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Assessing The Nexus Between Income Inequality and Health Outcomes in Nigeria

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ABSTRACT

The implications of consistent income inequality among various individuals in Nigeria has been a source of worry to different stakeholders. The health experts always argued that income disparity remains a constraint to accessing health services in Nigeria. This has led to the adoption of national health insurance scheme as well as its replication by some State government. In view of the ugly trend of the income disparity, and its attendant effect on the access to health in Nigeria; this study empirically investigated the relationship between income inequality and health outcomes in Nigeria from 1990 to 2023. Due to mixed results of the unit root test on the adopted data of the study, Autoregressive Distributed Lag (ARDL) Bound Testing approach was employed for the analysis. The study uses the following variables; health outcome (HO), income inequality (GINI), carbon dioxide emissions (CO₂), per capita gross domestic product (PGDP), energy consumption (EC), government consumption expenditure (GCE), political stability (PST), and deforestation (DFT). The findings reveal a negative relationship between CO₂ emissions and health outcomes. Conversely, income inequality was found to positively related with health outcomes in Nigeria. This implies that increasing income inequality, unexpectedly increase life expectancy, thereby challenging traditional economic theories. Furthermore, per capita GDP and energy consumption were positively associated with health outcomes, highlighting the benefits of economic growth and energy access on public health. However, government consumption expenditure was negatively correlated with health outcomes, possibly due to inefficiencies in public spending. Deforestation was also shown to negatively affect health outcome, aligning with previous studies on environmental degradation. The study therefore recommends that efficiency in government expenditure in health and environmental sectors should be enhanced, while addressing income inequality through targeted policies to improve overall health outcomes.

Keywords: Income Inequality, Health Outcomes, Environmental Degradation, Nigeria.

INTRODUCTION

Globally, the state of health outcomes is characterized by significant inequalities between and within countries (McCartney *et al.*, 2019). Health outcomes are the results of a country's healthcare system's planned treatment and interventions (Khezrian *et al.*, 2020). Achieving better health outcomes globally requires a multifaceted approach that addresses the root causes of health inequalities (McCartney *et al.*, 2019). This includes providing universal access to quality health care, improving living conditions, and empowering individuals and communities to take charge of their own health and well-being (Smith *et al.*, 2016), therefore, making clear that health status outcomes are affected by vectors of factors such as economic variables, social variables and environmental factors.

A higher living standard, a healthy working environment, maternal and preventative care, an educated population, and high income are factors that improve life expectancy (Ranabhat *et al.*, 2018). Recently,

developed and developing countries have given much concern to population health through socio-economic policies, as it is important in the development process which decides investment in workforce and human capital (Ali & Audi, 2016).

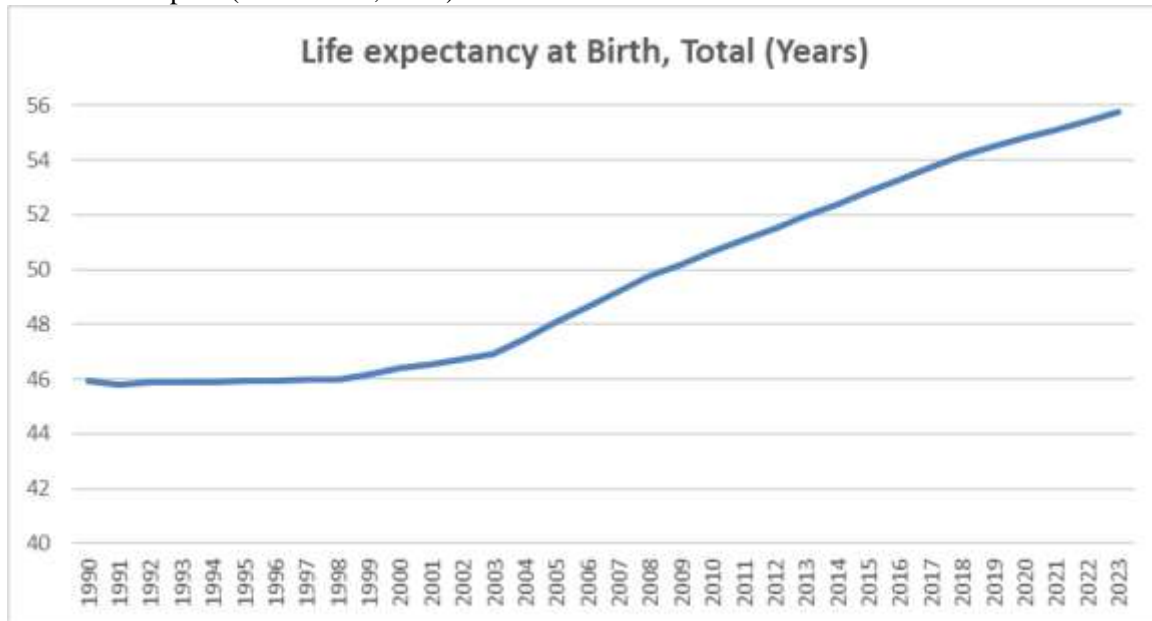


Figure 1.1: Life Expectancy at Birth, Total (Years) in Nigeria

Source: Author's Computation from World Bank Database (2023)

Figure 1.1 shows that the average life expectancy of Nigerians is increasing. The rate fell in 1991 and then began to increase at a low rate till 2000. It however increased greatly from 2001 and has been increasing at an increasing rate thereafter. The life expectancy rate in Nigeria was 45.9 years in 1990, fell to 45.8 years in 1991, increased to 46.5 years in 2001, and then increased further to 51.3 in 2011 and 54.3 years in 2018. According to WHO (2023), life expectancy in Nigeria was 52.89 years in 2020, 55.12 years in 2021, and 55.44 years in 2022. According to the World Life Expectancy Ranking, Nigeria is ranked 192th position out of 194th in the world with Chad and the Central Africa Republic preceding it, as well as followed by Lesotho, meaning that the country has one of the lowest life expectancies in the world. One of the factors that can contribute to low health outcomes measured using life expectancy is income inequality.

