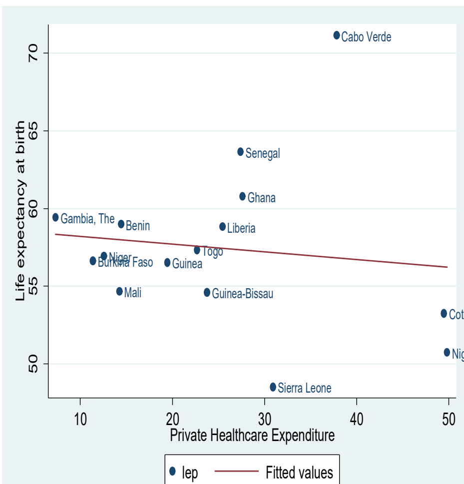

Fig. 4.6b Life Expectancy at birth and Private Healthcare Expenditure

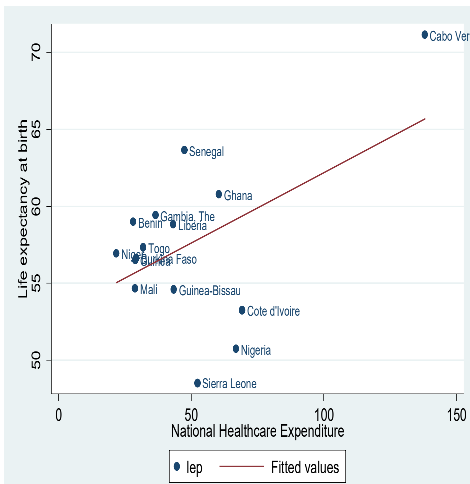

Fig. 4.6c: Life Expectancy at birth and National Healthcare Expenditure

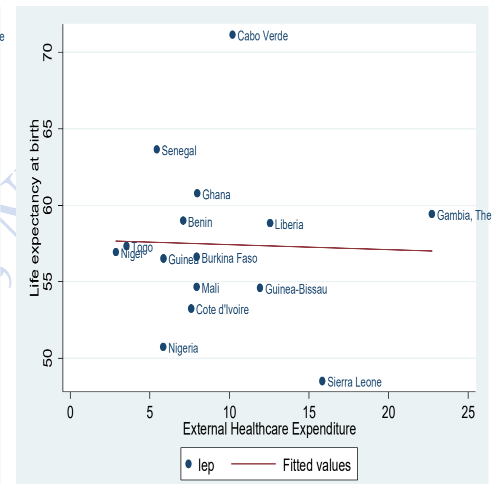

Fig.4.6d: Life Expectancy at birth and External Healthcare Expenditure

Figure 4.6(a-d): Scatter Plots of Healthcare Expenditure and Life Expectancy at Birth

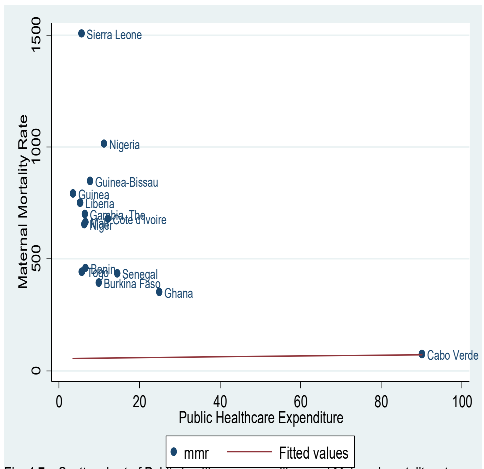

Fig. 4.7a: Scatter chart of Public healthcare expenditure and Maternal mortality rate

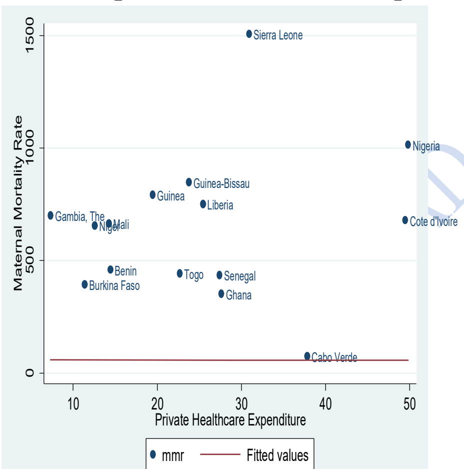

Fig. 4.7b: Scatter Chart of Private Healthcare expenditure and Maternal mortality rate

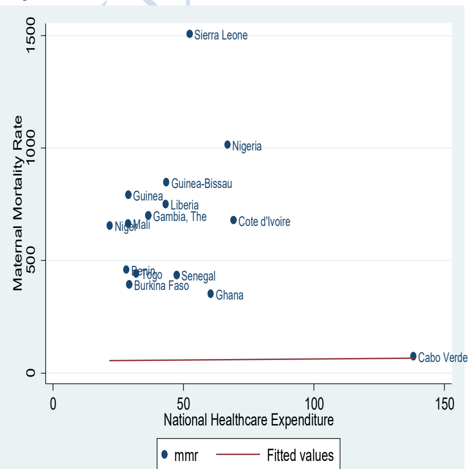

Fig. 4.7c: Scatter chart of National healthcare expenditure and Maternal mortality rate

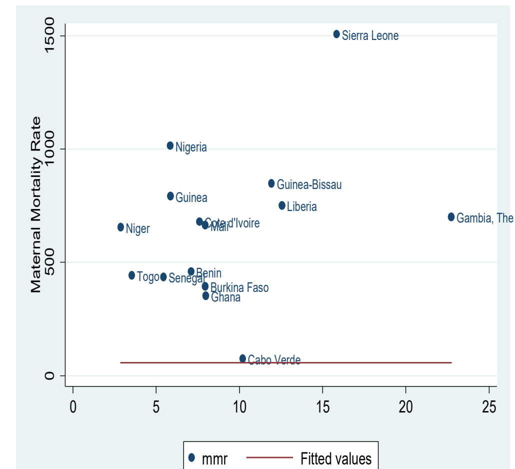

Fig.4.7d: Scatter chart of External healthcare expenditure and Maternal mortality rate

Figure 4.7(a-d): Scatter Plots of Healthcare Expenditure and Maternal Mortality Rate

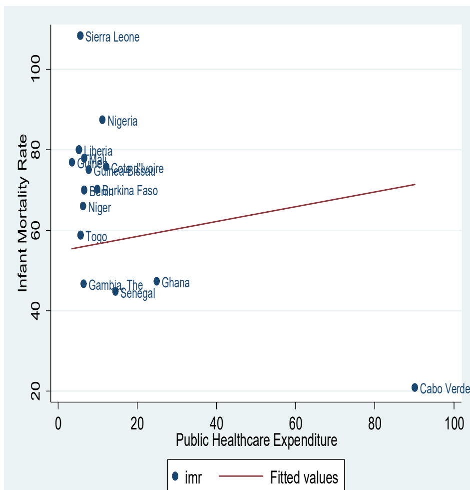

Fig.4.8a: Scatter chart of Public healthcare expenditure and Infant Mortality rate

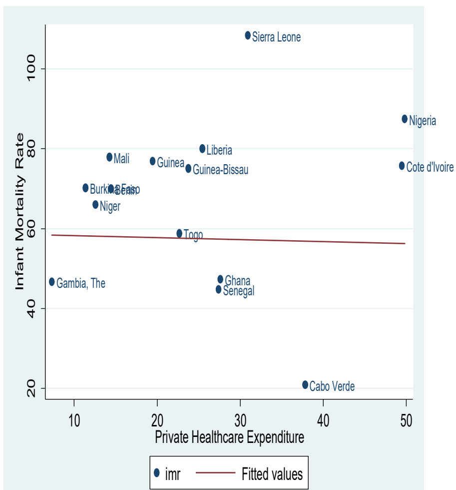

Fig. 4.8b:Scatter chart of Private Healthcare Expenditure and Infant Mortality rate

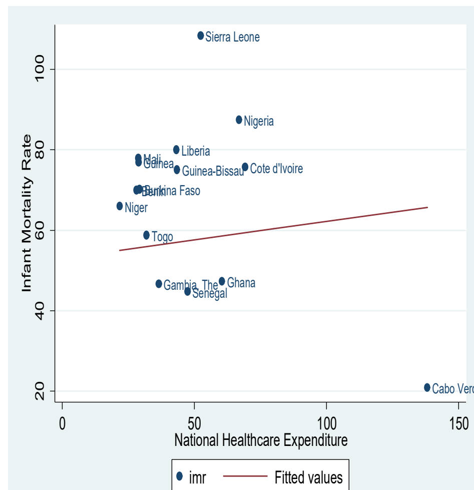

Fig.4.8c: Scatter chart of National Healthcare Expenditure and Infant Mortality Rate

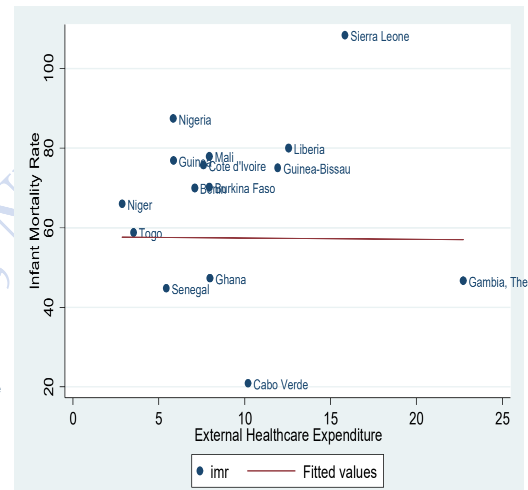

Fig.4.8d: Scatter chart of External Healthcare Expenditure and Infant Mortality Rate

Figure 4.8(a-d): Scatter Plots of Healthcare Expenditure and Infant Mortality Rate

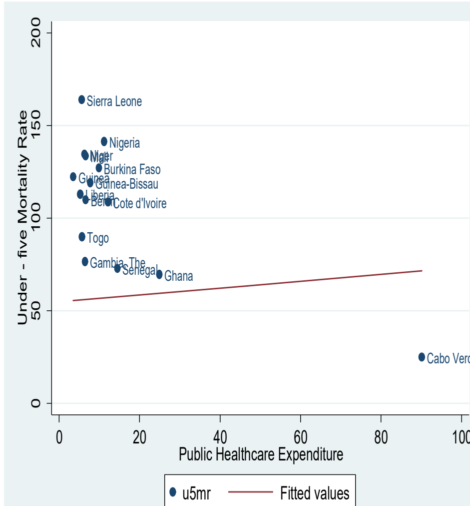

Fig.4.9a: Scatter chart of Public Healthcare Expenditure and Under-five Mortality Rate

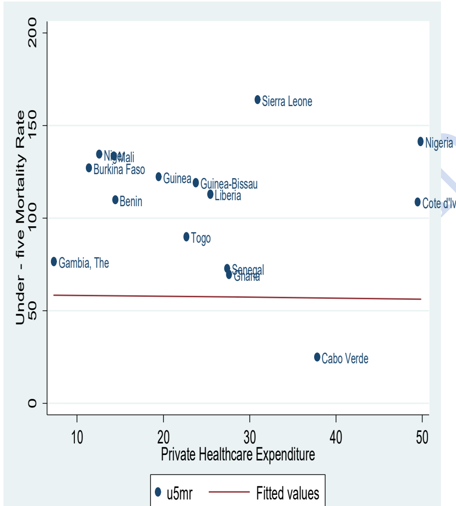

Fig.4.9b: Scatter chart of Private Healthcare Expenditure and Under-five Mortality Rate

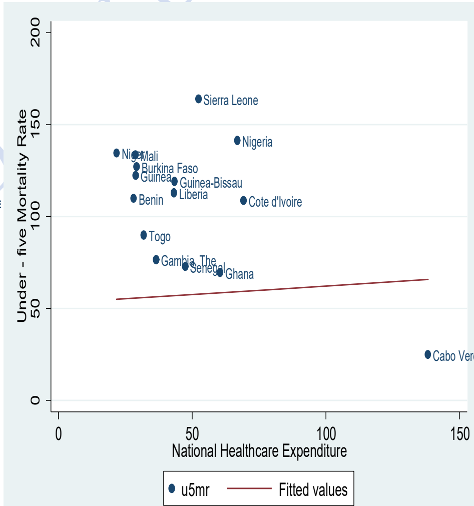

Fig.4.9c: Scatter chart of National Healthcare Expenditure and Under-five Mortality Rate

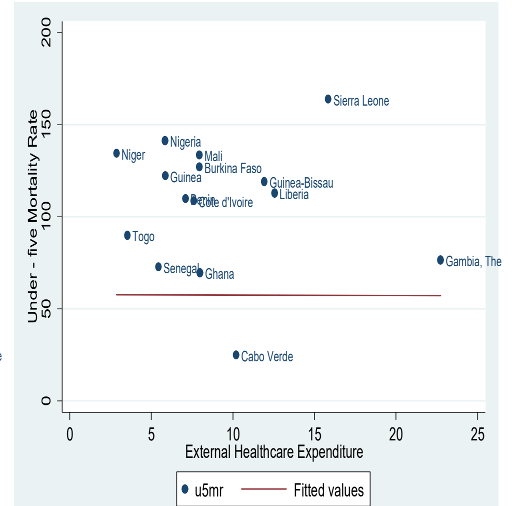

Fig.4.9d: Scatter chart of External Healthcare Expenditure and Under-five Mortality Rate

Figure 4.9(a-d): Scatter Plots of Healthcare Expenditure and Under-Five Mortality Rate

A pictorial view of the correlation coefficients is depicted in the scatter plot of the variables in Figures 4.6 (a – d) – Figures 4.9 (a – d) which shows that in ECOWAS, Cabo Verde, Ghana and Senegal are the top three nations that contributed more of the public funds into the health sector with the value of US$ 85 million, US$ 25 million and US$ 19 million respectively while the value of Nigeria US$ 17 million, Guinea Bissau US$ 15 million, Sierra Leone US$ 10 million and Guinea US$ 8 million were low. Also, the private healthcare expenditure in Cote d'Ivoire and Nigeria was high at US$ 50 million for both countries, followed by Cabo Verde, Sierra Leone and Ghana at US$ 40 million, US$ 32 million and US$ 28 million respectively while the Gambia has the least private healthcare expenditure of US$ 8 million.

Cabo Verde has the high value (US$ 148 million) of national healthcare expenditure, then Cote d'Ivoire (US$ 80 million), Nigeria (US$ 78 million), Ghana (US$ 70 million), Sierra Leone (US$ 55 million) respectively whereas Guinea Bissau (US$ 49 million), Mali US$ 45 million and Niger US$ 40 million recorded the lowest national healthcare expenditure. Meanwhile, the Gambia received more fund of US$ 23 million from the external bodies followed by Sierra Leone of US$ 17 million, Liberia US$ 13 million, Guinea Bissau US$ 12 million and Cabo Verde US$ 10 million while Senegal, Guinea, Nigeria, Togo and Niger have a low external healthcare expenditure with the value of US$ 7million, US$ 6 million, US$ 6 million, US$ 3 million and US$ 2 million respectively.

Also, the Cabo Verde has the high life expectancy at birth of 72 years, then, Senegal (64 years), Ghana (62 years), despite the high private healthcare expenditure. In spite of the high private healthcare expenditure in Cote d'Ivoire and Nigeria, these countries still have low life expectancy at birth 54 years and 52 years respectively. Similarly, the Gambia, has the highest external healthcare expenditure with a low life expectancy at birth of 58 years. This suggest that

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funds may not be properly channeled into health services which would have contributed to the improvement of health status.

Sierra Leone, Nigeria and Guinea Bissau showed high maternal mortality rate, this could be due to poor health infrastructure, inadequate health personnel, poor awareness during pregnancy. Likewise, Sierra Leone, Nigeria and Liberia has the high infant mortality rate and under-five mortality rate among ECOWAS nations, this suggests that aside funds, there are other measures that must be in place to help reduce the high mortality rate, such as clean water, clean sanitation, good healthy lifestyle, health related programmes and so on.

4.3.1.2 Cross-Sectional Dependence, Stationary and Cointegration Tests

The results of cross-sectional dependence test are presented in Table 4.4. The test statistics were performed for fifteen West African countries (Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo), for a period of 20 years (2000–2020). The Pesaran CD test results presented in Table 4.4 confirm the rejection of null hypotheses of no correlation at predictable significance levels. As for the test statistic values of standard normal Pesaran CD test, the statistical values of the health outcomes models are significant statistically as they reject the null hypotheses at 0.05 critical values.

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Table 4.4: Cross-Sectional Dependence Test Results (d.f. = 105)

H$_0$: There is no cross-sectional dependence

Test	**Main explanatory variables**	**Dependent Variables**							
		Life Expectancy		**Maternal Mortality**		**Infant Mortality**		**Under 5 Mortality**	
		Stat.	**Prob.**	**Stat.**	**Prob.**	**Stat.**	**Prob.**	**Stat.**	**Prob.**
Pesaran CD	National health	3.2319	0.0012	4.4700	0.0000	3.8285	0.0002	5.5606	0.0000
	Public health	2.1175	0.0342	5.8108	0.0000	4.4302	0.0000	9.1722	0.0000
	Private health	4.2392	0.0000	2.0620	0.0392	2.1467	0.0318	3.9250	0.0001
	External health	4.3198	0.0000	4.3560	0.0000	3.4005	0.0006	3.5622	0.0004

Note: Other explanatory variables included with the main explanatory variables are basic water and sanitation, immunizations (Hepb3, DTP and measles), incidence of HIV, malaria and tuberculosis, female prevalence of HIV, female school enrollment, total population age structure (65 and above, 15-24, 15-64), female population age structure (65 and above, 15-24, 15-64).
Source: Author's computation (2022).

4.3.1.3 Unit Root and Cointegration Tests

Furthermore, the panel unit root and cointegration tests were reported. Regarding Table 4.5, it shows the unit root test results Levin, Lin and Chin (LLC), Breitung (Breit) and Im, Pesaran and Shin (IPS) statistics approaches. As shown in the table, the methods confirmed female prevalence of HIV age 15 – 24 (f_hiv15_24) are stationary at levels of I (0). Likewise, population ages 65 and above (p_65_ab) is stationary at the levels of I (0) at 1% and 5% significant levels but at first differences the three (3) unit root test estimators reveal stationarity at 1% significance level respectively. Also, Immunization, measles shows stationarity at levels at 1% (LLC), 5% (Breit) and 10% (IPS) significance levels respectively but stationary at first differences at 1%.

The three (3) unit root test estimators revealed that external healthcare expenditure and female primary school enrollment (f_psch) are stationary at first difference of I (1). As regards Basic sanitation (BS), Incidence of Malaria (Inc_mal), Life Expectancy at birth (LEP), under-five mortality rate, infant mortality rate, maternal mortality rate, Incidence of tuberculosis (Inc_tb)

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and Private Healthcare Expenditures (PVHE) the unit root test results are mixed using the three (3) estimators. The results of Levin, Lin and Chin (LLC) and Im, Perasan and Shin (IPS) unit root test revealed that Basic sanitation (BS), Incidence of Malaria (Inc_mal), Life Expectancy at Birth (lep), Incidence of tuberculosis (Inc_tb), Private healthcare expenditure (PVHE) are stationary at levels but the Breitung (Breit) unit root test found that they are stationary at first differences.

Levin, Lin and Chin (LLC) and Im, Perasan and Shin revealed that immunization, HepB3 and Private Healthcare Expenditure (PVHE) are stationary at levels at 1% and 5% significant levels but the three methods show stationary at 1% significance level at first difference.

The unit root test results of Levin, Lin Chin (LLC) and Breitung (Breit) for Basic water (BW), National healthcare expenditure (nhe), Public healthcare expenditure (puhe), Immunization, DTP (Im_dtp), female population ages 65 and above (f_p65ab) are stationary at levels but Im, Pesaran and Shin (IPS) unit root test showed that they are stationary at first differences. It was observed that the estimators revealed National healthcare expenditure (nhe) and public healthcare expenditure (puhe) stationarity at first difference. The results of Breitung (Breit) unit root test showed that Infant mortality rate (imr) and incidence of HIV (Ihiv) are stationary at levels but Levin, Lin and Chin (LLC) and Im, Pesaran and Shin (IPS) unit root test revealed that infant mortality rate and incidence of HIV are stationary at first differences.

Meanwhile, unit root test of Levin, Lin and Chin (LLC) and Im, Pesaran and Shin (IPS) found that female population at ages 15 – 64 and Population at ages 15-64 are stationary at levels but unit root test of Breitung (Breit) found no results both at the levels and first differences. Levin, Lin and Chin (LLC) unit root test found maternal mortality rate and under-five mortality rate stationary at levels whereas Breitung (Breit) and Im, Pesaran and Shin (IPS) revealed

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stationarity of the variables at first difference The study concluded that Basic sanitation, Basic water, National healthcare expenditure, public healthcare expenditure, Private healthcare expenditure, external healthcare expenditure, Female population ages 65 and above, Population ages 65 and above, Incidence of HIV, Immunization, measles, Incidence of malaria, Incidence of Tuberculosis, Life Expectancy at birth , infant mortality rate, under-five mortality and maternal mortality rate are stationary at first difference.

