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Health Outcomes and Economic Growth Nexus: Evidence from Nigeria

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Abstract
This paper examines the intricate relationship between health outcomes and economic growth in Nigeria, aiming to shed light on the long-term dynamics between these two vital domains. Through empirical analysis, our study uncovers a compelling long-run association between health outcomes and economic growth in Nigeria. Our findings reveal that both life expectancy and crude death rate, serving as key indicators of health, exhibit a significant long-run negative impact on economic growth over the study period. This suggests that improvements in health outcomes, as measured by increased life expectancy and reduced crude death rates, are conducive to fostering economic growth within the Nigerian context. Furthermore, our analysis employs Granger causality tests to explore the directionality of the relationship between health outcomes and economic growth. The results reveal a unidirectional causality, indicating that changes in life expectancy and crude death rate precede and influence economic growth in Nigeria. Based on these empirical findings, our study underscores the importance of prioritizing investments in healthcare and public health initiatives as a means to bolster overall economic development. We advocate for government interventions at various levels to create conducive conditions for enhancing health outcomes in Nigeria, thereby fostering a healthier population and stimulating sustainable economic growth. Thus, research underscores the imperative for policymakers to recognize the intrinsic linkages between health and economic prosperity, emphasizing the need for concerted efforts to improve healthcare infrastructure and promote public health initiatives as integral components of Nigeria's development agenda.

Keywords: Health Outcomes, Economic Growth, Life Expectancy, Crude Death Rate
JEL Codes: I15, O11, O55, C32

1. INTRODUCTION

Empirical studies have consistently highlighted the significant role of human capital in driving economic growth. Traditionally, human capital has often been defined in terms of educational attainment, reflecting the knowledge, skills, and competencies that individuals acquire through formal education and training (Marimuthu et al., 2009). This perspective views education as a crucial investment that not only enhances individual productivity but also contributes to overall economic productivity and innovation. However, it's essential to recognize that human capital encompasses a broader range of factors beyond formal education. While education undoubtedly plays a pivotal role, other elements such as workforce experience, health, creativity, adaptability, and entrepreneurial spirit also contribute significantly to human capital formation (Šlaus and Jacobs 2011). In recent years, there has been a growing recognition of the importance of these non-education-related aspects of human capital. For example, research has highlighted the positive impact of health and well-being on productivity and innovation. Additionally, factors such as on-the-job training, skill development programs, and continuous learning initiatives have been identified as critical drivers of human capital accumulation. Moreover, in today's rapidly changing and knowledge-intensive economy, attributes such as creativity, problem-solving abilities, and adaptability are increasingly valued. These qualities enable individuals to thrive in dynamic work environments, drive innovation, and contribute to organizational competitiveness (Prajogo and Oke 2016).

Therefore, while education remains a cornerstone of human capital development, policymakers and organizations are increasingly focusing on holistic approaches that recognize the multifaceted nature of human capital. By investing in education, skills training, health promotion, and fostering a culture of continuous learning and innovation, societies can unlock the full potential of their human capital and drive sustained economic growth and prosperity. the relationship between health and economic development is intricate and multifaceted. Improvements in health status have far-reaching implications for various aspects of economic growth and development (Szreter 1997). Firstly, better health outcomes contribute significantly to household income and overall welfare. Healthy individuals are more productive and can actively participate in the labor market, leading to higher earnings and increased household income. Moreover, reduced healthcare expenditures and a lower incidence of illness alleviate financial burdens on households, allowing them to allocate resources to other essential needs,

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such as education and nutrition. Furthermore, improved health leads to enhanced labor productivity. Healthy workers are better able to perform their job duties effectively and efficiently, leading to higher output per worker (Fisk and Rosenfeld 1997). This increased productivity translates into higher economic output and contributes to overall economic growth. Additionally, better health outcomes positively influence labor force participation rates. Healthy individuals are more likely to engage in the labor market actively, which expands the workforce and promotes economic activity. Moreover, reduced absenteeism due to illness and disability leads to greater workforce availability and continuity, further bolstering economic productivity.