Furthermore, income inequality is an important determinant of health status in relatively wealthy societies. The study of the relationship between income inequality and health outcomes came to be widely known in the fields of sociology and health beginning in the mid-eighties, with the work published by Wilkinson. The health status of individuals is influenced by income inequality, whether they are living in developing countries or developed countries (Anwar *et al.*, 2017). Environmental quality is a good means through which income inequalities affect population health (Fatukasi & Ayeomoni, 2015). Areas with high income inequality may have increased risks of environmental degradation due to higher exposure to environmental pollutants which causes depletion in the environment, compared to areas with more even income distribution (Charafeddine & Boden, 2008).

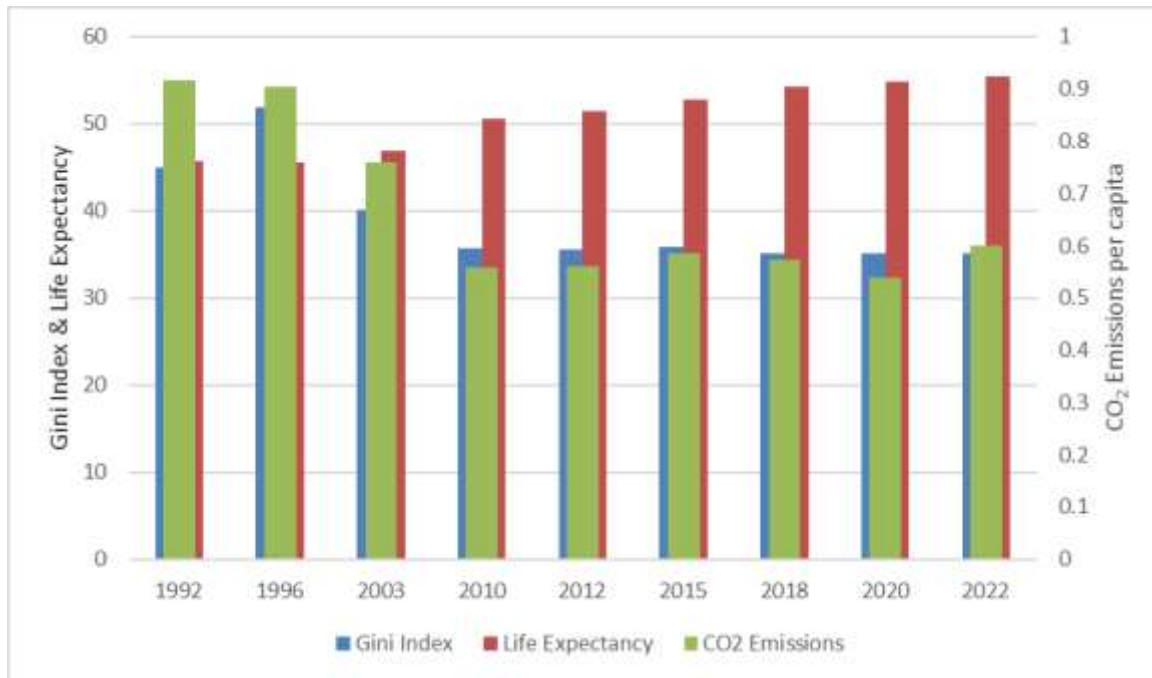


Figure 1.2: The Joint Movement of Income Inequality (Gini Index), Environmental Degradation (CO₂ Emission), and Health outcomes (Life Expectancy) in Nigeria

Source: Author's Computation from World Bank Database (2023)

Figure 1.2 gives an insight into the changes in income inequality, and life expectancy over time in Nigeria. It shows that although the changes in income inequality decreased and increased at different times of the year in the past decades, life expectancy continued to show increasing changes in Nigeria during the same period.

Income inequality influence health outcomes in Nigeria through multiple pathways, including environmental degradation, limited access to healthcare, and socio-economic disparities. High-income inequality often results in unequal access to clean air, water, and quality healthcare services, thereby exacerbating health challenges among low-income populations (Akinyemi, Oke & Yusuf, 2022). Studies have shown that increased CO₂ emissions contribute to air pollution, which is linked to respiratory diseases, cardiovascular complications, and premature mortality, particularly among vulnerable groups (Ezeanya & Okonkwo, 2021). The adverse health effects of CO₂ emissions are more pronounced in low-income communities, where poor housing conditions, lack of healthcare infrastructure, and limited financial resources increase exposure to environmental hazards (Ogunbiyi, Alao, & Daramola, 2023). Furthermore, income inequality restricts investments in public health interventions and climate adaptation strategies, intensifying the health burden (Adeyemi & Bello, 2020). Empirical evidence suggests that Nigeria's high-income disparity and reliance on fossil fuels exacerbate air pollution, leading to negative health outcomes (Ajayi & Ojo, 2023). A study by Nwosu and Nweke (2024) found that regions with higher income inequality experience increased mortality rates due to pollution-related illnesses, reinforcing the link between socio-economic disparity and environmental health risks. Therefore, policies promoting equitable income distribution, green energy transitions, and improved healthcare access are essential to mitigating the health impact of CO₂ emissions in Nigeria.

Income inequality in Nigeria has reached alarming levels, with significant disparities in wealth distribution across the population resulting in social and economic divides outcomes (Ajakaiye & Adeyeye, 2021). According to the World Bank, Nigeria ranks among the most unequal countries in the

world, with the Gini coefficient at approximately 43% in recent years. Income inequality is known to have profound effects on public health, as those in lower income brackets typically experience poorer health outcomes compared to wealthier individuals. This disparity arises from limited access to healthcare, education, clean water, and nutritious food, all of which are fundamental to good health (Wilkinson & Marmot, 2003).

Research has shown that high levels of income inequality can result in increased mortality rates, reduced life expectancy, and higher incidences of chronic diseases in societies. For Nigeria, these problems are exacerbated by the unequal distribution of healthcare services, which are often concentrated in urban areas, leaving rural populations with limited access to medical care. Additionally, income inequality fuels social exclusion, stigmatization, and increased mental health issues, all of which further affect overall public health (Ajao & Alabi, 2021). The Nigerian government has implemented several poverty alleviation programs, such as the National Social Investment Program (NSIP), to address income inequality. However, these efforts have been criticized for lacking sufficient impact due to issues such as corruption, mismanagement, and inadequate implementation (Odusola & Adebayo, 2022). As a result, there is a need for a comprehensive understanding of how income inequality directly impacts health outcomes in Nigeria, which this study aims to explore.

