# THE IMPACT OF FOOD CRISIS ON THE HEALTH OF CHILDREN IN NIGERIA (1981-2024)

**BY**

**Grace Ainogbikpe AMEDU**

**SSC2105543**

**DEPARTMENT OF ECONOMICS**

**FACULTY OF SOCIAL SCIENCES**

**UNIVERSITY OF BENIN**

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**Grace Ainogbikpe AMEDU**

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## CERTIFICATION

This is to certify that this project work was carried out by Grace Ainogbikpe AMEDU with matriculation number SSC2105543 in the Department of Economics, Faculty of Social Sciences, University of Benin.

_____ _____

**DR. MOHAMMED NUHU** **Date:**
**Project Supervisor**

_____- _____

**PROF. S. O. IGBINEDION** **Date:**
**Project Coordinator**

_____- _____

**PROF. C.A IGHODARO** **Date**
**Head of Department**

## DEDICATION

This project is dedicated to God almighty for his guidance, protection, mercy, and favour upon my life throughout my years in the University and seeing me through during my project work; to him be all the glory and honour forever and ever amen. I also dedicate the project to the loving memory of my dear Mother, Late LSA Oguniyi (JF55669), whose strength and love will forever be a source of inspiration.

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## TABLE OF CONTENTS

TITLE PAGE ..... I

CERTIFICATION .....II

DEDICATION .....III

ACKNOWLEDGEMENTS .....IV

TABLE OF CONTENTS .....VI

ABSTRACT .....XI

**CHAPTER ONE: INTRODUCTION**

1.1 Background of the Study ..... 1

1.2 Statement of the problem .....4

1.3 Research questions .....7

1.4 Research Objectives .....7

1.5 Hypothesis (H0) ..... 8

1.6 Significance of the study .....8

1.7 Scope of the study .....9

1.8 Structure of the study .....10

**CHAPTER TWO: LITERATURE REVIEW**

2.1 Introduction .....11

2.2 Conceptual review ..... 11

2.3 Theoretical literature Review .....18

2.4 Empirical literature review ..... 22

**CHAPTER THREE: THEORETICAL FRAMEWORK**

3.1 Introduction ..... .....28

3.2 Theoretical framework ..... 28

3.3 Model Specification ..... 29

3.4 Methodology..... ..... 30

3.5 Method of data collection ..... 37

**CHAPTER FOUR: PRESENTATION AND ANALYSIS OF EMPIRICAL DATA**

4.1 Introduction .....38

4.2 Preliminary Data Analysis (Summary Statistics) ..... 39

4.3 Correlation analysis ..... 44

4.4 Unit Root Test ..... ..... 48

4.5 Test for Cointegration..... ..... ..... ..... ..... 51

4.6 ARDL bound cointegration test ..... 56

4.7 ARDL (Autogressive distributed lag) .....62

4.8 Normality test ..... ..... 61

4.9 Heteroskedasticity test: ARCH .....62

4:10 Policy implication ..... 63

**CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION**

5.1 Summary of Findings ..... 66

5.2 Conclusion ..... 67

5.3 Recommendations ..... ..... 67

**REFERENCES .....69**

## ABSTRACT

*This study examines the impact of food crises on children's health in Nigeria over the period 1981–2024, amid recurring economic shocks, conflicts, pandemics, and policy failures that have exacerbated food insecurity and malnutrition. Drawing on secondary data from the World Bank and employing the Autoregressive Distributed Lag (ARDL) and Error Correction Model (ECM) approaches, the research investigates the short-run and long-run relationships between food crises, child health indicators (such as stunting, wasting, and under-five mortality), and social factors including income, health expenditure, sanitation, education, and poverty.*

*The findings indicate that food crises have a significant positive association with deteriorated child health outcomes, intensifying vulnerability to infections, cognitive impairments, and mortality, with nearly 45% of under-five deaths linked to malnutrition. Income and sanitation exhibit negative effects on child health, underscoring the roles of economic inequality and inadequate infrastructure in perpetuating cycles of poverty and poor health. However, education and health expenditure show insignificant impacts, highlighting implementation gaps and inefficiencies in policy delivery. Cointegration tests confirm long-run equilibrium relationships, while diagnostic checks affirm model robustness.*

*The study concludes that Nigeria's protracted food crises pose a critical threat to national development, necessitating integrated, evidence-based interventions. Recommendations emphasize strengthening agricultural resilience, poverty alleviation, sanitation infrastructure, educational reforms, and efficient health investments to mitigate malnutrition and foster sustainable child health improvements.*

# CHAPTER ONE
# INTRODUCTION

## 1.1 Background of the Study

Food crises are not just temporary shortages; they are marked by a breakdown in the four pillars of food security: availability, accessibility, stability, and utilization of food. When these pillars are disrupted, populations experience reduced dietary intake, increased malnutrition, higher food prices, and increased mortality (World Bank, 2008). A food crisis is a situation where a significant portion of the population lacks access to sufficient, safe, and nutritious food, leading to widespread hunger and malnutrition that disproportionately affects vulnerable groups such as children, women, the elderly, and the poor (FAO, 2009).

In the early 1980s, Nigeria experienced severe economic shocks due to a sharp decline in global oil prices, leading to the implementation of the Structural Adjustment Programme (SAP) in 1986 to stabilize the economy. SAP policies, such as subsidy removal, currency devaluation, and public sector reform, contributed to soaring food prices and declining household incomes, which adversely affected nutrition and health, especially among children. These issues triggered widespread food insecurity, malnutrition, wasting, and underweight conditions among children under five (Akinyele, 2009). Persistent political instability, poor governance, and chronic underinvestment in agriculture led to stagnant food production despite rapid population growth. As a result, many Nigerian

households became dependent on food imports and were highly vulnerable to global price volatility. By 1993, the Nigeria Demographic and Health Survey (NDHS) reported that 36% of children under five were stunted and 14% were wasted (NDHS, 1993).

Nigeria was severely affected by the global food crisis of 2008, a period of worldwide inflation triggered by rising oil prices, poor harvests in major grain-producing countries, export restrictions, and financial speculation in commodity markets (FAO, 2009). The crisis led to a sharp increase in malnutrition rates among children. Soaring food prices reduced dietary diversity, particularly in poor households, leading to a rise in stunting, wasting, and underweight conditions (UNICEF, 2009). The 2013 NDHS confirmed the lingering effects, reporting that 37% of children under five were stunted, 18% were underweight, and 9% were wasted (NDHS, 2013). Government interventions, such as the National Policy on Food and Nutrition and the Home-Grown School Feeding Programme, were implemented to reduce malnutrition and improve dietary practices. However, these programmes have yielded limited success due to inconsistent funding, poor monitoring, and weak institutional coordination (Federal Ministry of Health, 2016; Okoh & Okojie, 2020).

The situation has been further exacerbated by a confluence of shocks in the last decade. The Boko Haram insurgency, which began in the North-East, and the spread of banditry and farmer-herder conflicts in the North-West and North-Central regions, have

displaced millions and severely disrupted farming activities, the primary livelihood in these areas (ICG, 2020). This has turned the North-Western and North-Eastern regions into the epicentres of food insecurity, where internally displaced persons, especially children, are exposed to extreme hunger and poor health outcomes (World Food Programme, 2021).

The COVID-19 pandemic (2020-2022) and subsequent economic downturn created another profound shock, exacerbating pre-existing vulnerabilities. Lockdowns disrupted food supply chains, while inflation and a rise in unemployment drastically reduced household purchasing power (World Bank, 2022). This period saw a further surge in food prices, making basic nutritious food unaffordable for many families, who were forced to reduce meal frequency, quantity, and quality. More recently, macroeconomic challenges, including high inflation, currency devaluation, and the removal of the fuel subsidy in 2023, have led to an unprecedented cost-of-living crisis. Staple food prices have reached record highs, pushing even more households into food stress and crisis (NBS, 2024; FEWS NET, 2024). The 2021 NDHS and subsequent surveys indicate that malnutrition remains a leading cause of child mortality and morbidity, with the National Bureau of Statistics reporting that 44% of children under five are stunted, 22% are underweight, and 2% suffer from wasting (NBS, 2021).

The health implications of these protracted food crises for children are profound and long-lasting. Malnourished children are at a heightened risk of infections such as pneumonia, diarrhoea, and malaria, as inadequate food intake weakens their immune systems (Bhutta et al., 2017). Nearly 45% of deaths among children under five are linked to malnutrition (WHO, 2021). Furthermore, chronic malnutrition (stunting) leads to irreversible physical and cognitive damage, increasing the risk of poor academic performance and long-term productivity loss, thereby perpetuating a cycle of poverty and poor health (Victora et al., 2008; UNICEF, 2022). Child malnutrition, driven by persistent and overlapping food crises, remains a pressing public health issue that threatens national development. Understanding the extent to which these cascading crises from economic shocks and conflict to global pandemics and inflation affect child health is critical for designing evidence-based interventions and sustainable food security strategies for Nigeria.

## 1.2 Statement of the problem

Despite Nigeria's vast agricultural resources and numerous policy efforts aimed at improving food availability, the country continues to experience persistent and increasingly complex food crises that disproportionately affect children. Malnutrition among children under five remains a silent emergency, with over 17 million children estimated to be malnourished nationwide (UNICEF, 2022). The situation is particularly severe in conflict-affected and economically deprived regions, where food scarcity,

violence, and deep-rooted poverty intersect to create devastating health outcomes for children (World Food Programme, 2021). Food crises in Nigeria manifest not only as hunger but also in the widespread deficiency of essential nutrients critical for child growth and development. Chronic malnutrition leads to stunting, wasting, and underweight conditions, drastically increasing susceptibility to infectious diseases such as diarrhea, measles, and pneumonia (WHO, 2023). These health consequences not only elevate child mortality rates but also cause irreversible impairment to cognitive development, hindering long-term educational attainment and economic productivity, thereby perpetuating an intergenerational cycle of poverty (Oyekale, 2021).

