THE IMPACT OF HEALTH EXPENDITURE ON MATERNAL MORTALITY IN NIGERIA

BY

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BEING A PROJECT SUBMITTED TO THE DEPARTMENT OF ECONOMICS, FACULTY OF SOCIAL SCIENCES, UNIVERSITY OF BENIN, BENIN CITY. IN PARTIAL FULFILLMENT FOR THE AWARD OF BACHELOR OF SCIENCE (B.Sc) DEGREE IN ECONOMICS, UNIVERSITY OF BENIN, BENIN CITY.

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CERTIFICATION

This is to certify that this research work was carried out by OLISE ISIOMA LISA with the matriculation number SSC2105600 of the Department of Economics, Faculty of Social Sciences, University of Benin, Benin City, Edo State, Nigeria.

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DEDICATION

I dedicate this project to God almighty, my creator and the source of my strength wisdom and knowledge. It has been him all the way

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This work is dedicated first and foremost to God Almighty, the author and finisher of my faith — the One who saw me through every storm, lifted me through every fall, and crowned my efforts with grace and glory. Without Him, none of this would have been possible.

To my father, whose unwavering love, provision, and silent sacrifices formed the pillar upon which my dreams stood firm. Your belief in me has been my anchor. To my mother,my superwoman — your care, prayers, and wise counsel have been the wings that carried me when my strength failed. You are my heartbeat of courage, and I owe this success to your endless devotion.

To my Aunty Ogor, my light in the darkest tunnels — you have been my strength, my safe haven, and my guardian angel in human form. Your love illuminated every weary path and reminded me that I was never alone.

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To my course mates, grandparents, uncles, aunties, and all my well-wishers— your presence, prayers, and support have left footprints of kindness on my heart.

To everyone who stood by me in this journey — this success is not mine alone; it is ours.

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ABSTRACT

This research examines how health expenditure influences maternal mortality in Nigeria by utilizing annual data from 2000 to 2022. Despite various reforms and investments in the health sector, maternal mortality continues to be a significant public health issue in Nigeria. The study explores the effects of key indicators such as Government Health Expenditure (expressed as a percentage of GDP), Out-of-Pocket Expenditure, Literacy Rate (serving as a proxy for female educational attainment), Workforce Migration Index (indicating health worker migration), and Fertility Rate on the Maternal Mortality Ratio (MMR). The Autoregressive Distributed Lag (ARDL) modeling approach is used, given its appropriateness for analyzing variables that are integrated at different orders, I(0) and I(1). The findings reveal both short-term and long-term relationships between the components of health expenditure and maternal mortality. In particular, government health spending exhibits a negative correlation with maternal mortality, indicating that increases in public investment can lead to reductions in MMR over time. Conversely, high out-of-pocket expenses and increasing fertility rates are linked to higher maternal mortality, highlighting deficiencies in financial risk protection and reproductive health services. The study concludes that to achieve substantial decreases in maternal mortality in Nigeria, sustained increases in government health funding, a reduction in household healthcare costs, and enhancements in female education are crucial. Recommended policies include bolstering the National Health Insurance Scheme (NHIS), addressing the migration of health workers, and broadening maternal health initiatives aimed at at-risk populations.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Maternal mortality is still a significant public health issue in Nigeria. In spite of advancements worldwide, Nigeria is responsible for nearly 20 percent of global maternal fatalities, with over 58,000 maternal deaths reported in 2015 alone (World Health Organization, 2019). In 2020, the country recorded an estimated 1,047 deaths for every 100,000 live births,one of the highest rates in the world (MacroTrends, 2020). By 2023, this number had only slightly improved to 993 per 100,000 live births, indicating a slow reduction of 13 percent over the past two decades (MacroTrends, 2023.).

Worldwide, the rate of maternal mortality has decreased by about 40% from 2000 to 2023, reaching an estimated 197 deaths for every 100,000 live births (World Health Organization, 2025; UNICEF Data.). In contrast, Nigeria's statistics remain disturbingly high and continue to lead global rankings, highlighting significant deficiencies in maternal health results and underlying systemic problems within the country's healthcare system (Trends in Maternal Mortality report, WHO., 2025).

An essential underlying issue is the continuous lack of investment in healthcare financing. Despite Nigeria's commitment in the 2001 Abuja Declaration to dedicate at least 15% of its national budget to health, the actual funding levels remain significantly

below this target. Recent statistics indicate that Nigeria's current health expenditure represents just over 4% of GDP (World Health Organization, 2023). This enduring underfunding underscores a critical systemic deficiency in healthcare commitments, which directly impacts the country's unfavorable maternal health outcomes (World health organisation, 2023).

As a consequence, Nigeria's average health expenditure per capita was roughly ₦25,815.67 in 2020, increasing to ₦38,506.39 by 2022; however, this still falls significantly short of global averages (MacroTrends.; World Bank, 2023). This ongoing lack of investment leads to weaknesses at the system level. For example, Nigeria boasts only 0.44 hospital beds for every 1,000 individuals, in contrast to a worldwide average of roughly 2.9 per 1,000, highlighting considerable gaps in infrastructure (World Bank, 2025). The healthcare system is also plagued by frequent shortages of essential medications, a lack of trained staff, and unequal access to both antenatal care and skilled birth attendants, especially in rural and conflict-affected areas like the Northeast (Udeorah Sylvester Alor,Asuzu-Samuel, Henrrietta & Amadi, Elizabeth (2024).). These shortcomings collectively underscore the vulnerability of Nigeria's health financing and delivery system, with direct consequences for maternal health outcomes.

By contrast, some conflict-affected countries have achieved substantial reductions in maternal mortality. For example, South Sudan's maternal mortality ratio fell from an estimated 1,658 maternal deaths per 100,000 live births in 2000 to 692 per 100,000 in 2023 . a decline of roughly 58.3% (United Nations Maternal Mortality Estimation -

Inner Agency Source 2025). Syria's estimates show a reduction from about 31 to 20 per 100,000 over the same period (35.5%), which does not support the frequently repeated 78% claim (World health organisation 2025.). Globally, the maternal mortality ratio declined by about 40% between 2000 and 2023 (from 328 to 197 per 100,000), underscoring that while progress has been made worldwide, Nigeria's slower reductions reflect persistent structural and financing shortfalls (UNICEF Data, 2025.).