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Table 4.5: Panel Unit Root Test Results

Variables	Variable Description	Levels			1st Difference			Decision
		LLC	Breit	IPS	LLC	Breit	IPS	
Bs	Basic sanitation	-2.6731***	-0.1552	-12.173***	-	-1.8306**	-	I (1)
Bw	Basic water	-2.0640***	-3.3928***	0.6547	-	-	-3.6155***	I (1)
Exhe	External health expenditure	-1.8627	-0.8208	-0.2650	-6.7473***	-7.7250***	-8.7762***	I (1)
Nhe	National health expenditure	-1.6164**	-3.1151***	2.4291	-13.5125***	-11.2304***	-11.7622***	I (1)
Puhe	Public health expenditure	-1.8879**	-1.3273*	0.2263	-12.0540***	-6.2903***	-10.2515***	I (1)-
Pvhe	Private health expenditure	-1.8040**	-0.2623	-1.8100**	-11.1831***	-9.0773***	-8.5554***	I (1)
f_hiv15_24	Female Prevalence of HIV	-3.5629***	-2.3244***	-3.5045***	-	-	-	I (0)
f_p15_64	Female Population (15-64)	-9.9486***	3.0992	-3.6267***	-	-	-	I (0)
f_p65ab	Female Population (65&above)	-2.7664***	-3.4219***	-0.6747	-	-	-2.5056***	I (1)
p15_64	Population (15-64)	-2.0442**	3.2849	-2.0741**	-2.2589***	-	-2.2262***	I (0)
p65ab	Population (65&above)	-2.0793**	-5.2243***	-2.1764**	-17.6394***	-2.7398***	-11.8546***	I (1)
f_psch	Female Primary Sch. Enrollment	1.5121	5.1248	3.1128	-7.7483***	-3.3823***	-5.7511***	I (1)
Ihiv	Incidence of HIV	-0.2423	-4.7482***	1.2148	-7.1957***	-4.6874***	-6.0155***	I (1)
im_dtp	Immunization, DTP	-3.7072***	-2.3640***	-0.6281	-	-	-12.2434***	I (1)
im_hepb3	Immunization, HEPB3	-2.0162**	3.7901	-1.5199*	-10.1459***	-5.4675***	-10.1593***	I (1)
im_ms	Immunization, measles	-3.0762***	-1.9461**	-1.2848*	-13.2150***	-6.2514***	-10.5367***	I (1)
inc_mal	Incidence of malaria	-2.3782***	1.6069	-4.3903***	-	-3.6146***	-	I (1)
inc_tb	Incidence of tuberculosis	-6.1127***	7.2478	-1.6664**	-	-4.5767***	-	I (1)
Imr	Infant mortality rate	0.2289	-2.2716***	1.1727	-2.4431***	-	-2.4794***	I (1)
Lep	Life expectancy at birth	-29.5700***	3.5081	-42.2908***	-	-4.0415***	-	I (1)
Mmr	Maternal mortality rate	-6.2432***	9.6395	0.5512	-	-1.4659*	-5.4159***	I (1)
u5mr	Under-5 mortality rate	-2.1755**	0.5801	0.1851	-	-1.6325**	-2.7135***	I (1)

Note: LL denotes Levin, Lin & Chin (2002); Breit represents Breitung (2001); IPS denotes Im, Pesaran & Shin (2003); ***, ** & * denote 1%, 5% & 10% significance levels.
Source: Author's computation (2022).

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Table 4.6: KAO Residual Test for Cointegration

Test	**H$_0$:** There is no co-integration								
	Main explanatory variables	**Dependent Variables**							
		Life Expectancy		**Maternal Mortality**		**Infant Mortality**		**Under 5 Mortality**	
		Stat.	**Prob.**	**Stat.**	**Prob.**	**Stat.**	**Prob.**	**Stat.**	**Prob.**
Kao Test	National health	-2.5088	0.0061	-2.1171	0.0171	-4.2555	0.0000	-3.6844	0.0001
	Public health	-2.5543	0.0053	-2.1604	0.0154	-4.7150	0.0000	-4.0545	0.0000
	Private health	-2.3931	0.0084	-2.0360	0.0209	-4.3708	0.0000	-3.6307	0.0001
	External health	-2.3332	0.0098	-2.1673	0.0151	-4.2347	0.0000	-3.6062	0.0002

Note: Other explanatory variables included with the main explanatory variables are basic water and sanitation, immunizations (Hepb3, DTP and measles), incidence of HIV, malaria and tuberculosis, female prevalence of HIV, female school enrollment, total population age structure (65 and above, 15-24, 15-64), female population age structure (65 and above, 15-24, 15-64).
Source: Author's computation (2022)

Table 4.6 presents the KAO Residual test for cointegration (Kao). Within the conventional probability test criteria, Table 4.6 revealed that a rejection of the null hypotheses of no cointegration for the model at 5% level of significance. This means that there exists a long-run relationship among the regressand and regressors across all the estimated models in the study. Hence, it approves that the presence of co-integration or a long-run relationship between healthcare expenditures and health outcomes in ECOWAS.

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Table 4.7: Pooled Mean Group Estimates of Healthcare Expenditure and Life Expectancy at birth

Variables	**Dependent Variable: Life Expectancy at birth**			
	1	**2**	**3**	**4**
	Short-Run Estimates			
ECT	-0.1181***	-0.1479***	0.0622***	0.0139***
	(0.0132)	(0.0133)	(0.0038)	(0.0007)
D (National Health Expenditure (-1))	0.0010*			
	(0.0007)			
D (Public Health Expenditure (-1))		0.0001**		
		(0.0004)		
D (Private Health Expenditure (-1))			0.0016***	
			(0.0005)	
D (External Health Expenditure (-1))				0.0003*
				(0.0002)
D (People access to basic sanitation (-1))	-0.0114	0.0095	-0.0084	-0.0109
	(0.0340)	(0.0368)	(0.0214)	(0.0216)
D (People access to basic water (-1))	-0.0549	-0.0990	-0.1007	-0.0934
	(0.0846)	(0.0990)	(0.0916)	(0.0892)
D (Incidence of malaria (-1))	0.0006	-0.0007	0.0022	0.0019
	(0.0034)	(0.0034)	(0.0032)	(0.0036)
D (Incidence of tuberculosis (-1))	-0.0094	0.0152	0.0095	-0.0066
	(0.0280)	(0.0185)	(0.0172)	(0.0174)
D (Incidence of HIV (-1))	0.0024	-0.0002	-0.0008	-0.0015
	(0.0027)	(0.0029)	(0.0025)	(0.0472)
	Long-Run Estimates			
National Health Expenditure	0.0316***			
	(0.0040)			
Public Health Expenditure		0.0326***		
		(0.0053)		
Private Health Expenditure			0.0513***	
			(0.0179)	
External Health Expenditure				-0.0177
				(0.0509)
People access to basic sanitation	0.0291***	-0.0454***	0.3914*	-0.9837
	(0.0030)	(0.0048)	(0.2216)	(2.7621)
People access to basic water	0.0258***	0.0493 ***	-0.0739	-0.1331
	(0.0030)	(0.0056)	(0.0563)	(0.4860)
Incidence of malaria	0.0706***	0.0460***	-0.0744	-0.2898
	(0.0096)	(0.0085)	(0.0560)	(0.8401)
Incidence of tuberculosis	-0.2294***	-0.6903***	0.0387**	-0.1168
	(0.3240)	(0.0748)	(0.1479)	(0.4067)
Incidence of HIV	-0.0266***	-0.0338***	-0.0446	-0.6281
	(0.0056)	(0.0106)	(0.0811)	(1.7903)
Constant	0.0862	0.1488*	-0.0009	0.0069
	(0.0698)	(0.0855)	(0.0473)	(0.0472)
Log Likelihood	1669.161	1701.047	1635.112	1630.098
Hausman Test (Prob.)	0.22 (0.9998)	0.04(1.0000)	2.19(0.9010)	-0.12
Country	14	14	14	14
Observations	280	280	280	280

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10.
Source: Author's computation (2022)

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4.3.1.4 Short-run and Long-run Parameter Estimation

The empirical result of the effects of healthcare expenditures on health outcomes in ECOWAS using the pooled mean group estimator was discussed in this section. The null hypotheses of Hausman tests in Table 4.7- Table 4.10, indicate that the difference in coefficients of mean group and pooled mean group not being systematic are accepted at 5% level of significance. This therefore, indicates the suitability of pooled mean group as the appropriate estimator to test the research hypothesis. Health outcomes as the outcome variable was measured by Life expectancy, Maternal mortality rate, Infant mortality and Under-five mortality rate. Four models were estimated and labeled 1,2,3,4. The selection of optimal lag lengths on the variables were selected automatically using the Bayesian Information Criterion (BIC) after setting it at three in order to ensure sufficient degree of freedom. The most common lag across the fifteen ECOWAS countries is one for each variable of interest.

Table 4.7 presents the summary of short-run and long-run parameter estimates of the pooled mean group or panel autoregressive distributed - ARDL (1, 1, 1, 1, 1, 1) of healthcare expenditures and life expectancy at birth. From the table, the coefficients of error correction term (ECT) are found to be positive and negative and statistically significant at the conventional level. The coefficients of the error correction term are -0.1181, -0.1479,0.0622 and 0.0139 respectively with their probability values of t-statistic less than 1%. The implication is that the empirical models of life expectancy at birth in each healthcare expenditure models correct their short-run disequilibrium by 11.8%, 14.8%, 6.2% and 1.4% speed of adjustment in order to return to the long run equilibrium. This confirms that there is an existence of a long run relationship between healthcare expenditures and life expectancy at birth in ECOWAS countries. Thus, it established that the models' equilibrium nature is valid in the long run.

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In the short run estimates, the parameters of lag one of the healthcare expenditures are positive and statistically significant at 5% level. This means that there exists a positive relationship between life expectancy and healthcare expenditures in ECOWAS. The implication is that healthcare expenditures have significant impact on short run life expectancy at birth in ECOWAS countries. The coefficient of access to basic sanitation in national, public and external healthcare model is negatively and statistically insignificant on life expectancy in the short run while in Private healthcare expenditure model, it is positive and statistically insignificant at conventional level. Similarly, the indirect impact of access to basic water on life expectancy at birth in the short run is statistically insignificant across the four models.

The incidence of malaria in national, private and external healthcare expenditure models have a positive effect on life expectancy at birth in the short run while in the public healthcare expenditure model, there is a negative and an insignificant effect on life expectancy at conventional level. The coefficients of incidence of tuberculosis on life expectancy at birth shows negative in national and external healthcare expenditure model, positive in public and private healthcare expenditure models and is not statistically significant at 5% level. Incidence of HIV have a positive coefficient in national healthcare expenditure model and a negative coefficient in public, private and external healthcare expenditure models and have no statistically significant. This shows that incidence of HIV has no statistical impact on short run expectancy at birth in ECOWAS.

Regarding the long run relationship between healthcare expenditures and life expectancy at birth in ECOWAS countries between 2000 and 2020, healthcare expenditure expenditures have a direct and significant impact on life expectancy except external healthcare expenditure and have no statistically significant impact on life expectancy in the long run. The parameter

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estimates of National, Public and Private healthcare expenditure are positively and statistically significant at 1% and external healthcare expenditure parameter estimate is negative and statistically insignificant at conventional level. The implication is that a 10% increase in national, public and private healthcare expenditure improve life expectancy by 0.32%, 0.32% and 0.51% respectively while a 10% change in external healthcare expenditure will result into 0.18% decrease in life expectancy as a whole in the long run.

Access to basic sanitation have a positive coefficient in national and private healthcare expenditure models and a negative coefficient in public and external healthcare expenditure models. In national and private healthcare expenditure model, access to basic sanitation have a direct and statistically significant impact on life expectancy at 1% and 10% significance level though in the public expenditure model, there is an indirect and a statistically significant impact of basic sanitation on life expectancy, also in external healthcare expenditure model, basic sanitation has an indirect and an insignificant impact on life expectancy at birth in ECOWAS. Likewise, people access to basic water and incidence of malaria have positive coefficients and they are statistically significant at 1% level in national and public healthcare expenditure models. In private and external healthcare expenditure models, there is a negative and statistically insignificant relationship between access to basic water and incidence of malaria on life expectancy in the long run.

In national and public healthcare expenditure models, incidence of tuberculosis and Incidence of HIV are negatively and statistically significant on life expectancy at 1% significance level while in private healthcare expenditure model, incidence of tuberculosis have a direct and statistically significant effect on life expectancy at 5% while incidence of HIV have an indirect and insignificant effect on life expectancy in the ECOWAS. Meanwhile, incidence of

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tuberculosis and incidence of HIV coefficients are negative and not statistically significant at conventional level in external healthcare expenditure model. It means that the negative effects of incidence of tuberculosis and incidence of HIV on life expectancy in ECOWAS are not statistically confirmed in the long run.

Table 4.8 presents the summary of short-run and long-run parameter estimates of the pooled mean group or panel autoregressive distributed - ARDL (1, 1, 1, 1, 1, 1) of healthcare expenditures and Maternal mortality rate. From the table, the coefficients of error correction term (ECT) are found to be negative and statistically significant at the conventional level, with coefficients of the error correction term -0.1379, -0.1199, -0.2030 and -0.1642 respectively and their probability values of t-statistic is less than 1%. The implication is that the empirical models of maternal mortality in each healthcare expenditure models correct their short-run disequilibrium by 13.8%, 11.8%, 20.3% and 16.4% speed of adjustment in order to return to the long run equilibrium. This confirms that there is an existence of a long run relationship between healthcare expenditures and maternal mortality rate in ECOWAS countries.

As regards the short run estimates of national and external healthcare expenditure have a negative coefficient and have no statistical significance on maternal mortality rate. Public healthcare expenditure has a negative and statistically significant impact on maternal mortality rate at 1% and private healthcare expenditures have direct and a statistically significant impact on maternal mortality rate at 10% in the short run. It implies that 10% change in national, public and external healthcare expenditure will result into 0.07%, 0.15% and 0.02% reduction and 0.22% in increase in maternal mortality rate in the short run. However, female HIV ages 15-24 and female population ages 65 and above have an indirect and insignificant effect on maternal mortality in the short run at conventional levels.

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In national, public and external healthcare expenditure models, female population ages 15-64 have a positive and statistically insignificant impact on maternal mortality rate while in private healthcare expenditure model, female population ages of 15-64 have a negative and an insignificant effect on maternal mortality rate in the short run. Female primary school enrollment in national, public and private healthcare models have an indirect and insignificant impact on maternal mortality rate while in external healthcare expenditure model, there is a positive and statistically significant impact on maternal mortality rate in the short run.

Table 4.8 also reports the long run relationship between healthcare expenditures and maternal mortality rate. The coefficient of the pooled mean group regression estimator of national, public and external healthcare expenditures has a direct and statistically significant effect on maternal mortality rate whereas private healthcare expenditure has an indirect and statistically significant impact on maternal mortality rate in ECOWAS. This revealed that a 10% change in national, public and external healthcare expenditure will correct maternal mortality rate by 1.64%, 1.01% and 0.37% respectively. Also, a 10% change in private healthcare expenditure results into a decline of 1.01% in maternal mortality rate. The parameter estimates of national, public and external healthcare expenditures are positive and statistically significance at 1% and 5%. The private healthcare expenditure parameter estimate is negative and statistically significant at 1%.

Female population ages 15-64 have a direct and significant impact on maternal mortality rate in the four models at 1% in ECOWAS. Moreover, there is a negatively and statistically significant effect of female primary school enrollment on maternal mortality rate in ECOWAS countries in the long run. In national, public and external healthcare expenditures models, female HIV ages 15-24 have a positive coefficient and have statistically significant effect on maternal mortality rate at conventional level and in private healthcare expenditure model, female HIV ages 15-24

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have negative coefficients and is not significant at conventional level. It shows that female HIV ages 15-24 have a statistical effect in national, public and external healthcare expenditure models on long run maternal mortality rate in ECOWAS and in private healthcare expenditure model, female HIV ages have no statistical impact on maternal mortality rate in the long term.

Meanwhile, there is a negatively and statistically significant impact of female population ages 65 and above in national and public healthcare expenditure model on maternal mortality rate whereas, in private and external healthcare expenditure, there is a positively and statistically insignificant effect of female population ages 65 and above on maternal mortality rates in ECOWAS as a whole in the long term.

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Table 4.8: Pooled Mean Group Estimates of Healthcare Expenditure and Maternal Mortality Rate

Variables	Dependent Variable: Maternal Mortality Rate			
	1	2	3	4
	Short-Run Estimates			
ECT	-0.1379***	-0.1179***	-0.2030***	-0.1642***
	(0.0329)	(0.0403)	(0.0517)	(0.0365)
D (National Health Expenditure (-1))	-0.0071			
	(0.0080)			
D (Public Health Expenditure (-1))		-0.0148***		
		(0.0039)		
D (Private Health Expenditure (-1))			0.0215*	
			(0.0121)	
D (External Health Expenditure (-1))				-0.0020
				(0.0035)
D (Female HIV ages 15-24 (-1))	-0.0545	-0.05176	-0.0395	-0.0345
	(0.0386)	(0.0420)	(0.0445)	(0.0424)
D (Female Population ages 15-64 (-1))	0.0208	0.0146	-0.0192	0.0135
	(0.0369)	(0.0386)	(0.0390)	(0.0364)
D (Female Population ages 65 and above (-1))	-0.1150	-0.1607	-0.1549	-0.0807
	(0.1822)	(0.1932)	(0.2165)	(0.0005)
D (Female Primary School Enrollment (-1))	-0.0001	-0.0003	-0.0003	0.5569***
	(0.0006)	(0.0004)	(0.0006)	(0.1406)
	Long-Run Estimates			
National Health Expenditure	0.1636***			
	(0.0337)			
Public Health Expenditure		0.1005***		
		(0.0228)		
Private Health Expenditure			-0.1014***	
			(0.0136)	
External Health Expenditure				0.0369**
				(0.0171)
Female HIV ages 15-24	0.2827***	0.4311***	-0.0078	0.1398***
	(0.0517)	(0.0786)	(0.0147)	(0.0354)
Female Population ages 15-64	0.0561***	0.0745***	0.0426***	0.0610***
	(0.0139)	(0.0155)	(0.0064)	(0.0119)
Female Population ages 65 and above	-0.3281***	-0.2945***	0.0732	0.0236
	(0.0715)	(0.0830)	(0.0801)	(0.1040)
Female Primary School Enrollment	-0.0104***	-0.0082***	-0.0063***	-0.0082***
	(0.0011)	(0.0012)	(0.0007)	(0.0010)
Constant	0.5845***	0.3905***	0.9586***	0.5569***
	(0.1573)	(0.1543)	(0.2576)	(0.1406)
Log Likelihood	911.488	912.286	917.563	908.279
Hausman Test (Prob.)	0.21(0.9990)	3.06(0.6908)	0.68(0.9843)	1.46(0.9171)
Country	14	14	14	14
Observations	280	280	280	280

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10.
Source: Author's computation (2022).

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Table 4.9 presents the summary of short-run and long-run parameter estimates of the pooled mean group of healthcare expenditures and infant mortality rate. From the table, the coefficients of error correction term (ECT) are found to be negative and statistically significant at the conventional level. The coefficients of the error correction term -0.1300, -0.1032, -0.3537 and -0.1298 respectively and their probability values of t-statistic is less than 1%. The implication is that the empirical models of maternal mortality in each healthcare expenditure models correct their short-run disequilibrium by 13.0%, 10.3%, 35.4% and 13.0% speed of adjustment in order to return to the long run equilibrium. This confirms that there is an existence of a long run relationship between healthcare expenditures and maternal mortality rate in ECOWAS countries.

From the short run estimates in table 4.9, the parameters of lag one of national and private healthcare expenditures are negative and statistically insignificant whereas public and external healthcare expenditures are positive and statistically insignificant at conventional level. It means that there exists an indirect impact of national and private healthcare expenditure on infant mortality rate while public and external healthcare expenditure have a direct impact on infant mortality rate in the short run. This implies that healthcare expenditures have no statistically significant on short run infant mortality rate in ECOWAS.

However, the coefficients of immunization, Hepatitis B3 are negative and statistically significant at conventional level in national, private and external healthcare expenditure models while it is positive and statistically significant in public healthcare expenditure models in the short run. Also, immunization, measles and incidence of malaria are negatively and statistically insignificant at conventional level in short run. Nevertheless, there is a positive and insignificant relationship between immunization, DTP and infant mortality rate in national,

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private and external healthcare expenditure models while a negative relationship exists between immunization, DTP and infant mortality rate in public healthcare expenditure model in the short run.

People access to basic sanitation have an indirect and statistically insignificant impact on infant mortality rate in national, public and private healthcare expenditures models while it has a direct and insignificant impact on infant mortality rate in external healthcare expenditure model. Equally, indirect impacts of people access to basic water on infant mortality rate in national, private and external healthcare expenditure models and the direct impact in public healthcare expenditures are statistically insignificant at 0.05 critical values on the short run.

Also, the coefficients of incidence of HIV are negative in national and external healthcare expenditure models but positive in public and private healthcare expenditure models are not statistically significant at conventional level. This means that the negative and positive effects of incidence of HIV on infant mortality rate in the short run are not statistically established.