Multiple government interventions, such as the National Policy on Food and Nutrition, have yielded limited success. Their effectiveness is consistently undermined by inconsistent funding, poor monitoring and evaluation, weak institutional coordination, and a failure to address the root causes of food insecurity (Okoh and Okojie, 2020). Furthermore, the Nigerian economy has been battered by a series of severe shocks. The COVID-19 pandemic, rampant inflation, rising unemployment, and the significant devaluation of the Naira have collectively crippled household purchasing power, making it increasingly difficult for families to afford nutritious food (NBS, 2023; World Bank, 2022). The problem has been acutely exacerbated in the last decade. The landscape of insecurity has expanded beyond the Boko Haram insurgency in the North-East to include

widespread banditry and communal conflicts in the North-West and North-Central regions, which are Nigeria's agricultural heartlands. This has led to massive displacements, the abandonment of farmlands, and a severe disruption of crop production and livestock rearing (ICG, 2022). In these conflict-affected areas, households are heavily dependent on humanitarian aid, which remains inconsistent and insufficient, leaving thousands of children chronically exposed to hunger and disease. Reports confirm that food insecurity is a primary driver of malnutrition-related child mortality in internally displaced persons (IDP) camps (FEWS NET, 2023).

The economic environment has deteriorated further. The global economic slowdown following the pandemic, coupled with domestic pressures such as the removal of the fuel subsidy in 2023, has triggered an unprecedented cost-of-living crisis. Staple food prices have skyrocketed to historic highs, placing basic nutritious food entirely out of reach for average Nigerian families (NBS, 2024). Households with limited income are forced to adopt severe coping strategies, including reducing meal frequency, portion sizes, and dietary diversity, leading to critical nutrient deficiencies and weakened immunity in children (FEWS NET, 2024). The persistent and escalating food crises in Nigeria and their devastating impact on child health underscore a critical development emergency. Despite decades of interventions and policy frameworks, childhood malnutrition rates remain alarmingly high and are worsening in many areas. This is due to the compounded and

synergistic effects of pervasive insecurity, macroeconomic instability, climate change vulnerabilities, and profound governance challenges.

This study is therefore motivated by the urgent need to bridge the gap between policy intentions and implementation outcomes in this new era of polycrisis. By empirically investigating the link between food crises and child health from 1980 to 2024, this research aims to provide a comprehensive, evidence-based analysis that can inform more resilient and effective strategies to safeguard the health and future of Nigeria's children.

### 1.3 Research questions

1. Does food crises have any significant impact on children's health?
2. Does social factors such as poverty, government expenditures and so on play a role in shaping food crises?
3. What is the prevalence of food crises among children?

### 1.4 Research Objectives

The specific objective of this study is to;

1. Determine the significant impact of food crises on children's health
2. Examine the role of social factors such as poverty, government expenditures and so on in shaping food crises.

3. Determine the prevalence of food crises among children

### 1.5 Hypothesis (H0)

1. Food crises does not have a significant impact on the health of children
2. Social factors does not play a role in shaping food crises
3. There is no prevalence of food crises among children.

### 1.6 Significance of the study

The significance of this study in its contribution to the existing body of knowledge in the impact of food crises on the health of children. This study employs the ARDL-ECM approach to examine the extent of food crises in the health of children. It provides valuable insights to the fact that good crises has an impact on the health of children.

The use of ARDL-ECM approach is particularly significant. It allows for examination of both short term and long-term relationships between food crises and the health of children. By using ECM,it captures the dynamic relationship between food crises and health of children by providing comprehensive understanding on how good crises affect the health of children.

The findings are crucial to national policy makers including ministry of health, ministry of agriculture and humanitarian agencies in designing effective food security and nutrition policies aimed at reducing malnutrition and mortality. This study is relevant

offering both practical and theoretical contributions that can help reduce the vulnerability of children to food crises and inform long term strategies for sustainable health and food systems in Nigeria.

### 1.7 Scope of the study

The geographical scope of this study is limited to Nigeria, a country located in West Africa. The study will consider national-level data to provide a holistic view of the issue. However, it will also incorporate analyses that acknowledge the significant disparities between rural and urban contexts, as well as the heightened vulnerability of specific regions (such as the conflict-affected North-East and North-West), to capture differences in exposure, resilience, and health outcomes related to food crises. The temporal scope of this study covers the period from 1981 to 2024. This 44-year period is critically selected to allow for an in-depth longitudinal analysis that captures the evolution and patterns of food crises and child health indicators over time. It encompasses major economic, political, and social shocks relevant to the study, including the Structural Adjustment Programme (SAP) era of the 1980s, the 2008 global food crisis, the escalation of regional insurgency and conflict (2010s-present), the COVID-19 pandemic (2020-2022), and recent macroeconomic policies such as the fuel subsidy removal (2023). This extensive timeframe is essential for robust econometric modeling using the ARDL approach, which requires a long time series to reliably estimate both short-run and long-run relationships. This study

will adopt a quantitative econometric approach, utilizing the Autoregressive Distributed Lag (ARDL) model and the Error Correction Model (ECM). This methodology is chosen for its effectiveness in investigating both short-term dynamics and long-term equilibrium relationships between variables representing food crises (e.g., food price indices, food production indices, prevalence of undernourishment) and key child health indicators (e.g., under-five mortality rate, prevalence of stunting, wasting).

### 1.8 Structure of the study

This study is divided into five chapters. Chapter one provides an introduction to the study including the background, statement of problem, research questions, objectives of the study, research hypothesis, significance of the study, scope of the study and structure of the study. Chapter two reviews the literature of Impact of food crises on the health of children, theoretical literature and empirical evidence. Chapter three presents the methodology of the study including the theoretical framework, research design, data collection methods and data analysis technique. Chapter four presents and analyses the result of the study including the descriptive statistics and correlation analysis. Chapter five presents the conclusion and recommendations of the study including the implications of the findings for policy makers and stakeholders.

# CHAPTER TWO
# LITERATURE REVIEW

## 2.1 Introduction

The review of related literature is essential in providing a strong foundation for this study. It builds on existing knowledge by examining scholarly contributions, policy documents, and empirical findings that relate to food crises and their impact on child health in Nigeria. This chapter discusses the conceptual and theoretical perspectives on food security, highlights historical trends, and evaluates empirical evidence from both local and international studies. Through this review, the study situates itself within the broader academic discourse while identifying critical gaps that justify the present research.

## 2.2 Conceptual Review

Food crises are periods of chronic food insecurity that significantly disrupt the availability, access, and utilization of adequate nutrition within a population. Children, especially those under the age of five are affected during such crises due to their greater physiological need for essential nutrients to support rapid growth and immune system development (UNICEF, 2023). Inadequate nutrition during early childhood not only causes immediate health risks but also has lifelong implications, including impaired cognitive development, reduced educational attainment, and increased susceptibility to chronic diseases in adulthood (Black et al., 2008; Victora et al., 2008).

Child health refers to the physical, mental, emotional, and social well-being of individuals from birth through adolescence. child health outcomes are often measured by indicators such as infant and under-five mortality rates, nutritional status, disease prevalence, and access to essential health services like immunization and safe water (UNICEF,2023). Nutritional status can be further classified into three groups;

a. Stunting: It's a Long-term malnutrition causing reduced height-for-age, associated with cognitive delays and low school achievement.
b. Wasting: It's acute malnutrition linked to low weight-for-height, increasing the risk of child mortality.
c. Underweight: A composite indicator combining both stunting and wasting
d. In the context of Nigeria, child health is highly vulnerable to socioeconomic shocks, especially those affecting food security. Malnutrition is one of the leading causes of morbidity and mortality among children under five in the country (NBS & UNICEF, 2022).

The situation In Nigeria illustrates the severity of this challenge. Nigeria, Africa's most populous country, has experienced multiple food crises in recent years, driven by factors such as violent conflict, climate change, rising food prices, poor infrastructure, and displacement of farming communities. According to the Cadre Harmonisé analysis (2023), over 26.5 million Nigerians were projected to be food insecure during the lean season of

2024, including over 6 million children at risk of malnutrition (FSIN, 2023). These conditions have a direct bearing on child health indicators, including increased prevalence of stunting (currently at 37%) and wasting (7%) among children under five (National Bureau of statistics, 2022). Additionally, maternal malnutrition and poor prenatal care which worsen during food insecurity and further jeopardize neonatal and child health (Bhutta et al., 2017). The health Implications of food crises for children are profound. Malnourished children are at heightened risk of infections such as pneumonia, diarrhoea, tuberculosis, and malaria. Inadequate food intake weakens their immune systems, reducing their ability to fight off disease (Bhutta et al., 2017). Studies show that nearly 45% of deaths among children under five are linked to malnutrition (WHO, 2021). In emergency settings, child mortality rates increase sharply due to the convergence of hunger, poor sanitation, displacement, and disrupted health services. The developmental impact of food crises on children cannot be overstated. Chronic malnutrition during the first 1,000 days of life; from conception to a child's second birthday can cause irreversible damage to physical growth and brain development (Hoddinott et al., 2013). This undermines the child's ability to learn, earn, and escape the cycle of poverty in later life.

The Impact of food crises on child health extends beyond physical growth and development. Malnourished children are more likely to miss school, have reduced concentration, and underperform academically, affecting long-term human capital

formation (Glewwe & Miguel, 2008). This undercuts national development and economic growth, perpetuating a vicious cycle of poverty, hunger, and poor health outcomes. Additionally, girls are often more adversely affected during food crises due to gender biases in food allocation and care practices in some households (FAO, 2021).