Moreover, improvements in health can stimulate savings and investment rates within an economy. Healthy individuals are better positioned to engage in long-term planning and investment activities, including savings for retirement, education, and entrepreneurship. Higher savings and investment rates contribute to capital accumulation and drive economic growth over the long term (Solimano and Gutierrrez 2008) . The nexus between health and economic development underscores the importance of investing in healthcare systems, disease prevention, and health promotion initiatives. By prioritizing health interventions, policymakers can foster a healthier and more productive population, laying the foundation for sustained economic progress and improved societal well-being (Lefebvre 2013). Viewing health solely as a by-product of economic development overlooks its profound impact on economic growth and societal well-being. The economic burden of ill-health presents significant challenges that can hinder progress and development. Firstly, the loss of productivity due to poor health imposes a substantial economic cost on individuals, households, and economies as a whole. Illnesses and disabilities limit individuals' ability to participate in the labor force, resulting in lower output and decreased economic productivity. This loss of human capital not only affects current earnings but also has long-term implications for future economic growth and development. Moreover, poor health leads to increased healthcare expenditures, both in terms of direct medical costs and indirect costs associated with lost productivity. Healthcare systems must allocate resources to prevent, diagnose, and treat diseases, diverting funds away from other critical areas of investment (Jamison 2006). Additionally, households may face financial strain due to out-of-pocket expenses for medical care, medications, and rehabilitation services, further exacerbating economic inequalities and poverty. Furthermore, the burden of ill-health extends beyond the healthcare sector, impacting broader aspects of society such as education, social welfare, and infrastructure development. Resources that could be allocated to education and skill development may instead be diverted to address healthcare needs, hindering human capital formation and economic mobility. Additionally, the prevalence of preventable diseases and health conditions places a strain on community health systems, necessitating investments in public health infrastructure and disease prevention programs (Tulchinsky and Varavikova 2014). Failure to address these health challenges can lead to widespread epidemics, increased morbidity and mortality rates, and disruptions to economic activities.

In light of these challenges, it is imperative for policymakers to prioritize investments in health promotion, disease prevention, and healthcare delivery systems. By addressing the root causes of ill-health and promoting population-wide wellness, societies can unlock the full potential of their human capital, foster economic resilience, and achieve sustainable development goals. Viewing health as a fundamental component of economic development, rather than a secondary concern, is essential for building healthier, more prosperous societies (Diener and Seligman 2005). It's evident that there's a gap in the understanding of the role of health in Nigeria's development process. While some studies have explored the effects of specific diseases like HIV/AIDS and malaria on economic growth, there's a lack of comprehensive analysis linking health outcomes such as life expectancy, mortality rates, and fertility rates to broader economic development. The limited focus on health outcomes in relation to economic growth overlooks the multifaceted impact of health on various aspects of socio-economic development. For instance, improvements in life expectancy and reductions in mortality rates not only signify enhanced well-being for individuals but also contribute to increased productivity, labor force participation, and human capital accumulation. Similarly, changes in fertility rates can have significant implications for population dynamics, household savings, and investments in education and healthcare. Understanding the complex interplay between health outcomes and economic growth is essential for formulating evidence-based policies and interventions that promote sustainable development and equitable progress. By examining the broader determinants of health and their linkages to socio-economic indicators, policymakers can identify priority areas for investment and design targeted strategies to address health disparities and enhance overall welfare. Moreover, fostering interdisciplinary research collaborations and data-sharing initiatives can facilitate a more holistic understanding of the health-development nexus in Nigeria. By integrating insights from health sciences, economics, sociology, and other disciplines, researchers like Dauda (2011) can generate comprehensive evidence that informs policy decisions and drives positive change across sectors. Ultimately, prioritizing research on the relationship between health outcomes and economic development is crucial for advancing Nigeria's development agenda and achieving inclusive growth that benefits all segments of society. By recognizing health as a fundamental driver of human capital formation and economic prosperity, policymakers can build resilient health systems and foster sustainable development pathways for the nation.

2. LITERATURE REVIEW

Luft's observation, as cited in Aguayo-Rico and Guerra-Turrubiates (2005), sheds light on the intricate relationship between health and income. It suggests that while illness can often lead to poverty by limiting individuals' ability to work and earn income, the reverse causal pathway—from poverty to poor health—is less common. This insight underscores the importance of addressing health disparities as a means to alleviate poverty and promote socio-economic development. Indeed, the impact

of health on income and poverty is multifaceted. Poor health can diminish individuals' productivity and earning potential, leading to reduced income levels and increased reliance on social assistance programs. Moreover, healthcare expenditures associated with treating illness can impose financial burdens on households, further exacerbating economic hardships and perpetuating cycles of poverty. Conversely, investments in health can yield significant economic returns by enhancing human capital, labor productivity, and overall well-being. By improving access to preventive care, treatment services, and health education, policymakers can empower individuals to lead healthier lives and participate more fully in economic activities. This, in turn, can contribute to poverty reduction and foster inclusive growth that benefits society as a whole. However, it's essential to recognize that addressing health inequalities requires a comprehensive approach that goes beyond healthcare provision alone. Structural factors such as income inequality, social determinants of health, and access to education and employment opportunities must also be addressed to create enabling environments for health and prosperity.

Bloom et al. (2001) offer a more structured examination of the interplay between health and economic growth, positing that health can exert a positive influence on various determinants of economic productivity and development. Their analysis delves into several key channels through which improvements in health can contribute to broader economic outcomes. Firstly, Bloom et al. highlight the role of health in enhancing productivity levels among workers. By reducing absenteeism, improving physical and cognitive abilities, and lowering the incidence of disability, better health can lead to increased efficiency and output in the workforce. This boost in productivity can translate into higher economic output and growth over time.Additionally, Bloom et al. underscore the impact of health on human capital development and skill acquisition. Good health during childhood and adolescence is associated with better educational outcomes, higher levels of cognitive functioning, and greater learning capacity, all of which contribute to a more skilled and productive workforce in the long run. Furthermore, the authors suggest that investments in health can stimulate higher levels of savings and capital accumulation within economies. Improved health outcomes, particularly reductions in healthcare expenditures and disease-related financial burdens, can free up resources for households to allocate towards savings and investment, thereby fueling economic growth and development. In essence, Bloom et al.'s analysis offers a comprehensive framework for understanding the mechanisms through which health can act as a driver of economic growth. By elucidating the pathways linking health to productivity, labor supply, human capital, and savings, their work provides valuable insights for policymakers seeking to leverage health interventions as catalysts for broader socio-economic advancement.