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Table 4.9: Pooled Mean Group Estimates of Healthcare Expenditure and Infant Mortality Rate

Variables	**Dependent Variable:** Infant Mortality Rate			
	1	**2**	**3**	**4**
	Short-Run Estimates			
ECT	-0.1300***	-0.1032***	-0.3537***	-0.1298***
	(0.0202)	(0.0168)	(0.0213)	(0.0137)
D (National Health Expenditure (-1))	-0.0020			
	(0.0025)			
D (Public Health Expenditure (-1))		0.0018		
		(0.0014)		
D (Private Health Expenditure (-1))			-0.0017	
			(0.0023)	
D (External Health Expenditure (-1))				0.0004
				(0.0016)
D (Immunization, Hep B3(-1))	-0.0002*	0.0002*	-0.0002*	-0.0003***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
D (Immunization, measles (-1))	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
D (Immunization, DTP (-1))	0.0001	-0.0000	0.0001	0.0003
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
D (People access Basic sanitation (-1))	-0.0196	-0.0760	-0.0147	0.0042
	(0.1363)	(0.0955)	(0.1190)	(0.1052)
D (People access Basic Water (-1))	-0.1742	0.1067	-0.1563	-0.1445
	(0.1681)	(0.1351)	(0.1499)	(0.1350)
D (Incidence of Malaria (-1))	-0.0107	-0.0074	-0.0095	-0.0124
	(0.0168)	(0.0166)	(0.0173)	(0.0179)
D (Incidence of HIV)	-0.0002	0.0039	0.0072	-0.0005
	(0.0112)	(0.0061)	(0.0072)	(0.0123)
	Long-Run Estimates			
National Health Expenditure	-0.0184			
	(0.0165)			
Public Health Expenditure		-0.0204		
		(0.0171)		
Private Health Expenditure			-0.0366**	
			(0.0176)	
External Health Expenditure				-0.0584***
				(0.0220)
Immunization, Hep B3	0.0006	0.0008*	0.0008	0.0047**
	(0.0005)	(0.0005)	(0.0005)	(0.0020)
Immunization, measles	0.0013*	0.0036*	0.0016*	0.0028*
	(0.0009)	(0.0015)	(0.0009)	(0.0016)
Immunization, DTP	-0.0017**	0.0027*	-0.0021***	-0.0039**
	(0.0008)	(0.0016)	(0.0008)	(0.0017)
People access Basic sanitation	-0.0061*	-0.0123*	-0.0069*	-0.0095
	(0.0041)	(0.0080)	(0.0039)	(0.0086)
People access Basic Water	0.0160*	0.0279***	-0.0117	0.0312
	(0.0089)	(0.0073)	(0.0083)	(0.0254)
Incidence of Malaria	0.3071***	-0.1247***	0.2828***	0.5051***
	(0.0622)	(0.0414)	(0.0602)	(0.2046)
Incidence of HIV	0.1629***	0.0440**	0.1446***	0.1479***
	(0.0389)	(0.0191)	(0.0351)	(0.0511)
Constant	0.1786	-0.0767	0.1698*	0.1088
	(0.1786)	(0.1244)	(0.1116)	(0.1233)
Log Likelihood	1379.392	1409.123	1427.832	1393.319
Hausman Test (Prob.)	2.74(0.9495)	0.18(0.9844)	6.49(0.5928)	1.06(0.9978)
Country	14	14	14	14
Observations	280	280	280	280

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10.
Source: Author's computation (2022)

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Table 4.9 also presents the long run relationship between healthcare expenditures and infant mortality rate in 15 ECOWAS countries between 2000-2020. In the long run of the pooled mean group estimator, healthcare expenditures have a negative effect on infant mortality rate in ECOWAS. National and public healthcare expenditures have an indirect and insignificant impact on infant mortality rate while private and external healthcare expenditures have an indirect but a significant impact on infant mortality rate in the long run. In magnitude terms, a 10% change in healthcare expenditures results into 0.18%, 0.20%, 0.37% and 0.58% decreases in infant mortality rate respectively in ECOWAS countries.

Immunization, Hepatitis B3 has a direct impact on infant mortality rate in ECOWAS countries. In national and private healthcare expenditure models, Immunization, Hepatitis B3 have a positive and statistically insignificant effect on infant mortality rate and in public and external healthcare expenditure models, Immunization, Hepatitis B3 have a positive and statistically significant effect on infant mortality rate at 5% and 10% in ECOWAS. Also, Immunization, measles and incidence of HIV impacted infant mortality rate in ECOWAS, as there is a positive effect of immunization, measles and Incidence of HIV on infant mortality rate as a whole in the long-run. The implication of this is that, a change in Immunization, measles will result into a direct change in infant mortality rate. Also, an increase in incidence of HIV will result into an increase in infant mortality rate in the long-run.

Meanwhile, there is a negatively and statistically significant impact of access to basic sanitation on infant mortality rate in national, public, and private healthcare expenditure models while in external healthcare expenditure model, there is a negative and an insignificant impact of access to basic sanitation on infant mortality rate at conventional level. However, access to basic water has a positive and statistically significant effect on infant mortality rate in national and public

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healthcare expenditure models, also have positive but statistically insignificant effect in external healthcare expenditure model while it shows a negative and an insignificant effect on infant mortality in private healthcare expenditure model. Also, Incidence of malaria have a direct and statistically significant outcome on infant mortality in national, private and external healthcare expenditure models and an indirect and significant outcome in public healthcare expenditure model in the long-run.

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Table 4.10: Pooled Mean Group Estimates of Healthcare Expenditure and Under-Five Mortality Rate

Variables	Dependent Variable: Under-Five Mortality Rate			
	1	2	3	4
	Short-Run Estimates			
ECT	-0.0590***	-0.1751***	- 0.3671***	-0.0368***
	(0.1567)	(0.0141)	(0.0440)	(0.0058)
D (National Health Expenditure (-1))	0.0077			
	(0.0065)			
D (Public Health Expenditure (-1))		0.0073		
		(0.0032)		
D (Private Health Expenditure (-1))			0.0017	
			(0.0039)	
D (External Health Expenditure (-1))				0.0011
				(0.0018)
D (Immunization, Hep B3(-1))	0.0000	0.0001	-0.0002**	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0002)
D (Immunization, measles (-1))	-0.0003	-0.0003	-0.0008	-0.0002
	(0.0002)	(0.0002)	(0.0005)	(0.0002)
D (Immunization, DTP (-1))	0.0001	0.0000	0.0002	0.0002
	(0.0002)	(0.0001)	(0.0001)	(0.0002)
D (People access Basic sanitation (-1))	-0.0472	-0.0928	0.0779	-0.0252
	(0.0785)	(0.0719)	(0.1663)	(0.0602)
D (People access Basic Water (-1))	-0.0571*	-0.0669	-0.3647	0.0649
	(0.0304)	(0.1709)	(0.3502)	(0.1099)
D (Incidence of Malaria (-1))	-0.0064	0.0024	-0.0008	-0.0089
	(0.0191)	(0.0069)	(0.0187)	(0.0119)
D (Incidence of Tuberculosis (-1))	0.0304	0.0340	0.0294	0.0023
	(0.0921)	(0.0552)	(0.0505)	(0.0692)
	Long-Run Estimates			
National Health Expenditure	0.1542***			
	(0.0240)			
Public Health Expenditure		0.0052		
		(0.0092)		
Private Health Expenditure			0.0245**	
			(0.0127)	
External Health Expenditure				-0.3180**
				(0.1504)
Immunization, Hep B3	0.0053***	-0.0020***	0.0001	0.0135**
	(0.0009)	(0.0007)	(0.0001)	(0.0070)
Immunization, measles	0.0044***	0.0009	0.0019**	-0.0051
	(0.0010)	(0.0008)	(0.0008)	(0.0037)
Immunization, DTP	-0.0022***	0.0025**	0.0013*	-0.0032
	(0.0008)	(0.0011)	(0.0007)	(0.0036)
People access Basic sanitation	0.0530***	0.0757***	-0.0215***	0.0664***
	(0.0097)	(0.0165)	(0.0038)	(0.0547)
People access Basic Water	-0.0344***	-0.0593***	0.0049**	-0.0678**
	(0.0054)	(0.0086)	(0.0021)	(0.0334)
Incidence of Malaria	0.0630***	0.1787***	0.0580***	1.0096**
	(0.0216)	(0.0465)	(0.0127)	(0.4883)
Incidence of Tuberculosis	2.6790***	3.3247***	0.3371***	0.4355
	(0.2167)	(0.5261)	(0.0626)	(0.4559)
Constant	-0.0455	0.0978	0.3293	-0.1252
	(0.1321)	(0.1621)	(0.2550)	(0.0878)
Log Likelihood	1410.813	1474.268	1424.417	1485.236
Hausman Test (Prob.)	3.40 (0.9068)	0.32(1.0000)	0.05(1000)	-5.02
Country	15	15	15	15
Observations	300	300	300	300

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10.

Source: Author's computation (2022)

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Table 4.10 presents the summary of short-run and long-run parameter estimates of the pooled mean group or panel autoregressive distributed - ARDL (1, 1, 1, 1, 1, 1) of healthcare expenditures and under-five mortality rate. From the table, the coefficients of error correction term (ECT) are found to be negative and statistically significant at the conventional level. The coefficients of the error correction term -0.0590, -0.1751, -0.3671 and -0.0368 respectively and their probability values of t-statistic is less than 1%. The implication is that the empirical models of maternal mortality in each healthcare expenditure models correct their short-run disequilibrium by 5.9%, 17.5%, 35.7% and 3.7% speed of adjustment in order to return to the long run equilibrium. This confirms that there is an existence of a long run relationship between healthcare expenditures and under-five mortality rate in ECOWAS countries.

As regards the short-run coefficients, the parameters of lag one of total external debt is positive and statistically insignificant at conventional level. It means that there exists a positive relationship between healthcare expenditures and under-five mortality rate in ECOWAS. The implication is that healthcare expenditures has insignificant impact on short-run under-five mortality rate in ECOWAS. However, the coefficients of immunization, Hepatitis B3 are negative in private and external healthcare expenditure models while it is positive in national and public healthcare expenditure models in the short run. In private healthcare expenditure model, immunization, Hep B3 impact the under-five mortality rate indirectly and significantly at 5% while in national, public and external healthcare expenditure models, immunization Hep B3 have no significant impact on short run under-five mortality rate in ECOWAS. Also, immunization, DTP and incidence of tuberculosis are positively and statistically insignificant at conventional level in short run.

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Meanwhile, there is a negative and insignificant relationship between immunization, measles and under-five mortality rate in the short run. Similarly, people access to basic sanitation malaria have a negative and insignificant effect on under- five mortality rate in national, public and external healthcare expenditure models while a positive and insignificant effect occurs between people access to basic sanitation and under-five mortality rate in private healthcare expenditure model in the short run. Also, Incidence of malaria have an indirect and statistically insignificant result on under-five mortality in national, private and external healthcare expenditure models whereas, in public healthcare expenditure model, there is a direct and insignificant result in the short-run.

Table 4.10 also reports the long-run impact of healthcare expenditures on under-five mortality rate in ECOWAS countries between 2000 and 2020. In the long-run estimates, National and private healthcare expenditure has a direct and significant impact on under-five mortality rate. Private expenditure also has a direct but an insignificant impact on under-five mortality while External healthcare expenditure have a negative and a statistically significant impact on under-five mortality rate in ECOWAS.

Immunization, Hepatitis B3 has a direct and an indirect impact on under-five mortality rate in ECOWAS countries. In national and external healthcare expenditure models, Immunization, Hepatitis B3 have a positive and statistically significant effect on infant mortality rate. In private healthcare expenditure model, there is a direct and an insignificant effect on under-five mortality rate whereas in public healthcare expenditure models, Immunization, Hepatitis B3 have a positive and statistically insignificant effect on under-five mortality rate at conventional level in ECOWAS. Also, Immunization, measles impacted under-five mortality rate in ECOWAS, as there is a positive effect of the immunization, measles on under-five mortality

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rate in national and private healthcare models significantly. In public healthcare expenditure model, immunization, measles has a direct and an insignificant effect on under-five mortality rate and a negative and insignificant effect in external healthcare expenditure models.

Meanwhile, there is a negatively and statistically significant impact of immunization DTP, and access to basic water on infant mortality rate in national healthcare expenditure model while access to basic sanitation, incidence of malaria and incidence of tuberculosis has positive and significant effect on under-five mortality rate in the long run at the conventional level. In public healthcare expenditure model, there is a positive and a statistically significant impact of immunization DTP, access to basic sanitation, incidence of malaria and incidence of tuberculosis on under-five mortality rate at conventional level whereas people access to basic sanitation has a negative and a statistically significant impact on under-five mortality in pubic healthcare expenditure models. However, immunization DTP, access to basic water, incidence of malaria and incidence of tuberculosis has a positive and statistically significant effect on under-five mortality rate in private healthcare expenditure model, also have positive but statistically insignificant effect in external healthcare expenditure model while it shows a negative and an insignificant effect on under-five mortality rate mortality in private healthcare expenditure model.

Access to basic sanitation and incidence of malaria have a positive and significant effect on under-five mortality rate in external healthcare expenditure model. Also, in external healthcare expenditure model, immunization, DTP has an indirect and insignificant impact on under-five mortality while people access to basic water has a negative and significant effect on under-five mortality rate in ECOWAS. Meanwhile, incidence of tuberculosis coefficient is positive and not statistically significant at conventional level in external healthcare expenditure model. It means

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that incidence of tuberculosis has a positive effect on long run under-five mortality rate insignificantly in ECOWAS.

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4.3.2 Analysis of the Second Objectives

Concerning this sub-section, the research study presents the empirical outcomes relating to the impact of healthcare expenditures on economic growth in ECOWAS.

4.3.2.1 Correlation Analysis and Scatter Plots

Table 4.11 presents the correlation coefficients of variables relating to the Impact of Healthcare Expenditure on Economic growth in ECOWAS. The coefficient of correlation outcomes shows that Gross domestic product per capita has a strong positive relationship with National, Public and Private healthcare expenditure but weak positive relationship with External healthcare expenditure with a correlation coefficient of 0.013. Also, Gross fixed capital formation per capita correlate positively with Gross domestic product per capita, National, Public and Private healthcare expenditure but negatively correlate with External healthcare expenditure and population growth rate. Meanwhile, Population growth rate correlates negatively with Gross domestic product per capita and the Healthcare expenditure variables (National, Public, Private and External).

The coefficient of correlation results revealed that inflation has positive relationship with Gross fixed capital formation, a weak positive relationship with Gross Domestic Product per capita, Private healthcare expenditure and External healthcare expenditure but negatively correlate with National healthcare expenditure, public healthcare expenditure and Population growth rate. Lastly, Trade per capita also has positive relationship with Gross domestic product per capita, healthcare expenditures variables and Gross fixed capital formation per capita, positively weak with inflation and negatively related with population growth rate.

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From Figure 4.10 a-d, Cabo Verde, Nigeria, Cote d'Ivoire and Ghana has the highest Gross Domestic product per capita.

Table 4.11: Correlation Matrix

	Nhe	*Puhe*	*pvhe*	*exhe*	*pgr*	*gfcfpc*	*inf*	*tradepc*
gdppc	0.81384	0.757752	0.674536	0.01301	-0.5909	0.799562	0.032521	0.845742
nhe	1	0.844973	0.746927	0.395134	-0.62509	0.577134	-0.06053	0.845228
puhe		1	0.358877	0.091928	-0.60872	0.699002	-0.13314	0.9258
pvhe			1	0.183482	-0.42334	0.50891	0.052379	0.472751
exhe				1	-0.11697	-0.03744	0.009706	0.063022
pgr					1	-0.30264	-0.12928	-0.72503
gfcfpc						1	0.327172	0.808184
inf							1	0.00771

Note: gdppc – Gross domestic product per capita, nhe - National healthcare expenditure per capita, puhe- Public healthcare expenditure per capita, pvhe- Private healthcare expenditure per capita, exhe – External healthcare expenditure, pgr – Population growth (annual %) gfcfpc – Gross fixed capital formation, inf – Inflation (annual %)
Source: Author's computation (2022).

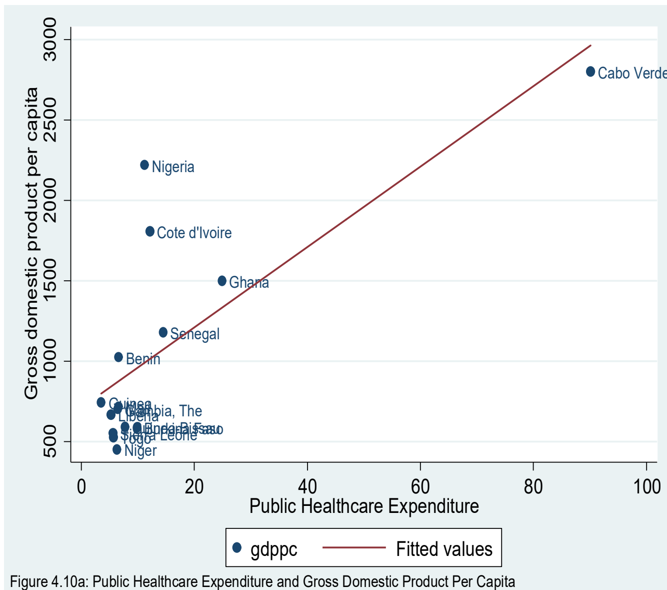

Figure 4.10a: Public Healthcare Expenditure and Gross Domestic Product Per Capita

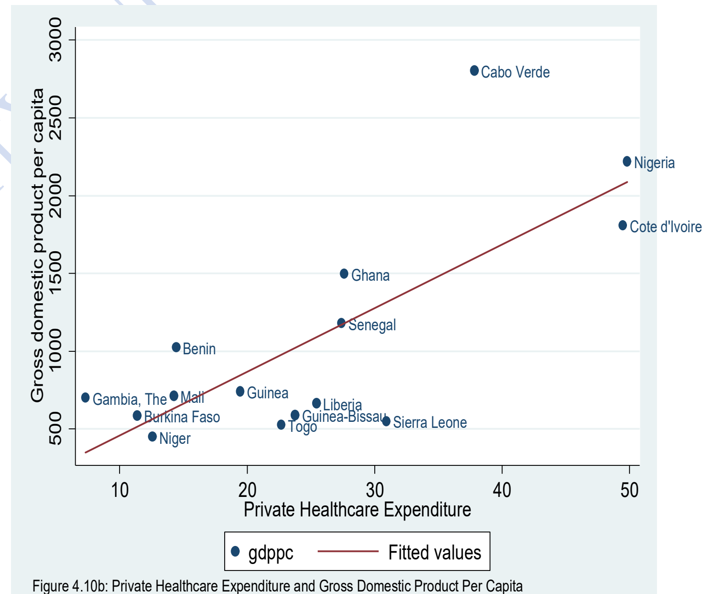

Figure 4.10b: Private Healthcare Expenditure and Gross Domestic Product Per Capita

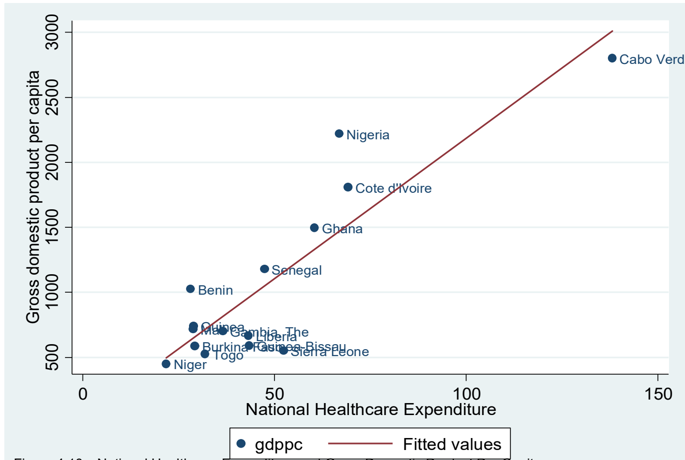

Figure 4.10c: National Healthcare Expenditure and Gross Domestic Product Per Capita

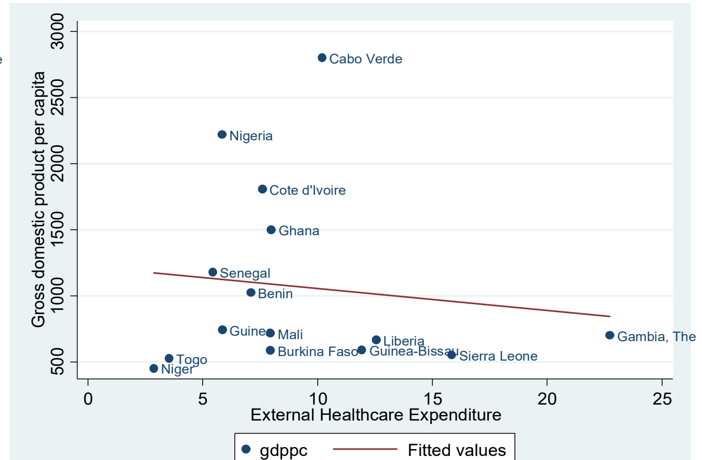

Figure 4.10d: External Healthcare Expenditure and Gross Domestic Product Per Capita

Figure 4.10(a-d): Scatter Plots of Healthcare Expenditures and Gross Domestic Product Per Capita

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4.3.2.2 Cross-Sectional Dependence, Stationary and Cointegration Tests

The results of cross-sectional dependence test are presented in Table 4.12. The test statistics were performed for fifteen West African countries (Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo), for a period of 20 years (2000–2020). The Pesaran CD test results presented in Table 4.12 confirm the rejection of null hypotheses of no correlation at predictable significance levels. As for the test statistic values of standard normal Pesaran CD test, their statistical values are significantly and they still reject the null hypotheses at 0.05 critical values.

Table 4.12: Cross-Sectional Dependence Test Results (d.f. = 105)

H_0: There is no cross-sectional dependence

Test	National health		Public health		Private health		External health	
	Stat.	**Prob.**	**Stat.**	**Prob.**	**Stat.**	**Prob.**	**Stat.**	**Prob.**
Pesaran CD: GDP per capita	7.1126	0.0000	4.2561	0.0000	5.3122	0.0000	3.7802	0.0002

Note: gdppc – Gross domestic product per capita, nhe - National healthcare expenditure per capita, puhe- Public healthcare expenditure per capita, pvhe- Private healthcare expenditure per capita, exhe – External healthcare expenditure, pgr – Population growth (annual %) gfcfpc – Gross fixed capital formation, inf – Inflation (annual %)
Source: Author's computation (2022).