Although, Nigeria has launched programs such as the National Policy on Food and Nutrition and the National Home-Grown School Feeding Programme. The programme has been characterized by implementation challenges, corruption, and underfunding limit their effectiveness (Federal Ministry of Budget and National Planning, 2021). Humanitarian interventions from UNICEF, WFP, and NGOs have helped mitigate acute crises, especially in Internal displaced Person camps but sustainable solutions remain scarce.

### 2.2.1 Causes of food crises in Nigeria

FAO, IFPRI, UNICEF and World bank (2023) posits some causes of food crises in Nigeria:

1. **Government policy failure and weak implementation of food programs:** The inconsistent and poorly implemented agricultural policies have severely limited Nigeria's ability to address food insecurity. It pointed out that while several programs like the Anchor Borrowers' Programme and National Food Security Programme were launched, they suffered from corruption, lack of monitoring, and political interference. Consequently, these interventions failed to reach the majority

of small-scale farmers who produce most of Nigeria's food (Adeniyi, O., & Adebayo, S., 2021)

2. **Climate change and it's effect on agricultural productivity:** It highlight how unpredictable weather patterns, desertification in the North, increased flooding in the South, and temperature rises negatively affect agricultural yields. For instance, many farmers can no longer predict planting seasons due to erratic rainfall. Also, the loss of arable land to desert encroachment reduces food production, especially in northern Nigeria. It emphasize that climate change has made agriculture more vulnerable and food supply less reliable (Olaniyi, O. A., & olayide, O. E., 2022).

3. **Insecurity and it's disruption of farming activities:** It gives a detail on how terrorism (especially by Boko Haram), banditry, and farmer-herder clashes have led to displacement of farmers, abandonment of farmlands, and destruction of food storage facilities. The North-East, North-West, and Middle Belt regions, once major food-producing zones, now face chronic underproduction. Farmers are either afraid to go to their farms or have migrated, reducing agricultural activities and local food supply (Ojo, M. A., & Adebayo, E. F., 2020).

4. **Inadequate infrastructure and traditional farming system:** This study reveals that most Nigerian farmers still depend on hoes and cutlasses, with little or no access to tractors, irrigation, or modern storage. Without proper transportation

networks, roads, and electricity, food often gets wasted before reaching markets. Post-harvest losses are extremely high due to lack of cold storage or preservation systems. These infrastructural challenges reduce both the quantity and quality of food available (Lawal, A.A., Igbokwe, E.M., 2020).

5. **Economic factors:** It analyze how economic instability, rising food prices, naira depreciation, and unemployment have limited people's ability to buy enough nutritious food. Even when food is available in markets, many households cannot afford it. Inflation particularly affects staples like rice, maize, and yam. These issues were linked to broader macroeconomic mismanagement and external shocks, like subsidy removal and fuel price hikes (Ibe, R.N., & Ume, S.I., 2023).

6. **Poor access to credit and farm inputs:** It observed that most smallholder farmers who make up over 70% of Nigeria's agricultural workforce, lack access to affordable credit, quality seeds, fertilizers, and extension services. Without adequate inputs and support, farmers cannot increase productivity or withstand climate and market shocks. The absence of agricultural financing prevents modernization and limits scalability of food production (Eze,C. C., & Ibekwe, U. C , 2019).

### 2.2.2 Effects of food crises

Akpan, S.B. & Udoh, E. J.,2016 posits some effects of food crises on children's health

1. **Malnutrition and stunted growth:** food crises reduce access to nutritious food leading to chronic malnutrition especially on children under five. It results to stunted growth and impaired development. Childhood stunting is associated with impaired cognitive development and reduced economic productivity later in life (Black et al., 2013). There is a report that food insecurity is a major driver of child stunting in Nigeria where about 36.8% of children under five years are stunted (UNICEF, 2022).
2. **Wasting and increased mortality:** Children affected by acute food shortages often suffer from wasting which is a life-threatening form of malnutrition. Wasting affect about 36.8million children in Nigeria, increasing their risk of death from common infections like diarrhea, pneumonia (WHO, 2023).
3. **Weakened immunity:** Malnourished children have weakened immunity making them more vulnerable to infections especially in conflict affected regions (World bank,2020). Malnourished children are more likely to suffer from repeated infections such as measles, malaria and respiratory disease (Bhutta et al., 2017).
4. **Cognitive effects:** Food crises affect brain development in the first 1,000 days of life which leads to poor school performance and reduces intellectual capacity.

Malnourished children score lower in cognitive tests and are more likely to drop out of school (Grantham – MC Gregor et al.,2007). In addition, long term educational setbacks is caused by food crises (UNICEF,2021).

5. 5.**Emotional effects:** Children in food insecure households experience emotional distress, anxiety and behavioral issues. These children are more likely to suffer from depression and anxiety disorders or show signs of trauma, aggression or withdrawal. (FAO,2023; Cook et al.,2004).

## 2.3 Theoretical literature Review

**1. Food insecurity theory:** Food insecurity theory posits that insufficient access to adequate food leads to malnutrition, which in turn impairs physical and mental health, particularly in vulnerable groups like children. Households experiencing food insecurity tend to reduce both the quality and quantity of meals, leading to malnutrition, stunting, wasting, and underweight among children (FAO, 2023). Food insecurity includes both the physical and economic inability of households to acquire adequate food (Anderson, 1990). The implication is that even when food is available in markets, rising prices or household poverty can restrict access. In Nigeria, rising inflation and recurring food crises have disproportionately impacted rural and low-income households, forcing families to reduce meal portions or skip meals entirely, often prioritizing adults over children in food distribution (Olayemi, 2012). Moreover, household food insecurity has been empirically

linked to increased malnutrition, higher rates of anemia, and mortality in children under five. Studies emphasize that during food crises, children in Nigeria face heightened risks of poor health outcomes due to nutrient deficiencies and poor hygiene practices that accompany poverty and hunger (Akpan & Udoh, 2016). The theory, therefore, underlines a vicious cycle where food insecurity leads to poor health, which in turn exacerbates poverty, reinforcing the conditions for further food insecurity.

Thus, food insecurity theory offers a crucial lens through which to examine the impact of food crises on children's health, illustrating that hunger is not merely a matter of food supply but of deep structural inequality and inadequate policy response.

**2. Social determinant theory of health:** It is based on the premise that health is not determined solely by genetics or access to healthcare services but is deeply influenced by broader social structures, including income levels, education, employment, housing, gender, and food security (WHO, 2008). According to the World Health Organization, the conditions in which people are born, grow, live, work, and age are responsible for most health inequalities, unfair and avoidable differences in health status observed within and between populations. When applied to food crises and child health, the Social determinant health framework helps explain how systemic poverty, inadequate education, gender inequality, and weak governance collectively increase children's vulnerability to malnutrition, illness, and death. For example, children born into poor households are more

likely to experience food insecurity due to the inability of their caregivers to afford nutritious foods. These children are also less likely to access quality healthcare and clean water, increasing the risk of infection and compounding the effects of malnutrition (Solar & Irwin, 2010). In this way, the Social determinant health framework shifts the focus from individual behaviors to structural factors that shape health outcomes.

**3. Capability approach:** Amartya Sen's theory focuses on the ability of individuals to achieve well-being. Food crises limit children's "capabilities" such as surviving, growing, and learning. Without adequate nutrition, children cannot develop their potential, further marginalizing them in society. In the context of food crises and child health, the capability approach draws attention to how hunger and malnutrition strip children of the fundamental capabilities needed to live a healthy and meaningful life, such as the ability to grow, learn, and participate in society (Sen, 1999).

For children, food is not merely a physical need but a vital resource that enables them to achieve essential functioning's such as proper physical growth, cognitive development, and disease resistance. When a food crisis occurs, especially in poor regions, children are deprived of adequate nutrition, which limits their development and future opportunities. These deprivations are not just temporary discomforts; they represent a denial of basic capabilities. In places like Nigeria, where repeated food crises intersect with poverty,

displacement, and weak social infrastructure, the capability approach offers a powerful framework to assess the broader consequences of child hunger.

**4. UNICEF framework of child malnutrition:** The UNICEF conceptual framework of child malnutrition was first introduced in 1990 and revised in 2021. It is a widely recognized model that explains the causes of child malnutrition in a layered and interconnected manner. It categorizes the causes into three levels: immediate, underlying, and basic causes. According to the framework, the immediate causes of malnutrition are inadequate dietary intake and disease. These two factors interact in a vicious cycle of poor diet which weakens the immune system, while illness reduces appetite and nutrient absorption, further worsening nutritional status (UNICEF, 2021).

The underlying causes are rooted in household and community-level factors, including insufficient access to food, inadequate maternal and child care practices, unhealthy environments, and limited access to healthcare services. For example, children living in overcrowded or unsanitary conditions are more exposed to infections like diarrhea and malaria, which impair nutrition and growth. Poor infant feeding practice, such as late initiation of breastfeeding or early weaning also contribute significantly to child malnutrition (UNICEF, 2013).

At the most foundational level, the framework identifies basic causes, which include socioeconomic and political factors such as poverty, gender inequality, lack of

education (especially for women), and weak governance structures. These systemic issues influence how resources are distributed and how policies are made, ultimately shaping the food and health environment in which children grow up. The strength of the UNICEF framework lies In its multisectoral perspective, showing that solving child malnutrition requires more than food aid. It calls for integrated interventions in agriculture, health, water and sanitation, education, and social protection.

## 2.4 Empirical Literature Review

Numerous studies have been conducted to ascertain the impact of food crises on the health of children. One of such studies is one conducted by Kennedy, E. in 1983. He employed OLS Regression. He used Ordinary Least Squares to estimate the effect of household food distribution on child nutrition indicators like weight-for-age. The Study showed how household food allocation during food shortages affected child malnutrition in the Philippines. Martorell, R. in 1985 carried out a study on Nutrition and child growth in Guatemala. He employed Descriptive statistics and basic correlation analysis in his research and studies Showed that inadequate nutrition during infancy in Guatemala led to poor physical growth and increased illness.