The interplay between income inequality and health outcomes creates a vicious cycle: poorer populations are more likely to live in areas with poor environmental conditions, and their limited financial resources make it difficult for them to protect themselves from the health impacts of environmental degradation. Additionally, the lack of access to quality healthcare services in these areas means that these individuals are less likely to receive timely treatment, further compounding health disparities.

The Nigerian government has made some efforts to address the intertwined issues of income inequality, and public health, while the National Health Policy aims to improve healthcare access, particularly for vulnerable populations. However, these efforts have often been fragmented and poorly implemented, resulting in minimal progress. The effectiveness of government policies in reducing income inequality has been limited by factors such as political instability, corruption, lack of enforcement, a lack of effective monitoring mechanisms, and inadequate funding (Okunmadewa *et al.*, 2018).

While the individual effects of income inequality on health outcomes are well-documented, it is essential to recognize that income inequality does not exist in isolation but interacts with environmental degradation to amplify health risks, especially for the most marginalized groups in society. For instance, wealthier individuals may have the means to move away from polluted areas, invest in private healthcare, and access cleaner technologies, while those in lower income brackets bear the brunt of environmental hazards (Duru & Chima, 2019). This exacerbates health inequalities, as the poor are disproportionately exposed to environmental risks, leading to higher rates of diseases such as malaria, respiratory infections, and waterborne diseases (Eze, Okechukwu & Njoku, 2020).

This study therefore intends to providing a comprehensive analysis of how income inequality affect health outcomes in Nigeria. By examining the impacts of income inequality on health outcomes in Nigeria, this research offers valuable insights into the policy measures needed to address these socioeconomic issue bedevilling most developing countries of the world.

LITERATURE REVIEW

2.1 Conceptual Literature

2.1.1: Income Inequality

Income inequality is a significant disparity in the distribution of income between individuals, groups, populations, social classes, or cities. While some individuals amass vast fortunes, others struggle to meet basic needs, creating a chasm that threatens social cohesion and economic stability (Regidor, Calle, Navarro & Dominguez, 2003). One of the primary drivers of income inequality is globalization. Technological advancements have facilitated the movement of capital and labour, often benefiting those with specialized skills and education while displacing low-skilled workers in developed countries. This process, coupled with trade policies favouring corporations over workers, has led to a decline in

unionization and stagnant wages for many. The rise of the gig economy, characterized by precarious employment and limited benefits, further exacerbates this trend, contributing to a growing underclass (Wilkinson, 2005).

The consequences of income disparity are far-reaching and multifaceted. It erodes social mobility, hindering the ability of individuals born into disadvantaged backgrounds to climb the economic ladder. It fuels social unrest and political polarization, as those who feel left behind may turn to populist movements or extremist ideologies. Additionally, income inequality negatively impacts health outcomes with lower-income individuals experiencing higher rates of chronic diseases and premature death (Atkinson, 2015). Income is a major determinant of quality of life which affects the well-being and health of individuals. This is to say that individuals with higher incomes will likely have better health and vice versa. Addressing income disparity requires a multi-pronged approach. Progressive taxation systems that redistribute wealth from the top to the bottom can help narrow the gap (Wilkinson & Pickett, 2011). Investing in education and training programs can equip individuals with the skills needed to thrive in the global economy. Strengthening social safety nets, such as unemployment insurance and healthcare, can provide essential support for those struggling to make ends meet. Finally, promoting fair trade practices and regulations that protect workers' rights can ensure that globalization benefits all, not just a selected few (Murshed, *et al.*, 2019).

Income inequality specifically pertains to the distribution of material resources within a society, which impacts the social standing of individuals. These attributes typically refer to resources or things that are highly sought after in society. This indicates the dissemination of sharing patterns, whether in terms of tangible resources or consumption characteristics. Osahon (2011), as referenced in Atkinson (2015), raised concerns about the formulation of inequality assessment using the explicit logic of social choice theory.

Economic inequality is the situation when one person is granted certain material options or resources while another person is deprived of the same opportunities. Inequality can manifest in several forms such as disparities in income, consumption, wealth, gender, employment, health characteristics, and numerous other factors (Rajakumar *et al.*, 2020). However, our focus for this study is specifically on the income disparity. Income inequality refers to the unfair allocation of income within a specific group, economy, or society. Income inequality can be assessed using the Lorenz curve, the Gini coefficient, and the General Entropy class. The Gini coefficient is commonly employed as a measure and it closely corresponds to the Lorenz curve. The Gini coefficient quantifies income inequality by analyzing the Lorenz curve. It ranges from 0 to 1, with values closer to 0 indicating a more equal distribution of income, values closer to 1 indicating a more unequal distribution, and 0 representing perfect income equality. Income inequality can manifest either domestically or internationally, whether within a single country or between multiple countries.

Income disparity is a complex and pressing issue with far-reaching consequences. Understanding its causes and effects is crucial for developing effective policy solutions. By implementing strategies that promote economic justice and social mobility, we can build a more equitable and sustainable future for all. Income disparity, also known as economic inequality, wealth inequality, or wealth gap, pertains to disparities in earnings and overall levels of well-being among various demographic groups. These groupings can encompass entire countries, which are typically the focus of study, or smaller subsets within local, national, or regional populations, including individuals within these subsets. Income disparity can be observed within the same groups or countries across different historical periods, while simultaneously considering variations in the economic systems that these countries have adopted across time (Atkinson, 2015).

Health outcomes

The concept of "health outcomes" pertains to the overall health status or condition of a population within a designated timeframe. A range of health status markers or indices can be employed to assess this phenomenon. There is currently no agreement on the most effective method for quantitatively evaluating health outcomes. However, several specialists in population health have employed different indices as

substitutes for determining health outcomes in their studies. According to Orji and Okechukwu (2015), other indicators that might be included are self-rated health, infant mortality rate, population mortality rate, life expectancy, average age at death, child nutritional status, sickness burden, and maternal mortality, among others.