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Table 4.13: Panel Unit Root Test Results

Variables	Variable Description	Levels			1st Difference			Decision
		LLC	Breit	IPS	LLC	Breit	IPS	
Exhe	External health expenditure	-1.8627	-0.8208	-0.2650	-6.7473***	-7.7250***	-8.7762***	I (1)
Nhe	National health expenditure	-1.6164**	-3.1151***	2.4291	-13.5125***	-11.2304***	-11.7622***	I (1)
puhe	Public health expenditure	-1.8879**	-1.3273*	0.2263	-12.0540***	-6.2903***	-10.2515***	I (1)
Pvhe	Private health expenditure	-1.8040**	-0.2623	-1.8100**	-11.1831***	-9.0773***	-8.5554***	I (1)
Gdppc	Gross Domestic Product	-0.3363	2.2126	1.3970	-6.4481***	-1.1644*	-7.0110***	I (1)
Gfcfpc	Gross Fixed Capital Formation	-3.9414***	1.1462	-2.4387***	-	-6.2814***	-	I (1)
Inf	Inflation	-5.7464***	-5.3979***	-5.3240***	-	-	-	I (0)
Pgr	Population growth rate	-11.7726***	1.8296	-16.6701***	-	-1.9912**	-	I (1)
Tradepc	Trade per capita	-1.3437*	0.2015	-4.1603***	-9.3059***	-1.6538**	-9.7300***	I (1)

Note: LL denotes Levin, Lin & Chin (2002); Breit represents Breitung (2001); IPS denotes Im, Pesaran & Shin (2003); ***, ** & * denote 1%, 5% & 10% significance levels.
Source: Author's computation (2022).

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4.3.2.3 Unit Root and Cointegration Tests

Table 4.13 presents the unit root test results using Levin, Lin and Chin (LLC), Breitung (Breit) and Im, Pesaran and Shin (IPS). As seen in the table, the test estimators confirmed that inflation is stationary at the level of I (0). Also, the three test estimators revealed that external healthcare expenditure and Gross Domestic Product per capita are stationary at the first difference I (1). National, private, public healthcare expenditure unit root test outcomes are mixed using the three (3) estimators. The results of Levin, Lin and Chin (LLC) and Breitung (Breit) unit root test shows that National healthcare expenditure (NHE) and public healthcare expenditure (PUHE) is stationary at levels but Im, Pesaran and Shin (IPS) unit root test found that they are stationary at first difference I (1). Also, results of Levin, Lin and Chin (LLC) and Im, Pesaran and Shin (IPS) revealed that Private healthcare expenditure, Gross fixed capital formation, Population growth rate and Trade per capita are stationary at levels I (0) while Breitung (Breit)

report stationarity at first difference I (1). It is therefore concluded that the variables are stationary at first difference I (1) except Inflation.

Table 4.14: KAO Residual Test for Cointegration

H_0: There is no co-integration

Test	National health		Public health		Private health		External health	
	Stat.	**Prob.**	**Stat.**	**Prob.**	**Stat.**	**Prob.**	**Stat.**	**Prob.**
Kao Test: GDP per capita	-2.1610	0.0153	-3.4566	0.0003	-2.6529	0.0040	-1.9726	0.0243

Note: gdppc – Gross domestic product per capita, nhe - National healthcare expenditure per capita, puhe- Public healthcare expenditure per capita, pvhe- Private healthcare expenditure per capita, exhe – External healthcare expenditure, pgr – Population growth (annual %) gfcfpc – Gross fixed capital formation, inf – Inflation (annual %)
Source: Author's computation (2022).

Table 4.14 presents the KAO Residual test for cointegration (Kao) with the predictable probability test criteria which revealed a rejection of the null hypotheses of no cointegration for the model at 5% level of significance. This implies that there exists a long-run relationship among the regressand and regressors across the estimated model in the study. It thus approves that the presence of co-integration or a long-run relationship between healthcare expenditures and economic growth in ECOWAS.

4.3.2.4 Short-run and Long-run Parameter Estimation

The empirical result of objectives two (2) which is to examine the impact of healthcare expenditure on Economic growth in ECOWAS using pooled mean group estimator was discussed in this section. In Table 4.15, the null hypotheses of Hausman tests indicated that the difference in coefficients of mean group and pooled mean group not being systematic are not rejected at 5% level of significance. Thus, implies the suitability of pooled mean group as the appropriate estimator to test the hypothesis of the research. Economic growth as the outcome variable was measured by Gross Domestic Product Per Capita. Accordingly, the economic growth was estimated along each healthcare expenditure variables and are labeled 1, 2, 3 and 4.

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The selection of optimal lag lengths on the variables were designated automatically using the Bayesian Information Criterion (BIC) after setting it at three in order to ensure sufficient degree of freedom. The most common lag across the fifteen ECOWAS countries is one (1) for each variable of interest.

The summary of short-run and long-run parameter estimates of the pooled mean group or panel autoregressive distributed - ARDL (1, 1, 1, 1, 1, 1) is presented in Table 4.15. From the table, the coefficients of error correction term (ECT) are found to be negative and statistically significant at 1 percent level of significance. The coefficients of the error correction term (ECT) are -0.1069, -0.2001, -0.1060 and -0.1635, and the probability values of their t-statistic is less than 1%. It implies that the empirical models of healthcare expenditures on economic growth correct their short-run disequilibrium by 10.7%, 20.0%, 10.6% and 16.4% speed of adjustment in order to return to the long run equilibrium. This further confirms that there exists a long-run relationship healthcare expenditures and economic growth in ECOWAS countries. Hence, it established that the models' equilibrium nature is valid in the long run.

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Table 4.15: Pooled Mean Group Estimates of Healthcare Expenditure and Gross Domestic Product Per Capita

Variables	**Dependent Variable: Gross Domestic Product Per Capita**			
	1	**2**	**3**	**4**
	Short-Run Estimates			
ECT	-0.1069***	-0.2001***	-0.1060***	-0.1635***
	(0.0257)	(0.0561)	(0.0255)	(0.0454)
D (National Health Expenditure (-1))	0.0121			
	(0.0127)			
D (Public Health Expenditure (-1))		0.0244*		
		(0.0162)		
D (Private Health Expenditure (-1))			-0.0011	
			(0.0177)	
D (External Health Expenditure (-1))				0.0038
				(0.0049)
D (Gross Fixed Capital Formation (-1))	0.0162	-0.0262	0.0135	-0.0169
	(0.0153)	(0.0236)	(0.0145)	(0.0235)
D (Inflation (-1))	-0.0007	0.0004	-0.0011	0.0006
	(0.0006)	(0.0007)	(0.0008)	(0.0005)
D (Population growth rate (-1))	-0.0405	0.1362	-0.0290	0.0988
	(0.0739)	(0.1427)	(0.0611)	(0.1414)
D (Trade Per capita (-1))	0.0502*	0.0695**	0.0522*	0.0520*
	(0.0280)	(0.0300)	(0.0275)	(0.0282)
	Long-Run Estimates			
National Health Expenditure	0.1043***			
	(0.0310)			
Public Health Expenditure		0.0335**		
		(0.0167)		
Private Health Expenditure			0.1165***	
			(0.0355)	
External Health Expenditure				-0.0512***
				(0.0132)
Gross Fixed Capital Formation	0.4118***	0.4462***	0.4169***	0.5354***
	(0.0603)	(0.0423)	(0.0554)	(0.0584)
Inflation	0.0105***	-0.0054***	0.0116***	-0.0069***
	(0.0022)	(0.0016)	(0.0020)	(0.0023)
Population growth rate	0.2902***	-0.1153***	0.2943***	0.0204
	(0.0486)	(0.0349)	(0.0486)	(0.0418)
Trade per capita	0.0146	-0.0751**	0.0611	0.0328
	(0.0608)	(0.0366)	(0.0558)	(0.0605)
Constant	3.1045***	1.0589***	0.3433***	0.6508***
	(0.5433)	(0.2949)	(0.0811)	(0.1765)
Log Likelihood	672.4416	689.5304	682.2416	680.4777
Hausman Test (Prob.)	8.56 (0.1323)	9.70(0.0843)	8.94(0.1116)	3.99 (0.5514)
Country	13	13	13	13
Observations	259	259	259	259

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10.
Source: Author's computation (2022).

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As regards the short-run coefficients, the national, public and external healthcare expenditures are positively and statistically insignificant at 5% significance level while Private healthcare expenditure is negatively and statistically insignificant. This means that a positive relationship exists between national, public and external healthcare expenditures and Gross domestic product per capita in ECOWAS while a negative relationship exists between Private healthcare expenditures and Gross domestic product per capita. At 10% changes in national, public and external healthcare expenditures, Gross domestic product per capita increases by 0.12%, 0.24% and 0.03% respectively and the 10% changes in Private healthcare expenditure results to a 0.01% decrease in Gross domestic product per capita. The coefficients of Gross fixed capital formation in National and Private healthcare expenditures models on Gross domestic product per capita are positive while in Public and external healthcare expenditures model, gross fixed capita formation per capita coefficients are negative and not statistically significant at conventional level. This means that the negative effects of gross fixed capital formation in public and external healthcare expenditure models on Gross domestic product per capita in the short run are not statistically confirmed.

Similarly, population growth rate and inflation are negative in national and private healthcare expenditures models but positive in public and external healthcare expenditures models in the short run are statistically insignificant at 0.05 critical values on Gross domestic product per capita. This shows that in National and Private healthcare expenditures model on Gross domestic product per capita, population growth rate and inflation have no statistical impact on short run Gross domestic product per capita in ECOWAS. However, trade per capita have positive coefficients and statistically significant at 5% and 10% level. This implies that Trade per capita have statistical impact on short run Gross domestic product per capita in public

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healthcare expenditure model while in national, private and external healthcare expenditure models, trade per capita impact Gross domestic products per capita positively but no strong statistical impact on the short run in ECOWAS.

Also, the long-run relationship between healthcare expenditures and Gross domestic product per capita in 15 countries of ECOWAS members between 2000 and 2020 is reported in table 4.15. In the long-run coefficients of the pooled mean group regression estimator, National, Public and Private healthcare expenditures have a direct and significant impact gross domestic product per capita while external healthcare expenditure has an indirect and a statistical significance on gross domestic product per capita in ECOWAS. A 10% increase in National, Public and Private healthcare expenditures results into 1.04%, 0.34% and 1.17% increase in Gross domestic product per capita respectively with a parameter estimate that is positively and statistically significant at 1%. It means that there exists a positive relationship between national, public and private healthcare expenditures and gross domestic product in ECOWAS. Likewise, a 10% change in external healthcare expenditure results into 0.51% decrease in Gross domestic product per capita with a parameter estimate which is negative and statistically significant at 1% level in ECOWAS. This means that there is negative relationship between external healthcare expenditures and gross domestic product per capita in ECOWAS.

Also, Gross fixed capital formation statistically impacted gross domestic product per capita significantly in the healthcare expenditures models in ECOWAS, as there is a positive impact of gross fixed capital formation on gross domestic product per capita in long run. This revealed that a 10% increase in gross fixed capita formation improve gross domestic product per capita by 4.12%, 4.46%, 4.17% and 5.35% respectively. The parameter estimates of gross fixed capital formation are positive and statistically significance at 1%. In national and private

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healthcare expenditures models, inflation and population growth rate is positively and statistically significant on gross domestic product per capita. In public healthcare expenditure, there is a negatively and statistically insignificant impact of inflation and population growth rate on gross domestic product per capita at 1% significance level while in external healthcare expenditure model, inflation has a negative and shows no statistical significance on gross domestic product per capita and population growth rate is positively and statistically insignificant on gross domestic product per capita.

There is a positively and statistically insignificant impact of trade per capita in national, private and external healthcare expenditures model on gross domestic product per capita while in public healthcare expenditure, trade per capita is negatively and statistically significant at 5% level on gross domestic product per capita in ECOWAS in the long run.

4.4 Empirical Results of the Causal Relationship among Healthcare expenditures, Health Outcomes and Economic Growth in ECOWAS

The F-statistics of panel causality results of indicators of healthcare expenditures, health outcomes and economic growth is reported in Table 4.16. The causality test results reported in the table showed that the null hypothesis of the causal relationship among healthcare expenditures, health outcomes and economics were not statistically significant at the conventional level. This means that there is no causal relationship among the variables in ECOWAS within the periods understudied. The Gross domestic product per capita granger cause the external healthcare expenditure and national healthcare expenditure at 10%, likewise public healthcare expenditure and private healthcare expenditure at 1% and 5% significance levels respectively. The feedbacks of the causality test results from external healthcare expenditure to gross domestic product per capita were found to be significant at 10%, private

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healthcare expenditure granger cause gross product per capita at 5% and national healthcare expenditure granger cause at 1% significance levels. Meanwhile, public healthcare expenditure has no causal relationship with gross domestic product per capita. Thus, it implies that there is a bi-causal relationship between gross domestic product per capita and external, private and national healthcare expenditures while there is a uni-causal with public healthcare expenditure in ECOWAS.

The implications of both gross domestic product per capita and healthcare expenditures of countries in the region cause one another except public healthcare expenditures. Again, the causality result found that gross domestic product per capita granger causes maternal mortality rate at 1% significance levels while no causality exists between infant mortality rate, life expectancy at birth and under-five mortality rate. The reactions of causality test from Infant mortality rate, Under-five mortality rate and Life expectancy at birth were found to be significant at 1% and 5% significance levels respectively while maternal mortality rate does not granger cause pross domestic product per capita. This implies that, there is a one-way relationship between gross domestic product per capita and health outcomes in ECOWAS.

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Table 4.16: Panel Causal Tests of Healthcare Expenditure, Health Outcomes and Economic Growth

Dependent Variables	Independent Variables								
	Gdp	exhe	Puhe	Pvhe	Nhe	Imr	lep	Mmr	u5mr
Gdp		2.735*	4.438***	4.263**	2.602*	0.287	0.504	6.189***	0.209
Exhe	2.418*		0.230	0.871	0.406	0.010	0.198	0.245	0.219
Puhe	0.899	5.163***		2.330*	5.469***	0.510	0.611	1.416	0.609
Pvhe	3.397**	9.403***	0.675		0.109	0.593	0.291	1.311	0.089
Nhe	11.35***	21.658***	10.924***	0.912		0.638	0.633	1.928	0.586
Imr	12.123***	6.148***	1.100	1.508	2.895*		0.462	0.655	13.775***
Lep	3.064**	15.947***	2.381*	10.634***	3.944**	28.581***		5.878***	26.915***
Mmr	0.151	0.368	1.912	3.884**	0.522	1.032	3.354**		0.120
u5mr	10.246***	6.792***	1.021	0.171	2.378*	18.842***	4.340***	1.715	

Note: ***, ** & * denote 1%, 5% & 10% significance levels; gdp – Gross domestic product per capita; exhe – External healthcare expenditure per capita; puhe – Public healthcare expenditure per capita; pvhe -Private healthcare expenditure per capita; nhe – National healthcare expenditure per capita; imr -Infant mortality rate (per 1,000 lives birth); lep- Life expectancy at birth; mmr- Maternal mortality rate (per 100,000 live birth); u5mr – Under-five mortality rate (per 1,000 lives birth)
Source: Author's computation (2022).

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There is a one-way relationship between external healthcare expenditure and other healthcare expenditure at 1% significance level. Likewise, the causality test revealed that a uni-directional relationship between external healthcare expenditure and health outcomes at 1% significance level except Maternal mortality rate where no causal relationship is found. Results also shows that there is a unidirectional link between public healthcare expenditure and private healthcare expenditure at 10% while a bi-directional causal link exist between pubic healthcare expenditure and national healthcare expenditure at 1% significance levels. Also, at 10% significance level, a one-way relationship exists between public healthcare expenditure and life

expectancy at birth but no causal link between public healthcare expenditure and infant mortality rate, maternal mortality rate and under-five mortality rate.

The causality test also reveals that, a uni-directional causal link runs between private healthcare expenditure, life expectancy at birth at 10% and maternal mortality rate at 5% significance level, while no causal exists between private healthcare expenditure with National healthcare expenditure, infant mortality rate and under-five mortality rate. Furthermore, the national healthcare expenditure does not granger cause health outcomes variables within the periods understudied. Meanwhile, the feedbacks of infant mortality rate, life expectancy at birth and under-five mortality rate at 5% and 10% significance level respectively. This means that there is a one-way causal relationship running from National healthcare expenditure to health outcomes except maternal mortality rate where no causal link exists. Likewise, the causal test results showed a uni-directional causal link between Infant mortality rate and life expectancy at birth at 1% level of significance while a two-way relationship exists between infant mortality rate and under-five mortality rate at 1% level of significance. Maternal mortality rate has no causal relationship with under-five mortality rate.

Regarding life expectancy at birth, the result found a bi-directional causal link between life expectancy at birth and maternal mortality rate. As well, life expectancy at birth granger cause under-five mortality rate at 1% level. However, the null hypotheses feedbacks of under-five mortality rate granger causing life expectancy at birth were not accepted at 1% level of significance. It means that there is a two-way causal relationship running from life expectancy at birth and Under-five mortality rate.

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4.5 Discussion of Findings

Concerning objective one, the study estimates show that among other findings that healthcare expenditures (National, public, private and external healthcare expenditures) have a significant effect on health outcomes (Life expectancy at birth, maternal mortality rate, infant mortality rate and under-five mortality rate) of ECOWAS countries for the period under investigation. The research outcomes shows that healthcare expenditures have significant effect on life expectancy at birth used as a measurement for health outcomes in ECOWAS. This falls within the theoretical expectations of existing studies and theories which states that healthcare expenditures are expected to improve the health outcomes. This further indicates that an improvement in national, public, private and external healthcare expenditures will improve the life expectancy at birth, reduce the risk of the mortality rate in ECOWAS region. The results are consistent in agreement with the position of scholars who found that healthcare expenditures statistically influence life expectancy and it is an important predictor of Life Expectancy in Africa in West Africa, after using two estimation approaches (Two stage least square and fixed effects regression) to investigate the effect of healthcare expenditure on Life Expectancy at birth in 45 African countries from 2000 to 2015 [1].

Likewise, the study aligns with some researcher who carried out studies on the impact of healthcare spending on Life Expectancy on selected West African Countries within 1999 – 2014 using pooled regression and pairwise correlation and discovered that healthcare expenditure especially public healthcare expenditure has a positive relationship with Life Expectancy [2,3,4]. Also, the findings corroborate the result of an author that healthcare expenditures have positive and significant impact on Life Expectancy which implies that a steady increase in health expenditures overtime have the tendency to improve Life Expectancy

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in Sub-Saharan Africa [5,6]. The study contradicts the findings of a research on government health expenditure and health outcomes in under developed economy especially Nigeria which states that healthcare expenditures does not improve Life Expectancy [7]. Another research outcome shows that there is no significant relationship between public healthcare and Life Expectancy in Sub-Saharan Africa[4,8]. This is not in line with the findings of this study.

The findings of the study also revealed the effects of healthcare expenditure on Maternal mortality rates. The findings showed that there is a positive and significant effect between National, Public and External healthcare whereas there is a negative and significant effect of Private healthcare expenditure on Maternal mortality rate. This indicates that as National, Public and External healthcare expenditures increase maternal mortality rate is increasing which contradicts a prior expectation that it should be negative but the positive result is similar to the fact that funds from National, Public and External expenditure on maternal health services are not well managed to realize its stated goals. There is misappropriation of funds to its rightful places. Hence, there should be a proper management of public fund and the international funds on maternal health welfare and should be well allocated and monitored to ensure proper utilization.

Meanwhile, the Private healthcare expenditure has a negative and significant effect on maternal mortality rate which implies that as the expenditure increases, maternal mortality rate declines. These results corroborate with empirical studies that investigated the relationship between health expenditures, health outcomes and economic growth in 48 countries in Africa over the period 2000 to 2015 in a panel data regression framework. The study concluded that health expenditure has a negative and significant impact on maternal mortality in Africa [9]. Also, for eight East African countries over the 2000-2014 period [10]. The study contradicts with research

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conducted in Ghana on the impact of health expenditures on health outcomes in Sub-Saharan Africa and discover that steady increase in health expenditures over time resulted in Maternal mortality rates in Sub-Saharan Africa [5,11].

The study also finds out that healthcare expenditures have a negative relationship with infant mortality rates in ECOWAS countries. The results revealed that national and public has negative insignificant effect on Infant mortality rates in ECOWAS. This means that the allocated funds towards morality of infants are not significant enough. There is more to be done in that aspect, whereas the private and external healthcare has a negative and statistically significant effect on Infant mortality rates. This support the fact that Private individuals or organization and international bodies are more efficient than National and Public institution. The implication of this finding is that Private sectors or organization and international bodies (WHO, UNICEF etc.) have greater influence on child health outcomes which means that health services especially for the children will be obtained at ahigh cost in ECOWAS countries. This finding is in-line with the scholar who established no effect to inefficient effect of health expenditure on Infant mortality in developing countries [12]. This could be

Contrarily, some scholars established that healthcare expenditure has an effect on Infant mortality rate [5,11,13]. Also, another study contradicts the outcome of the research, establishing that a unit increase in public health expenditures decreases Infant mortality rates in developing countries especially Nigeria[14].

The findings of the study also shows that there are two sides of relationship between healthcare expenditures and Under-five mortality rates. National and Private healthcare expenditures have positive and significant impact on under-five mortality rates, whereas public healthcare expenditures have a positive and insignificant effect on under-five mortality rates and external

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healthcare expenditures has a negative and statistically significant impact on under-five mortality rates. This finding is in concession with the research outcome in government health expenditure and health outcomes which revealed that public healthcare expenditures have a positive relationship with child mortality rate whereas private healthcare expenditure has a negative and significant impact on under-five mortality rate in developing countries. This contradicts the private healthcare expenditure findings of this study [7].