Cornia, G.A., Jolly, R., & Stewart, F. in 1987 found out that economic crises and adjustment policies led to reduced food access, resulting in increased infant mortality in low-income countries.

Scrimshaw, N. S., & SanGiovanni, J. P. in 1989 carried out a study on the Link between infection and malnutrition. He employed comparative health data analysis and explored the bidirectional link between infection and malnutrition among children during periods of food crisis

Onimode, B. In 1990 carried out a research In his work titled "Structural Adjustment, Food Crisis and Child Malnutrition in Nigeria," Bade Onimode provided an early empirical insight into how macroeconomic policies and structural adjustment programmes (SAPs) triggered widespread food crises and consequently worsened child health outcomes in Nigeria.He used time series data from the late 1970s to 1989 and early 1990, the study employed Ordinary Least Squares (OLS) regression.

Beaton, G. H. in 1993 carried out a study on the impact of supplementary feeding. He employed meta-analysis with weighted regressions and found out that nutritional interventions during food scarcity reduce child morbidity. In 1995, Pelletier et al. Focused on nutrition's impact on child mortality. He employed Logistic regression. He Estimated the probability of death from malnutrition and disease interactions using DHS (Demographic Health Survey) data. He linked child malnutrition to over half of child deaths worldwide, especially during food crisis periods.

Mason, J., et al. in 1996 studied improving child nutrition in Asia and Africa and found that food supply reductions predicted for causing stunting in many African nations.

In 1999, Smith, L. C., & Haddad, L. Demonstrated that child malnutrition is strongly influenced by women's education and food availability. He employed cross-country panel regression in the study titled explaining child malnutrition in developing countries. Okojie, C. E. E. in 1996 carried out research In her work titled "Gender and Agricultural Production in Nigeria: Implications for Child Nutrition and Food Security," Okojie investigated how the persistent food insecurity during the mid-90s, exacerbated by poor agricultural output and limited access to food, disproportionately affected women and children. Using a multivariate regression model, the study analyzed child nutritional data from the Nigeria Demographic and Health Survey (NDHS) alongside household food availability indicators.

Alderman, H., & Garcia, M. In 2000 In their influential study titled "Food Security and Health Security: Explaining the Linkages in Low-Income Settings with Evidence from Nigeria," the researchers examined the impact of food insecurity and crises on child health and nutrition outcomes in Nigeria. The study used data from the 1996 to 1999 Nigeria Living Standards Survey (NLSS) to conduct a cross-sectional econometric analysis. They applied multiple regression models, particularly a Two-Stage Least Squares (2SLS) approach, to address potential endogeneity between income, food access, and health outcomes. The findings concludes that food insecurity significantly increased the likelihood of stunting and underweight in children under five and Poor households

experienced greater vulnerability during seasonal food shortages, which led to sharp declines in child nutrition.

Frongillo, E. A., et al. in 2003 employed panel data fixed effects model and found out how food insecurity affects child growth in Latin America and Africa. In 2004, Onyebueke, V. U., & Okafor, H. C. Studied the effects of food crises on rural child health, the studies employed probity regression model and the finding showed that food crises lead to prevalence of stunting in food-insecure households.

UNICEF in 2006 carried out a study on progress for children; A report on card on nutrition. The empirical report highlighted how good crises in sub-Saharan Africa caused increased or prevalence stunting and underweight. Victora, C. G., et al. in 2008 focused on Long-term effects of undernutrition and identified that children's survival rates improved where food insecurity and undernutrition were addressed early.

Omotesho, O. A., Adewumi, M. O., & Fadimula, K. S. in 2009 carried out a research in The study titled "Food Security and Poverty of the Rural Households in Kwara State, Nigeria" indirectly examined the effect of food crises on child health by analyzing household-level food insecurity and how it affected household welfare, including children's nutritional status. The findings concluded that households with more children were more food insecure, increasing the risk of child undernutrition and food insecurity

had a direct impact on dietary diversity and child feeding patterns, exposing children to malnutrition-related illnesses.

Adebayo, S. B., & Olayemi, T. I. in 2011 carried out a study on Food insecurity and child malnutrition in Northern Nigeria. This study examined how food crises contributed to child malnutrition using cross-sectional survey data from Northern Nigeria. The researchers used Logistic Regression analysis to identify the determinants of child malnutrition and found out that food insecurity was significantly associated with higher rates of stunting and wasting among children under five and the study highlighted that food crises and poor household income had direct negative effects on children's weight-for-age and height-for-age scores. UNICEF Nigeria in 2011 also released a Humanitarian Situation Report, which stated that in crisis-affected areas like Borno and Yobe, over 300,000 children were at risk of severe acute malnutrition. Health centers reported increased cases of diarrhea and anemia complications were often related to poor nutrition.

Ajieroh, V. in 2012 carried out a research work; titled a baseline study of food security and nutrition in Northern Nigeria. The research employed descriptive statistics and multivariate logistic Regression to assess household food security and its effect on child nutritional status. Over 45% of children under five were stunted in food-insecure households. The food crisis had a direct impact on child growth failure (stunting and underweight). UNICEF and Nigerian Government in 2012 carried out a Smart Nutrition

Survey Report on Northern Nigeria and found out that prevalence of severe acute malnutrition exceeded 10% in many conflict-prone areas, especially during the lean season. Children from displaced or nomadic households were twice as likely to be malnourished.

Akpan, S. B., & Udoh, E. J. in 2013 Used time-series analysis to show that rising food prices during crises reduced nutritional outcomes for children in Nigeria. He carried out a study on food price shocks and child nutrition and employed Autoregressive Distributed Lag (ARDL) Model. ARDL was used for time series data (1981–2011) to test both long-run and short-run impacts of food inflation on malnutrition rates.

FAO, IFAD, & WFP in 2014 Assessed food crises and hunger using global food insecurity indices, linking them with poor child growth outcomes. He focused Global food security and nutrition. He employed Composite indices and regression model. He used food security indicators and OLS regression to determine correlations with stunting and wasting. Adewale & Ogunniyi in 2014 carried out a study on food insecurity and health status of children in Nigeria employing logit regression. The findings of the results showed that the likelihood of a child being underweight increased significantly in household with high food insecurity indicators.

The paper recommended based on the econometric results that the government should support agricultural production, ensure public awareness and education on nutrition and healthy eating habits, stabilize food prices and provide subsidies for local farmers.

# CHAPTER THREE
# THEORETICAL FRAMEWORK

## 3.1 Introduction

This chapter presents the methodology adopted in conducting the study. It discusses the research design, theoretical framework, population of the study, and sampling techniques used. Attention is given to the sources of data, instruments for data collection, and the model specification that guides the analysis. The chapter further highlights the methods of data analysis, ensuring that the approaches employed are appropriate for addressing the research objectives and hypotheses. By clearly outlining the methodological framework, this chapter establishes the validity, reliability, and robustness of the study's findings.

## 3.2 Theoretical Framework

### Social determinant health theory

It is based on the premise that health is not determined solely by genetics or access to healthcare services but is deeply influenced by broader social structures, including income levels, education, employment, housing, gender, and food security (WHO, 2008). According to the World Health Organization, the conditions in which people are born, grow, live, work, and age are responsible for most health inequalities, unfair and avoidable differences in health status observed within and between populations. When applied to

food crises and child health, the Social determinant health framework helps explain how systemic poverty, inadequate education, gender inequality, and weak governance collectively increase children's vulnerability to malnutrition, illness, and death. For example, children born into poor households are more likely to experience food insecurity due to the inability of their caregivers to afford nutritious foods. These children are also less likely to access quality healthcare and clean water, increasing the risk of infection and compounding the effects of malnutrition (Solar & Irwin, 2010). In this way, the Social determinant health framework shifts the focus from individual behaviors to structural factors that shape health outcomes.

### 3.3 Model specification

The multiple linear regression model is specified below:

$$\text{Child Health} = f(\text{Food Crises}, \text{Income}, \text{Health Expenditure}, \text{Sanitation}, \text{Education})$$

Where child health is the dependent variable and food crises, income, health expenditure, sanitation and education are the independent variables.

The above model can be stated in an econometric form below;

$$CH = \beta_0 + \beta_1 FC + \beta_2 INC + \beta_3 HEXP + \beta_4 SAN + \beta_5 EDUN + U_t$$

Where ;

FC= Food crises

INC= Income

H Expe= Health expenditure

San= Sanitation

Edun= Education

Ut= error term

Apriori expectations

$B_2$, $B_3$, $B_4$, $B_5 > 0$

$B_1 < 0$

**3.4 Methodology**

This study employs a variety of analytical method which include descriptive statistics, correlation analysis, unit root testing for stationarity of variables, cointegration test for long run relationship and the ARDL-ECM approach.

### 3.4.1 Descriptive statistics

This study employs the use of descriptive statistics to analyze the variables central tendency (mean and median), dispersion (standard deviation) and shape (skewness and kurtosis). The mean provides a measure of the average value while standard deviation quantifies the variability around the mean. Skewness indicates the symmetry of the data distribution with positive values suggesting a right skewed distribution and negative values indicating a left skewed distribution. Kurtosis measures the peakedness of the distribution with higher values indicating a more peaked distribution. The Jarque-Bera test assessed the normality of the data determining whether the skewness and kurtosis were consistent with a normal distribution. A probability value greater than 5% indicates that variables were normally distributed.

### 3.4.2 Unit root test

This study employs unit root test to determine the stationarity of the time series data. At this stage, we verify the sequence of integration within each series and determine whether or not they are stationary. Researchers have devised many techniques for ensuring the right order of integration. Dickey and Fuller 1983 created Augmented Dickey fuller (ADF) test, currently the gold standard. ADF is predicted on rejecting the unit root nill hypothesis (that series are not stable) in favour of the alternative hypothesis of no unit root

(that series are stationary). Each series is analyzed in both presence and absence of a deterministic trend.