The increased consumption of non-medical goods means- people can consume more foods, more quality-full and nutrient foods can spend more on children's education, etc. Increasing consumption of medical goods means that people can spend more on medical care, can afford regular check-ups, can purchase reliable life and health insurance, and can have access to the treatment of any diseases. Hence, people with higher income can afford more medical and non-medical goods and services compared to lower-income people, it can thus be concluded that economic growth or increasing real per capita income improves the life expectancy of people (Hossain *et al.*, 2020).

Income Inequality and Health outcomes

Income inequalities directly influence some health outcomes (Pickett & Wilkinson, 2015). This is to say that reducing income inequalities by raising the incomes of the most disadvantaged will improve their health and invariably life expectancy. The more equally wealth is distributed, the better the health (and of course life expectancy) of that society. According to Hamilton and Kawachi (2013), a contested relationship between income inequality and health status is the claim that both the poor and rich members of society are adversely affected by income inequality. In other words, greater inequality harms not just the health security of the poor, but also the population which enjoys a favourable income as well. Supporting this view, Ali and Audi (2016) stated following the linear relationship between income and health, an extra unit of income has an equal impact on health irrespective of which aspect of the society the income goes to, that is, the poor or rich and such a situation may bring about an increase in the income of the poor population which will further improve the aggregate health status. This means that an increase in income inequality hurts the aggregate health status of the population.

The main mechanisms through which income inequality affects life expectancy are the absolute income hypothesis, relative income hypothesis, psychosocial hypothesis, and the neo-materialism hypothesis. The absolute income hypothesis asserts that the unequal distribution of income does not directly affect individual health. Instead, the observed association between income inequality and population health is solely a result of a curvilinear relation between the health of individuals and income, i.e., a diminishing health return to income (Luo & Xie, 2020). The relative income hypothesis states that an individual's health is affected by the income distribution within society. Considering this hypothesis, someone with a given income would have decreased health if he/ she lived in a society with higher income inequality than in a society with more equally distributed income. The psychosocial hypothesis explains that social comparisons may lower social capital, confidence, and efficiency. Income inequality has a negative impact on health as poor status in the social ranking causes gloomy feelings like embarrassment, depression, and mistrust which will provide a route to dangerous activities like smoking, imprudent drinking, and harmful drugs (Anwar, Hashmi & Nasreen, 2017). Finally, the neo-materialism hypothesis assumes a negative association between income inequality and health. It is claimed in this hypothesis that income inequality first affects the division of available resources and then it affects human health. Therefore, poor health might be the result of increasing inequality of income which leads to less expenditure on the provision of healthcare facilities to the poor by the state (Anwar, Hashmi & Nasreen, 2017).

The Social Determinants of Health (SDH) Theory

Primarily developed by Michael Marmot and Richard Wilkinson in 1999, emphasizes that health outcomes are not solely determined by biological factors or individual behaviours but are significantly shaped by social and environmental conditions. SDH highlights the importance of the socio-economic environment, including factors such as income, education, employment, housing, and the physical environment, in determining individuals' health outcomes. In the context of environmental degradation, SDH posits that harmful environmental exposures such as air and water pollution, poor sanitation, and inadequate infrastructure are direct results of socio-economic inequalities. The theory suggests that

marginalized groups are more likely to experience these environmental hazards, which leads to worse health outcomes, including respiratory diseases, cardiovascular disorders, and premature death. By focusing on the social context in which people live, SDH underscores the intersection between environmental degradation and health, recognizing that the inequities in access to clean air, safe water, and healthcare services exacerbate health disparities, especially in low-income populations.

Evidence supporting the SDH theory is abundant in the literature that links environmental degradation to health outcomes, particularly in socioeconomically disadvantaged communities. Studies have shown that individuals living in impoverished areas are more likely to be exposed to environmental hazards, leading to a higher burden of diseases linked to pollution, such as asthma, lung cancer, and stroke (Smith, Miller & Johnson, 2020). Research also indicates that these communities have limited access to healthcare, which exacerbates the negative effects of environmental degradation. For example, studies in Nigeria reveal that low-income communities are disproportionately affected by air and water pollution due to poor infrastructure and high dependence on fossil fuels, which leads to severe health issues (Akinyemi., Oke & Yusuf, 2022; Ogunbiyi, Alao, & Daramola, 2023). Furthermore, global studies corroborate the SDH framework by showing that areas with high-income inequality and environmental degradation exhibit higher rates of disease, demonstrating the interplay between socio-economic factors and environmental exposures (Marmot & Wilkinson, 2005). This body of evidence supports the idea that environmental conditions are not just biological determinants of health, but are deeply embedded within the broader social determinants, shaping health disparities at both local and global levels.

The Power Principle

The Power Principle, rooted in the work of C. Wright Mills (1956), posits that concentrated power within a small elite shapes key societal outcomes, including income distribution, environmental policies, and ultimately, public health. According to Mills, a few individuals and institutions hold disproportionate power, enabling them to influence decision-making processes that maintain and reinforce systemic inequalities. In this framework, income inequality is not merely an economic outcome but a result of deliberate power structures that allocate resources and opportunities unevenly. Environmental degradation, often stemming from policies that prioritize industrial and economic growth over sustainability, is similarly influenced by these power dynamics. The elite, with their substantial influence, are frequently able to steer regulatory frameworks in ways that protect their interests, even when such policies result in higher pollution levels and deteriorating environmental quality. This dynamic is critical in understanding health outcomes, as communities with less political and economic clout often suffer the brunt of environmental hazards, leading to increased incidence of respiratory diseases, cardiovascular conditions, and other pollution-related illnesses (Mills, 1956).