Financial constraints, inefficient and inequitable distribution of existing funds often worsened by governance issues significantly undermine health outcomes in Nigeria. The healthcare workforce is heavily concentrated in urban centers, leaving rural areas deeply underserved: only about 4 doctors, 9 nurses, and 6 midwives per 10,000 people nationally, well below WHO's minimum thresholds, with much lower densities in rural north (e.g., Bauchi, Sokoto) due to attrition, lack of incentives, and unfavorable conditions (WHO, 2025). Antenatal care utilization illustrates stark disparities: while 35.5% of urban women receive the WHO-recommended eight or more ANC contacts, only 10.4% of rural women do; in the North-East and North-West the rates drop to 3.0% and 2.7% in certain areas (Adewuyi., 2024).Meanwhile, urban delivery in health facilities is around 74.3%, compared to just 34.5% in rural areas,a gap echoing inequitable access to skilled birth attendance (Healthwise, 2025). Weak accountability in how health funds are allocated and used underscored by calls from WHO and civil society for greater transparency, parliamentary oversight and community inclusion exacerbate the inequity in regional health service delivery (WHO, 2025).

Socio-economic factors also intensify maternal health risks in Nigeria. According to the World Health Organization (WHO, 2023), a Nigerian woman faces a lifetime risk of 1 in 19 of dying from pregnancy-related causes, compared to 1 in 4900 in high-income countries. Contributing factors include poverty, low maternal literacy, early childbearing, and cultural practices that discourage timely use of health services (UNICEF, 2021). These risks are often linked to weak health systems, lack of affordable and accessible emergency obstetric care, and limited antenatal coverage (National Population Commission [NPC] & Inner city fund (ICF, 2019).

Although Nigeria has introduced policy initiatives such as the Midwives Service Scheme (2009) to expand skilled birth attendance and reduce maternal mortality, results have largely been mixed. Evaluations show that while such interventions improved access in some regions, they were undermined by inadequate funding, weak governance, and implementation challenges (Federal Ministry of Health [FMoH], 2020; WHO, 2022). This persistent underfunding Nigeria spends less than 5% of its annual budget on health, far below the 15% commitment of the 2001 Abuja Declaration continues to limit progress toward better maternal health outcomes (World Bank, 2021; WHO, 2022).

1.2 Statement of the Research Problem

Maternal mortality remains a critical and persistent challenge to public health in Nigeria, exhibiting a troubling resistance to numerous interventions designed to reduce it. A primary factor underpinning this crisis is the chronic and systematic underfunding of the national healthcare system. In 2001, member states of the African Union, including

Nigeria, signed the Abuja Declaration, pledging to allocate at least 15% of their annual budgets to the health sector to address such fundamental healthcare challenges. However, more than two decades later, Nigeria has consistently failed to meet this commitment. Health budget allocations have languished significantly below this benchmark, ranging between 4% and 6% in recent years, a trend that reflects a profound under-prioritization of public health (Federal Ministry of Finance, 2023; WHO, 2021).

This consistent underfunding has resulted in a severely weakened health system, characterized by poor infrastructure, critical shortages of medical supplies and personnel, and limited access to quality maternal healthcare services, particularly in rural areas. The situation is further exacerbated by inefficiencies in the utilization of even these limited resources, issues of corruption, and significant inequities in the distribution of healthcare services. Consequently, Nigeria continues to bear one of the highest global burdens of maternal mortality, a stark indicator of a health system in distress and a problem demanding urgent, evidence-based solutions (World Bank, 2022; UNICEF, 2023).

This financial neglect manifests in a dire shortage of skilled medical personnel, a lack of essential equipment and pharmaceuticals, and a severely inequitable distribution of health facilities that leaves rural populations where the majority of maternal deaths occur profoundly marginalized (World Bank, 2022).

However, the problem is not solely one of insufficient funding. A confounding paradox exists whereby even available resources often fail to translate into improved health outcomes due to systemic inefficiencies, weak governance, and corrupt practices within the health sector. This raises a pivotal question: is maternal mortality in Nigeriaprimarily a consequence of financial insufficiencies, or is it a more complex failure of resource allocation, management, and utilization (Okonjo-Iweala, 2018)?

Furthermore, the issue is deeply entangled with a nexus of socio-economic and cultural determinants that operate beyond the confines of the health sector. High poverty rates, low female literacy, early marriage and childbirth, limited female autonomy in healthcare decision-making, and harmful traditional practices collectively create formidable barriers that prevent women from accessing existing maternal health services, even when available (Nigeria Bureau of statistics (NBS) 2019).Therefore, the core research problem is the urgent need to empirically investigate and disentangle the precise relationship between health expenditure public, private, and total and maternal mortality rates in Nigeria. This involves a critical examination of whether increased financial investment alone can significantly reduce maternal deaths, or if deeper, systemic issues of governance, efficiency, and socio-cultural barriers negate the potential impact of funding, rendering it ineffective without concurrent structural and social reforms.

1.3 Research Questions

This study is guided by the following research questions:

1)How does healthcare expenditure affect maternal mortality in Nigeria?

2) How does government expenditure on maternal health services affect maternal mortality in Nigeria?

3) How does the migration of health care workers affect maternal mortality in Nigeria?

4. How does GDP per capital affect maternal mortality in Nigeria?

5. How does Fertility Rate influence Maternal Mortality Ratio in Nigeria?

1.4 Objectives

This research seeks to analyze the influence of health sector financing on maternal mortality rates in Nigeria. The general aim is to evaluate how healthcare spending affects maternal health outcomes. The specific objectives designed to achieve this goal are as follows:

1) To examine the relationship between government health expenditure and maternal mortality in Nigeria.
2) To examine the effect of government expenditure on maternal health services on maternal mortality in Nigeria.
3) To assess the effect of health workforce migration on maternal mortality in Nigeria.

4. To evaluate the impact of GDP per capita on Maternal Mortality Ratio.

5. To determine the effect of Fertility Rate on Maternal Mortality Ratio.

1.5 Research Hypothesis

This study rigorously assesses the influence of health financing mechanisms on maternal health outcomes in Nigeria. In accordance with standard scientific practice, the following null hypotheses are established to guide the evaluation:

H_{01}: health expenditure has no effect on maternal mortality in Nigeria.

H_{02}: Government expenditure on maternal health services has no effect on maternal mortality in Nigeria.

H_{03}: Migration of health care workers has no effect on maternal mortality in Nigeria.

H_{04}: GDP per capita has no significant effect on Maternal Mortality Ratio in Nigeria.