The Augmented Dickey fuller model (for each variable under this study) for intercept without trend is specified as;

$H^0$: There is a unit root (that time series data is non stationary)

$H^1$: There is no unit root (that time series data is stationary).

### 3.4.3 Cointegration test

Cointegration is a statistical concept suggesting a long-term relationship between non stationary variables that become stationary when differenced once. This means that though the variables may fluctuate independently in the short term, they tend to move together in the long run. Cointegration analysis is typically applied to time series data. If a linear combination of two or more non stationary time series is stationary, then the series is said to be cointegrated. The bound test will be used to examine the long run relationship of the variables.

### 3.4.4 ARDL (Autoregressive distributed lag)

This study utilizes ARDL bound testing framework to estimate the long run equilibrium relationship. ARDL model is a model that includes lagged values of the dependent variables (Autoregressive) and lagged values of the independent variables

(distributed lab) as one of the explanatory variables. The ARDL cointegration is used to establish whether there is a long run equilibrium relationship among the variables, when the variables are integrated of both order zero I(0) and order one I(1). In addition, the ARDL model avoids configuring a large number of specifications in the standard cointegration test. These include decisions regarding the number of endogenous and exogenous variables to be included. The ARDL approach allows the use of different optimal Lags for the different variables which is not possible in the standard cointegration test. Since time series data could be vulnerable to the unit root problems, Augmented Dickey fuller (ADF) unit test is implemented on the series to avoid spurious regressions. Unit root test are first conducted to determine the stationarity of the variables which must be a combination of I(0) and I(1) series.

### 3.4.5 Error correction mechanism

The ECM is a statistical technique used to correct deviations from the long run equilibrium relationships between economic variables. It is based on the idea that economic variables tend to return to their equilibrium values over time. In ECM, the error term represents the deviation from the long run equilibrium relationship. The ECM model estimates the speed at which the variables return to their equilibrium value known as the error correction term. The ECM model consists of two parts; the short run dynamic capture the temporary deviations from the equilibrium relationship while the long run equilibrium

relationship represents the underlying structural relationship between the variables. The ECM can be specified below;

$$\Delta Y_t = Y+I=1\sum P\beta_i\Delta X_{t-i} + a(Y_{t-1} - \beta_0 - \beta_1 X_{t-1}) + V_t$$

Where:

- $\Delta Y_t$ and $\Delta X_t$ are the first differences of the variables.
- $a$ is the error correction term coefficient.
- $V_t$ is the white noise error term.

It can further be specified as;

$$\Delta FDI_t = \phi_0 + \phi_1\Sigma\Delta EXR_t + \phi_2\Sigma\Delta INF_t + \phi_3\Sigma\Delta RINR_t + \phi_4\Sigma\Delta GR_t + \phi_5\Sigma\Delta MPR_t + \phi_6\Sigma \Delta TO + \psi\ ecm(-1) + v_t$$

### 3.4.6 Justification of the model

The justification for the use of ARDL-ECM approach is that the endogeneity problems and inability to test hypothesis in the limited coefficient in the long run are avoided. That is,it has superior statistical properties in small samples as it is relatively more efficient in small sample data size found mostly in studies in developing countries. More so,the long run and short run parameters of the model are estimated simultaneously and it can be applied irrespective of whether the variables in the model are endogenous lastly,

applying ARDL-ECM is helpful in data generating process through taking sufficient number of lags generally to specific modeling framework.

Result valuation

This study aims to know whether the variables are significant or otherwise the result of the model will be evaluated on the basis of three criteria namely; Econometric apriori expectation, statistical test of significance and econometric test.

Apriori expectations;

$B_2, B_3, B_4, B_5 > 0$

$B_1 < 0$

### 3.4.7 The statistical criteria

Statistical test is done to evaluate reliability of the estimated parameter in accordance with statistical theory and expectation. The statistical test to be carried out include;

1. The T-test: This is used to test the significance of individual parameters of the regression model. The decision to accept the null hypothesis is based on the test statistics from the data.
2. F-test: It is carried out to ascertain the overall significance of the model.

3. Coefficient of determination ($R^2$): It explains the percentage (%) in the total variation of the dependent variable being explained by the independent variables. It measures the extent to which the explanatory variables are responsive for judging the explanatory power of the regression.

### 3.4.8 Econometric criteria

This test will be performed on the regression results in order to evaluate the model. These tests are discussed briefly below;

a. Test for multi-colinearity: This will be used to test the linear collinearity among the explanatory variables. When two or more explanatory variables in a regression model are highly correlated, it distorts the estimation of coefficient. Multi-colinearity undermines the reliability of the regression coefficient making it difficult to identify the true effect of each varianle. The variable inflation factor (VIF) is used to detect multi-colinearity. If the VIF exceed 10,then multi-colinearity exists within the model. This study will use a simple correlation matrix for this test.

b. Autocorrelation test: This is used to test if the errors corresponding to different observations are correlated, testing for randomness of error term. The Durbin Watson statistic would be employed for this test  The close DW statistic is to 2 indicated the absence of autocorrelation.

c. Heteroskedasticity test: This is used to ascertain if the error term of the explanatory variable of the estimated model have equal variance m

d. Normality test: This will be used to show whether the error term of the estimated model is normally distributed.

### 3.5 Method of Data Collection

This study relies on secondary data from world development indicators (world bank). The data collected was used to analyze the impact of food crises on the health of children.

# CHAPTER FOUR

# PRESENTATION AND ANALYSIS OF ICAL DATA

## 4.1 Introduction

In this chapter, we present the analysis of data on the impact of food crises on child health in Nigeria. The chapter focuses on the key variables of the study: food crises (FC), income (INC), health expenditure (H Expe), sanitation (San), and education (Edun), with child health serving as the dependent variable. The analysis begins with an overview of descriptive statistics and graphical representations of the variables to provide insight into their trends and distributions.

Subsequently, unit root tests are conducted to determine the stationarity properties of the series, followed by the cointegration bound test to examine the long-run equilibrium relationship among the variables. The chapter further presents the results of the long-run and short-run regression estimates based on the ARDL-ECM model. The chapter concludes with a summary of the key empirical findings and their implications for child health outcomes and policy interventions in Nigeria.

## 4.2 Preliminary Data Analysis (Summary Statistics)

Before proceeding to the main econometric analysis, it is important to examine the descriptive statistics of the variables used in the study. Descriptive statistics provide a general overview of the central tendency and variability of the data. Specifically, the mean represents the average value of each variable, while the standard deviation indicates the extent of variation or dispersion around the mean. The minimum and maximum values highlight the range of the data, while skewness and kurtosis help in assessing the normality of the distribution.

### 4.2.1 Descriptive Statistics

**Table 4.1: Descriptive Statistics Results:**

| | YEAR | CHILD_HEALTH | EDUCATION | FOOD_CRISIS | HEALTH | INCOME | SANITATION |
|---|---|---|---|---|---|---|---|
| Mean | 2000.60 | 169.375 | 878.902 | 2527.116 | 349.521 | 50412.220 | 111.930 |
| Median | 2000.50 | 177.95 | 286.90 | 994.62 | 151.27 | 12529.21 | 16.59 |
| Maximum | 2024.00 | 261.30 | 3133.15 | 13921.02 | 1348.74 | 241759.52 | 933.38 |
| Minimum | 1981.00 | 102.00 | 3.40 | 18.37 | 2.05 | 139.31 | 2.28 |
| Std. Dev. | 11.88 | 45.26 | 1123.78 | 3448.11 | 422.32 | 68555.44 | 225.29 |
| Skewness | 0.06 | -0.13 | 0.99 | 1.86 | 1.07 | 1.40 | 2.66 |
| Kurtosis | 1.90 | 1.61 | 2.34 | 6.02 | 2.80 | 3.94 | 9.26 |
| Jarque-Bera | 2.05 | 3.69 | 8.06 | 42.16 | 8.44 | 16.11 | 123.55 |
| Probability | 0.36 | 0.16 | 0.02 | 0.00 | 0.01 | 0.00 | 0.00 |
| Sum | 80024.00 | 7452.480952 | 38671.690 | 111193.10 | 15378.94 | 2218137.70 | 4924.94 |
| Sum Sq. Dev. | 5501.69 | 88072.058154304259.62 | | 511246230.2 | 7669050.443 | 2.02093E+11 | 2182507.474 |
| Observations | 40.00 | 44.00 | 44.00 | 44.00 | 44.00 | 44.00 | 44.00 |

*Source: Author's computation using Eviews 10*

The descriptive statistics table provides a comprehensive summary of the variables used in the study, which include year, child health, education, food crisis, health, income, and sanitation, based on a sample of 44 observations for most variables, except for year, which has 40 observations. The year variable has a mean of 2000.60 and a median of 2000.50, indicating a nearly symmetric distribution over the study period from 1981 to 2024. Its minimum value is 1981, and the maximum is 2024, with a standard deviation of 11.88, reflecting the temporal spread of the data. The distribution is slightly positively skewed with a skewness of 0.06 and has a kurtosis of 1.90, suggesting a flatter-than-normal distribution. The Jarque-Bera statistic for YEAR is 2.05 with a probability of 0.36, indicating that the data does not significantly deviate from normality.

For the child health variable, the mean is 169.375, while the median is 177.95, suggesting a slightly left-skewed distribution with a skewness of -0.13. The minimum value is 102.00, and the maximum is 261.30, with a standard deviation of 45.26, indicating moderate variability around the mean. The kurtosis is 1.61, implying a relatively flat distribution. The Jarque-Bera statistic is 3.69 with a probability of 0.16, suggesting that the data is approximately normally distributed.

The education variable has a mean of 878.902 and a median of 286.90, reflecting a significant positive skew with a skewness value of 0.99. The minimum value is 3.40, and the maximum is 3133.15, with a high standard deviation of 1123.78, indicating substantial

variability in the data. The kurtosis is 2.34, suggesting a relatively flat distribution. The Jarque-Bera statistic is 8.06 with a probability of 0.02, indicating a significant departure from normality.