Suhrcke et al. (2005) offer another perspective on the nexus between health and economic outcomes, focusing specifically on the role of early childhood health in shaping cognitive development and educational attainment. Their analysis underscores the crucial influence of health during formative years on long-term educational outcomes and subsequent economic prospects. The authors emphasize that good health in childhood lays the foundation for optimal cognitive functioning and academic achievement. By reducing the incidence of illnesses and chronic conditions that can hinder learning, such as malnutrition and infectious diseases, improved childhood health contributes to more consistent school attendance and higher levels of engagement in educational activities. Moreover, Suhrcke et al. (2012) contend that children with better health outcomes are more likely to stay enrolled in school and complete higher levels of education. This sustained educational trajectory, facilitated by good health, leads to the acquisition of valuable skills, knowledge, and qualifications, which are instrumental in enhancing labor market prospects and earning potential in adulthood.

Hamoudi and Sachs (1999) contribute to the discourse on the relationship between health and economic growth by introducing the concept of a cyclical relationship, wherein improvements in health status serve as both a cause and a consequence of economic growth. Their analysis highlights the dynamic interplay between health outcomes and economic development, challenging simplistic notions of unidirectional causality. The authors propose a nuanced understanding of the health-economy nexus, wherein initial investments in health interventions yield positive outcomes that, in turn, contribute to further economic advancement. This feedback loop underscores the self-reinforcing nature of the relationship, wherein improved health outcomes catalyze economic growth, which, in turn, fosters additional improvements in health. By framing the relationship as cyclical, Hamoudi and Sachs (1999) draw attention to the potential synergies between health and economic development, emphasizing the importance of holistic approaches to development that prioritize investments in both sectors. Their analysis suggests that strategies aimed at promoting health and well-being can yield significant economic dividends, while economic growth can, in turn, create opportunities for further advancements in health. Bloom and Sachs (1998) conducted an influential study that analyzed cross-country data spanning from 1965 to 1990 to investigate the impact of health outcomes on economic growth. Their empirical analysis revealed compelling evidence supporting the significant role of health and demographic variables in shaping economic development trajectories. One key finding from their study is the substantial effect of improvements in life expectancy on GDP per capita growth rates. Bloom and Sachs (1998) found that a mere 1% increase in life expectancy corresponded to a remarkable acceleration of GDP per capita growth, amounting to over 3% annually in the subsequent quarter century. This finding underscores the profound influence of health outcomes on broader economic dynamics, highlighting the importance of population health as a driver of sustainable growth. Moreover, Bloom and Sachs (1998)' analysis shed light on the disparities in growth rates observed across different regions, particularly in Africa. By examining health and demographic variables, they were able to account for a significant portion of the variation in growth rates between Africa and the rest of the world during the study period. This suggests that factors related to health and demographics played a crucial role in shaping the economic performance of countries across regions. Hamoudi and Sachs (1999) conducted a comprehensive review of the economic consequences associated with health status, shedding light on the

intricate relationship between health outcomes and economic growth. Their analysis unearthed compelling evidence highlighting the profound impact of health indicators, such as infant mortality and fertility rates, on overall economic performance. One significant finding from their study pertains to the detrimental effects of high infant mortality and fertility rates on economic growth. Hamoudi and Sachs (1999) revealed that countries grappling with elevated levels of infant mortality and fertility tend to experience markedly slower rates of economic growth. Specifically, they found that a reduction of two per thousand live births in infant mortality and two children per woman in fertility rates corresponded to a notable 1% acceleration in growth rates over the duration of the study period. This finding underscores the critical role that improvements in child health and maternal well-being can play in fostering economic advancement. By reducing infant mortality rates and fertility levels, countries can unlock substantial economic dividends, as reflected in accelerated growth rates. Hamoudi and Sachs (1999 analysis underscores the importance of targeted interventions aimed at improving health outcomes, particularly among vulnerable populations, as integral components of broader development strategies.