Further supporting the Power Principle, subsequent scholars have illustrated how entrenched power relations are instrumental in perpetuating socio-environmental injustices. Michel Foucault (1977) expanded on these ideas by demonstrating that power is omnipresent and embedded within institutional practices and societal norms, subtly guiding behaviour and policy decisions that affect marginalized groups. Similarly, Steven Lukes (1974) offered a three-dimensional view of power, highlighting not only overt decision-making but also the manipulation of preferences and the suppression of alternative viewpoints. Empirical studies in environmental justice further corroborate these theoretical insights; for instance, research by Bullard (1993) shows that communities with limited political influence are disproportionately exposed to environmental risks, which in turn exacerbate health disparities. By applying the Power Principle to the nexus of income inequality, environmental degradation, and health outcomes, researchers can better understand how elite dominance drives policy decisions that sustain inequitable resource distribution, environmental neglect, and adverse health effects.

The Physiological Principle

Walter Cannon is widely recognized as the founder of the physiological principle of homeostasis, introduced in his seminal work "*The Wisdom of the Body*" in 1932. At its core, this principle posits that living organisms maintain internal stability by regulating bodily functions in response to external stressors. In the context of income inequality and environmental degradation, the principle elucidates how

persistent exposure to adverse conditions disrupts the body's equilibrium, leading to deleterious health outcomes. When individuals face chronic socio-economic stress, stemming from income disparities, they experience physiological strain, triggering stress responses such as elevated cortisol levels and inflammatory processes. Similarly, exposure to environmental pollutants, including heightened CO₂ emissions and toxic particulates, further challenges the body's homeostatic balance. The disruption of this balance, if sustained, can overwhelm adaptive mechanisms and lead to chronic illnesses, including cardiovascular disease, diabetes, and respiratory disorders. Cannon's theory fundamentally underscores the interconnectedness of environmental, social, and biological determinants of health, providing a robust framework for understanding how external pressures can manifest in physiological dysfunction.

Subsequent research has provided compelling evidence supporting this physiological principle. For example, studies have shown that prolonged exposure to socio-economic disadvantage is associated with dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, which plays a crucial role in stress management and overall homeostasis (McEwen, 1998; Evans & Kim, 2010). This dysregulation results in an increased allostatic load, a cumulative burden of chronic stress, which significantly heightens the risk of developing various chronic diseases. Moreover, environmental degradation, characterized by high levels of air pollutants and CO₂, exacerbates these physiological stress responses, leading to cellular and systemic inflammation (Selye, 1936; McEwen, 2003). This body of evidence reinforces the notion that both income inequality and environmental hazards contribute to the deterioration of health by overwhelming the body's natural regulatory mechanisms. In essence, the physiological principle as advanced by Cannon (1932) not only provides a theoretical underpinning for the biological impact of chronic stress but also emphasizes the need for holistic interventions that address both social inequities and environmental pollution to restore and preserve public health.

Empirical Literature

Angbas, Pam, and Eshaleku (2018) conducted a study to examine the influence of income distribution and inequality on the health of individuals in Nasarawa state. They utilized socioeconomic and cross-sectional data from the three senatorial districts of the state, which were obtained through a field survey. The data was analyzed using a bivariate model. The study reveals that the increasing disparity in income, particularly in rural parts of Nigeria, has had a detrimental impact on the health outcomes of the population. The primary cause is the absence of access to the means of production. Despite the desire of individuals to live healthy lifestyles, which has various positive effects on their social, economic, productive, and political aspects, achieving this goal is sometimes challenging due to the prevalence of poverty exacerbated by low earnings and increasing inequality. In most developing countries, income levels are not only low but also heavily skewed against the poor, resulting in worsening inequality. This has consequences for achieving optimal health for the population, as outlined in the Millennium Declaration of the United Nations. If healthcare continues to be funded by private revenues, as it already is, and is supported by a weak and disorganized insurance system, the overall health of the population will be significantly jeopardized. Consequently, this implies that individuals will become more susceptible to disease situations, along with their associated adverse consequences. To achieve sustainable development, it is crucial to actively address opportunities that can significantly improve the incomes of the most impoverished individuals in society.

Similarly, Odusanya and Agboola (2017) conducted a study to investigate the impact of wealth and income disparity on health in Nigeria from 1980 to 2014. The study utilizes the ARDL bounds testing approach to examine the impact of income and income disparity on health over both long-term and short-term timeframes. Research findings indicate a strong positive correlation between income and health, both in the short term and the long term. This suggests that income plays a crucial role in safeguarding against poor health. Conversely, it was discovered that there is a strong and detrimental association between wealth disparity and health in Nigeria, both over a prolonged period and in the immediate term.

Furthermore, Aluko and Aluko (2017) conducted a study on the relationship between income inequality, health outcomes, and economic growth in Nigeria, specifically focusing on the Federal Capital Territory

(FCT). This study examines the factors that influence health outcomes among high and low-income families in Nigerian society, as well as the effects on economic growth. The study utilized panel data and employed the one-way error component panel modelling technique as its methodology. The results revealed a correlation between income inequality and mortality rates across income quintiles. Additionally, it was found that child mortality negatively affects growth by reducing individual income levels. Consequently, the death rates for infants and children under the age of five are approximately 2.5 times greater in the poorest 20% of the population compared to the wealthiest 20%.

Shao and Dou (2023) examined how environmental degradation and income disparities influenced national health in China's provinces from 2005 to 2020 using the CS-ARDL and common correlated effect mean group (CCE-MG). The variables of interest were environmental degradation, green energy, health expenditures, income inequality, technology (ICT), and mortality rate. The estimated results showed the significant contribution of environmental deterioration and income inequality to the mortality rate. Furthermore, health expenditures, ICT, and green energy significantly reduce the mortality rate. Similarly, the moderate effect of income inequality on health expenditure, green energy, and ICT significantly reduces the mortality rate in selected provinces of China. This study was carried out for China and it employed the CS-ARDL and common correlated effect mean group (CCE-MG), while the current study employs the auto-regressive distributed lag model and it is carried out for Nigeria.