H_{05}:Fertility Rate has no significant effect on Maternal Mortality Ratio in Nigeria.

1.6 Significance of the Study

This research holds importance for government officials and policymakers as it offers empirical findings on the connection between healthcare spending and maternal health results in Nigeria. Such findings are vital for guiding budget allocations, resource distribution, and the development of health policies specifically aimed at decreasing maternal mortality. Considering Nigeria's disproportionately high rate of maternal deaths worldwide, these results will provide a foundation for enhancing national health

financing systems to meet Sustainable Development Goal 3, which focuses on maternal health (WHO, 2023; World Bank, 2022).

For non-governmental organizations (NGOs) and donor agencies, this research provides valuable insights to inform funding choices and intervention approaches. By pinpointing the primary factors contributing to maternal mortality, it underscores the effectiveness of financial resources in enhancing maternal health. This assessment is especially crucial as international donors and NGOs continually invest substantial funds into maternal health initiatives throughout Sub-Saharan Africa, making it essential to evaluate their efficiency and sustainability (UNICEF, 2021; UNFPA, 2020).

The findings of this study hold substantial implications for healthcare practitioners by highlighting the essential relationship between how financial resources are allocated, the quality of clinical service delivery, and subsequent maternal health outcomes. It draws attention to the necessity of using available health funds efficiently, stressing that merely increasing budgets is insufficient unless investments are effectively converted into enhanced service provision, higher standards of care, and improved health results for pregnant women. This perspective is consistent with established health economic principles indicating that financial investments in healthcare must be accompanied by robust and functional delivery mechanisms to achieve measurable improvements in public health (Adebisi , 2021).

For the academic and research community, this investigation enriches the expanding scholarly discourse surrounding health economics, maternal mortality, and public health

policy within developing nations. It addresses a significant void in empirical evidence while simultaneously establishing a foundational benchmark for subsequent research endeavors, both within Nigeria and throughout the Sub-Saharan African region. Through its detailed examination of the mechanisms through which health financing impacts maternal survival rates, the study furnishes a methodological and theoretical model that can be leveraged for crossnational comparative analysis in other low- and middle-income economies with analogous socio-economic challenges (Oluwafemi & Abubakar, 2022).

Finally, this research also holds significant value for the broader citizenry. By elucidating the critical roles that national budgeting and deep-seated social and economic factors play in driving maternal mortality rates, the study serves to elevate public consciousness regarding the pressing necessity to confront these fundamental obstacles. An informed citizenry, equipped with this understanding, is better positioned to engage in grassroots advocacy, hold governing bodies and public officials to account, and champion greater community involvement in the push for enhanced, equitable, and high-quality maternal healthcare services (WHO, 2022; National Population Commission, 2019).

1.7 Scope of the Study

This study adopts a comprehensive national scope, analyzing the relationship between healthcare financing and maternal mortality across Nigeria. The research utilizes a longitudinal framework, covering the period from 1990 to 2023. This extensive time

frame is selected to capture long-term trends and fluctuations in both health expenditure and maternal health outcomes, thereby enabling a more robust and reliable statistical analysis. The core variables under investigation include public, private, and total health expenditure as independent variables, with the maternal mortality rate serving as the dependent variable. To strengthen the model, key socio-economic factors like national income levels and female education rates are incorporated as control variables, acknowledging their significant influence on health outcomes (World Bank, 2023; National Bureau of Statistics, 2021). A primary limitation of this methodology is its reliance on secondary data from sources such as the World Health Organization (WHO), the World Bank, and the Nigeria Demographic and Health Survey (NDHS). Consequently, the analysis is subject to potential constraints including data inaccuracies, the known underreporting of maternal deaths in national statistics, and inconsistencies in financial reporting across different government levels (WHO, 2023). Furthermore, while the study acknowledges the profound impact of qualitative factors like cultural practices and political will, these elements remain beyond the scope of this quantitative investigation.

1.8 Definition of Terms

To enhance clarity and consistency in this research, the following key terms related to maternal health and healthcare expenditure in Nigeria are defined:

1) Maternal Mortality Ratio (MMR)

The maternal mortality ratio reflects the number of maternal deaths per 100,000 live births within a specified timeframe. The World Health Organization (WHO, 2019) defines maternal death as "the death of a woman during pregnancy or within 42 days after the conclusion of pregnancy, regardless of the duration and setting of the pregnancy, resulting from any complications associated with or aggravated by the pregnancy or its management, excluding accidental or incidental causes."

This measure serves as a consistent standard for global comparisons.

In Nigeria, the maternal mortality ratio is exceedingly high, with an estimated 917 deaths per 100,000 live births reported in 2017 (WHO, UNICEF, World Bank) and increasing to 993 deaths per 100,000 in 2023 (World Health Organization (WHO) 2017).

In this research, MMR is treated as the dependent variable, representing the maternal health outcome influenced by healthcare spending and other factors.

2) Health Expenditure

Health expenditure refers to the total financial resources allocated to healthcare services, assessed as either a percentage of Gross Domestic Product (GDP), per capita spending, or a portion of the government budget. The World Bank (2022) states that total health expenditure includes both public and private healthcare expenses, covering services, infrastructure, personnel, medications, and preventive measures.

3)Public Health Expenditure: This term refers to financial resources allocated by the government towards health services, which includes budget distributions, health programs, and international donor funding channeled through public entities. In Nigeria, this includes budget allocations made by the Federal Ministry of Health, as well as state ministries and programs like the Basic Health Care Provision Fund (BHCPF).

4)Private Health Expenditure: This category includes healthcare spending by non-governmental organizations, which comprises individuals, non-profit entities, and private insurance companies. In Nigeria, private health expenditure is particularly significant, primarily because out-of-pocket payments account for over 70% of total health spending (WHO, 2021).

5)Total Health Expenditure: This figure represents the combined total of public and private health expenditures, reflecting the overall financial investment in healthcare within the economy. For the purposes of this research, health expenditure—which includes public, private, and total amounts—is considered an independent variable influencing maternal mortality rates.

6)Antenatal Care (ANC): Antenatal care refers to the standard medical care provided to pregnant women throughout their gestation to ensure safe deliveries and maternal wellbeing. The WHO (2016) recommends a minimum of eight antenatal consultations during pregnancy to improve outcomes for both mothers and their newborns. ANC services involve monitoring the health of both the mother and fetus, providing nutritional support, identifying potential issues, and offering preventive measures, such

as tetanus toxoid immunizations. In Nigeria, ANC attendance is particularly low in rural areas, where only 67% of pregnant women attend at least one ANC appointment, and fewer than 50% have four or more visits (National Population Commission, 2019). ANC plays a crucial role in decreasing maternal mortality and is utilized as a key indicator of effective maternal health service delivery in this study.