In their comprehensive study, Bloom et al. (2001) embarked on a rigorous examination of the intricate relationship between health and economic growth, employing a panel dataset spanning several decades to uncover nuanced insights into this complex dynamic. By extending conventional production function models of economic growth, they sought to elucidate the pivotal role of health and work experience—two key facets of human capital—as drivers of long-term economic development. Through their meticulous analysis, Bloom et al. (2001) and his colleagues made a compelling case for the profound impact of health on economic outcomes, drawing upon theoretical frameworks and empirical evidence from microeconomics to bolster their assertions. Their findings underscored the significant and positive association between health status and economic growth, highlighting the crucial role played by investments in health human capital in fostering sustained economic advancement. The study's empirical results provided robust support for the notion that enhancing the stock of health human capital can yield substantial dividends in terms of per capita income growth. By elucidating the pathways through which improvements in health contribute to economic prosperity, Bloom et al. (2001) underscored the importance of prioritizing investments in healthcare infrastructure, disease prevention, and health promotion as integral components of broader development strategies. In a follow-up to their earlier study, Bloom et al. (2001) and his team (2004) conducted another comprehensive analysis, once again utilizing a panel dataset spanning several decades to delve deeper into the relationship between health and economic growth. Their findings reaffirmed and expanded upon their previous research, providing further insights into the profound impact of health on economic outcomes.

By meticulously controlling for the working experience of the labour force and other relevant factors, Bloom et al. (2004) were able to isolate the specific effects of good health on economic growth. Their estimated results revealed a robust and statistically significant positive association between health and economic productivity, even after accounting for variations in workforce experience. One of the key findings of their study was the substantial magnitude of the effect of improvements in health on economic output. According to their estimates, a one-year increase in life expectancy was associated with a notable 4% increase in output—a finding that underscores the considerable economic dividends of investments in health. Importantly, Bloom et al. (2004) emphasized the practical implications of their findings, suggesting that the substantial impact of health on labour productivity justifies increased expenditure on healthcare infrastructure and services. Beyond the direct benefits to individual welfare, investments in health were shown to yield significant economic returns, further underscoring the importance of prioritizing health as a fundamental component of development strategies. Acemoglu and Johnson (2006) offered a contrasting perspective on the relationship between health and economic growth through their comprehensive analysis spanning multiple countries and decades. Unlike previous studies that had highlighted the significant positive impact of health improvements on economic outcomes, Acemoglu and Johnson (2006) offered research yielded different findings. Their study focused on investigating the effects of life expectancy, used as a proxy for overall health status, on the economic growth of 59 countries over a considerable period from 1940 to 1980. Employing rigorous OLS regression techniques, they sought to discern any discernible patterns between changes in life expectancy and income per capita growth. Surprisingly, the results of their analysis revealed no conclusive evidence to support the notion that increases in life expectancy were associated with corresponding increases in income per capita growth. This unexpected finding challenged prevailing assumptions regarding the causal linkages between health improvements and economic development.

In their interpretation of the results, Acemoglu and Johnson (2006) cast doubt on the conventional wisdom that poor health conditions serve as the primary driver of poverty in certain countries. By failing to find a significant relationship between improvements in life expectancy and income growth, their study suggested that other factors beyond health might be more influential in shaping economic outcomes. The findings of Acemoglu and Johnson (2006) prompted a reevaluation of the complex interplay between health and economic development, highlighting the need for nuanced approaches to understanding the multifaceted dynamics at play. While their results diverged from earlier studies emphasizing the economic benefits of health improvements, their research underscored the importance of rigorous empirical analysis in unpacking the intricate relationships between health, poverty, and economic growth. Huang et al. (2010) delved into the intricate relationship between the prevalence of HIV/AIDS and its impact on human capital development and economic growth using a sophisticated analytical framework. Their study employed a three-period overlapping generations model, which allowed for a nuanced exploration of how disease burden influences individuals' life trajectories across different stages – young, adult, and old. By incorporating the dynamics of HIV/AIDS prevalence into their model, Huang et al. (2010) sought to elucidate the pathways through which the disease hampers human capital accumulation and, subsequently, impedes economic progress, particularly

in African countries where HIV/AIDS prevalence is notably high. The findings of their research painted a sobering picture of the repercussions of HIV/AIDS on both individual outcomes and macroeconomic indicators. One of the key insights gleaned from their analysis was the significant decline in life expectancy attributable to the prevalence of HIV/AIDS in African nations. This decline in life expectancy, in turn, had far-reaching implications for educational attainment, as individuals faced heightened mortality risks and reduced opportunities for skill development over their lifetimes. In essence, Huang et al. (2010) demonstrated that the prevalence of HIV/AIDS acted as a formidable barrier to human capital development, stifling educational attainment and skill acquisition among affected populations. Consequently, this hampered the potential for sustained economic growth, as a well-educated and healthy workforce is crucial for driving productivity and innovation. By shedding light on the complex interplay between disease prevalence, human capital formation, and economic growth, their study underscored the urgent need for targeted interventions to mitigate the impact of HIV/AIDS and other diseases on vulnerable populations. Moreover, their findings underscored the importance of addressing health disparities as a fundamental component of broader development strategies aimed at fostering inclusive and sustainable growth in regions grappling with high disease burdens.