In the same vein, Orekoya (2022) examined the relationship between wealth disparity and health status in Nigeria. Life expectancy, public health expenditure, and infant mortality rate were employed as indicators for measuring health. The study posited that examining the relationship between income inequality and health is more effectively done by utilizing inter-temporal measurements, such as growth rate and per capita indicators. This is because income inequality and health are macroeconomic variables that have microeconomic underpinnings. The Autoregressive Distributed Lags (ARDL) technique was used for secondary data from 1980 to 2015. The study aimed to determine if a state of long-term balance exists among the variables in the model. A reparametrized autoregressive distributed lag (ARDL) model was employed to analyze the short-term dynamics of the variables' interaction. The study discovered that the relationship between income inequality and health is influenced by the specific measurement utilized in empirical investigations. Quantitative indicators such as life expectancy and new-born mortality rate suggest that income inequality has no impact on the health status in Nigeria.

Again, Jorgenson *et al.* (2020) study on how power, proximity, physiology, income inequality, and racial composition amplify the impacts of air pollution on life expectancy in the United States represents a significant empirical contribution to the intersection of environmental degradation, social stratification, and population health. Utilizing a comprehensive theoretical framework encompassing power, proximity, and physiology, the research investigates the complex interplay between fine particulate matter (PM_{2.5}), income inequality, and racial/ethnic composition on state-level life expectancy. Employing two-way fixed effects regression analysis over the 2000-2014 periods across all U.S. states, the authors find compelling evidence supporting their hypothesis that the detrimental effects of PM_{2.5} on life expectancy are exacerbated in states characterized by higher income inequality and larger black populations. The study expands on prior research by incorporating a nuanced consideration of racial/ethnic composition – providing a more holistic understanding of environmental justice. The conclusion emphasized the refinement of theoretical principles and the identification of states where air pollution's impact on life expectancy is most pronounced. While acknowledging study limitations and suggesting avenues for future research, this empirical review recognizes Jorgenson *et al.*'s work as a crucial advancement in interdisciplinary scholarship, offering valuable insights into the nuanced relationships between pollution, inequality, and health in the United States.

In the same vein, (Anwar, Hashmi, and Nasreen, 2017). analyzed the consequences of environmental degradation and income inequality on health status using CO₂ emissions, the Gini index, Child Mortality, and Life expectancy as proxies in South Asian countries from 1980 to 2014 using Fully Modified OLS. The estimated results showed that CO₂ emissions and the Gini index are detrimental to health status in terms of child mortality and life expectancy in the long run. This study differs from the current study as

this study was carried out for South Asian countries using Fully Modified OLS, whereas the current study is on Nigeria using the Auto-Regressive Distributed Lag Model.

Ali and Audi (2016) investigated the impact of income inequality, globalization, and environmental degradation on life expectancy in Pakistan. The study used time series data for the period 1980- 2015 for empirical analysis and employed Auto-Regressive Distributed Lag (ARDL). The results of the study revealed that income inequality and environmental degradation have a negative and significant impact on life expectancy in Pakistan. This study was based on Pakistan, while the current study is focusing on Nigeria.

Again, Fatukasi and Ayeomoni (2015) studied the effect of income inequality on health indicators in Nigeria from 1980 to 2014 using the dynamic ordinary least square (DOLS) method. The variables used were income inequality, per capita income, education level, and savings level on health indicators proxied by mortality and life expectancy rate. The results from the analysis showed that income inequality has an inverse effect on mortality rate. However, a direct relationship existed between income inequality and life expectancy rate in the model. Finally, per capita income, education level, and saving level employed as control variables have a positive effect on health indicators in Nigeria. The current study differs in terms of methodology as it applies the Auto-Regressive Distributed Lag Model rather than the dynamic ordinary least square (DOLS) method.

Finally, Drabo (2011) examined how environmental degradation could be considered as a channel through which income distribution affects population health. Using the Two-Step Least Square (2SLS) and Generalized Method of Moments (GMM system) methods, it was discovered that income inequalities negatively affect environmental quality and that environmental degradation worsens the population's health. Also, income inequality negatively affects health status. Another interesting result that was found is that when environmental variables are taken into account, the level and the statistical significance of the coefficient of income inequality variable vanish which confirms that environment quality is an important channel through which income inequalities affect population health. This study employed the Two Step Least Square (2SLS) and Generalized Method of Moments (GMM system), while the current study employs Auto-Regressive Distributed Lag (ARDL).

METHODOLOGY

The study seeks to evaluate the effects of income inequality (GINI) on health outcomes (HO) in Nigeria. Incorporating the effect of income inequality (GINI) into the model, we specified the following:

$$HO = f(GINI, CO_2, PGDP, GCE, PST, DFT) \dots\dots\dots(3.1)$$

Where: HO is the vector of health outcomes which is accounted for using life expectancy at birth and infant mortality rate. CO₂ is carbon emission (metric tons per capita) and deforestation (Forest Area measured in sq. km) which represents the environmental degradation factors used in the estimation. GINI is the Gini coefficient which represents the social variable, income inequality, while PGDP is per capita income, LER is life expectancy rate which is a proxy for health outcomes, and GCE is government capital expenditure. Equation (3.1) shows that vectors of health outcomes proxied by life expectancy (LER) are a function of the Gini coefficient (GINI), carbon dioxide emission (CO₂), per capita income (PGDP), GCE is government capital expenditure, Political Stability, and Absence of Violence/Terrorism (PST), and deforestation (DFT).

Political Stability and Absence of Violence/Terrorism. While CO₂, GCE, and HOI variables are integrated of order zero 1(0). Having obtained a mixed order of integration among the variables of this study, the ARDL Bound test can be suitably used to analyse the effect of income inequality on health outcomes in Nigeria.

Table 4.2: Income Inequality and Health Outcomes

Variables	Coefficient	Prob.
ARDL		
CO ₂	-5.0330*	0.0002
LOGGINI	2.6197**	0.0171
LOGPGDP	0.7419*	0.0002
EC	0.0938*	0.0012
LOGGCE	-0.1793***	0.0899
PST	0.2147	0.3834
DFT	-0.0001*	0.0000
C	960.97**	0.0232

Source: Author's Computation from E-Views 10

The results presented in table 4.2 indicate that income inequality, measured by the Gini coefficient, has a positive and statistically significant effect on health outcomes in Nigeria, with a coefficient of 2.619. Thus, we reject the null hypothesis that income inequality has no significant impact on health outcomes, and accept the alternative. This finding contradicts traditional economic theory, which suggests that income inequality negatively affects public health (Wilkinson & Pickett, 2009). However, such a positive effect may arise from higher investments in healthcare, and in more unequal societies (Choi *et al.*, 2021).