7) Skilled Birth Attendance (SBA):

Skilled birth attendance pertains to deliveries that are supported by qualified health practitioners, such as doctors, nurses, or midwives; who are trained and certified to handle normal births and identify complications. The World Health Organization emphasizes that having skilled personnel present at birth is one of the most effective strategies to lower maternal and neonatal death rates. Countries with high levels of skilled birth attendance have seen substantial decreases in maternal mortality worldwide. In Nigeria, approximately 43% of births are overseen by skilled health professionals, showcasing significant disparities between urban and rural areas. This study incorporates skilled birth attendance as a factor influencing maternal health outcomes, demonstrating the impact of resource distribution on the availability of skilled professionals. (National Population Commission, 2019).

8)Emergency Obstetric Care (EMCOR):

Emergency obstetric care encompasses the medical treatments provided to women facing complications during pregnancy, childbirth, or shortly after delivery. The WHO

categorizes EMCOR into two types: Basic EMCOR (provision of antibiotics, oxytocics, anticonvulsants, manual removal of the placenta, assisted vaginal delivery, etc.) and Comprehensive EMCOR (which includes cesarean sections and blood transfusions). Many rural women in Nigeria lack prompt access to EMCOR because of inadequate infrastructure, long distances to healthcare facilities, and a shortage of trained healthcare workers. This situation continues to be a significant factor contributing to avoidable maternal deaths.

9)Out-of-pocket spending (OOP) refers to the immediate expenses that families pay for health services when they utilize them. The WHO (2020) categorizes OOP as catastrophic when it exceeds 10% of a household's earnings. Nigeria is one of the nations with the highest out-of-pocket healthcare costs in the world, where more than 70% of healthcare is funded directly by households. The high costs of OOP expenses discourage women from seeking professional maternal care, which increases maternal mortality rates. (Aderemi and Ifekwem, 2025).

10) Sustainable Development Goals (SDGs): Launched by the United Nations in 2015, the Sustainable Development Goals define worldwide targets for inclusive development. SDG 3.1 seeks to lower the worldwide maternal mortality rate to under 70 deaths for every 100,000 live births by the year 2030. Nigeria's existing maternal mortality rate (993/100,000) far surpasses this target, underscoring the urgent need for data-driven approaches to improve outcomes. (United Nations, 2015)

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter systematically reviews the existing literature relevant to the influence of health sector financing, targeted maternal health spending, and human resource dynamics on maternal mortality in Nigeria. It establishes the conceptual framework, examines the theoretical underpinnings, and synthesizes empirical findings to create a strong scholarly foundation for the study's specific objectives and the rigorous testing of the established null hypotheses.

2.2 Maternal Mortality Ratio (MMR)

Maternal Mortality is defined by the World Health Organization (WHO, 2015) as the death of a woman while pregnant or within 42 days of termination of pregnancy, from any cause related to or aggravated by the pregnancy or its management. The Maternal Mortality Ratio (MMR), the primary dependent variable, is calculated as the number of maternal deaths per 100,000 live births. It serves as the definitive output measure of the health system's failure to provide effective care during the perinatal period, providing a crucial lens through which to assess policy impact.

MMR is a critical indicator of the overall efficiency and equity of a nation's health system, reflecting the nation's progress toward Sustainable Development Goal (SDG) 3.1. Nigeria's persistently high MMR figures—among the highest globally—directly signal systemic failures in providing essential life-saving interventions, making its reduction an urgent policy imperative (UNICEF, 2022). Its operationalisation requires the use of consistent national-level annual time-series data to capture the long-run trends necessary for the study's dynamic analysis.

2.2.1 General Government Health Expenditure and the Paradox of Input

General Government Health Expenditure refers to the total financial funds allocated by the public sector (federal, state, and local governments) to the health sector. This aggregate variable is central to the study's primary goal, which is to evaluate how healthcare spending affects maternal health outcomes, specifically addressing the question of how healthcare expenditure affects maternal mortality in Nigeria. Theoretically, increased Government expenditure is expected to improve public health goods, reduce financial barriers, and fund infrastructure, which should, by the logic of the Health Production Function, result in reduced MMR (Abdulahi & Adegbite, 2019).

However, the necessity of testing the null hypothesis that health expenditure has no effect on maternal mortality in Nigeria, stems from the widely observed "Nigerian Paradox." Empirical literature frequently finds a weak, insignificant, or even counter-intuitive short-run positive relationship between HE and poor outcomes (Aziz, 2021). This paradoxical finding suggests that funds allocated are often undermined by

corruption, misallocation, or gross inefficiencies, justifying a rigorous test of the null hypothesis to determine the true, long-run impact.

2.2.2 Targeted Spending on Maternal Health Services

While general expenditure addresses system-wide needs, a more granular analysis is required to identify effective policy levers, which leads directly to the specification of targeted funding. This variable captures purpose-specific allocations for services directly related to preventing maternal death, such as Emergency Obstetric Care (EmOC) funding, procurement of life-saving drugs (e.g., oxytocin), and subsidies for Skilled Birth Attendants (SBA) training (Okonofua, 2018). GEMS is the dedicated variable for the study's objective to examine the effect of government expenditure on maternal health services on maternal mortality in Nigeria, and the corresponding research question of how government expenditure on maternal health services affects maternal mortality in Nigeria.

Conceptually, GEMS is hypothesized to have a significantly stronger negative impact on MMR compared to general Government expenditure. This is because these funds directly target the "Third Delay" (the delay in receiving adequate, high-quality care), which is the most lethal phase of the Three Delays Model (Thaddeus & Maine, 1994). The purpose of testing the null hypothesis that Government expenditure on maternal health services has no effect on maternal mortality in Nigeria, is to empirically prove the superiority of targeted, policy-specific expenditure over broad, aggregated

budgetary allocations in the context of Nigeria's high MMR, thus offering evidence for a more efficient funding model.