Meanwhile, the study contradicts with research outcomes on Health expenditures and child health outcomes in West Africa from 1991 to 2015 using Panel fully modified least square and discovered that there is a long-run relationship between public health expenditure per capita and under-five mortality rate. This implies that aside funds allocated for child health services, quality of institutions, Immunizations are also important influence on Under-five mortality rates that should not be neglected in ECOWAS region [5,13,15].

The control variables such as access to sanitation, access to basic water, Incidence of malaria, Incidence of tuberculosis, Incidence of HIV, have a significant effect on Life Expectancy at birth. This means that it is not only about money, there are other variables that influences the improvement of Life Expectancy in ECOWAS region and expands the survival prospects of infants and under-five child in the region unfortunately this is not always the case. Also, immunizations against infant and child diseases, tend to have better infant and under-five health outcomes. The female HIV within the ages of 15 – 24 affects maternal mortality rates, as it increases, the rate of women's death during childbirth by 2.8%, 4.3% and 1.4% increases respectively.

Likewise, the female population ages 15 – 64 have a positive relationship with maternal mortality rates which implies that maternal mortality rates increase with maternal age. Female

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primary school enrollment has a negative and significant effect on maternal mortality rate. Increase in female education at least primary level will result into a decline in maternal mortality rate. Thus, female education may be used to achieve sustainable long-term reduction in maternal mortality.

For objective two, the findings show that healthcare expenditures have significant impact on Gross domestic product per capita used as a measurement for economic growth in ECOWAS. This falls within the theoretical expectations of existing studies and theories which states that healthcare expenditure will increase economic growth. This further indicates that an increase in national, public and private healthcare expenditures will increase gross domestic product per capita in ECOWAS region. The research outcome is consistent with the findings of a study conducted on impact of health expenditure on economic growth in 36 Sub-Saharan Africa between 1995 and 2014, using General Method of Moments (GMM) technique, the results revealed that health expenditure has significant impact on the economic growth of the region [16]. Also, for 46 sub-Saharan African countries spanning from 2000–2015 [5].

Likewise, the outcome of the study aligns with the research outcome of a study on effect of human capital development on economic growth of ECOWAS member states within the periods of 1980 – 2016 using panel random effect model and the results revealed the government health expenditure plays a significant favorable impact in economic growth of ECOWAS region [17].

The study contradicts the research outcomes on effects of healthcare expenditure and economic growth using three stage-least-square (3SLS) regression estimation, the results showed that government health expenditure have negative and statistically insignificant impact on gross

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domestic product per capita. That is, an increase in government health expenditure reduces gross domestic product per capita and have no significant relationship [3].

Other control variables used are Gross Fixed Capital Formation population growth rate, trade and inflation. Gross Fixed Capital Formation coefficient is positive and statistically significant which is in line with theoretical expectation. This implies that a unit increase in gross fixed capital formation will increase gross domestic product per capita by 4.1%, 4.5%, 4.2% and 5.4% respectively. Nevertheless, there is need for more infrastructures and funding of capital projects by government, private institutions and international bodies. Likewise, the study contradicts the research on healthcare expenditure and health outcomes in Sub-Saharan African countries within 1995 to 2018 for 45 countries using fixed effects and generalized methods of moments estimating approaches, revealed that private healthcare expenditure had no impact on Under-five mortality rate.

Regarding the third objective, the casual findings revealed that there is a causal link among healthcare expenditures, health outcomes and economic growth in ECOWAS. This explains the directions of the variables in ECOWAS region. The findings shows that there is bi-directional relationship between national, private and external healthcare expenditure and Gross domestic product per capita. The national, private and external healthcare expenditure granger causes gross domestic product per capita and vice versa. This means that there is a two-way direction between national, private and external healthcare expenditures and gross domestic product per capita. While, gross domestic product per capita has a uni-directional link with public healthcare expenditure in ECOWAS region. Gross domestic product per capita granger causes public healthcare expenditure while there is no causal link between public healthcare expenditure and gross domestic product per capita. This study aligns with empirical results

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which indicated that there is a unidirectional causality running from Gross domestic product and government expenditure on health in 15 countries of ECOWAS [17].

This study contradicts with a research outcome of an empirical investigation on health expenditures and economic growth in Sub-Saharan African from 2008 to 2017 using panel ECM Based Granger causality model. The result discovered that there is a distinct unidirectional causality from health expenditure to economic growth [18]. This study opposes the findings of the relationship between health expenditure and economic growth on Emerging countries from 1996 and 2016 using Dumitrescu Hurlin panel causality analysis results, discovered that there is no causality relationship found from healthcare expenditure and economic growth [19]. Also, the causality test results from the study on economic growth and health expenditure analysis for Turkey from 1975 to 2018, revealed that there is a unidirectional causality between health expenditure and economic growth for the related period in Turkey in the short term. An improvement in the health level of the population would result in an increase in GDP, through a healthier and more productive labor force [20].

The casual analysis also shows that there is a unidirectional link between Life expectancy at birth, Infant mortality rate, maternal mortality rate and under-five mortality rate and Gross domestic product per capita in ECOWAS countries. This means that, Life expectancy at birth, Infant mortality rate and under-five mortality rate granger causes gross domestic product per capita at 1% and 5% while maternal mortality rate does not granger cause gross domestic product per capita. Meanwhile, the gross domestic product per capita granger causes maternal mortality rate at 1% while it has no causal link with life expectancy at birth, infant mortality and under-five mortality rate. Thus, it is safe to state that there is a one-way direction between gross domestic product per capita and health outcomes in the 15 countries of ECOWAS region.

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Likewise, there is unidirectional link between External healthcare expenditure and Infant mortality rate, Life expectancy at birth and Under-five mortality rate whereas there is no causal link with maternal mortality rate. This mean that Life expectancy at birth, under-five mortality and infant mortality rate have cause and effect on external healthcare expenditure at 1% and not vice versa. Whereas, there is no causality link between external healthcare expenditure and maternal mortality rate. Also, the findings revealed that there is a unidirectional causality from Life expectancy at birth to public healthcare expenditure. Life expectancy at birth granger cause public healthcare expenditure at 10%.

Meanwhile, there is no causality from public healthcare expenditure to infant mortality rate, maternal mortality rate and under-five mortality rate and vice versa.

Similarly, a one-way causality flows from Life expectancy at birth and maternal mortality rate to private healthcare expenditures but no causality runs from private healthcare expenditure to life expectancy at birth and maternal mortality rate while there is no causal relationship exists between private healthcare expenditures and infant mortality rate and under-five mortality rate and vice versa. The causal results also discovered that there exists a causal link from Life expectancy at birth, infant mortality rate and under-five mortality rate to National healthcare expenditure and not vice versa. This implies that there is a unidirectional causality between life expectancy at birth, infant mortality rate, under-five mortality rate and national healthcare expenditure.

Meanwhile, there is no causal relationship from maternal mortality rate to national healthcare expenditure and vice versa. This means that national healthcare expenditure has no cause and effect on maternal mortality rate. Thus, from the discussion, it is discovered that there is a unidirectional causality from Life expectancy at birth to healthcare expenditures and gross

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domestic product per capita in ECOWAS region. This finding corroborates with the research outcomes of an investigation on health expenditures and economic growth in Sub-Saharan African from 2008 to 2017 using panel ECM Based Granger causality model. The result revealed that there is a unidirectional causality from Life expectancy at birth health expenditure to economic growth both at short run and long run [18].

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Chapter Five

Conclusion

This chapter presents the summary, conclusion, and recommendation of the study. This is divided into five sections which includes summary of findings, conclusion, recommendations, contribution to knowledge, and suggestions for future studies.

5.1 Summary of Findings

The main objective of this study is to empirically explore and investigate the link among healthcare expenditure, health outcomes and economic growth in ECOWAS using annual data spanning from 2000 to 2020. The study employed pooled mean group estimation techniques and pairwise granger causality test to achieve the set objectives. The empirical results of the specific objectives are reported and discussed in details in previous chapter. Nevertheless, the summary of findings from this research are discussed in this sub-section.

The outcome of the trend analysis did not capture the exact link among healthcare expenditure, health outcomes and economic growth in ECOWAS whether direct or otherwise. Thus, this required the need for more empirical analysis with appropriate econometrics techniques as the directions are not conclusive. The unit roots test results discovered that some of the series are not stationary at levels I (0) but they were stationary at first difference I (1). The implication is that a lot of the series trended with prevalent political, financial, social, economic, cultural, and external sector restructuring. Therefore, they have stochastic trends. The Kao residual test for cointegration was used to confirm the long run co-movement of the series. The parameter estimates were calculated using a pooled mean group based on the Hausman test result.

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For objective one, National healthcare expenditures at first lag positively impact life expectancy at birth in the short run and significant at 10% level of significance. Public healthcare expenditure at lag one has a positive and significant impact on life expectancy at birth in the short run at 5%. Likewise, Private healthcare expenditure at lag one has a positive impact on life expectancy at birth and significant at 1% level of significance. Also, external healthcare expenditure at first lag positively impacts life expectancy at birth in the short run. In the long run, National healthcare expenditure positively and significantly impact life expectancy at 1% level of significance. Also, Public healthcare expenditure positively and significantly influence the life expectancy at birth at 1% level of significance. Similarly, Private healthcare expenditure on life expectancy at birth in the long run is positive and significant at 1% level of significance. However, in the long run external healthcare expenditure has a negative and insignificant impact on life expectancy at birth at conventional level.

Also, National healthcare expenditure at lag one in the short run has a negative and insignificant effect on maternal mortality rate at conventional level. Also, public healthcare expenditure at lag one in the short run has a negative and significant effect on maternal mortality rate at 1% level. However, private healthcare expenditure in the short run has a positive and significant impact on maternal mortality rate at 10% level of significance. While, external healthcare expenditure has a negative and insignificant impact on maternal mortality rate at conventional levels. Nevertheless, in the long run, national, public and external healthcare expenditure has a positive and significant effect on maternal mortality rate at 1% and 5% level of significance while private healthcare expenditure has a negative and significant impact on maternal mortality rate at 1% level.

National and private healthcare expenditures at first lag negatively impact infant mortality rate in the short run and insignificant at conventional level. However, Public healthcare expenditure at

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lag one has a direct and insignificant impact on infant mortality rate in the short run. In the long run, National healthcare expenditure has a negative and insignificantly impact on infant mortality rate at conventional level. Meanwhile, Private and external healthcare expenditure negatively and significantly influence infant mortality rate at 1% and 5% level of significance respectively.

Also, Healthcare expenditures on under-five mortality rate at lag one in the short run has a negative and insignificant effect at conventional level of significance. However, in the long run national and private healthcare has a positive and significant impact on under-five mortality rate at 1% and 5% at level of significance. However, public healthcare expenditure has a positive and insignificant impact on under-five mortality rate. Meanwhile, external healthcare expenditure has a negative and significant impact on under-five mortality rate in the long run.

Regarding Second objectives, the National healthcare expenditure first lag positively impacts gross domestic product per capita in the short run and not significant at conventional levels. However, in the long run national healthcare expenditure positively and significantly impact gross domestic product per capita at 1% level of significance. Whereas, public healthcare expenditure on gross domestic product per capita at lag one in the short run has a positive and significant effect at 10% level of significance. However, in the long run public healthcare expenditure at lag one has a positive and significant impact on gross domestic product per capita at 5% level of significance.

The private healthcare expenditure at lag one in the short run has a negative and insignificant effect on gross domestic product per capita at conventional levels. While in the long run private healthcare expenditure has positive and significant impact on gross domestic product per capita at 1% level of significance. Also, at lag one of external healthcare expenditure on gross domestic product per capita in the short run has a positive and insignificant impact at the conventional

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levels. Meanwhile, in the long run external healthcare expenditure has a negative and significant impact on gross domestic product at 1% level of significance.

Concerning the third objectives, The granger causality test at lag two revealed that there is a two-way or bi-directional relationship between National, Private and external public healthcare expenditure and gross domestic product per capita. That is, gross domestic product per capita affects the national, private and external healthcare expenditure and vice versa. Whereas, gross domestic product per capita affects public healthcare expenditure at 1% level of significance and not vice versa. This implies that there is only one flow of casual direction from gross domestic product per capita to public healthcare expenditure.

Also, the causality test revealed that there is a unidirectional connection between gross domestic product per capita and health outcomes. That is, there is a causal direction from Infant mortality rate, Life expectancy at birth and under-five mortality to gross domestic product per capita and no causal flow from gross domestic product per capita to infant mortality rate, life expectancy at birth and under-five mortality rate. Although, there is a causal direction from gross domestic product per capita to maternal mortality rate at 1% but no causality direction from maternal mortality rate to gross domestic product per capita.

Similarly, there is one-way relationship between external healthcare expenditure and life expectancy at birth, under-five mortality rate and infant mortality rate. The causal direction was from life expectancy at birth, infant mortality rate and under-five mortality rate to external healthcare expenditure while no causal link exists between maternal and external mortality rate. At lag 2 of the granger causality tests, public healthcare expenditure does not granger cause infant mortality rate, maternal mortality rate and under-five mortality rate. Meanwhile, life expectancy at birth granger causes public healthcare expenditure at 10% level of significance.

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This shows that there is a unidirectional causality from life expectancy at birth to public healthcare expenditure and not vice versa.

Also, causality tests revealed a one-way direction between private healthcare expenditure and life expectancy at birth as well as maternal mortality rate. And the direction is from life expectancy at birth to private healthcare expenditure, also from maternal mortality rate to private healthcare expenditure. However, there is no causality relationship between infant mortality rate and private healthcare expenditure, also with under-five mortality rate.

Likewise, national healthcare expenditure does nor granger causes the health outcomes indicators whereas, life expectancy at birth, infant mortality rate and under-five mortality rate granger causes national healthcare expenditure at conventional levels. This implies that there is a unidirectional causality between national healthcare expenditure and infant mortality rate, life expectancy at birth and under-five mortality rate.

5.2 Conclusion

This research study gives an empirical insight on the relationship among healthcare expenditures, health outcomes and economic growth in ECOWAS for the period spanning from 2000 to 2020. The poor healthcare intervention in the health system has been one of the major challenges hindering the improvement of health outcomes and sustainable economic growth in ECOWAS countries. Therefore, aside ensuring adequate and proper utilization of healthcare expenditures, amongst other economic goals, there is need to invest more on child health system, maternal health delivery and any health-related activities, also implement appropriate policies that are able to sustain these qualities in both present and future of the countries in ECOWAS as they serve as mechanism in achieving a favourable health outcomes and sustainable economic growth in the region and Africa at large.

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The study formulated three specific objectives and estimated using appropriate statistical methods like pooled mean group approaches and pairwise granger causality test. Also, the study carried out pre-estimation tests (such as trend analysis, descriptive statistics, correlation matrix, scatter plots, cross sectional dependence, panel unit root and Kao cointegration) to authenticate the choice of estimation techniques.

Regarding healthcare expenditures (national, public, private and external healthcare expenditure) and health outcomes indicators (Life expectancy at birth, infant mortality rate, maternal mortality rate and under-five mortality rate), the empirical outcomes show that healthcare expenditures significantly impact life expectancy at birth in the short run and in the long run, The national healthcare expenditure, public healthcare expenditure and public healthcare expenditures significantly impact life expectancy directly in ECOWAS. The causality test revealed that there is a unidirectional causal flow from life expectancy at birth to healthcare expenditures and gross domestic product per capita in ECOWAS.

Likewise, healthcare expenditures and maternal mortality rate reveals that in the short run, national and external healthcare expenditure has a negative and insignificant impact on maternal mortality rate. Public healthcare expenditure has a negative and significant impact on maternal mortality rate in the short run. Private healthcare expenditure has a direct and significant influence on maternal mortality rate. The study reports that National, public and external healthcare expenditure had a positive and significant effect on maternal mortality rate in the long run but had a negative and significant effect on maternal mortality rate.

In the short run, the Healthcare expenditures has no significant effect on infant mortality rate and under-five mortality rate whereas, in the long run, National and public healthcare expenditure reports negative and insignificant effect on infant mortality rate whereas private and external

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healthcare expenditure has a negative and significant influence on infant mortality rate. As for the under-five mortality rate, it was observed that in the long run, national and private expenditure has a direct and significant influence on under-five mortality rate. External healthcare expenditure has a negative and significant impact on under-five mortality rate whereas, public healthcare expenditure impact directly but insignificantly on under-five mortality rate in ECOWAS. This therefore, implies that an improvement in health level of the population would result in an increase in gross domestic product per capita through healthier and more productive labour force.

The findings show that national, public and private healthcare expenditures positively and significantly impact gross domestic product per capita in the long run whereas external healthcare expenditure negatively and significantly impact gross domestic product per capita in ECOWAS for the understudied period. This implies that an increase in healthcare expenditures would result in an increase in gross domestic product per capita in ECOWAS except for external healthcare expenditure that has negative and significant impact on gross domestic per capita. This could be as a result of (i) different external funding sources allocated health to countries in ECOWAS (ii) poor distribution of direct foreign transfers and foreign transfers distributed by government encompassing by financial inflows into the national health system from outside the country.

Causality tests results reveals that there is a bi-directional causality between national, private and external healthcare expenditure and gross domestic product per capita while there exists a unidirectional from gross domestic product per capita to pubic healthcare expenditure. Also, the health outcomes indicators granger causes the gross domestic product per capita except maternal mortality rate that was granger cause by gross domestic product per capita. Similarly, there is a

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unidirectional causality from life expectancy at birth to healthcare expenditures and economic growth in ECOWAS. The causal test reports a one-way direction between Infant mortality rate, under-five mortality rate and external healthcare expenditure and national healthcare expenditure, also between maternal mortality rate and private healthcare expenditure. While no causal movement exist between public healthcare expenditure and mortality rate (infant mortality rate, maternal mortality rate and under-five mortality rate), private healthcare expenditure and infant mortality rate and under-five mortality rate, national healthcare expenditure and maternal mortality rate and between external healthcare expenditure and maternal mortality rate.

5.3. Recommendations

The following recommendations arising from the empirical results of this study are suggested in this sub-section. The following suggestions are stated as follows

a) The study recommends that government of ECOWAS should put in place proper monitoring of public funds and international funds and ensure more funds are channeled on maternal delivery services. The number of physicians per patients is also an important aspect in health sector that needs urgent attention.

b) In terms of policy implication, the study recommends that government of ECOWAS countries should increase budget allocation as presented by during Abuja declaration in April 2001, into the health sectors to achieve better health outcomes and sustainable economic growth.

c) The study recommended that contributions or donations from international bodies in terms of funds, medications and so on, aside allocation of healthcare funds, should be channeled appropriately, monitored and utilized for its purpose.

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d) The study recommended that aside allocation of funds into the health system, the government should ensure that basic amenities are in place such as clean sanitation, basic clean water, preventive medications and so on, as these also have direct effect on the health status of the population. Also, it is part of the Sustainable Development Goals that ECOWAS member should endeavour to achieve. That is, goal three (3) (good health and well-being) and goal six (6) (clean water and sanitation) of Sustainable Development Goals

5.4 Contribution to Knowledge

This study contributed to the existing body of literatures by investigating the link or channels among healthcare expenditures, health outcomes and economic growth. The study found that healthcare expenditures have the ability to improve or influence the health outcomes and economic growth in the long run. Also, health outcome serves as a channel between healthcare expenditures and economic growth. Apart from this, the study also considers healthcare expenditures classifications which includes national, public, private and external healthcare expenditures. The study also incorporated external healthcare expenditure. The findings shows that external healthcare expenditure has little on health outcomes and economic growth.

This study employs appropriate estimation techniques to achieve the stated objectives. The study used pooled mean group estimation technique to examine both the short- and long- run estimates of the parameters of the variables and granger causality test to examine the cause-effect among the variables. These estimation approaches clearly states link among healthcare expenditure, health outcomes and economic growth in short run and long run.

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5.5 Suggested Area for Further Study

Further research should focus on impact of other measures that have a significant influence on health outcomes (mortality and morbidity) such as institutional Quality of sustainable healthcare in Africa.