DISCUSSION OF FINDINGS AND POLICY IMPLICATIONS

The positive coefficient value of 2.619 also indicates that higher income inequality increases life expectancy, which contradicts traditional economic theories suggesting that inequality harms social health outcomes. For instance, Wilkinson and Pickett (2009) argue that income inequality negatively affects societal well-being. However, a contrasting study by Choi *et al.* (2021) found that, in some contexts, inequality could correlate with higher investments in public health. Likewise, a positive and significant coefficient value of 0.741 per capita GDP suggests that higher income levels increase life expectancy, supporting the widely held belief in the health benefits of economic growth. This is corroborated by studies like Bello *et al.* (2020), which also observed a positive relationship between income levels and health outcomes.

The findings that income inequality has a positive impact on health outcomes in Nigeria, which contrasts with conventional economic theories that link inequality to poorer health outcomes. This outcome could be attributed to higher public investments in health and social services in contexts of inequality, as suggested by Choi *et al.* (2021). The positive relationship observed could also reflect improved healthcare access for the wealthier segments of society, indirectly benefiting the general population. However, this finding contradicts studies like Wilkinson and Pickett (2009), which argue that income inequality generally undermines social health outcomes by fostering divisions and limiting access to resources.

RECOMMENDATIONS

The study highlights a significant relationship between income inequality and health outcomes. To mitigate the effects income inequality on health outcomes, the government and other stakeholders in the industry should prioritize the development and implementation of comprehensive energy policies that encourage the use of renewable energy. These policies should aim to reduce CO₂ emissions while

improving energy access for both the poor and the rich in the country. Additionally, addressing income inequality could create opportunities for more equitable access to energy and healthcare, thereby indirectly promoting environmental sustainability. Policies that encourage the diversification of energy sources, combined with fiscal incentives for renewable energy investments, could significantly reduce the adverse environmental effects associated with high energy consumption.

The study also found that income inequality, contrary to conventional economic theories, can have a positive relationship with health outcomes in some contexts. However, it also showed that income inequality can exacerbate environmental degradation and public health issues in the long run. Therefore, it is recommended that government implement policies aimed at reducing income inequality. Progressive taxation for improved social welfare programs, and investments in education and healthcare for disadvantaged populations can promote a more equitable distribution of resources. By reducing income inequality, the government can improve social welfare, foster better health outcomes, and alleviate the pressures of unsustainable consumption patterns that contribute to environmental degradation.

CONCLUSION

The study explores the intricate relationships between income inequality, and health outcomes in Nigeria, revealing several important dynamics. It highlights the significant and direct impact of CO₂ emissions on life expectancy, indicating that increased emissions worsen health outcomes. Interestingly, while higher income inequality typically correlates with worse health outcomes, the study found a positive relationship between income inequality and health outcomes in the long run. The findings from the study challenge conventional economic theories, suggesting that in some contexts, income inequality might stimulate public health investments. Furthermore, while energy consumption was shown to positively influence health outcomes, government consumption expenditure had a surprisingly negative impact, potentially due to inefficient or misallocated spending. Deflation in deforestation and the broader environmental impacts were found to significantly affect health outcomes, especially in the case of health outcomes.

REFERENCES

- Adeyemi, T., & Bello, A. (2020). Income Inequality, Environmental Degradation, and Health outcomes in Nigeria. *Journal of Economic Studies*, 45(3), 210-228.
- Ajakaiye, D., & Adeyeye, A. (2021). Political Stability and Environmental Sustainability in Sub-Saharan Africa. *Journal of African Development*, 19(2), 56-71.
- Ajao, A., & Alabi, A. (2021). The impact of income inequality on public health in Nigeria. *Journal of Development Economics*, 48(3), 220-235.
- Ajayi, F., & Ojo, K. (2023). Fossil Fuel Dependence and Public Health: Examining Nigeria's CO₂-Health Nexus. *Energy & Society*, 8(2), 99-115.
- Akinyemi, S., Oke, M., & Yusuf, R. (2022). Socioeconomic Disparities and Health Implications of CO₂ Emissions in Nigeria. *Environmental Policy Review*, 12(1), 56-74.
- Ali, A., & Audi M., (2016). The impact of income inequality, environmental degradation and globalization on life expectancy in Pakistan: An empirical analysis. *MPRA Paper No. 71112*, posted 05 May 2016. (Ali and Audi, 2016) MPRA 71112.
- Aluko, O.O. & Aluko, W.O. (2017). Income disparity and family health outcomes in the fct: implication for economic growth in Nigeria (1985-2015). *International Journal of Management Sciences and Business Research*, 6(2),1-15
- Angbas, J. A., Pam, M. & Eshaleku, O Z. (2018). Income inequality and health outcomes: A challenge to sustainable development in Nigeria-Focus on Nasarawa State. *International Journal of Social Sciences and Conflict Management*, 3(4), 55-68
- Anwar, S., Hashmi, F., & Nasreen, S., (2017). Impact of environmental degradation and income inequality on health status in south Asian countries. *Journal of Applied Environmental and Biological Sciences* 7(6)178-190, 2017.
- Atkinson, A. B. (2015). *Inequality: What can be done?*. Harvard University Press.