In their study, Peykarjou et al. (2011) employed a semi-log regression model within a comprehensive framework to investigate the influence of health-related variables, such as life expectancy and fertility rate, on the economic growth trajectories of member states of the Organization of Islamic Cooperation (OIC). Utilizing panel time series data spanning from 2001 to 2009, they sought to elucidate the nuanced dynamics between health indicators and economic performance across the studied countries. The findings of their empirical analysis yielded valuable insights into the relationship between health outcomes and economic growth within the context of OIC member states. Specifically, Peykarjou et al. (2011) uncovered a positive association between increases in life expectancy and economic growth, suggesting that improvements in life expectancy have a beneficial impact on the overall economic performance of the countries under study. Moreover, their study revealed a notable negative relationship between fertility rate and economic growth. This finding underscores the importance of demographic factors in shaping economic development trajectories, as higher fertility rates can pose challenges to economic growth by exerting pressure on resources, labor markets, and social welfare systems. By employing rigorous econometric techniques and leveraging panel time series data, Peykarjou et al. (2011) provided empirical evidence supporting the crucial role of health-related variables in driving economic growth within OIC member states. Their findings underscored the significance of investing in public health initiatives and policies aimed at improving life expectancy and reducing fertility rates as viable strategies for fostering sustainable economic development across the region.

In his study, Dauda (2011) delves into the intricate relationship between health indicators and economic growth within the Nigerian context, employing a robust analytical framework comprising health expenditure, infant mortality, and life expectancy as key variables. Leveraging annual time series data spanning from 1970 to 2009, Dauda (2011seeks to elucidate the nuanced dynamics between health as a component of human capital and the overarching trajectory of economic growth in Nigeria. Utilizing Solow's production function and error correction mechanism, Dauda (2011undertakes a comprehensive empirical analysis to explore the intricate interplay between health variables and economic performance. The findings of his study unveil compelling insights into the nexus between health outcomes and economic growth dynamics within the Nigerian context. Remarkably, Dauda (2011empirical analysis reveals that health expenditure and life expectancy exert a positive and statistically significant influence on economic growth in Nigeria, even after controlling for crucial factors such as the labor force, education expenditure, and gross fixed capital formation. This underscores the pivotal role of investments in healthcare infrastructure and initiatives aimed at improving life expectancy in fostering sustained economic development. Furthermore, Dauda (2011findings highlight the significant impact of infant mortality on economic growth over the study period, aligning with theoretical expectations regarding the adverse consequences of high infant mortality rates on broader economic performance. By shedding light on the intricate relationship between health indicators and economic growth, Dauda (2011study provides valuable insights for policymakers and stakeholders seeking to formulate evidence-based strategies for promoting sustainable development and improving public health outcomes in Nigeria.

In his study, Majdi (2012) delves into the intricate relationship between health indicators and economic growth across a panel of 15 countries spanning the northern and southern banks of the Mediterranean region. Through rigorous econometric analysis conducted over the period from 1990 to 2008, Majdi (2012) seeks to unravel the nuanced dynamics between healthcare expenditures, life expectancy, and the broader trajectory of economic development within these countries. Employing robust econometric techniques, Majdi (2012) study unveils compelling insights into the causal linkages between health outcomes and economic performance across the Mediterranean region. The findings of his analysis underscore the pivotal role played by both healthcare expenditures and life expectancy in driving economic growth within the studied countries. Remarkably, Majdi (2012) empirical results reveal a positive and statistically significant relationship between healthcare expenditure, life expectancy, and GDP per capita growth across the northern and southern Mediterranean countries. Specifically, the study demonstrates that a 10% increase in life expectancy corresponds to a substantial rise in GDP per capita, highlighting the profound impact of improvements in population health on broader economic outcomes. The study's findings underscore the importance of prioritizing investments in healthcare infrastructure and initiatives aimed at enhancing life expectancy as key drivers of sustained economic development in the Mediterranean region. By elucidating the intricate nexus between health indicators and economic growth, Majdi (2012) research offers valuable insights for policymakers and stakeholders seeking to formulate evidence-based strategies for promoting inclusive and sustainable development across the region. In a recent study

by Yaqub et al. (2012), the relationship between public health expenditure, health outcomes, and governance dynamics in Nigeria was rigorously examined using both conventional OLS and two-stage least square estimation frameworks. Spanning from 1980 to 2008, the study sought to shed light on the nuanced interplay between healthcare investment, governance quality, and key health indicators within the Nigerian context. The empirical findings of Yaqub et al, (2012) investigation yield insightful revelations regarding the multifaceted relationship between public health spending, governance quality, and health outcomes. Notably, the inclusion of governance indicators in the analytical framework unveils a compelling narrative wherein sustained increases in public health expenditure are associated with notable improvements in health status metrics, including reductions in infant and under-5 mortality rates, as well as increases in life expectancy. However, the study's results also unveil intriguing nuances in the relationship between health outcomes, economic performance, and governance dynamics. While an inverse relationship between infant and under-5 mortality rates and per capita GDP is observed, suggesting a potential trade-off between economic growth and child health outcomes, the findings regarding life expectancy and GDP per capita paint a more complex picture. Contrary to expectations, an inverse relationship between life expectancy and GDP per capita is identified, challenging conventional assumptions regarding the linear association between economic prosperity and population health. Yaqub et al. (2012) study underscores the pivotal role of governance quality in shaping the effectiveness of public health expenditure and its impact on health outcomes. By elucidating the complex interactions between governance dynamics, healthcare investment, and health outcomes, the findings of this research provide valuable insights for policymakers and stakeholders striving to formulate evidence-based strategies for enhancing healthcare delivery and promoting population health in Nigeria and beyond.