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Appendix 1

Table 4.1: Descriptive statistics

Signs	Variables Measurements	Mean	Std. Dev.	Max.	Min.	Kurtosis	Skewness	Obs.
Outcome Variables								
Lep	Life expectancy at birth, total (years)	57.459	6.125	73.166	39.441	0.444	0.241	315
Mmr	Maternal mortality ratio (modeled estimate, per 100,000 live births)	652.025	351.367	2480	58	4.675	1.478	315
Imr	Mortality rate, infant (per 1,000 live births)	67.048	24.053	138.1	12.2	0.180	0.166	315
u5mr	Mortality rate, under-5 (per 1,000 live births)	107.11	43.072	224.9	14.2	-0.002	0.176	315
Gdppc	GDP per capita (constant 2015 US$)	1070.9	713.96	3482.5	364.02	1.317	1.481	315
Main Explanatory Variables								
Nhe	Current health expenditure per capita (current US$)	48.43	33.88	191.28	7.544	4.988	2.034	315
Puhe	Domestic general government health expenditure per capita (current US$)	14.44	22.18	116.99	1.126	10.699	3.326	315
Pvhe	Domestic private health expenditure per capita (current US$)	24.96	15.79	80.29	3.479	0.183	0.938	315
Exhe	External health expenditure per capita (current US$)	9.024	8.449	74.70	0.452	15.984	3.076	315
Control Variables								
im_dtp	Immunization, DPT (% of children ages 12-23 months)	74.62	17.42	99	25	-0.242	-0.764	315
Im_hepB3	Immunization, HepB3 (% of one-year-old children)	73.86	20.17	99	10	1.311	-1.304	315
Im_ms	Immunization, measles (% of children ages 12-23 months)	71.94	16.02	99	30	-0.587	-0.429	315
Ihiv	Incidence of HIV, all (per 1,000 uninfected population)	0.918	0.699	3.85	0.05	3.592	1.667	294
f_hiv15_24	Prevalence of HIV, female (% ages 15-24)	0.945	0.664	4.4	0.1	3.319	1.222	315
Inc_mal.	Incidence of malaria (per 1,000 pop.at risk)	320.9	148.5	603.21	0.008	-0.185	-0.812	313
Inc_tb.	Incidence of tuberculosis (per 100,000 people)	167.8	97.05	367	36	-0.920	0.486	315
Bw	People using at least basic drinking water services (% of population)	64.1	11.917	88.77	36.85	-0.711	-0.122	315
Bs	People using at least basic sanitation services (% of population)	24.9	16.079	79.12	5.197	0.562	1.132	315
p15_64	Population ages 15-64 (% of total population)	53.4	3.371	67.13	47.18	4.053	1.413	315
f_ p15_64	Population ages 15-64, female (% of female population)	53.9	3.019	65.99	47.78	3.636	1.232	315
p65ab	Population ages 65 and above (% of total pop.)	3.035	0.617	5.673	2.407	7.444	2.641	315
f_p65ab	Population ages 65 and above, female (% of female population)	3.377	0.833	6.661	2.582	6.739	2.577	315
f_psch	School enrollment, primary, female (% gross)	86.59	21.77	145.59	25.99	-0.159	-0.175	296
Pgr	Population growth (annual %)	2.679	0.612	5.363	1.094	1.917	0.250	315
Gfcfpc	Gross fixed capital formation per capita (constant 2015 US$)	191.3	149.9	750	23.91304	1.422	1.425	255
Inf	Inflation, consumer prices (annual %)	5.631	6.788	41.51	-3.503	5.832	1.992	303
Tradepc	Trade per capita	702.9	687.9	4036.403	0	7.506	2.661	293

Source: Author's computation (2022)

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Appendix 2

Table 4.2: Average of Healthcare Expenditure, Health Outcomes and Economic Growth (2000-2020)

S/N	Country	Life expectancy at birth, total (years)	Maternal mortality ratio (modeled estimate, per 100,000 live births)	Mortality rate, infant (per 1,000 live births)	Mortality rate, under-5 (per 1,000 live births)	GDP per capita (constant 2015 US$)	Current health expenditure per capita (current US$)	Domestic general government health expenditure per capita (current US$)	Domestic private health expenditure per capita (current US$)	External health expenditure per capita (current US$)	Incidence of HIV, all (per 1,000 uninfected population)	Population growth (annual %)
1	Benin	58.98	459.71	70.02	109.89	1024.48	28.13	6.61	14.42	7.09	0.606	2.849
2	Burkina Faso	56.62	394.81	70.16	127.02	587.40	29.22	9.90	11.38	7.94	0.493	2.936
3	Cabo Verde	71.14	75.57	20.80	24.72	2803.02	138.16	90.13	37.83	10.20	n.a.	1.331
4	Cote d'Ivoire	53.24	679.67	75.70	108.54	1808.27	69.21	12.12	49.50	7.59	1.468	2.371
5	Gambia, The	59.41	701.67	46.66	76.52	700.17	36.51	6.46	7.32	22.73	1.281	3.037
6	Ghana	60.78	353.43	47.26	69.59	1498.03	60.51	24.90	27.63	7.98	1.065	2.390
7	Guinea	56.53	793.71	76.86	122.22	741.26	28.84	3.52	19.46	5.85	0.818	2.328
8	Guinea-Bissau	54.59	849.57	75.05	119.15	590.57	43.45	7.75	23.76	11.93	2.195	2.447
9	Liberia	58.81	751.86	80	112.96	666.41	43.26	5.27	25.43	12.55	0.754	2.989
10	Mali	54.66	664.33	77.94	133.51	714.95	28.78	6.60	14.24	7.94	0.597	3.063
11	Niger	56.93	656.43	65.94	134.50	451.09	21.77	6.33	12.57	2.87	0.173	3.786
12	Nigeria	50.71	1015.43	87.46	141.42	2221.08	66.90	11.22	49.84	5.84	0.724	2.606
13	Senegal	63.64	435.48	44.68	72.75	1179.02	47.38	14.51	27.42	5.44	0.283	2.664
14	Sierra Leone	48.51	1506.67	108.37	163.89	550.67	52.38	5.60	30.92	15.85	1.078	2.766
15	Togo	57.33	442.05	58.82	89.98	526.54	31.91	5.70	22.68	3.53	1.318	2.615

Source: Author's computation (2022)

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Appendix 3

Table 4.3: Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Lep	-0.822	-0.936	-0.923	0.525	0.657	0.108	0.181	0.626	0.444	0.583	-0.486	-0.592	-0.642	-0.441	0.664	0.584	0.507	0.556	0.526	0.559	0.428
mmr(1)	1	0.836	0.764	-0.320	-0.497	-0.007	0.034	-0.538	-0.290	-0.467	0.315	0.397	0.352	0.648	-0.499	-0.359	-0.351	-0.383	-0.315	-0.355	-0.260
imr(2)		1	0.954	-0.501	-0.602	-0.130	-0.187	-0.688	-0.446	-0.623	0.380	0.552	0.654	0.466	-0.654	-0.611	-0.462	-0.502	-0.361	-0.381	-0.366
u5mr(3)			1	-0.575	-0.602	-0.258	-0.245	-0.718	-0.425	-0.648	0.289	0.409	0.651	0.333	-0.750	-0.606	-0.579	-0.609	-0.428	-0.426	-0.542
nhe(4)				1	0.845	0.747	0.395	0.371	0.272	0.383	-0.097	-0.208	-0.517	0.001	0.581	0.626	0.784	0.748	0.604	0.621	0.371
puhe(5)					1	0.359	0.092	0.395	0.295	0.439	-0.182	-0.351	-0.581	-0.272	0.519	0.637	0.759	0.748	0.780	0.819	0.294
pvhe(6)						1	0.183	0.040	-0.034	-0.003	-0.059	0.091	-0.221	0.257	0.341	0.316	0.514	0.459	0.215	0.184	0.254
exhe(7)							1	0.375	0.381	0.388	0.007	-0.081	-0.147	0.239	0.331	0.248	0.190	0.178	-0.027	-0.005	0.252
im_dtp(8)								1	0.678	**0.933**	-0.122	-0.234	-0.406	-0.247	0.499	0.341	0.390	0.385	0.208	0.230	0.414
im_hepb3(9)									1	0.714	-0.201	-0.296	-0.343	-0.079	0.363	0.238	0.254	0.259	0.089	0.122	0.162
im_ms(10)										1	0.007	-0.187	-0.387	-0.149	0.486	0.346	0.397	0.385	0.231	0.259	0.347
ihiv(11)											1	0.843	0.066	0.504	-0.043	-0.259	0.168	0.128	0.028	-0.046	-0.031
f_hiv15-24(12)												1	0.380	0.501	-0.193	-0.511	0.004	-0.047	-0.230	-0.273	-0.001
inc_mal(13)													1	-0.049	-0.502	-0.604	-0.480	-0.549	-0.490	-0.489	-0.355
inc_tb(14)														1	-0.105	-0.266	0.030	0.026	-0.130	-0.169	-0.065
bw(15)															1	0.706	0.571	0.586	0.446	0.393	0.386
bs(16)																1	0.429	0.438	0.454	0.430	0.170
p15-64(17)																	1	0.985	0.591	0.627	0.592
f_p15-64(18)																		1	0.605	0.648	0.595
p65ab (19)																			1	**0.969**	0.351
f_p65ab (20)																				1	0.346
f_psch (21)																					1

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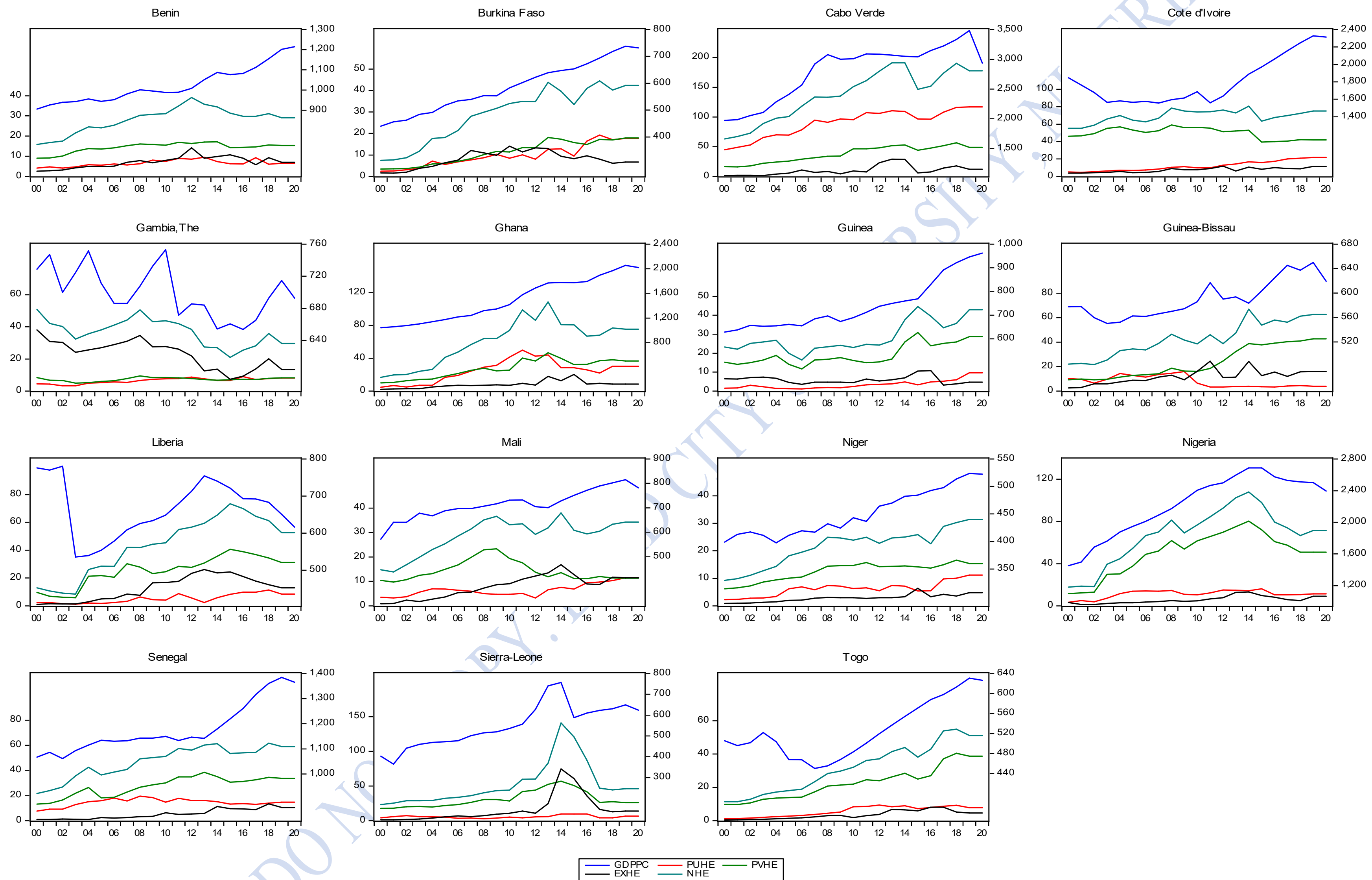

Figure 4.1: Plot of Income per capita and healthcare expenditure (private, public, national and external) in ECOWAS
Source: Author's computation from WDI (2020).

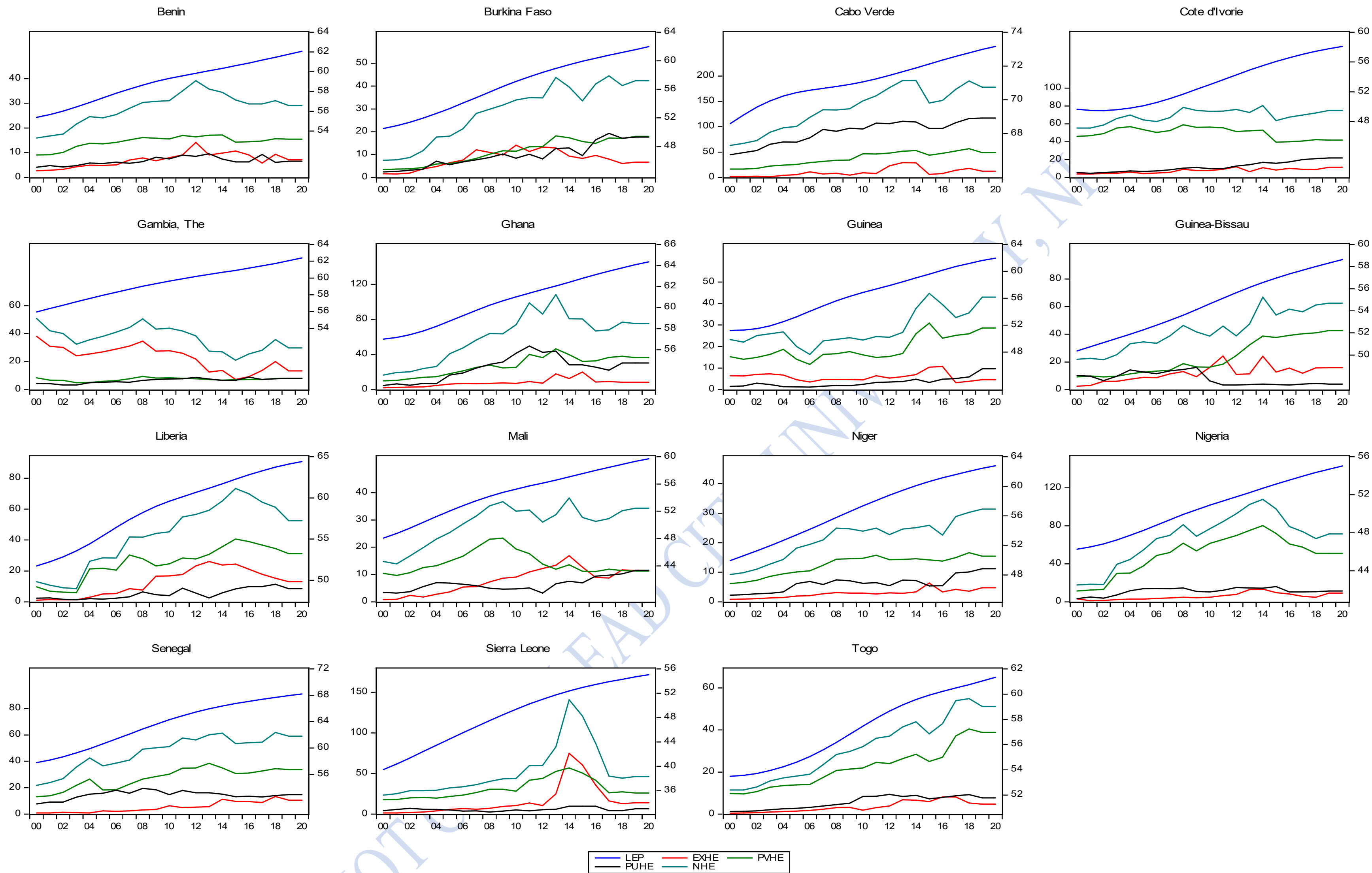

Figure 4.2: Plot of Life Expectancy at birth and healthcare expenditure (private, public, national and external) in ECOWAS

Source: Author's computation from WDI (2020).

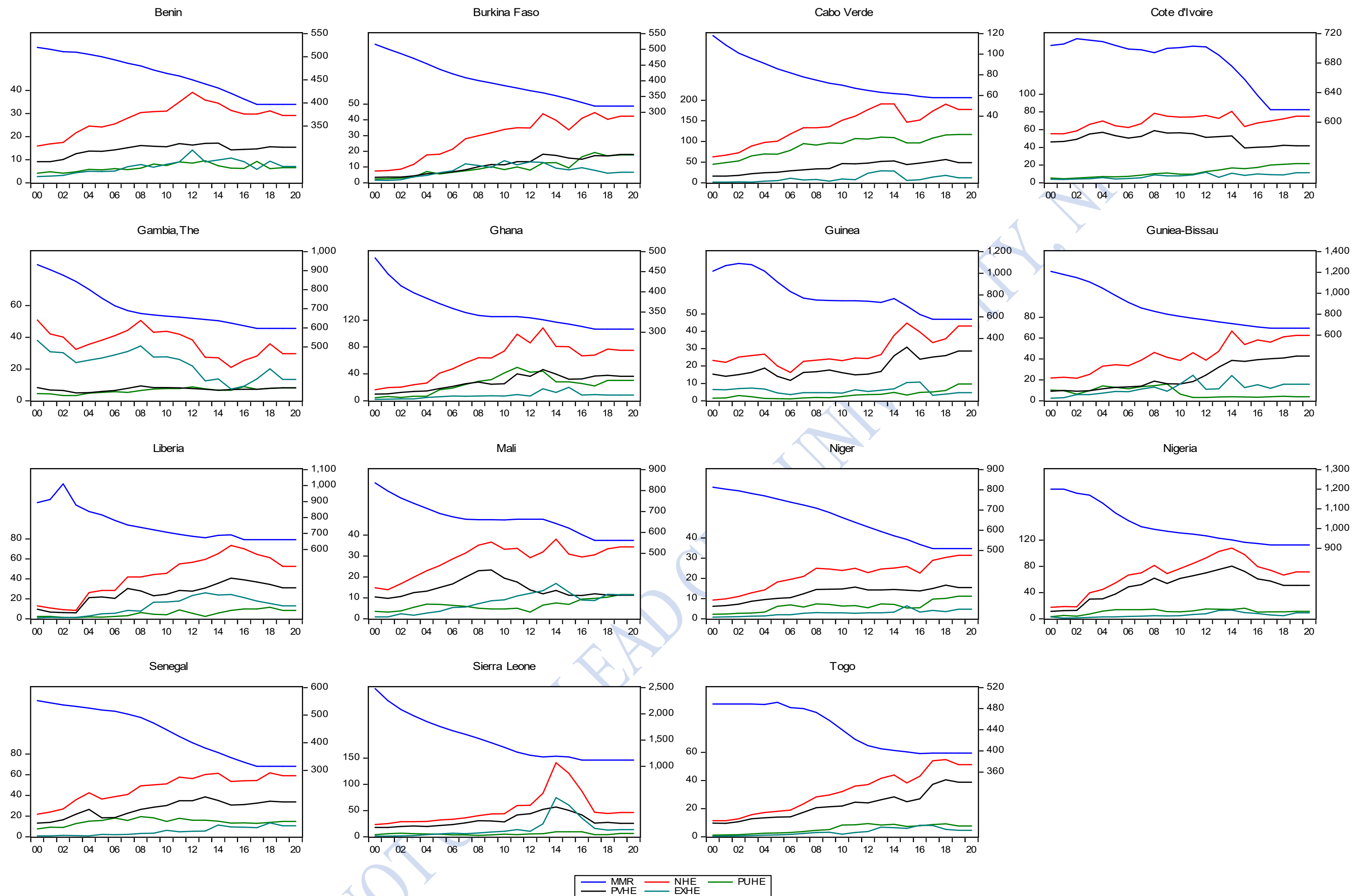

Figure 4.3: Plot of Maternal Mortality Rate and healthcare expenditure (private, public, national and external) in ECOWAS

Source: Author's computation from WDI (2020)

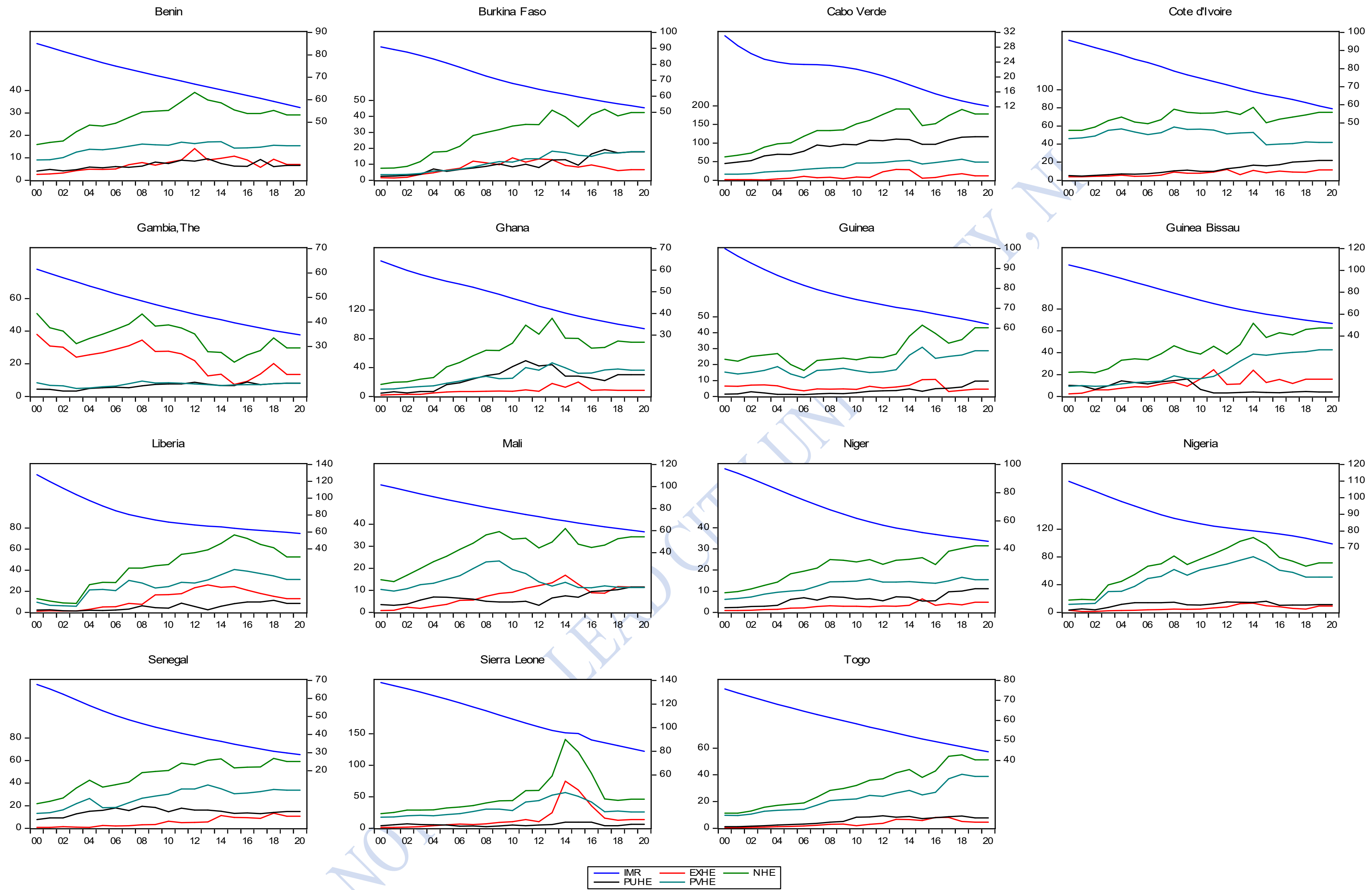

Figure 4.4: Plot of Infant Mortality Rate and healthcare expenditure (private, public, national and external) in ECOWAS
Source: Author's computation from WDI (2020).