- Bello, M., et al. (2020). Energy consumption and public health in developing countries. *Journal of Development Studies*.
- Charafeddinea, R., & Boden, L.I., (2008). Does income inequality modify the association between air pollution and health? *Environmental Research* 106 (2008) 81–88
- Choi, Y., et al. (2021). Income inequality and health outcomes in emerging economies. *Global Health Journal*.
- Drabo A., (2011). Impact of income inequality on health: does environment quality matter? *Environment and PlanningA*, 43(1): 146–165. 2010-06
- Duru, I. L., & Chima, G. N. (2019). The relationship between income inequality and health outcomes in Nigeria: A causal investigation. *Nigerian Economic Review*, 17(4), 45-67.
- Evans, G. W., & Kim, P. (2010). Multiple risk exposures as potential explanatory factors for the socioeconomic status–health gradient. *Annals of the New York Academy of Sciences*, 1186, 174–189.
- Eze, S., Okechukwu, O., & Njoku, C. (2020). The link between income inequality and environmental health in sub-Saharan Africa: A case study of Nigeria. *Journal of African Health*, 34(1), 19-28.
- Ezeanya, C., & Okonkwo, L. (2021). Air Pollution and Respiratory Health in Low-Income Communities of Nigeria. *African Journal of Public Health*, 14(4), 134-150.
- Fatukasi, A. A., & Ayeomoni, I. O. (2015). Effect of Income Inequality on Health Indicators in Nigeria (1980-2014). *International Journal of Academic Research in Business and Social Sciences*, 5(8), 274-285.
- Hossain, S., Siddika, M.T., Koly, I.J., & Akter, K., (2020). Exploring the impact of environmental degradation on life expectancy in Bangladesh: An ARDL bounds test approach. *International Journal of Science and Business* Volume: 4, Issue: 12 Page: 69-79 2020.
- Jorgenson, A.K., Thombs, R.P., Clark, B., Givens, J.E., Hill, T.D., Huang, X., Kelly, O.M., & Fitzgerald, J.B., (2020). Inequality amplifies the negative association between life expectancy and air pollution: A cross-national longitudinal study. *Science of the Total Environment*, <https://doi.org/10.1016/j.scitotenv.2020.143705>.
- Kawachi, I., et al. (1997). Income inequality and health: A critical review. *Journal of Health Psychology*.
- Khezrian, M., McNeil, C. J., Murray, A. D., & Myint, P. K. (2020). An overview of prevalence, determinants and health outcomes of polypharmacy. *Therapeutic Advances in Drug Safety*, 11, 204209862093374. <https://doi.org/10.1177/2042098620933741>
- Luo, W., & Xie, Y., (2020). Economic growth, income inequality and life expectancy in China. *Social Science & Medicine* 256 (2020) 113046 <https://doi.org/10.1016/j.socscimed.2020.113046>
- Marmot, M., & Wilkinson, R. (2005). *Social Determinants of Health: The Solid Facts*. World Health Organization.
- McCartney, G., Popham, F., McMaster, R., & Cumbers, A. (2019). Defining health and health inequalities. *Public Health*, 172, 22–30. <https://doi.org/10.1016/j.puhe.2019.03.023>
- McEwen, B. S. (1998). Protective and damaging effects of stress mediators. *New England Journal of Medicine*, 338(3), 171-179.
- McEwen, B. S. (2003). The neurobiology of stress: From serendipity to clinical relevance. *Brain Research*, 835(1), 281-291.
- Mills, C. W. (1956). *The Power Elite*. Oxford University Press.
- Murshed, M., et al. (2019). Energy Consumption, Economic Growth, and CO2 Emissions in Developing Countries: A Non-linear Analysis. *Environmental Economics and Policy Studies*, 21(4), 667-682.
- Nwosu, E., & Nweke, I. (2024). Income Disparities and Environmental Health in Nigeria: A Quantitative Analysis. *Journal of Health Economics & Policy*, 19(1), 87-105.
- Oduanya, I. A., & Agboola, B. (2017). Income, income inequality and health: Evidence from Nigeria. *Izvestiya Journal of Varna University of Economics*, 61 (4). p. 345 – 361.

- Odusola, A., & Adebayo, O. (2022). Assessing poverty alleviation programs in Nigeria: The role of social investments. *Development Economics Review*, 23(4), 34-50.
- Ogunbiyi, J., Alao, T., & Daramola, P. (2023). Environmental Pollution, Income Inequality, and Healthcare Access in Nigeria. *Sustainable Development Review*, 7(3), 45-68.
- Okunmadewa, F., et al. (2018). Government policies on poverty reduction and healthcare delivery in Nigeria: An analysis of effectiveness and outcomes. *Journal of Policy Analysis*, 30(1), 21-38
- Orekoya O. S. (2022). Income inequality, health expenditure and outcome in Nigeria. *AJSD*, 7(2), 1-26
- Orji, A., & Okechukwu, E. (2015). Income, income distribution and health outcomes in Nigeria: Empirical evidence form national demographic and health surveys. *The Nigerian Journal of Economic and Social Studies*, 57(1), 101-150.
- Rajakumar, S., et al. (2020). Income inequality and its effect on infant mortality in developing countries. *Global Health & Economics*.
- Ranabhat, C. L., Atkinson, J., Park, M., Kim, C., & Jakovljevic, M. (2018). The influence of universal health coverage on Life Expectancy at Birth (LEAB) and Healthy life Expectancy (HALE): a Multi-Country Cross-Sectional study. *Frontiers in Pharmacology*, 9. <https://doi.org/10.3389/fphar.2018.00960>
- Selye, H. (1936). A syndrome produced by diverse nocuous agents. *Nature*, 138, 32.
- Shao, Z., & Dou, L. (2023). How can environmental degradation and income disparities influence national health: an eye bird view on China's provinces. *Frontiers in Public Health*, 11.
- Smith, C., Miller, L., & Johnson, P. (2020). Environmental Hazards and Health outcomes: A Study of Socioeconomic Disparities in Urban Areas. *Journal of Public Health*, 38(4), 142-158.
- Smith, K. E., Hill, S., & Bambra, C. (Eds.). (2016). *Health inequalities: critical perspectives*. Oxford University Press.
- Wilkinson, R. G. (2005). The impact of inequality on health: A review of the literature. *Social Science & Medicine*.
- Wilkinson, R., & Marmot, M. (2003). *Social Determinants of Health: The Solid Facts*. World Health Organization.
- Wilkinson, R., & Pickett, K. (2009). *The Spirit Level: Why More Equal Societies Almost Always Do Better*. Bloomsbury Publishing.
- World Health Organisation. (2023). *Countries data*. Available at: <https://data.who.int/countries/566>.