2.2.3 The Effect of Health Workforce Migration

Beyond financial inputs, the quality of human capital remains a crucial non-financial determinant, which necessitates the inclusion of health workforce dynamics. Addressing the critical human capital dimension, Health Workforce Migration (MHCW) is operationalised as the "brain drain"—the annual emigration of skilled health professionals (physicians, nurses, midwives) to high-income countries, or proxied by a decline in health worker density (Lundstrom & Sissoko, 2017). MHCW is the core variable for the study's objective to assess the effect of health workforce migration on maternal mortality in Nigeria, and the research question how does the migration of health care workers affect maternal mortality in Nigeria?

The continuous outflow of trained personnel severely compromises the quality and availability of care, particularly in rural Primary Healthcare Centres (PHCs). This human resource deficit acts as a non-financial constraint, meaning that even if GE or GEMS funds are available, there may be no qualified personnel to deliver the services, thereby increasing the risk of death (Dada., 2023). Therefore, testing the null hypothesis that migration of health care workers has no effect on maternal mortality in Nigeria, is essential to quantifying the economic cost of human capital erosion on maternal health outcomes.

2.2.4 Foundational Conceptual Models for Maternal Mortality

The following conceptual models provide the necessary analytical frameworks for interpreting the variables and the expected direction of the study's findings, linking financial expenditure to physical health outcomes.

2.2.5 The Three Delays Model: Pathways to Preventable Death

The Three Delays Model (Thaddeus & Maine, 1994) serves as the primary conceptual tool for understanding the chain of events that lead to preventable maternal death in resource-constrained settings. The delays are: Delay in deciding to seek care (often due to financial or social barriers); Delay in reaching a facility (geographical and transport barriers); and Delay in receiving adequate, high-quality care at the facility. This model provides crucial context for our expenditure variables, as it illuminates where the money must be spent to break the mortality chain. GEMS is explicitly designed to minimize the Third Delay by ensuring the availability of drugs and skilled personnel. In contrast, MHCW directly exacerbates the Third Delay; if a woman arrives at a facility in time, the absence of a skilled attendant (due to migration) will translate into a critical treatment delay and a likely fatality (Mojekwu & Ibekwe, 2012).

2.2.6 Systemic Failure: The Nigerian Paradox in Health Outcomes

The concept of the "Nigerian Paradox"—where rising nominal health expenditure does not translate into commensurate improvements in health outcomes like MMR—

highlights the systemic failures of efficiency and governance (Aziz, 2021). This paradox is the empirical puzzle that the study is attempting to solve.

The paradox implies that any significant long-run relationship between GE and MMR is likely to be masked by severe short-run inefficiencies, political instability, or fund misapplication. This conceptual understanding dictates the use of a dynamic econometric model, such as the ARDL, capable of separating the transient, paradoxical short-run effects from the expected negative, theoretically sound long-run relationship (Igbinedion & Olele, 2018).

2.3 Theoretical Literature: Linking Economics to Health Outcomes

The theoretical framework grounds the empirical investigation in established economic principles, justifying the inclusion of all specified independent variables in the econometric model.

2.3.1 The Health Production Function (HPF) as an Input-Output Model

The Health Production Function (HPF) is the core economic theory that underpins the model specification. It posits that health status (in this case, the inverse of MMR) is a dependent output produced by various inputs, including financial resources (GE, GEMS), human capital (MHCW), and socio-demographic factors (RGDP, FSSR) (Gerdtham & Löthgren, 2002).

The HPF is essential because it justifies the inclusion of both financial and non-financial variables, fulfilling the study's comprehensive aim to evaluate how healthcare

spending affects maternal health outcomes. If only financial factors were included, the model would suffer from omitted variable bias, especially since the effect of money (GEMS) is clearly mediated by the capacity to spend it (the presence of personnel, or lack thereof due to MHCW). The HPF, therefore, mandates a comprehensive model structure that allows for the simultaneous estimation of these heterogeneous inputs.

2.3.2 Health production function Application to Targeted Expenditure and Marginal Returns

Building on the HPF, the theory allows for the analysis of marginal returns to different types of spending. The theory suggests that GEMS, being a focused input, should have a higher marginal product than general GE because it is less susceptible to leakages and directly targets bottlenecks (the Third Delay). This distinction is vital for understanding the true policy efficacy.

Testing the null hypothesis that Government expenditure on maternal health services has no effect on maternal mortality in Nigeria within the HPF framework allows the research to compare the efficacy of different funding mechanisms. A significant negative coefficient for GEMS would provide strong empirical evidence that resource allocation should be targeted, thereby guiding policy recommendations based on economic efficiency (Novignon & Lawanson, 2017).

2.3.3 Health production function Application to Health Workforce Migration

While financial inputs are necessary, the HPF emphasizes that human resources are an essential component of the "technology" or efficiency with which financial inputs are converted into health outcomes. The migration of health workers (MHCW) effectively represents a negative technological shock to the HPF, impairing the system's ability to maximize outcomes from available funds.

A high rate of MHCW shifts the HPF inward, meaning the health system requires exponentially greater financial input (GE, GEMS) to achieve the same level of outcome it could have achieved with adequate staffing levels (Dada., 2023). This theoretical link establishes MHCW as a vital, non-financial determinant that must be controlled for and explicitly tested to understand the full cost-effectiveness equation of Nigeria's health system, thus justifying the focus on the question how does the migration of health care workers affect maternal mortality in Nigeria?

2.3.4 The Human Capital Theory: Brain Drain as Capital Erosion

The Human Capital Theory (Grossman, 1972) views investment in health and education as capital accumulation, treating health as a stock of capital that depreciates over time. Therefore, maintaining this stock requires continuous investment, and a loss of skilled professionals constitutes a depreciation of the nation's human capital.

This theory provides the underlying rationale for the expected positive sign of MHCW on MMR. The Nigerian government invests heavily in training medical personnel.

When they emigrate, that investment, or human capital, is transferred, cost-free, to the receiving country (Lundstrom & Sissoko, 2017). This loss reduces the remaining system's capacity to manage complex maternal emergencies, leading to a higher rate of capital loss (maternal death) for the population.

2.4 Empirical Literature E And Hypothesis Testing

This section synthesizes findings from previous studies, explicitly connecting existing evidence to the hypotheses and research questions being tested in this study. The contradictory nature of current findings highlights the necessity of a new, dynamic analysis.

2.4.1 Empirical Evidence on Health Expenditure and Maternal Mortality

The literature on expenditure and outcomes provides the central debate that the current study is designed to resolve by disaggregating the inputs.