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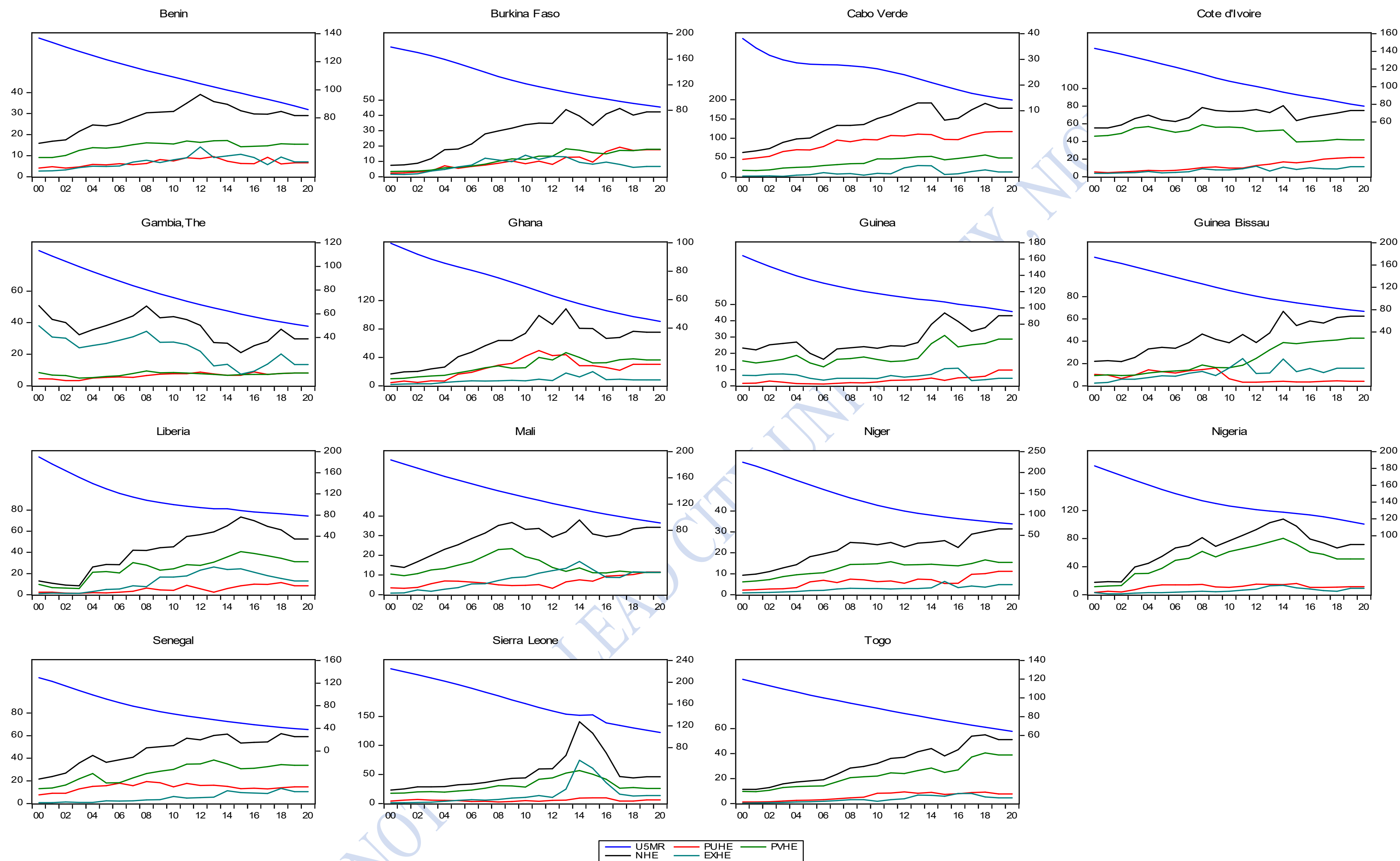

Figure 4.5: Plot of Under-five Mortality Rate and healthcare expenditure (private, public, national and external) in ECOWAS
Source: Author's computation from WDI (2020).

Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id
Time Variable (t): year

Number of obs = 280
Number of groups = 14
Obs per group: min = 20
avg = 20.0
max = 20

Log Likelihood = 1409.123

D.imr	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ECT						
puhe	-.020439	.0170786	-1.20	0.231	-.0539125	.0130344
im_hepb3	.000758	.0004731	1.60	0.109	-.0001693	.0016854
im_ms	.0036443	.0015352	2.37	0.018	.0006354	.0066532
im_dtp	.0026742	.0016212	1.65	0.099	-.0005034	.0058517
bs	-.0123232	.0079539	-1.55	0.121	-.0279126	.0032662
bw	.0279173	.007314	3.82	0.000	.0135822	.0422524
inc_mal	-.1246536	.0413654	-3.01	0.003	-.2057283	-.0435789
ihiv	.043959	.0190581	2.31	0.021	.0066058	.0813122
SR						
ECT	-.1031731	.0167744	-0.62	0.000	-.431945	.0225598
puhe						
D1.	.0017934	.0014082	1.27	0.203	-.0009666	.0045533
im_hepb3						
D1.	.0001596	.00009	1.77	0.076	-.0000169	.000336
im_ms						
D1.	-.0001836	.0001571	-1.17	0.243	-.0004916	.0001243
im_dtp						
D1.	-.0000223	.0001591	-0.14	0.888	-.0003342	.0002896
bs						
D1.	-.0759471	.0954911	-0.80	0.426	-.2631061	.1112119
bw						
D1.	.1067126	.1350776	0.79	0.430	-.1580346	.3714598
inc_mal						
D1.	-.0073455	.0166164	-0.44	0.658	-.0399129	.025222
ihiv						
D1.	.0038487	.0061418	0.63	0.531	-.008189	.0158865
_cons	-.0767287	.124392	-0.62	0.537	-.3205326	.1670753

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```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id                 Number of obs      =      280
Time Variable (t): year                  Number of groups   =       14
                                         Obs per group: min =       20
                                          avg =      20.0
                                          max =        20

                              Log Likelihood     =  1379.392
------------------------------------------------------------------------------
      D.imr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ECT          |
        nhe |  -.018427   .0165435    -1.11   0.265    -.0508516    .0139975
   im_hepb3 |  .0005828   .0005321     1.10   0.273    -.0004601    .0016258
     im_ms |  .0013259   .0008485     1.56   0.118    -.0003371    .0029888
     im_dtp |    -.0017    .000762    -2.23   0.026    -.0031936   -.0002065
         bs | -.0061295   .0040526    -1.51   0.130    -.0140724    .0018135
         bw |  .0160263    .008861     1.81   0.071    -.0013409    .0333935
    inc_mal |  .3071417   .0621629     4.94   0.000     .1853046    .4289788
       ihiv |  .1628795   .0388792     4.19   0.000     .0866777    .2390814
-------------+----------------------------------------------------------------
SR           |
        ECT | -.1299851   .0201746     -6.4   0.000      -.05254     .026543
             |
        nhe |
        D1. | -.0006791   .0025216    -0.27   0.788    -.0056214    .0042632
             |
   im_hepb3 |
        D1. | -.0001696   .0000975    -1.74   0.082    -.0003607    .0000214
             |
      im_ms |
        D1. | -.0001693   .0001672    -1.01   0.311    -.0004971    .0001585
             |
     im_dtp |
        D1. |  .0001443   .0001896     0.76   0.447    -.0002273    .0005159
             |
         bs |
        D1. |  -.019548   .1362858    -0.14   0.886    -.2866633    .2475674
             |
         bw |
        D1. | -.1742431   .1680456    -1.04   0.300    -.5036065    .1551202
             |
    inc_mal |
        D1. | -.0106634   .0167665    -0.64   0.525    -.0435252    .0221983
             |
       ihiv |
        D1. | -.0001527   .0111806    -0.01   0.989    -.0220663    .0217609
             |
      _cons |  .1785698    .132064     1.35   0.176    -.0802708    .4374105
------------------------------------------------------------------------------
```

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```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id                Number of obs      =      280
Time Variable (t): year                 Number of groups   =       14
                                        Obs per group: min =       20
                                        avg =      20.0
                                        max =        20

                                 Log Likelihood = 1379.062
------------------------------------------------------------------------------
      D.imr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ECT          |
        pvhe |  -.0365785   .0176084    -2.08   0.038    -.0710904   -.0020666
    im_hepb3 |   .0007797   .0005382     1.45   0.147    -.0002751    .0018345
       im_ms |   .0015963   .0009147     1.75   0.081    -.0001964    .0033891
      im_dtp |  -.0020963   .0007923    -2.65   0.008    -.0036491   -.0005434
          bs |  -.0068747   .0038795    -1.77   0.076    -.0144785     .000729
          bw |   .0117378   .0083303     1.41   0.159    -.0045894    .0280649
     inc_mal |   .2828408   .0601706     4.70   0.000     .1649085    .4007731
        ihiv |   .1445572   .0350859     4.12   0.000       .07579    .2133243
-------------+----------------------------------------------------------------
SR           |
         ECT |   -.353711   .0213171   -16.60   0.000    -.5531781   .0282438
             |
        pvhe |
         D1. |   -.001718   .0023282    -0.74   0.461    -.0062812    .0028452
             |
    im_hepb3 |
         D1. |  -.0001509   .0000861    -1.75   0.080    -.0003196    .0000179
             |
       im_ms |
         D1. |  -.0001586   .0001474    -1.08   0.282    -.0004476    .0001303
             |
      im_dtp |
         D1. |   .0001169   .0001636     0.71   0.475    -.0002038    .0004376
             |
          bs |
         D1. |  -.0147439   .1190067    -0.12   0.901    -.2479928    .2185051
             |
          bw |
         D1. |  -.1563413   .1498821    -1.04   0.297    -.4501048    .1374223
             |
     inc_mal |
         D1. |  -.0095428   .0172712    -0.55   0.581    -.0433937    .0243081
             |
        ihiv |
         D1. |   .0072144   .0071511     1.01   0.313    -.0068015    .0212303
             |
       _cons |   .1697507   .1115474     1.52   0.128    -.0488782    .3883796
------------------------------------------------------------------------------
```

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```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id                 Number of obs      =     280
Time Variable (t): year                  Number of groups   =      14
                                         Obs per group: min =      20
                                          avg =      20.0
                                          max =        20

                              Log Likelihood = 1393.319
------------------------------------------------------------------------------
      D.imr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ECT          |
        exhe |  -.0584313   .0220259    -2.65   0.008    -.1016012   -.0152614
    im_hepb3 |   .0046858    .001986     2.36   0.018     .0007933    .0085784
       im_ms |   .0028124   .0016122     1.74   0.081    -.0003473    .0059722
      im_dtp |  -.0038985   .0017261    -2.26   0.024    -.0072815   -.0005155
          bs |  -.0094642   .0086341    -1.10   0.273    -.0263868    .0074584
          bw |   .0311511   .0253776     1.23   0.220     -.018588    .0808903
     inc_mal |   .5050898   .2045875     2.47   0.014     .1041058    .9060739
        ihiv |   .1479205   .0511404     2.89   0.004     .0476872    .2481537
-------------+----------------------------------------------------------------
SR           |
         ECT |   -.129772   .0137155    -9.50   0.000     -.398591    .0139046
             |
        exhe |
         D1. |   .0003734   .0015536     0.24   0.810    -.0026716    .0034184
             |
    im_hepb3 |
         D1. |  -.0002874   .0001071    -2.68   0.007    -.0004973   -.0000775
             |
       im_ms |
         D1. |  -.0002207   .0001635    -1.35   0.177    -.0005413    .0000998
             |
      im_dtp |
         D1. |   .0002926   .0002025     1.44   0.149    -.0001043    .0006896
             |
          bs |
         D1. |   .0042399   .1051481     0.04   0.968    -.2018465    .2103263
             |
          bw |
         D1. |  -.1444714   .1349932    -1.07   0.285    -.4090532    .1201103
             |
     inc_mal |
         D1. |  -.0123786   .0178803    -0.69   0.489    -.0474233    .0226662
             |
        ihiv |
         D1. |  -.0005053   .0122543    -0.04   0.967    -.0245233    .0235127
             |
       _cons |   .1087864      .1233     0.88   0.378    -.1328772    .3504499
------------------------------------------------------------------------------
```

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```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id                    Number of obs      =      280
Time Variable (t): year                     Number of groups   =       14
                                            Obs per group: min =       20
                                             avg =      20.0
                                             max =        20

                              Log Likelihood     =  911.4884
------------------------------------------------------------------------------
      D.mmr |      Coef.   Std. Err.      z    P>|z|    [95% Conf. Interval]
-------------+----------------------------------------------------------------
ECT          |
         nhe |   .1635518   .0336814     4.86   0.000     .0975376    .2295661
  f_hiv15_24 |   .2826565   .0517432     5.46   0.000     .1812418    .3840713
    f_p15_64 |   .0560971   .0138538     4.05   0.000     .0289441      .08325
     f_p65ab |  -.3281335   .0714854    -4.59   0.000    -.4682423   -.1880247
      f_psch |  -.0103655   .0011071    -9.36   0.000    -.0125353   -.0081957
-------------+----------------------------------------------------------------
SR           |
         ECT |  -.1378936   .0329074    -4.19   0.000    -.2023909   -.0733963
             |
         nhe |
         D1. |  -.0071435   .0080286    -0.89   0.374    -.0228791    .0085922
             |
  f_hiv15_24 |
         D1. |  -.0544461   .0385909    -1.41   0.158    -.1300829    .0211907
             |
    f_p15_64 |
         D1. |   .0208131   .0369151     0.56   0.573    -.0515391    .0931653
             |
     f_p65ab |
         D1. |  -.1149978   .1821495    -0.63   0.528    -.4720042    .2420086
             |
      f_psch |
         D1. |  -.0001355   .0005758    -0.24   0.814     -.001264     .000993
             |
       _cons |   .5845207   .1573346     3.72   0.000     .2761505     .892891
------------------------------------------------------------------------------
```

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Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id
Time Variable (t): year

Number of obs = 280
Number of groups = 14
Obs per group: min = 20
avg = 20.0
max = 20

Log Likelihood = 912.2864

D.mmr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ECT						
puhe	.1005205	.0228206	4.40	0.000	.0557931	.145248
f_hiv15_24	.4310694	.0785569	5.49	0.000	.2771007	.585038
f_p15_64	.0744472	.0155098	4.80	0.000	.0440486	.1048458
f_p65ab	-.2945976	.0829553	-3.55	0.000	-.4571869	-.1320083
f_psch	-.0082134	.0011711	-7.01	0.000	-.0105086	-.0059181
SR						
ECT	-.1178514	.0403098	-2.92	0.003	-.1968571	-.0388457
puhe						
D1.	-.0148154	.0038462	-3.85	0.000	-.0223537	-.0072771
f_hiv15_24						
D1.	-.0517562	.0419883	-1.23	0.218	-.1340518	.0305393
f_p15_64						
D1.	.0145691	.0386266	0.38	0.706	-.0611376	.0902758
f_p65ab						
D1.	-.1607004	.193171	-0.83	0.405	-.5393086	.2179079
f_psch						
D1.	-.0002647	.0004376	-0.60	0.545	-.0011223	.000593
_cons	.3904469	.1542919	2.53	0.011	.0880403	.6928534

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```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id                Number of obs      =      280
Time Variable (t): year                 Number of groups   =       14
                                        Obs per group: min =       20
                                         avg =      20.0
                                         max =        20

                             Log Likelihood     = 917.5626
------------------------------------------------------------------------------
      D.mmr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ECT          |
       pvhe |  -.1014126   .0136415    -7.43   0.000    -.1281494   -.0746757
 f_hiv15_24 |  -.0077712   .0146828    -0.53   0.597    -.0365489    .0210064
   f_p15_64 |   .0425735   .0064254     6.63   0.000       .02998    .0551669
    f_p65ab |    .073202   .0807771     0.91   0.365    -.0851182    .2315221
     f_psch |  -.0063142   .0006461    -9.77   0.000    -.0075805   -.0050479
-------------+----------------------------------------------------------------
SR           |
        ECT |  -.2029763   .0516446    -3.93   0.000    -.3041978   -.1017548
             |
       pvhe |
        D1. |   .0215424   .0120769     1.78   0.074    -.0021278    .0452126
             |
 f_hiv15_24 |
        D1. |  -.0395092   .0444845    -0.89   0.374    -.1266972    .0476787
             |
   f_p15_64 |
        D1. |   -.019155   .0390335    -0.49   0.624    -.0956592    .0573492
             |
    f_p65ab |
        D1. |  -.1548511   .2165422    -0.72   0.475     -.579266    .2695638
             |
     f_psch |
        D1. |  -.0002843   .0005905    -0.48   0.630    -.0014416     .000873
             |
      _cons |   .9568304    .257588     3.71   0.000     .4519673    1.461694
------------------------------------------------------------------------------
```

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```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id                Number of obs      =      280
Time Variable (t): year                 Number of groups   =       14
                                        Obs per group: min =       20
                                                       avg =     20.0
                                                       max =       20

                                Log Likelihood     =  908.2788
------------------------------------------------------------------------------
       D.mmr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ECT          |
        exhe |    .036886   .0171099     2.16   0.031     .0033512    .0704209
  f_hiv15_24 |   .1397516   .0354028     3.95   0.000     .0703633    .2091398
    f_p15_64 |   .0609985    .011932     5.11   0.000     .0376122    .0843847
     f_p65ab |   .0235597   .1040352     0.23   0.821    -.1803456     .227465
      f_psch |  -.0081816   .0009407    -8.70   0.000    -.0100254   -.0063379
-------------+----------------------------------------------------------------
SR           |
         ECT |  -.1641497   .0364936    -4.50   0.000    -.2356759   -.0926236
             |
        exhe |
         D1. |  -.0019838   .0034531    -0.57   0.566    -.0087517    .0047841
             |
  f_hiv15_24 |
         D1. |  -.0344602   .0424214    -0.81   0.417    -.1176046    .0486841
             |
    f_p15_64 |
         D1. |    .013453   .0363986     0.37   0.712     -.057887    .0847931
             |
     f_p65ab |
         D1. |   -.080738   .2067916    -0.39   0.696    -.4860421     .324566
             |
      f_psch |
         D1. |    -.00028   .0005391    -0.52   0.603    -.0013365    .0007765
             |
       _cons |   .5568588   .1405489     3.96   0.000      .281388    .8323295
------------------------------------------------------------------------------
```

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Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id
Time Variable (t): year

Number of obs = 280
Number of groups = 14
Obs per group: min = 20
avg = 20.0
max = 20

Log Likelihood = 1669.161

D.lep	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ECT						
nhe	.0316349	.0039563	8.00	0.000	.0238808	.0393891
bs	.0290588	.0029727	9.78	0.000	.0232324	.0348852
bw	.025798	.0030155	8.56	0.000	.0198878	.0317082
inc_mal	.0706296	.0096281	7.34	0.000	.051759	.0895003
inc_tb	-.2294306	.0324036	-7.08	0.000	-.2929406	-.1659207
ihiv	-.0265675	.0056329	-4.72	0.000	-.0376078	-.0155272
SR						
ECT	-.1180591	.0132374	-8.91	0.000	-.3775081	.0141389
nhe						
D1.	.0010124	.0006533	1.55	0.121	-.0002679	.0022928
bs						
D1.	-.0113858	.0339759	-0.34	0.738	-.0779773	.0552057
bw						
D1.	-.0549314	.0845827	-0.65	0.516	-.2207103	.1108476
inc_mal						
D1.	.0005629	.0034149	0.16	0.869	-.0061302	.007256
inc_tb						
D1.	-.0094067	.0280402	-0.34	0.737	-.0643644	.045551
ihiv						
D1.	.0024356	.0026774	0.91	0.363	-.0028121	.0076833
_cons	.0862311	.0697769	1.24	0.217	-.0505291	.2229914

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Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id — Number of obs = 280
Time Variable (t): year — Number of groups = 14