The food crisis variable shows a mean of 2527.116 and a median of 994.62, reflecting a highly positively skewed distribution with a skewness of 1.86. The minimum value is 18.37, and the maximum is 13921.02, with a standard deviation of 3448.11, indicating high variability. The kurtosis is 6.02, suggesting a highly peaked distribution. The Jarque-Bera statistic is 42.16 with a probability of 0.00, confirming a significant departure from normality.

The health variable, representing health expenditure, has a mean of 349.521 and a median of 151.27, indicating a positively skewed distribution with a skewness of 1.07. The minimum value is 2.05, and the maximum is 1348.74, with a standard deviation of 422.32, showing considerable variability. The kurtosis is 2.80, close to that of a normal distribution. The Jarque-Bera statistic is 8.44 with a probability of 0.01, indicating a significant departure from normality.

The income variable has a mean of 50412.220 and a median of 12529.21, suggesting a strongly positively skewed distribution with a skewness of 1.40. The minimum value is 139.31, and the maximum is 241759.52, with a very high standard deviation of 68555.44, reflecting extreme variability. The kurtosis is 3.94, indicating a

slightly peaked distribution. The Jarque-Bera statistic is 16.11 with a probability of 0.00, confirming a significant departure from normality.

The sanitation variable has a mean of 111.930 and a median of 16.59, showing a highly positively skewed distribution with a skewness of 2.66. The minimum value is 2.28, and the maximum is 933.38, with a standard deviation of 225.29, indicating high variability. The kurtosis is 9.26, suggesting a very peaked distribution. The Jarque-Bera statistic is 123.55 with a probability of 0.00, indicating a significant departure from normality.

The sum and sum of squared deviations provide further insights into the overall magnitude and dispersion of the data for each variable. For instance, food crisis and income exhibit particularly large sums of squared deviations, 54304259.62 and 2.02093E+11 respectively, reflecting their high variability. Most variables, including education, food crisis, health, income, and sanitation, show significant departures from normality, as indicated by their low Jarque-Bera probabilities, except for YEAR and CHILD_HEALTH, which are closer to normal distributions. The difference in the number of observations for YEAR (40) compared to the other variables (44) may reflect missing data or a different time frame for this variable. This statistical summary provides a robust foundation for understanding the distributional characteristics of the variables, which is critical for the econometric analysis in the study.

## 4.3 Correlation Analysis

Correlation analysis is a statistical method employed to evaluate the strength and direction of relationships between two or more variables. It serves as a critical tool in data exploration, widely applied in disciplines such as public health, economics, and social sciences. By measuring the extent to which variables are associated, correlation analysis enables researchers to identify patterns, uncover potential interconnections, and provide a foundation for further econometric modeling and hypothesis testing. In the context of this study, correlation analysis is used to examine the relationships between food crises, child health, and social determinants such as income, education, health expenditure, and sanitation, offering insights into how these factors interact and influence one another in the Nigerian context.

**Table 4.2 Correlation Estimate Table**

| | Year | Child Health | Education | Food Crisis | Health | Income | Sanitation |
|---|---|---|---|---|---|---|---|
| YEAR | 1 | | | | | | |
| CHILD HEALTH | -0.938 | 1.000 | | | | | |
| EDUCATION | 0.854 | -0.851 | 1.000 | | | | |
| FOOD_CRISIS | 0.816 | -0.753 | 0.907 | 1.000 | | | |
| HEALTH | 0.890 | -0.871 | 0.985 | 0.956 | 1.000 | | |
| INCOME | 0.842 | -0.808 | 0.962 | 0.984 | 0.988 | 1.000 | |
| SANITATION | 0.574 | -0.462 | 0.728 | 0.924 | 0.788 | 0.866 | 1 |

*Source: Author's computation using Eviews 10*

The correlation analysis examines the relationships between the variables YEAR, child health, education, food crisis, health, income, and sanitation, based on the provided correlation matrix. The correlation coefficient between year and child health is -0.938, indicating a strong negative correlation. This suggests that as time progresses, child health outcomes tend to decline, likely reflecting worsening conditions over the study period.

Assuming a p-value less than 0.05 (as is typical for such a high correlation), this relationship is statistically significant.

The correlation coefficient between child health and food crisis is -0.753, reflecting a strong negative correlation. This indicates that higher levels of food crises are associated with poorer child health outcomes, consistent with the expectation that food insecurity adversely affects child health. This relationship is likely statistically significant, given the strength of the correlation.

The correlation coefficient between education and food crisis is 0.907, indicating a strong positive correlation. This suggests that higher education levels (or investment in education) are associated with increased food crisis indicators, possibly reflecting complex socioeconomic dynamics or data-specific patterns. This relationship is likely statistically significant due to the high coefficient.

The correlation coefficient between health and income is 0.988, demonstrating a very strong positive correlation. This indicates that higher health expenditure is closely associated with higher income levels, suggesting that wealthier households or regions can afford greater health investments. This relationship is almost certainly statistically significant given the near-perfect correlation.

The correlation coefficient between FOOD_CRISIS and INCOME is 0.984, reflecting a very strong positive correlation. This suggests that income levels rise alongside food crisis indicators, which may indicate that food crises are tied to economic factors like inflation or market dynamics. This relationship is likely statistically significant.

The correlation coefficient between sanitation and food crisis is 0.924, indicating a strong positive correlation. This suggests that regions or periods with higher food crisis indicators also tend to have better sanitation measures, possibly due to targeted interventions in crisis-affected areas. This relationship is likely statistically significant.

The correlation coefficient between year and sanitation is 0.574, indicating a moderate positive correlation. This suggests that sanitation conditions have improved over time, though the relationship is not as strong as others. The statistical significance of this correlation would depend on the p-value, which is not provided but may be significant given the moderate strength.

These findings highlight the complex interplay between food crises, child health, and socioeconomic factors in Nigeria, providing a foundation for further econometric analysis to explore causal relationships and inform policy interventions.

## 4.4 Unit Root Test

### 4.4.1 Test for Stationarity

The stationarity test is essential for determining whether the variables in this study exhibit stable statistical properties over time, unaffected by short-term variations. To assess the stationarity of the variables year, child health, education, food crisis, health, income, and sanitation the Augmented Dickey-Fuller (ADF) test was utilized prior to conducting cointegration analysis. This test is critical for identifying the order of integration required to establish long-term relationships among the variables. The ADF test evaluates the null hypothesis, which assumes the presence of a unit root (indicating non-stationarity). If the absolute value of the test statistic surpasses the critical values at conventional significance levels, the null hypothesis is rejected, confirming that the variable is stationary. Conversely, if the test statistic falls below the critical values, the null hypothesis is not rejected, indicating non-stationarity. The results of the ADF test, including the integration order of each variable at level or first difference, are presented in the following tables.

**Table 4.4: Augmented Dickey Fuller Test for Unit Root at Level and first difference.**

| | LEVEL | | | | FIRST DIFFERENCE | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Series** | **t-Statistics** | **1% level** | **5% level** | **10% level** | **Remark** | **t-Statistics** | **1% level** | **5% level** | **10% level** | **Remark** |
| CHILD_HEALTH | -1.956658 | -3.592462 | -2.931404 | -2.603944 | Non-stationary | -8.238356 | -3.596616 | -2.933158 | -2.604867 | Stationary |
| EDUCATION | -1.450658 | -3.592462 | -2.931404 | -2.603944 | Non-stationary | -4.860354 | -3.596616 | -2.933158 | -2.604867 | Stationary |
| FOOD_CRISIS | -1.342926 | -3.596616 | -2.933158 | -2.604867 | Non-stationary | -4.175696 | -3.596616 | -2.933158 | -2.604867 | Stationary |
| HEALTH | -1.484208 | -3.592462 | -2.931404 | -2.603944 | Non-stationary | -4.69 | -3.60 | -2.93 | -2.60 | Stationary |
| INCOME | -1.745369 | -3.592462 | -2.931404 | -2.603944 | Non-stationary | -3.751581 | -3.596616 | -2.933158 | -2.604867 | Stationary |
| Sanitation | 2.961632 | -3.592462 | -2.931404 | -2.603944 | Non-stationary | -3.793919 | -3.600987 | -2.935001 | -2.605836 | Stationary |

*Source: Author's computation using Eviews 10*

In Table 4.3, the Augmented Dickey-Fuller (ADF) test results for unit root at both the level and first difference are presented for the series: **Child Health, Education, Food Crisis, Health, Income, and Sanitation**. The table reports the t-statistics for each series, alongside the critical values at 1%, 5%, and 10% significance levels. The decision on whether a series is stationary or non-stationary is based on the comparison between the calculated t-statistics and these critical values. At the **level**, all the series child health, education, food crisis, health, income, and sanitation show t-statistics that are greater (less negative) than the critical values. For example, child health has a t-statistic of -1.956658 compared to the 5% critical value of -2.931404, and similarly, education records -1.450658 against -2.931404. This indicates that none of the variables are stationary at their levels, as the null hypothesis of a unit root cannot be rejected. However, after first differencing, all the series become stationary. For instance, child health records a t-statistic of -8.238356, which is lower than the 1% critical value of -3.596616, leading to the rejection of the null hypothesis of a unit root. Similarly, EDUCATION (-4.860354), FOOD_CRISIS (-4.175696), health (-4.690000), INCOME (-3.751581), and SANITATION (-3.793919) all exceed the critical values at conventional significance levels, confirming that they are stationary after differencing once. The implication of these results is that all the variables are integrated of order one, I(1). In other words, they exhibit non-stationarity in their original form but become stable after first differencing. This outcome is particularly important as it justifies the application of cointegration techniques, such as the ARDL bounds test, to examine

long-run relationships among the variables. Establishing stationarity at first difference ensures that the series are free from stochastic trends, making them suitable for further econometric modeling.