3. METHODOLOGY

The variables under consideration are log of real Gross Domestic Product (LRGDP) as a proxy for economic growth, and life expectancy and crude death rate to stand for the variables of health outcomes. Other control variables used in the study include trade openness and net income from abroad. The data were sourced mainly from the publications of World Development Indicators.

4. DISCUSSION OF RESULTS

The table 1 presents the results of the unit root test for various variables using the Augmented Dickey-Fuller (ADF) test at both the level and first difference. For the variable "LRGDP," the ADF test statistic at the level is 5.5616, indicating non-stationarity. However, after taking the first difference, the ADF test statistic is -3.3052, which is significant at the 1% level, suggesting stationarity.Similarly, for the variable "LLEXP," the ADF test statistic at the level is -0.3822, which is not significant, implying non-stationarity. But after differencing once, the ADF test statistic becomes -5.0006, significant at the 1% level, indicating stationarity.For the variable "LCMRT," the ADF test statistic at the level is 0.1765, and after differencing, it becomes -4.7942, significant at the 1% level, indicating stationarity. The variable "LOPNS" shows a similar pattern, with the ADF test statistic at the level being -1.2937 and after differencing becoming -8.4850, significant at the 1% level, suggesting stationarity. Lastly, for the variable "LNTIN," the ADF test statistic at the level is 3.2570, indicating non-stationarity, but after differencing, it becomes -8.8524, significant at the 1% level, implying stationarity.

Table 1: Results of Unit Root Test

Variable	ADF test at level	ADF test at first difference	P-value
LRGDP	5.5616	-3.3052**	0.0199
LLEXP	-0.3822	-5.0006*	0.0001
LCMRT	0.1765	-4.7942*	0.0003
LOPNS	-1.2937	-8.4850*	0.0000
LNTIN	3.2570	-8.8524*	0.0000

The table 2 presents the outcomes of the Johansen cointegration test, a crucial analysis to determine the existence of cointegration among the variables under consideration. Cointegration signifies the presence of a long-term relationship among the variables. The null hypotheses are formulated in terms of the number of cointegrating vectors and are sequentially tested using Trace Statistics and Max-eigen Statistics. For the Trace Statistics, hypotheses include the absence of cointegrating vectors ("None*") and the presence of a maximum number of cointegrating vectors ("At most 1*", "At most 2", etc.). Similarly, for Max-eigen Statistics, the hypotheses test the same conditions.For each hypothesis, the table provides the respective eigenvalues, test statistics, critical values at the 5% significance level, and p-values. Interpretation involves comparing the test statistics with the critical values: if the test statistic exceeds the critical value, the null hypothesis is rejected, indicating the presence of cointegration. Conversely, if the test statistic is lower than the critical value, the null hypothesis is retained, suggesting no cointegration. For instance, under Trace Statistics, when testing the hypothesis "None*", the test statistic surpasses the critical value, leading to rejection of the null hypothesis with a p-value of 0.0000. Similarly, for the hypothesis "At most 1*", the test statistic exceeds the critical value, resulting in rejection of the null hypothesis with a p-value

of 0.0001. Conversely, for hypotheses like "At most 2", "At most 3", and "At most 4", the test statistics fall below their respective critical values, indicating failure to reject the null hypothesis.

Table 2: Results of Johansen Cointegration Test

	Null Hypothesis	Eigenvalue	Test Statistics	Critical Value (5%)	P-value
Trace Statistics	None*	0.8450	158.8687	69.8189	0.0000
	At most 1*	0.6516	71.2584	47.8561	0.0001
	At most 2	0.2239	21.7076	29.7971	0.3151
	At most 3	0.1466	9.7920	15.4947	0.2971
	At most 4	0.0486	2.3417	3.8415	0.1260
Max-eigen statistics	None*	0.8450	87.6103	33.8769	0.0000
	At most 1*	0.6516	49.5508	27.5843	0.0000
	At most 2	0.2239	11.9156	21.1316	0.5560
	At most 3	0.1466	7.4503	14.2646	0.4373
	At most 4	0.0486	2.4317	3.8415	0.1260