2.4.1.1 Testing the General Effect

Empirical research provides varied evidence on the relationship between general health expenditure (GE) and MMR, which is the focus of the question how healthcare expenditure affects maternal mortality in Nigeria. Studies outside of Nigeria often affirm the expected negative relationship—that more spending leads to lower mortality (Chirwa & Matita, 2018). However, Nigerian-specific studies are frequently contradictory. For instance, while (Ojapinwa 2023) suggests that sustained public GE

has a long-run reduction effect, others, consistent with the "Nigerian Paradox," find the relationship insignificant or even positive in the short run (Funlayo & Folorunso, 2024).

This heterogeneity in findings underscores the necessity of the current study's rigorous econometric approach. By explicitly testing the null hypothesis that health expenditure has no effect on maternal mortality in Nigeria, the research aims to provide a definitive and current assessment of whether the aggregate GE in Nigeria overcomes system inefficiencies to achieve a statistically significant long-run reduction in MMR.

2.4.1.2 The Efficacy of Targeted Spending (Addressing the Question of GEMS's Impact)

The empirical literature strongly suggests that targeted spending (GEMS) provides superior returns compared to general expenditure, which is the driving principle behind the question how government expenditure on maternal health services affects maternal mortality in Nigeria. Studies focusing on specific, dedicated interventions (such as reproductive health campaigns or disease-specific budgets) consistently show better returns than broad budgetary allocations (Obansa & Orimisan, 2013). This evidence provides the basis for predicting a stronger negative coefficient for GEMS than for general General expenditure in the model.

The current study is designed to overcome the empirical challenge of separating GEMS from General Expenditure. By explicitly isolating GEMS and testing the null hypothesis that Government expenditure on maternal health services has no effect on maternal mortality in Nigeria, the research seeks to confirm the hypothesis that focused

financial allocations are the most effective policy lever for improving maternal outcomes, thereby providing direct, policy-actionable evidence to budget planners.

2.4.1.3 Empirical Evidence on Health Workforce Migration

The literature on human capital confirms that service quality is indispensable, linking directly to the question how does the migration of health care workers affect maternal mortality in Nigeria? Empirical research overwhelmingly supports the view that the migration of health care workers severely degrades health outcomes. Studies by Lundstrom and Sissoko (2017) demonstrated that brain drain in Sub-Saharan Africa (SSA) directly correlated with worse coverage of essential health interventions. The impact on MMR is particularly acute because maternal services require skilled, continuous, and immediate care (Okonofua , 2018). Low physician and midwife density, directly resulting from MHCW, increases the risk of maternal death by forcing complex deliveries to be managed by insufficiently trained personnel. Nigeria's position as a leading source of migrating health workers makes this relationship critically important to test empirically against the null hypothesis that migration of health care workers has no effect on maternal mortality in Nigeria.

2.5 Gaps in the Literature and Research Contribution

The systematic synthesis of the empirical and theoretical literature, when aligned with the current study’s objectives and hypotheses, reveals three specific gaps that this research is uniquely positioned to fill. These gaps directly justify the necessity of the present investigation. The first is the disaggregation and targeting gap, as most existing

studies employ highly aggregated measures of general health expenditure without isolating the specific impact of funds devoted explicitly to maternal health services. This limitation results in policy recommendations that lack precision and fail to guide targeted interventions. By disaggregating expenditure components, this study provides policy-actionable insights and directly addresses the core research questions regarding the impact of both general and targeted health expenditure on maternal mortality.

The second is the Human Resource Integration Gap, which highlights the neglect of human capital factors in existing econometric models. Although the issue of health workforce migration has been widely acknowledged, few studies in Nigeria have systematically integrated it as a core long-run determinant of maternal health outcomes alongside financial variables. This omission introduces bias in evaluating the cost-effectiveness of public health spending. The present study incorporates the health workforce migration variable into the ARDL framework to assess its influence on maternal mortality, thereby filling a crucial gap in Nigerian health economics literature.

Lastly, the Dynamic Analysis Gap underscores the methodological limitations of previous research that relied mainly on static regression models. By employing the robust ARDL approach, this study captures and quantifies both the short-run dynamics and the speed of adjustment toward the long-run equilibrium path. This dynamic estimation provides a more comprehensive understanding of the time-varying and interdependent nature of the relationships among health expenditure, workforce

migration, GDP per capita, fertility rate, and maternal mortality in Nigeria (Pesaran, 2001).

CHAPTER THREE

METHODOLOGY

3.1 Theoretical Framework

The theoretical basis for examining the effect of health spending on maternal mortality in Nigeria is largely linked to the Production Function Theory and the Grossman Model of Health Capital (Grossman, 1972). These frameworks justify the anticipated inverse correlation between increased monetary investment in health and negative health outcomes. The Production Function Theory acts as the primary viewpoint, asserting that a decline in the Maternal Mortality Ratio (MMR) is a measurable outcome that results directly from key inputs, with health expenditure (both governmental and private) being of utmost importance. Within the context of Nigeria, health spending is the essential resource needed to 'produce' vital maternal healthcare services, including funding for infrastructure, procurement of vital medications and equipment, as well as the salaries and training of qualified staff (George-Anokwuru, 2024). This theory supports the hypothesis that an adequate and efficient distribution of financial resources should improve service delivery, leading to increased numbers of skilled birth assistance and access to emergency obstetric care, which in turn results in a negative correlation with

the MMR. A lack of adequate inputs consequently leads to poor health outcomes and heightened maternal mortality.

Additionally, the Grossman Model of Health Capital reinterprets health as a lasting capital asset that individuals hold. This capital can deplete over time (for example, due to aging or unfavorable living conditions) but can also be enhanced through investment. Health expenditure is thus considered not merely an expense, but rather an investment that boosts the 'maternal health capital' of women in Nigeria, making them more adaptable to the challenges associated with pregnancy and childbirth. Greater financial commitment results in higher quality antenatal care, improved preventative services, and enhanced education—all factors that contribute to increasing a woman's health capital stock. When health spending is consistent and effectively managed, it fosters a strong healthcare infrastructure capable of ongoing prevention and prompt intervention, ultimately leading to a lower and more sustainable MMR. In contrast, insufficient investment results in a decrease in this capital stock, leaving women more susceptible to avoidable complications (Grossman, 1972). The integrated theoretical framework thus suggests a negative causal relationship between health expenditure and maternal mortality while recognizing that effective resource allocation and governance are key moderating variables in the Nigerian health system.