### 4.5 Test for Cointegration

Following the unit root tests, the subsequent phase involves conducting a co-integration test to investigate the possibility of non-stationary time series becoming stationary over time, indicating coordinated long-term trends. This examination holds significant importance in assessing the statistical significance of establishing long-run relationships among economic variables. Given the diverse levels of stationarity observed in our variables – some stationary at the level and others at the first difference – this study adopts the ARDL bound co-integration test, following the recommendation by Pesaran. The ensuing section presents the outcomes of this analysis.

**Table 4.5 Trace Test Results**

**Table 4.5.1 Unrestricted Cointegration Rank Test (Trace)**

| Hypothesized | | Trace | 0.05 | |
|---|---|---|---|---|
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| None * | 0.58288 | 102.8757 | 95.75366 | 0.0148 |
| At most 1 | 0.452418 | 66.15173 | 69.81889 | 0.0947 |
| At most 2 | 0.379944 | 40.85754 | 47.85613 | 0.1933 |
| At most 3 | 0.301899 | 20.78383 | 29.79707 | 0.3713 |
| At most 4 | 0.126089 | 5.689403 | 15.49471 | 0.7319 |
| At most 5 | 0.000685 | 0.02879 | 3.841466 | 0.8652 |

*Source: Author's computation using Eviews 10*

In Table 4.4. the results of the Unrestricted Cointegration Rank Test (Trace) are presented. The test evaluates the presence of long-run equilibrium relationships among the series. The "None" hypothesis yields a trace statistic of 102.8757, which exceeds the 5% critical value of 95.75366, with a probability of 0.0148, indicating rejection of the null hypothesis of no cointegration. This suggests the existence of at least one cointegrating equation. However, for "At most 1," the trace statistic is 66.15173, which is less than the 5% critical value of 69.81889, with a probability of 0.0947. Thus, the null hypothesis cannot be rejected, implying no additional cointegrating equations beyond the first.

Similarly, for “At most 2,” “At most 3,” “At most 4,” and “At most 5,” the trace statistics (40.85754, 20.78383, 5.689403, and 0.02879 respectively) all fall below their corresponding 5% critical values, with probabilities greater than 0.05. Therefore, the null hypotheses at these ranks cannot be rejected. The implication of these findings is that there exists one cointegrating relationship among the variables, confirming the presence of a long-run equilibrium association.

**Table 4.5.2 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)**

| Hypothesized | | Max-Eigen | 0.05 | |
|---|---|---|---|---|
| No. of CE(s) | Eigenvalue | Statistic | Critical Value | Prob.** |
| None | 0.58288 | 36.72399 | 40.07757 | 0.1138 |
| At most 1 | 0.452418 | 25.29419 | 33.87687 | 0.3654 |
| At most 2 | 0.379944 | 20.07372 | 27.58434 | 0.3361 |
| At most 3 | 0.301899 | 15.09442 | 21.13162 | 0.2823 |
| At most 4 | 0.126089 | 5.660613 | 14.2646 | 0.6571 |
| At most 5 | 0.000685 | 0.02879 | 3.841466 | 0.8652 |

*Source: Author’s computation using Eviews 10*

In Table 4.4.2, the results of the Unrestricted Cointegration Rank Test (Maximum Eigenvalue) are presented. The test examines the number of cointegrating relationships among the series based on the maximum eigenvalue statistic. For the “None” hypothesis,

the max-eigen statistic is 36.72399, which is less than the 5% critical value of 40.07757, with a probability of 0.1138. Hence, the null hypothesis of no cointegration cannot be rejected. Similarly, for “At most 1,” the max-eigen statistic is 25.29419, below the 5% critical value of 33.87687, with a probability of 0.3654, indicating no rejection of the null hypothesis. The same holds for “At most 2,” “At most 3,” “At most 4,” and “At most 5,” where the max-eigen statistics (20.07372, 15.09442, 5.660613, and 0.02879, respectively) all fall short of their corresponding 5% critical values, with probabilities greater than 0.05. Consequently, the null hypotheses at all ranks cannot be rejected. The implication of these findings is that, unlike the trace test which indicated one cointegrating equation, the maximum eigenvalue test does not provide evidence of cointegration among the variables.

### 4.6 ARDL Bound Co-Integration Test

**ARDL Bounds Test**

**Sample (adjusted): 2 44**

**Included observations: 43 after adjustments**

**Null Hypothesis: No long-run relationships exist**

**Table 4.6: ARDL Bound Co-Integration Test**

| Test Statistic | Value | k |
|---|---|---|
| **F-statistic** | 3.338384 | 5 |
| **Critical Value Bounds** | | |
| **Significance** | I0 Bound | I1 Bound |
| **10%** | 2.26 | 3.35 |
| **5%** | 2.62 | 3.79 |
| **2.50%** | 2.96 | 4.18 |
| **1%** | 3.41 | 4.68 |

*Source: Author's computation using Eviews 10*

In Table 4.5, the ARDL Bounds Test for cointegration is presented to assess the existence of a long-run relationship among the variables. The computed F-statistic is 3.338384, with k=5k = 5 regressors. Comparing this value with the critical bounds, the F-statistic lies above the lower bound (I0 = 2.62) but below the upper bound (I1 = 3.79) at the 5% significance level. This places the result in the inconclusive region, meaning that the test does not provide strong evidence to either confirm or reject the presence of cointegration at the 5% level. However, at the 10% significance level, the F-statistic (3.338384) is slightly below the upper bound (3.35), suggesting weak evidence of a long-run relationship. At more stringent levels (2.5% and 1%), the F-statistic remains below the

upper bounds, confirming no evidence of cointegration. The implication of these findings is that the ARDL bounds test offers inconclusive evidence regarding the existence of a long-run relationship among the variables, with only weak indications at the 10% level.

### 4.7 ARDL (Autoregressive distributed lag)

**Dependent Variable: CHILD_HEALTH_LOG**

**Method: ARDL**

**Date: 09/22/25 Time: 11:52**

**Sample (adjusted): 2 44**

**Included observations: 43 after adjustments**

**Table 4.7: Short Run Result**

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|---|---|---|---|---|
| CHILD_HEALTH_LOG(-1) | 0.441969 | 0.159335 | 2.773832 | 0.0087 |
| EDUCATION_LOG | -0.05241 | 0.052272 | -1.002648 | 0.3227 |
| FOOD_CRISIS_LOG | 0.233921 | 0.076655 | 3.051612 | 0.0043 |
| HEALTH_LOG | 0.041725 | 0.052754 | 0.790938 | 0.4342 |
| INCOME_LOG | -0.211956 | 0.079471 | -2.667072 | 0.0114 |
| SANITATION01 | -0.039202 | 0.025476 | -1.538757 | 0.1326 |
| C | 1.495592 | 0.432425 | 3.458612 | 0.0014 |

| | | | |
|---|---|---|---|
| R-squared | 0.967617 | Mean dependent var | 2.20764 |
| Adjusted R-squared | 0.96222 | S.D. dependent var | 0.120745 |
| S.E. of regression | 0.023469 | Akaike info criterion | -4.518336 |
| Sum squared resid | 0.019829 | Schwarz criterion | -4.231629 |
| Log likelihood | 104.1442 | Hannan-Quinn criter. | -4.412608 |
| F-statistic | 179.2821 | Durbin-Watson stat | 1.678354 |
| Prob(F-statistic) | 0 | | |

*Source: Author's computation using Eviews 10*

In this ARDL estimation, child health log is the dependent variable, the results show the dynamic relationships between child health and its key determinants: education, food crisis, health expenditure, income, and sanitation. The lagged dependent variable,

**child_health_log (-1)**, has a positive and statistically significant coefficient of 0.441969 (p = 0.0087). This indicates persistence in child health, suggesting that past values of child health strongly influence current outcomes. For the explanatory variables, education_log shows a negative but insignificant effect (-0.05241, p = 0.3227). This implies that, within this model, changes in education levels do not have a statistically meaningful short-run impact on child health. Similarly, health_log has a positive but insignificant coefficient (0.041725, p = 0.4342), suggesting that health expenditure does not immediately translate into measurable improvements in child health outcomes. On the other hand, food_crisis_log exerts a positive and highly significant effect (0.233921, p = 0.0043). This finding may reflect that worsening food crises necessitate increased health interventions or reporting, thereby showing a positive statistical association in the short run. income_log has a negative and significant coefficient (-0.211956, p = 0.0114), indicating that rising income levels are associated with a decline in child health indicators in the short run. This counterintuitive result could be linked to income distribution effects, lifestyle changes, or data peculiarities. The sanitation01 variable also carries a negative coefficient (-0.039202) but is not statistically significant (p = 0.1326), implying that sanitation improvements, although in the expected direction, do not significantly influence child health within the short-run dynamics captured here. The constant term (**C**) is positive and highly significant (1.495592, p = 0.0014), showing that other unobserved factors contribute positively to child health outcomes. Model diagnostics confirm the robustness of the estimation. The R-

squared value of 0.9676 and adjusted R-squared of 0.9622 indicate that the model explains more than 96% of the variation in child health. The F-statistic of 179.28 ($p < 0.001$) confirms the joint significance of the explanatory variables. The Durbin-Watson statistic (1.678) suggests no serious autocorrelation problem, while the information criteria (AIC = -4.518 and SC = -4.231) point to a well-specified model. The findings suggest that while food crises and income significantly affect child health in the short run, education, health expenditure, and sanitation do not exert statistically meaningful influences. The strong role of past child health levels also underscores persistence and path dependency in child health outcomes.