Table 3 presents the long-run coefficients for the dependent variable LRGDP, which represents the logarithm of GDP. Each variable included in the model, namely the constant (C), logarithm of labor expenditure (LLEXP), logarithm of capital market returns (LCMRT), logarithm of openness (LOPNS), and logarithm of trade integration (LNTIN), is accompanied by its coefficient, standard error, and t-statistic. These coefficients offer insights into the magnitude and significance of the variables' effects on LRGDP. The standard error measures the variability of the coefficient estimates, while the t-statistic indicates the significance level of each coefficient. A higher absolute value of the t-statistic suggests greater statistical significance. Interpreting the coefficients involves examining their signs and magnitudes. Positive coefficients signify a positive relationship with LRGDP, indicating that an increase in the respective variable leads to higher GDP. Conversely, negative coefficients suggest an inverse relationship, where an increase in the variable is associated with a decrease in GDP. For instance, the coefficient of LLEXP is -1.0111, indicating a negative relationship between labor expenditure and GDP. Similarly, the coefficient of LNTIN is -5.8632, suggesting a substantial negative impact of trade integration on GDP. These coefficient estimates, along with their associated standard errors and t-statistics, provide valuable insights into the underlying relationships between economic variables and GDP in the long run.

Table 3: Long-run Coefficients: Dependent Variable: LRGDP

Variable	Coefficient	Std. Error	T-statistics
C	6.8312	-	-
LLEXP	-1.0111	1.110	9.2739
LCMRT	-1.1411	1.310	8.8928
LOPNS	1.2908	2.108	-0.6085
LNTIN	-5.8632	0.9080	6.4577

Table 4: Short-run Coefficients of the VECM: Dependent Variable: Δ*LRGDP*

Variable	Coefficient	Std. Error	T-statistics	P-value
ECM_{t-1}	-0.041614	0.020428	-2.0371	0.0481**
$\Delta LRGDP_{t-1}$	0.3211	0.1537	2.0887	0.0430**
$\Delta LLEXP_t$	5.6810	2.1210	2.6818	0.0105**
$\Delta LCMRT_t$	8.7910	3.4810	2.5279	0.0154**
$\Delta LOPNS_t$	5978764	61468478	0.0973	0.9230
$\Delta LNTIN_t$	0.036147	0.263025	0.1374	0.8914

Table 4 displays the short-run coefficients of the Vector Error Correction Model (VECM) with the dependent variable ΔLRGDP, representing the first difference of the logarithm of GDP. Each variable included in the model, including lagged error correction term (ECM), lagged first difference of GDP (ΔLRGDPt-1), and the first differences of labor expenditure (ΔLLEXPt), capital market returns (ΔLCMRTt), openness (ΔLOPNSt), and trade integration (ΔLNTINt), is accompanied by its coefficient, standard error, t-statistic, and p-value. These coefficients provide insights into the short-term dynamics of the relationship between the variables and the change in GDP (ΔLRGDP). The coefficient of the lagged error correction term (ECMt-1) is -0.041614, indicating the speed of adjustment towards the long-run equilibrium following a deviation from it. Positive coefficients for the lagged first differences suggest a positive relationship with the change in GDP, while negative coefficients suggest an inverse relationship. For instance, the coefficient of ΔLLEXPt is 5.6810, indicating a positive relationship between the change in labor expenditure and the change in GDP. Similarly, the coefficient of ΔLCMRTt is 8.7910, suggesting a positive impact of changes in capital market returns on GDP. These coefficients, along with their

associated standard errors, t-statistics, and p-values, help assess the significance and direction of the short-run effects of the variables on GDP dynamics. The asterisks denote the significance levels, with ** indicating significance at the 5% level.

Table 5 presents the results of the Granger causality test conducted to examine the causal relationship between different variables. The null hypothesis for each test is that one variable does not Granger cause the other. The Wald Chi-squared test statistic, associated p-value, and the conclusion regarding causality are provided for each pair of variables. For instance, the first row of the table tests whether LRGDP Granger causes LLEXP (labor expenditure). The Wald Chi-squared test statistic is 0.1255 with a corresponding p-value of 0.7231. Since the p-value is greater than the significance level of 0.05, the null hypothesis that LRGDP does not Granger cause LLEXP cannot be rejected, suggesting no significant Granger causality from LRGDP to LLEXP. However, the reverse relationship is statistically significant at the 1% level, indicating that there is Granger causality from LLEXP to LRGDP. Similarly, the table provides the results for other pairs of variables, such as LRGDP and LCMRT (capital market returns), LRGDP and LOPNS (openness), and LRGDP and LNTIN (trade integration). In each case, the Wald Chi-squared test statistic, p-value, and conclusion regarding the direction of causality are reported. The asterisks denote the significance levels, with * indicating significance at the 5% level and ** indicating significance at the 1% level.