Obs per group: min = 20
avg = 20.0
max = 20

Log Likelihood = 1701.047

D.lep	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ECT						
puhe	.0325522	.0053253	6.11	0.000	.0221147	.0429897
bs	-.0453834	.0048375	-9.38	0.000	-.0548647	-.0359021
bw	.0493261	.0055633	8.87	0.000	.0384223	.0602299
inc_mal	.0459659	.0084526	5.44	0.000	.0293991	.0625328
inc_tb	-.6902469	.0748206	-9.23	0.000	-.8368926	-.5436013
ihiv	-.033759	.0105637	-3.20	0.001	-.0544634	-.0130546
SR						
ECT	-.1478651	.0132853	-11.11	0.000	-.4082511	.0112521
puhe D1.	.0000655	.0004433	0.15	0.883	-.0008034	.0009344
bs D1.	.009524	.036819	0.26	0.796	-.0626399	.0816879
bw D1.	-.0989565	.0989634	-1.00	0.317	-.2929212	.0950081
inc_mal D1.	-.0007168	.0034117	-0.21	0.834	-.0074035	.0059699
inc_tb D1.	.015148	.0184793	0.82	0.412	-.0210707	.0513667
ihiv D1.	-.0002304	.0028552	-0.08	0.936	-.0058266	.0053658
_cons	.1487485	.0854645	1.74	0.082	-.0187589	.3162559

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```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id                Number of obs      =      280
Time Variable (t): year                 Number of groups   =       14
                                        Obs per group: min =       20
                                          avg =      20.0
                                          max =        20

                         Log Likelihood     = 1635.112
------------------------------------------------------------------------------
      D.lep |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ECT          |
        pvhe |   .0512693   .0179179     2.86   0.004      .016151    .0863877
          bs |    .391417   .2216073     1.77   0.077    -.0429254    .8257593
          bw |  -.0739442   .0563165    -1.31   0.189    -.1843225    .0364342
     inc_mal |  -.0744212    .056015    -1.33   0.184    -.1842086    .0353661
      inc_tb |   .3259932   .1478516     2.20   0.027     .0362095     .615777
        ihiv |  -.0445581   .0810815    -0.55   0.583    -.2034749    .1143587
-------------+----------------------------------------------------------------
SR           |
         ECT |   .0621571   .0037999     16.4   0.000    -.0123211    .0136634
             |
        pvhe |
         D1. |   .0015761   .0004908     3.21   0.001     .0006141    .0025381
             |
          bs |
         D1. |  -.0084421   .0213898    -0.39   0.693    -.0503653    .0334811
             |
          bw |
         D1. |  -.1006786   .0916387    -1.10   0.272    -.2802872      .07893
             |
     inc_mal |
         D1. |   .0022361    .003184     0.70   0.482    -.0040044    .0084766
             |
      inc_tb |
         D1. |   .0095351    .017218     0.55   0.580    -.0242116    .0432818
             |
        ihiv |
         D1. |  -.0008049    .002474    -0.33   0.745    -.0056538     .004044
             |
       _cons |  -.0008968    .047284    -0.02   0.985    -.0935717    .0917781
------------------------------------------------------------------------------
```

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Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id
Time Variable (t): year

Number of obs = 280
Number of groups = 14
Obs per group: min = 20
avg = 20.0
max = 20

Log Likelihood = 1630.098

D.lep	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ECT						
exhe	-.0176729	.0509357	-0.35	0.729	-.117505	.0821593
bs	.9836594	2.762107	0.36	0.722	-4.429972	6.397291
bw	-.1331094	.4859668	-0.27	0.784	-1.085587	.8193681
inc_mal	-.2898188	.8401036	-0.34	0.730	-1.936392	1.356754
inc_tb	-.1167867	.4067333	-0.29	0.774	-.9139693	.680396
ihiv	-.6280969	1.790316	-0.35	0.726	-4.137053	2.880859
SR						
ECT	-.0139011	.0007266	-19.1	0.000	-.000341	.0028142
exhe						
D1.	.0003142	.0002093	1.50	0.133	-.0000961	.0007246
bs						
D1.	-.0109048	.0215629	-0.51	0.613	-.0531673	.0313577
bw						
D1.	-.0933488	.0891618	-1.05	0.295	-.2681027	.0814052
inc_mal						
D1.	.0018813	.0035525	0.53	0.596	-.0050814	.008844
inc_tb						
D1.	-.0065476	.017381	-0.38	0.706	-.0406137	.0275184
ihiv						
D1.	-.0014548	.0031305	-0.46	0.642	-.0075905	.0046809
_cons	.0068869	.0472274	0.15	0.884	-.085677	.0994508

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```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id                    Number of obs      =      300
Time Variable (t): year                     Number of groups   =       15
                                            Obs per group: min =       20
                                             avg =      20.0
                                             max =        20

                                 Log Likelihood     =  1410.813
------------------------------------------------------------------------------
     D.u5mr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ECT          |
        nhe |   .1542347   .0240395     6.42   0.000     .1071182    .2013511
   im_hepb3 |   .0053234    .000905     5.88   0.000     .0035497    .0070972
     im_ms |   .0043515    .001002     4.34   0.000     .0023877    .0063154
     im_dtp |   -.002163   .0007469    -2.90   0.004    -.0036269   -.0006991
         bs |    .052979     .00968     5.47   0.000     .0340066    .0719513
         bw |  -.0343465   .0054131    -6.35   0.000    -.0449559   -.0237371
    inc_mal |   .0629486   .0216259     2.91   0.004     .0205626    .1053346
     inc_tb |   2.678989   .2166956    12.36   0.000     2.254274    3.103705
-------------+----------------------------------------------------------------
SR           |
        ECT |  -.0059028   .0156654    -0.38   0.706    -.0366064    .0248009
            |
        nhe |
        D1. |   .0076555   .0065202     1.17   0.240    -.0051239    .0204349
            |
   im_hepb3 |
        D1. |   .0000183   .0001409     0.13   0.896    -.0002577    .0002944
            |
      im_ms |
        D1. |  -.0003329   .0002345    -1.42   0.156    -.0007925    .0001267
            |
     im_dtp |
        D1. |   .0001262   .0001733     0.73   0.466    -.0002134    .0004659
            |
         bs |
        D1. |   -.047236   .0784723    -0.60   0.547    -.2010388    .1065669
            |
         bw |
        D1. |  -.0571394   .0303578    -1.88   0.060    -.1166396    .0023608
            |
    inc_mal |
        D1. |  -.0063729    .019116    -0.33   0.739    -.0438396    .0310939
            |
     inc_tb |
        D1. |    .030351   .0921178     0.33   0.742    -.1501965    .2108985
            |
      _cons |  -.0455059   .1320555    -0.34   0.730    -.3043298    .2133181
------------------------------------------------------------------------------
```

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Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id
Time Variable (t): year

Number of obs = 300
Number of groups = 15
Obs per group: min = 20
avg = 20.0
max = 20

Log Likelihood = 1429.659

D.u5mr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ECT						
pvhe	.0493566	.0106185	4.65	0.000	.0285448	.0701684
im_hepb3	.0022889	.0002698	8.48	0.000	.0017601	.0028176
im_ms	.001291	.0002445	5.28	0.000	.0008117	.0017703
im_dtp	-.0008757	.00024	-3.65	0.000	-.0013461	-.0004053
bs	.0147856	.0042111	3.51	0.000	.006532	.0230392
bw	-.0080836	.0022239	-3.63	0.000	-.0124424	-.0037248
inc_mal	-.0723355	.014252	-5.08	0.000	-.1002688	-.0444022
inc_tb	1.707186	.0642839	26.56	0.000	1.581192	1.833181
SR						
ECT	-.0466213	.0350176	-1.33	0.183	-.1152544	.0220119
pvhe						
D1.	.0063767	.0069847	0.91	0.361	-.007313	.0200665
im_hepb3						
D1.	-.0002	.0000896	-2.23	0.026	-.0003755	-.0000245
im_ms						
D1.	-.0003532	.0002958	-1.19	0.232	-.000933	.0002265
im_dtp						
D1.	.0002208	.0002369	0.93	0.351	-.0002435	.0006852
bs						
D1.	-.3163492	.2479684	-1.28	0.202	-.8023582	.1696599
bw						
D1.	.2162454	.3106276	0.70	0.486	-.3925736	.8250644
inc_mal						
D1.	.0209997	.0298686	0.70	0.482	-.0375417	.079541
inc_tb						
D1.	.0001507	.0896426	0.00	0.999	-.1755456	.175847
_cons	-.394393	.359214	-1.10	0.272	-1.098439	.3096534

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Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id Number of obs = 300
Time Variable (t): year Number of groups = 15
Obs per group: min = 20
avg = 20.0
max = 20

Log Likelihood = 1426.501

D.u5mr	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
ECT						
exhe	-.5583221	.3609446	-1.55	0.122	-1.265761	.1491164
im_hepb3	.0172218	.0119149	1.45	0.148	-.0061309	.0405745
im_ms	-.0061493	.0058649	-1.05	0.294	-.0176442	.0053457
im_dtp	-.0061281	.007089	-0.86	0.387	-.0200222	.0077661
bs	.1631888	.1405957	1.16	0.246	-.1123737	.4387512
bw	-.1068426	.0716912	-1.49	0.136	-.2473546	.0336695
inc_mal	1.924406	1.257147	1.53	0.126	-.5395562	4.388369
inc_tb	1.029617	.8261207	1.25	0.213	-.5895503	2.648783
SR						
ECT	.0016753	.0041807	0.40	0.689	-.0065188	.0098694
exhe						
D1.	.0028615	.0028545	1.00	0.316	-.0027332	.0084561
im_hepb3						
D1.	-.0001672	.0002278	-0.73	0.463	-.0006136	.0002792
im_ms						
D1.	-.0001478	.0003487	-0.42	0.672	-.0008311	.0005356
im_dtp						
D1.	.000382	.0002396	1.59	0.111	-.0000876	.0008515
bs						
D1.	-.0425507	.0871156	-0.49	0.625	-.2132941	.1281927
bw						
D1.	.1076834	.1148728	0.94	0.349	-.1174632	.3328301
inc_mal						
D1.	-.0049385	.0147484	-0.33	0.738	-.0338447	.0239678
inc_tb						
D1.	.0126212	.0844136	0.15	0.881	-.1528264	.1780687
_cons	-.1145748	.1030002	-1.11	0.266	-.3164516	.0873019

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```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id                    Number of obs      =      259
Time Variable (t): year                     Number of groups   =       13
                                  Obs per group: min =       19
                                                 avg =     19.9
                                                 max =       20

                                  Log Likelihood     = 672.4416
------------------------------------------------------------------------------
    D.gdppc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ECT          |
         nhe |   .1042477   .0309663     3.37   0.001     .0435549    .1649406
      gfcfpc |   .4117762   .0603397     6.82   0.000     .2935125    .5300399
         inf |   .0104671   .0021576     4.85   0.000     .0062382     .014696
         pgr |   .2902335   .0485465     5.98   0.000     .1950841    .3853828
     tradepc |    .014618   .0607576     0.24   0.810    -.1044647    .1337008
-------------+----------------------------------------------------------------
SR           |
         ECT |  -.1068961   .0256673    -4.16   0.000    -.1572031   -.0565891
             |
         nhe |
         D1. |   .0120984   .0126852     0.95   0.340    -.0127642    .0369609
             |
      gfcfpc |
         D1. |   .0162348   .0152817     1.06   0.288    -.0137169    .0461864
             |
         inf |
         D1. |  -.0007431   .0005744    -1.29   0.196    -.0018688    .0003826
             |
         pgr |
         D1. |  -.0404945   .0739003    -0.55   0.584    -.1853364    .1043475
             |
     tradepc |
         D1. |   .0502353   .0279813     1.80   0.073     -.004607    .1050777
             |
       _cons |   .3769105   .0894487     4.21   0.000     .2015943    .5522268
------------------------------------------------------------------------------
```

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```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id                    Number of obs      =      259
Time Variable (t): year                     Number of groups   =       13
                                  Obs per group: min =       19
                                             avg =      19.9
                                             max =       20

                                  Log Likelihood     =  689.5304
------------------------------------------------------------------------------
    D.gdppc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ECT          |
        puhe |  .0334821   .0167396     2.00   0.045      .000673    .0662912
      gfcfpc |  .4462095   .0423082    10.55   0.000     .3632869     .529132
         inf |  -.005349   .0015823    -3.38   0.001    -.0084503   -.0022478
         pgr | -.1152913   .0348819    -3.31   0.001    -.1836586   -.0469239
     tradepc | -.0750689   .0365775    -2.05   0.040    -.1467596   -.0033783
-------------+----------------------------------------------------------------
SR           |
         ECT |  -.200111   .0560838    -3.57   0.000    -.3100333   -.0901888
             |
        puhe |
         D1. |    .02439   .0162401     1.50   0.133      -.00744    .0562201
             |
      gfcfpc |
         D1. | -.0262261   .0236068    -1.11   0.267    -.0724947    .0200424
             |
         inf |
         D1. |  .0003851   .0006894     0.56   0.576    -.0009661    .0017363
             |
         pgr |
         D1. |  .1361454   .1426687     0.95   0.340    -.1434802    .4157709
             |
     tradepc |
         D1. |  .0695045   .0300778     2.31   0.021     .0105531     .128456
             |
       _cons |  1.058872   .2949394     3.59   0.000     .4808015    1.636943
------------------------------------------------------------------------------
```

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```
Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): c_id                 Number of obs      =      259
Time Variable (t): year                   Number of groups   =       13
                                  Obs per group: min =        19
                                                 avg =      19.9
                                                 max =        20

                                  Log Likelihood     = 680.4777
------------------------------------------------------------------------------
    D.gdppc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ECT          |
        exhe |  -.0512174   .0131554    -3.89   0.000    -.0770014   -.0254334
      gfcfpc |   .5354302   .0583939     9.17   0.000     .4209802    .6498802
         inf |  -.0069257   .0022671    -3.05   0.002    -.0113691   -.0024824
         pgr |    .020349   .0418439     0.49   0.627    -.0616636    .1023615
     tradepc |   .0327786   .0604804     0.54   0.588    -.0857608    .1513181
-------------+----------------------------------------------------------------
SR           |
         ECT |   -.163538   .0453551    -3.61   0.000    -.2524323   -.0746437
             |
        exhe |
         D1. |   .0038318   .0049092     0.78   0.435      -.00579    .0134536
             |
      gfcfpc |
         D1. |  -.0169378   .0234618    -0.72   0.470    -.0629221    .0290464
             |
         inf |
         D1. |   .0005502   .0004889     1.13   0.260    -.0004079    .0015084
             |
         pgr |
         D1. |   .0987791   .1414421     0.70   0.485    -.1784422    .3760004
             |
     tradepc |
         D1. |   .0520074   .0281689     1.85   0.065    -.0032028    .1072175
             |
       _cons |     .65077    .176523     3.69   0.000     .3047912    .9967487
------------------------------------------------------------------------------
```

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Pairwise Granger Causality Tests
Date: 10/03/22 Time: 09:43
Sample: 2000 2020
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EXHE does not Granger Cause GDPPC	285	2.73484	0.0666
GDPPC does not Granger Cause EXHE		2.41783	0.0910
PUHE does not Granger Cause GDPPC	285	4.43825	0.0127
GDPPC does not Granger Cause PUHE		0.89889	0.4082
PVHE does not Granger Cause GDPPC	285	4.26296	0.0150
GDPPC does not Granger Cause PVHE		3.39653	0.0349
NHE does not Granger Cause GDPPC	285	2.60222	0.0759
GDPPC does not Granger Cause NHE		11.3450	2.E-05
IMR does not Granger Cause GDPPC	285	0.28732	0.7505
GDPPC does not Granger Cause IMR		12.1226	9.E-06
LEP does not Granger Cause GDPPC	285	0.50421	0.6045
GDPPC does not Granger Cause LEP		3.06379	0.0483
MMR does not Granger Cause GDPPC	285	6.18877	0.0023
GDPPC does not Granger Cause MMR		0.15096	0.8600
U5MR does not Granger Cause GDPPC	285	0.20933	0.8113
GDPPC does not Granger Cause U5MR		10.2464	5.E-05
PUHE does not Granger Cause EXHE	285	0.22995	0.7947
EXHE does not Granger Cause PUHE		5.16288	0.0063
PVHE does not Granger Cause EXHE	285	0.87130	0.4195
EXHE does not Granger Cause PVHE		9.40271	0.0001
NHE does not Granger Cause EXHE	285	0.40552	0.6670
EXHE does not Granger Cause NHE		21.6582	2.E-09
IMR does not Granger Cause EXHE	285	0.01025	0.9898
EXHE does not Granger Cause IMR		6.14769	0.0024
LEP does not Granger Cause EXHE	285	0.19817	0.8203
EXHE does not Granger Cause LEP		15.9470	3.E-07
MMR does not Granger Cause EXHE	285	0.24543	0.7825
EXHE does not Granger Cause MMR		0.36789	0.6925
U5MR does not Granger Cause EXHE	285	0.21881	0.8036
EXHE does not Granger Cause U5MR		6.79201	0.0013
PVHE does not Granger Cause PUHE	285	2.33007	0.0992
PUHE does not Granger Cause PVHE		0.67540	0.5098
NHE does not Granger Cause PUHE	285	5.46845	0.0047
PUHE does not Granger Cause NHE		10.9235	3.E-05
IMR does not Granger Cause PUHE	285	0.50971	0.6012
PUHE does not Granger Cause IMR		1.09969	0.3344
LEP does not Granger Cause PUHE	285	0.61046	0.5438

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PUHE does not Granger Cause LEP		2.38081	0.0943
MMR does not Granger Cause PUHE	285	1.41555	0.2445
PUHE does not Granger Cause MMR		1.91242	0.1496
U5MR does not Granger Cause PUHE	285	0.60930	0.5444
PUHE does not Granger Cause U5MR		1.02134	0.3615
NHE does not Granger Cause PVHE	285	0.10900	0.8968
PVHE does not Granger Cause NHE		0.91205	0.4029
IMR does not Granger Cause PVHE	285	0.59262	0.5536
PVHE does not Granger Cause IMR		1.50797	0.2232
LEP does not Granger Cause PVHE	285	0.29068	0.7480
PVHE does not Granger Cause LEP		10.6340	4.E-05
MMR does not Granger Cause PVHE	285	1.31087	0.2712
PVHE does not Granger Cause MMR		3.88412	0.0217
U5MR does not Granger Cause PVHE	285	0.08909	0.9148
PVHE does not Granger Cause U5MR		1.77638	0.1712
IMR does not Granger Cause NHE	285	0.63786	0.5292
NHE does not Granger Cause IMR		2.89535	0.0569
LEP does not Granger Cause NHE	285	0.63298	0.5318
NHE does not Granger Cause LEP		3.94388	0.0205
MMR does not Granger Cause NHE	285	1.92799	0.1474
NHE does not Granger Cause MMR		0.52244	0.5937
U5MR does not Granger Cause NHE	285	0.58563	0.5574
NHE does not Granger Cause U5MR		2.37798	0.0946
LEP does not Granger Cause IMR	285	0.46219	0.6304
IMR does not Granger Cause LEP		28.5811	5.E-12
MMR does not Granger Cause IMR	285	0.65528	0.5201
IMR does not Granger Cause MMR		1.03232	0.3575
U5MR does not Granger Cause IMR	285	13.7752	2.E-06
IMR does not Granger Cause U5MR		18.8421	2.E-08
MMR does not Granger Cause LEP	285	5.87772	0.0032
LEP does not Granger Cause MMR		3.35453	0.0363
U5MR does not Granger Cause LEP	285	26.9152	2.E-11
LEP does not Granger Cause U5MR		4.33949	0.0139
U5MR does not Granger Cause MMR	285	0.12024	0.8868
MMR does not Granger Cause U5MR		1.71461	0.1819

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Biodata

A. Personal Data

1. Full Names: Oniyide Funmilola Victoria
2. Address: 3, The Lord's Avenue, Badore, Ajah, Lagos State, Nigeria
3. Date and Place of Birth: 3rd March, 1988 Lagos
4. Nationality: Nigerian
5. Name and Address of Next of Kin: Oniyide Jesutola Ayomide, 3, The Lord's Avenue, Badore, Ajah, Lagos State, Nigeria

B. Educational Background

Educational Institutions Attended with Dates and Qualifications

Lead City University Ibadan, Oyo State (M.Sc. Economics)	In-view
Lead City University, Ibadan, Oyo State (B.Sc. Economics)	2012-2014
Olabisi Onabanjo University, Ago-Iwoye, Ogun State. (Diploma)	2008 - 2010
Marywood Grammar School, Ebute-Metta, Lagos State (SSCE)	2001 - 2006
Army Children School, Ibadan, Oyo State (First School Leaving Certificate)	1991-1999

C. Working Experience with Dates

Lead City University, Ibadan, Oyo State, Nigeria	2020-till Date
Loveland Primary School, Awoyaya, Lagos State (Personal Assistant)	2019– 2020
Oceanic Health Management, Lagos (Business Development Executive)	2017 – 2019
Royal Infirmary Hospital, Lagos, Nigeria	2015 – 2017

D. Award and Fellowships: NIL

E. Membership of Academic Professional Bodies:

Member, Association of Management and Social Sciences Research (AMSSRN)	2020
Member, Chartered Institute of Customer Relationship Management	2015

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F. Publication (if Any) – Oniyide F. V. and Ogunjinmi O. O**.** (2021). *Effect of Manufacturing Capacity Utilization on Economic Growth: An Empirical Evidence of Nigeria*, **International Journal of Research and Scientific Innovation** (3) 5: 39 – 48. ***International (India)***

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Signature

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Date

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University Compliance Certification

This is to certify that, this Thesis written by **Funmilola Victoria ONIYIDE** with Matriculation number **LCU/PG/001574** in the Department of Economics, Faculty of Management and Social Sciences, Lead City University, Ibadan, Oyo State is in full compliance with the approved University format and style.

____________________________ ____________________________

Name Date

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