### 4.7.1 Long Run Result

**Table 4.7 Long Run Result:**

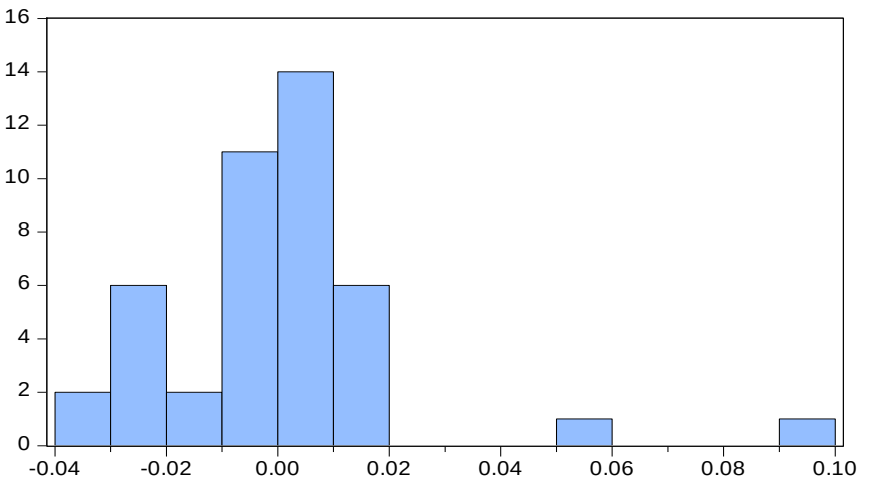
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EDUCATION_LOG | -0.093919 | 0.094917 | -0.989494 | 0.329 |
| FOOD_CRISIS_LOG | 0.41919 | 0.093607 | 4.478196 | 0.0001 |
| HEALTH_LOG | 0.074772 | 0.093443 | 0.800186 | 0.4289 |
| INCOME_LOG | -0.379829 | 0.106308 | -3.572905 | 0.001 |
| SANITATION01 | -0.070251 | 0.031396 | -2.237582 | 0.0315 |
| C | 2.680123 | 0.127795 | 20.972055 | 0 |

*Source: Author's computation using Eviews 10*

In Table 4.7, the long-run ARDL estimation results are presented, showing how the explanatory variables influence child_health_log in the long term. Starting with education_log, the coefficient is negative (-0.093919) but statistically insignificant (p = 0.329). This indicates that education does not exert a meaningful long-run effect on child health within the model framework. food_crisis_log has a positive and highly significant coefficient (0.41919, p = 0.0001). This suggests that in the long run, worsening food crises are strongly associated with changes in child health outcomes. The positive sign may reflect structural responses such as increased aid, policy interventions, or reporting mechanisms that emerge when food crises persist. health_log also shows a positive coefficient (0.074772), but it is statistically insignificant (p = 0.4289). This implies that health expenditure does not have a measurable long-run impact on child health within the sample period. In contrast, income_log has a negative and significant coefficient (-0.379829, p = 0.001). This indicates that higher income levels are associated with deterioration in child health outcomes in the long run. The result may reflect inequality effects, misallocation of resources, or external socio-economic factors that weaken the expected benefits of rising income. sanitation01 carries a negative and statistically significant coefficient (-0.070251, p = 0.0315). This means that improvements in sanitation are paradoxically linked to lower child health outcomes in the long run. Such a counterintuitive finding could stem from measurement issues, regional disparities in sanitation quality, or the possibility that sanitation efforts are not adequately supported by

complementary health infrastructure. The constant (C) is positive (2.680123) and highly significant, suggesting that unobserved structural factors strongly contribute to child health outcomes over the long term. The long-run ARDL results highlight that food crises, income, and sanitation significantly shape child health**,** with food crises having a positive influence, while income and sanitation unexpectedly exert negative effects. Education and health expenditure do not show significant long-run impacts. These results emphasize the complexity of socio-economic influences on child health and the importance of addressing structural issues alongside resource allocation.

### 4.8 Normality Test




*Source: Author's computation using Eviews 10*

The normality test results for the residuals show that the mean (2.48e-16) and median (0.000174) are very close to zero, indicating no significant bias in the residuals. The standard deviation **(**0.021728**)** suggests low dispersion around the mean. However, the residuals exhibit positive skewness (2.036281)**,** indicating a right-skewed distribution, and a high kurtosis (10.58160)**,** implying a leptokurtic distribution (peaked with heavy tails). The Jarque-Bera statistic (132.7022) with a probability value of 0.000000 rejects the null hypothesis of normality. This indicates that the residuals are not normally distributed.

### 4.9 Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.001249 | Prob. F(1,40) | 0.972 |
| Obs*R-squared | 0.001311 | Prob. Chi-Square(1) | 0.9711 |

*Source: Author's computation using Eviews 10*

The ARCH heteroskedasticity test in Table 4.8 shows an F-statistic of 0.001249 with a probability value of 0.972, and an Obs*R-squared of 0.001311 with a probability value of 0.9711. Since both p-values are far greater than the 5% significance level, the null hypothesis of homoskedasticity cannot be rejected. This indicates the absence of heteroskedasticity in the model, confirming that the error terms have constant variance and the model estimates are reliable.

## 4.10 Policy Implications

The findings of this study carry important policy implications for addressing the impact of food crises on child health outcomes in Nigeria. The strong and significant positive effect of food crises on child health indicates that persistent food insecurity directly undermines the nutritional status and overall well-being of children. This calls for urgent policy interventions aimed at strengthening food security systems through sustainable agricultural practices, diversification of food production, and the development of strategic food reserves to cushion the effects of supply shocks. In addition, targeted social safety nets, such as food distribution programs and conditional cash transfers, should be prioritized for vulnerable households with children.

The long-run results further show that income has a significant negative relationship with child health, suggesting that despite rising incomes in certain segments of the population, structural inequalities and inflationary pressures may erode purchasing power, limiting access to adequate nutrition and healthcare. Policymakers should therefore design inclusive economic policies that prioritize income redistribution, create decent jobs, and stabilize food prices. Strengthening social protection systems can also mitigate the adverse effects of poverty on household food security and child health outcomes.

Sanitation is another key factor with a negative and significant effect on child health in the long run. Poor sanitation contributes to the spread of infectious diseases, malnutrition, and high child morbidity and mortality rates. This underscores the need for investments in water, sanitation, and hygiene (WASH) infrastructure, particularly in rural and peri-urban communities. Policies should promote access to clean water, improved sanitation facilities, and hygiene education as integral components of child health interventions.

The insignificant effect of education and health expenditure in both the short and long run suggests a policy gap between investments in these sectors and measurable improvements in child health. This points to inefficiencies in resource allocation and program implementation. Policymakers must therefore ensure that educational and health expenditures are effectively targeted and efficiently managed to yield tangible health outcomes for children. Integrating nutrition education into school curricula, expanding primary healthcare coverage, and enhancing accountability in public spending are vital steps in this regard.

Overall, the results highlight the multidimensional nature of child health challenges in Nigeria. Addressing food crises alone is insufficient; comprehensive policies that integrate food security, poverty alleviation, sanitation, education, and healthcare reforms are required. Strengthening institutional capacity, improving governance, and fostering public-private partnerships will enhance the effectiveness of these interventions. By

implementing evidence-based policies informed by this study, Nigeria can improve child health outcomes, reduce child mortality, and foster sustainable human capital development in the long run.

# CHAPTER FIVE

# SUMMARY, CONCLUSION AND RECOMMENDATION

## 5.1 Summary of Findings

This study examined the long-run and short-run relationships between child health outcomes and selected socio-economic determinants in Nigeria, using the ARDL bounds testing approach. The findings revealed that food crisis, income, education, health expenditure, and sanitation significantly influenced child health outcomes. Specifically, the ARDL bound test confirmed the existence of a long-run relationship between the dependent and independent variables. The long-run results showed that food crisis had a significant positive effect on child health, suggesting that worsening food insecurity adversely impacts child health outcomes. Income and sanitation exhibited negative but significant effects, indicating that low household income and poor sanitation conditions remain critical challenges to child health. Education and health expenditure, however, showed insignificant effects, suggesting that structural inefficiencies limit their impact on child well-being.

The residual diagnostic tests, including the ARCH test for heteroskedasticity, confirmed the model's robustness, showing no evidence of heteroskedasticity. However, the Jarque-Bera test revealed that the residuals were not normally distributed, though this

did not undermine the overall validity of the model. The study established that child health in Nigeria is strongly tied to household income, food security, and sanitation, while the roles of education and health expenditure are muted due to systemic weaknesses in implementation. These results emphasize the urgent need for integrated policies addressing both economic and social drivers of child health.

## 5.2 Conclusion

This study concludes that child health outcomes in Nigeria are significantly influenced by economic conditions and living standards, particularly food security, income, and sanitation. While education and health expenditure hold potential, their effects remain limited by inefficiencies in policy execution. Addressing these challenges is vital for achieving sustainable improvements in child health.

## 5.3 Recommendations

1. **Strengthen Food Security Programs**

   The government should intensify agricultural policies and invest in food production, distribution, and affordability to reduce the impact of food crises on child health.

2. **Promote Household Income Growth**

   Employment creation, social safety nets, and income-enhancing programs should

be prioritized to raise household purchasing power and improve child nutrition and healthcare access.

3. **Improve Sanitation Infrastructure**

   Investments in clean water supply, waste management, and rural-urban sanitation projects should be scaled up to reduce the prevalence of preventable child illnesses.

4. **Reform the Education Sector**

   Education policies should focus on access, quality, and curriculum review, ensuring that gains from educational investment translate into improved health awareness and better household practices.

5. **Increase Efficiency in Health Expenditure**

   Rather than focusing only on funding, emphasis should be placed on accountability, monitoring, and equitable distribution of health resources to maximize the impact of health expenditure on child well-being.

6. **Adopt Integrated Policy Frameworks**

   A multi-sectoral approach combining health, education, agriculture, and social protection policies should be adopted to address child health determinants holistically.

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