Table 5: Granger Causality Test

Null hypothesis	Wald Chi-sq test	P-value	Causality
LRGDP does not granger cause LLEXP	0.1255	0.7231	Runs from
LLEXP does not granger cause LRGDP	7.3582	0.0067*	LEXP to RGDP
LRGDP does not granger cause LCMRT	0.1775	0.6736	Runs from
LCMRT does not granger cause LRGDP	6.5767	0.0103**	CMRT to RGDP
LRGDP does not granger cause LOPNS	4.5480	0.0330**	Runs from
LOPNS does not granger cause LRGDP	0.0037	0.9513	RGDP to OPNS
LRGDP does not granger cause LNTIN	10.0895	0.0015*	Runs from
LNTIN does not granger cause LRGDP	0.0106	0.9180	RGDP to NTIN

5. CONCLUSIONS

In this study, the researchers sought to investigate the relationship between health outcomes and economic growth in Nigeria. To achieve this, they utilized annual time series data spanning from 1961 to 2012. The initial step involved assessing the unit root properties of the data using the Augmented Dickey Fuller test (ADF), a common technique for analyzing stationarity in time series data. Following the examination of unit root properties, the researchers proceeded to conduct cointegration and causality tests. Cointegration analysis helps determine long-term relationships between variables, while causality tests provide insights into the direction of causality between health outcomes and economic growth. In addition to these tests, the researchers employed the Error Correction Model (ECM) to examine short-run dynamics. The ECM is a valuable tool for analyzing the adjustment process when variables deviate from their long-term equilibrium relationship. By employing a combination of these statistical methods, the study aimed to shed light on the complex relationship between health outcomes and economic growth in Nigeria over the specified time period. This empirical approach allowed the researchers to uncover insights into how changes in health indicators may influence economic performance, and vice versa, within the Nigerian context.

The findings of the study indicated that there exists a long-run equilibrium relationship between health outcome variables, namely life expectancy and crude mortality rate, and economic growth in Nigeria. This suggests that changes in health indicators such as life expectancy and mortality rates have a lasting impact on the country's economic performance over time. By establishing this long-run equilibrium relationship, the study provides empirical evidence supporting the notion that health outcomes and economic growth are closely intertwined in the Nigerian context. These findings underscore the importance of investing in healthcare and public health interventions as integral components of strategies aimed at fostering sustainable economic development. Understanding the linkages between health and economic growth is essential for policymakers and stakeholders involved in shaping public health policies and economic development initiatives in Nigeria. By recognizing the interconnected nature of these factors, decision-makers can design more effective policies and interventions that promote both improved health outcomes and economic prosperity for the nation. The results of the Granger causality test revealed the presence of unidirectional causality running from health outcomes to economic growth. This implies that changes in health indicators, such as life expectancy and crude mortality rate, precede and influence variations in economic growth in Nigeria. The identification of this causal relationship suggests that improvements in health outcomes have a significant impact on driving economic growth in the country. As such, investments in healthcare infrastructure, disease prevention, and public health interventions can be seen as critical drivers of economic development in Nigeria. By recognizing the causal link between health and economic growth, policymakers can prioritize health-related initiatives as part of broader strategies aimed at promoting sustainable economic development.

Efforts to improve healthcare access, enhance healthcare quality, and address public health challenges can thus be viewed as essential components of strategies aimed at fostering long-term economic prosperity in Nigeria. The negative and statistically significant coefficient of the error correction term indicates that the system corrects for short-term deviations from the long-run equilibrium between health outcomes and economic growth in Nigeria. This implies that any deviations from the long-run equilibrium are gradually corrected over time, with the system moving back towards equilibrium in subsequent periods. The presence of a significant error correction term suggests that there is a mechanism in place that acts to restore equilibrium in the relationship between health outcomes and economic growth. This mechanism ensures that any short-term imbalances are corrected, allowing the system to return to its long-run equilibrium over time.

The study's conclusion underscores the significance of health outcomes in driving economic growth in Nigeria. By establishing a long-run equilibrium relationship between health indicators and economic growth, the research highlights the integral role that improvements in health status play in fostering sustained economic development. This implies that policies and interventions aimed at enhancing health outcomes can have significant positive implications for the country's overall economic performance. In essence, the study emphasizes the importance of prioritizing healthcare initiatives and investments as part of broader economic development strategies. By focusing on improving health outcomes, policymakers can not only enhance the well-being of the population but also stimulate economic growth and productivity in the long run. This recognition of the interdependence between health and economic development underscores the need for integrated approaches to policymaking that address both health and economic objectives simultaneously. Indeed, the relationship between improved health status and economic growth is multifaceted and influenced by various factors beyond healthcare alone. Rising standards of living, lifestyle choices, access to education, and quality healthcare services all play crucial roles in determining the overall health outcomes of a population. Therefore, any policies aimed at enhancing health status for sustainable economic growth must adopt a comprehensive approach that addresses these underlying determinants. Efforts to promote economic growth through improved health outcomes should be complemented by initiatives that address social and economic inequalities, promote education and awareness, and provide equitable access to healthcare services. By tackling these broader determinants of health, policymakers can create an enabling environment where individuals have the opportunity to lead healthier lives and contribute more effectively to economic development.Furthermore, fostering collaboration across sectors, including health, education, labor, and social welfare, is essential for implementing integrated policies that address the complex interplay between health and economic growth. By adopting a holistic approach that considers the interconnected nature of health and development, policymakers can maximize the impact of their interventions and ensure sustainable progress towards improved health outcomes and economic prosperity for all.

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