3.2 Research Methodology

The research utilizes a thorough quantitative research design, employing time-series econometric analysis to explore and measure the dynamic and causal relationship

between health spending and maternal mortality in Nigeria. This method depends on an ex post facto (non-experimental) analysis of data gathered over a defined historical timeframe (e.g., 2000–2020) to ensure reliability and to capture long-term structural impacts (Gujarati & Porter, 2009). The approach is designed to address the evolving nature of both healthcare funding and health outcomes, specifically recognizing lagged effects where the current maternal mortality rate is affected by expenditures and policy choices from prior years.

3.2.1 Sources and Nature of Data: Secondary Macro-Economic and Health Data

The research relies solely on secondary data sourced from reliable international and national organizations to guarantee precision, consistency, and comparability over time. The dependent variable, maternal mortality ratio (MMR), defined as the number of maternal deaths per 100,000 live births, was sourced from the World Health Organization (WHO), UNICEF, and the World Bank's World Development Indicators (WDI). The primary independent variables encompass government health expenditure (GOVHEXP), out-of-pocket expenditure (OOPE), workforce migration index (WMI), fertility rate (FR), and female literacy rate (Lit). Information on government health expenditure was obtained from the Nigerian National Bureau of Statistics, Federal Ministry of Health publications, and UNICEF reports, reflecting public funding in maternal and health services. Out-of-pocket expenditure, indicating household healthcare costs, was acquired from the WHO Global Health Expenditure Database, World Bank WDI, and Nigeria Health Accounts documents. The workforce migration

index, which indicates the availability and movement of skilled healthcare workers, was gathered from the WHO Global Health Observatory, reports from the International Organization for Migration, and pertinent academic studies. Data on fertility rates were collected from the Nigeria Demographic and Health Surveys (NDHS), reports from the UN Population Division, and the World Bank WDI, whereas female literacy rates were sourced from the UNESCO Institute for Statistics, NBS publications, and the World Bank database. All monetary figures are represented in constant Purchasing Power Parity (PPP)-adjusted international dollars to facilitate meaningful temporal and cross-country comparisons. This extensive dataset ensures that the model effectively captures the economic, demographic, and human capital factors affecting maternal mortality in Nigeria while reducing potential bias from excluded variables.

3.3 Model Specification: Dynamic Econometric Approach (ARDL)

The empirical evaluation conducted in this study utilizes a dynamic econometric model, specifically the Autoregressive Distributed Lag (ARDL) model. The ARDL approach is suitable for this analysis as it allows for variables integrated at different levels, I(0) and I(1), without the bias associated with preliminary tests commonly found in other cointegration methods (Pesaran, Shin, & Smith, 2001). This method facilitates the assessment of both short-term dynamics and long-term equilibrium relationships between the variables.

This study investigates the impact of key socio-economic and health-related factors on maternal mortality in Nigeria. The variable of interest is the Maternal Mortality Ratio

(MMR), which is defined as the number of maternal deaths per 100,000 live births. The independent variables analyzed include Government Health Expenditure (GOVHEXP), Out-of-Pocket Expenditure (OOPE), Workforce Migration Index (WMI), Fertility Rate (FR), and Literacy Rate (Lit).

Several models have been constructed to evaluate the individual and collective impacts of these variables on maternal mortality:

Model 1: Government Health Expenditure: $MMR_t=\beta 0+\beta 1GOVHEXP_t+\epsilon t$

This model assesses the effect of government health expenditure on maternal mortality. A negative coefficient ($\beta_1 < 0$) is expected, indicating that increased public health spending is likely to reduce maternal deaths (Aregbeyen & Kolawole, 2018).

Model 2: Out-of-Pocket Expenditure: $MMR_t=\beta 0+\beta 1OOPE_t+\epsilon t$

This model explores the influence of household health expenditures. A positive coefficient ($\beta_1 > 0$) is anticipated, as higher out-of-pocket costs may restrict access to care and contribute to increased maternal mortality.

Model 3: Workforce Migration Index: $MMR_t=\beta 0+\beta 1WMI_t+\epsilon t$

This model investigates the relationship between health worker migration and maternal mortality. A positive coefficient ($\beta_1 > 0$) is expected, as the emigration of qualified health personnel can negatively impact the quality of maternal care (Oluwagbemiga, 2019)

Model 4: Fertility Rate: $MMR_t=\beta 0+\beta 1FR_t+\epsilon t$

Increased fertility rates are expected to elevate maternal mortality ($\beta_1 > 0$) as more pregnancies pose greater health risks to women.

Model 5: Literacy Rate: $MMR_t=\beta 0+\beta 1Lit_t+\epsilon t$

Improved female literacy is predicted to lower maternal mortality ($\beta_1 < 0$) by increasing health awareness and promoting the use of maternal health services.

Model 6: Combined Model:

$MMR_t=\beta 0+\beta 1GOVHEXP_t+\beta 2OOPE_t+\beta 3WMI_t+\beta 4FR_t+\beta 5Lit_t+\epsilon t$

This integrated model takes into account the cumulative impact of all variables on maternal mortality, addressing both direct and indirect influences (Pesaran, 2001). This modeling approach enables a thorough examination of the short-term and long-term factors affecting maternal mortality in Nigeria, offering essential insights for policy development.

3.4 Estimation Techniques

To estimate the models, this study employs the following methods:

1) Unit Root Test: The Augmented Dickey-Fuller (ADF) test will be utilized to assess the stationarity of the time series data (Dickey & Fuller, 1979). This step is vital to prevent spurious regression results.

2) Autoregressive Distributed Lag (ARDL) Approach: The ARDL method will be used to explore both short-run and long-run relationships among the variables (Pesaran, 2001). It is appropriate for small sample sizes and variables with mixed orders of integration (I(0) and I(1)).

3) Cointegration Test: The bounds testing procedure within the ARDL framework will be conducted to investigate long-run relationships among the variables (Pesaran, 2001).

4) Diagnostic Tests: A serial correlation test (Breusch-Godfrey LM test), a heteroskedasticity test (Breusch-Pagan/Cook-Weisberg test), and a normality test (Jarque-Bera test) will be carried out.

These tests ensure the reliability of the ARDL findings.

3.5 Data Sources and Collection

This research employs secondary data from 2000 to 2022 to investigate the influence of healthcare spending, governmental investment in maternal health services, and the migration of healthcare professionals on maternal mortality rates in Nigeria. The data was gathered from reputable and official sources to ensure both reliability and accuracy.

Data Sources

1) Government Expenditure on Maternal Health Services (GOVHEXP):

Information was collected from UNICEF Nigeria reports, publications from the Federal Ministry of Health, and budget documents from the Nigerian National Bureau of Statistics (NBS).

2) Migration of Health Workers (MIG): Data was sourced from the WHO Global Health Observatory, reports from the International Organization for Migration (IOM), and pertinent academic studies.

3) Maternal Mortality Rate (MMR): Statistics on maternal mortality were gathered from the WHO, UNICEF, and the Nigeria Demographic and Health Surveys (NDHS).

4) Fertility Rate (FR): Fertility rate data, reflecting the average number of births per woman, was sourced from the Nigeria Demographic and Health Surveys (NDHS), World Bank World Development Indicators (WDI), and reports from the United Nations Population Division.

5) Literacy Rate (Lit): Information regarding female literacy was obtained from the UNESCO Institute for Statistics (UIS), reports from the National Bureau of Statistics (NBS), and the World Bank WDI database.

6) Out-of-Pocket Expenditure (OOPE): Data on household out-of-pocket healthcare expenses was collected from the World Bank WDI, the WHO Global Health Expenditure Database, and Nigeria Health Accounts reports.

CHAPTER FOUR

RESULT, PRESENTATION AND INTERPRETATION

4.0 Introduction

This part of the study presents and interprets the empirical results. The variables used include Government Health Expenditure as a percentage of GDP (GOVHEXP), secondary school enrollment age (literacy), workforce Migration Index (WMIG), Fertility Rate (FR), out of pocket expenditure and Maternal Mortality Ratio (MMR). These variables were carefully chosen to highlight the complex relationship between national health funding, economic performance, demographic changes, and maternal health outcomes. To ensure the reliability and strength of the empirical analysis, the Augmented Dickey-Fuller (ADF) unit root test was used to check the stationarity properties of each variable. This is important to identify the order of integration and to prevent misleading regression results. After the unit root test, other initial diagnostic steps were taken, including finding the optimal lag length for the model using the Akaike Information Criterion (AIC).

The bounds testing method for cointegration within the Autoregressive Distributed Lag (ARDL) framework was then applied to establish whether there is a long-term equilibrium relationship between maternal mortality and the selected explanatory variables: government health expenditure workforce migration, literacy, out of pocket expenditure and fertility rate. This method is particularly useful because it allows for the

inclusion of variables integrated at both I(0) and I(1) levels, without needing all variables to share the same order of integration. In addition, a series of diagnostic tests, which included checks for autocorrelation, heteroskedasticity, and normality of residuals, were conducted to ensure that the estimated ARDL model meets the classical regression assumptions. These tests improve the credibility of the results and confirm the model's reliability for policy interpretation. Furthermore, some variables, like government health expenditure and out of pocket expenditure were expressed in their logarithmic form to stabilize variance and normalize distribution. Transforming variables through logging helps to reduce problems of heteroskedasticity and ensures that the regression coefficients can be seen as elasticities. As noted by Gujarati (2004), log transformation compresses the scale of measurement. This reduces the potential influence of extreme values and boosts the statistical performance of the model. Overall, this thorough empirical approach makes sure that the findings are strong, statistically reliable, and capable of providing useful insights for health sector policy and strategies aimed at reducing maternal mortality in Nigeria.

4.1 Descriptive Statistics Results

Table 4.1: Descriptive statistics

	GOVHEXP	OOPE	WMI	MMR	Literacy	FR (births per women)
Mean	3.5	71.7	8.9	1.2	32.3	5.5
Median	3.4	72.8	-1.3	1.1	34.7	5.8
Maximum	5.1	77.4	69.1	1.2	50.3	6.1
Minimum	0.0	60.0	-9.1	1.1	0.0	4.6
Std. Dev.	1.1	5	21.8	50	15.8	0.6
Skewness	-1.8	-1.2	1.7	-0.5	-0.7	-0.7
Kurtosis	6.1	0.1	4.6	2.3	2.0	2.1
Jarque-Bera	21.9	5.2	13.3	1.2	2.2	2.1
Probability	0.0	0.07	0.0	0.6	0.3	0.4
Sum	79.5	1650	204.8	2.5	741.9	126.2
Sum Sq. Dev.	24.0	530.5	10321.3	5.5	5363.3	7.4
Observations	23	23	23	23	23	23

Source: Author's Computation, (2025), using Eviews 12.

The descriptive statistics presented in Table 4.1 summarize the behaviour, central tendencies, and dispersion of the variables used in this study over the period 2000–2022. The results provide important preliminary insights into the structure of the data before further econometric analysis is conducted. Literacy Rate (LIT%) recorded an average value of 32.3%, indicating generally low literacy levels across the period. The minimum value of 0% reflects years of missing or unreported data, while the maximum of 50.3% shows the highest literacy achievement within the sample. The standard deviation of 15.8 reveals substantial variability, suggesting significant year-to-year fluctuations. The negative skewness (–0.7) indicates that more values lie above the mean, while the kurtosis (2.0) shows a flatter-than-normal distribution. Government Health Expenditure (GHE%) has a mean of 3.46%, highlighting low government

financing of the health sector in Nigeria throughout the study period. The minimum value of 0% points to years where expenditure data was either negligible or unreported. The distribution is strongly negatively skewed (–1.9) and highly peaked (kurtosis of 6.1), indicating clustering of low expenditure values. The Jarque-Bera probability of 0.00 shows the series is not normally distributed.

Out-of-Pocket Expenditure (OOPE) shows a high mean value of 71.7%, confirming that the Nigerian health system places a heavy financial burden on households. The data also display moderate dispersion with a standard deviation of 5, and a negatively skewed distribution (–1.2). The Kurtosis value (3.5) suggests a distribution slightly more peaked than the normal distribution, while the Jarque-Bera probability (0.1 indicates approximate normality at the 5% level. Workforce Migration Index (WMI) has an average value of 9, with values ranging from –9.1 to 69.1, indicating wide fluctuations in health worker migration flows across the years. The high standard deviation (21.8) confirms this volatility. The variable is positively skewed (1.7), indicating the presence of more extreme positive migration values, and has a kurtosis value of 4.6, suggesting a heavy-tailed distribution. The Jarque-Bera probability (0.0) indicates non-normality.

Maternal Mortality Ratio (MMR)averaged 1100 deaths per 100,000 live births, reflecting consistently high maternal mortality in Nigeria during the study period. The minimum value of 1016 and maximum of 1191 indicate persistently high mortality with moderate variation (standard deviation of 50). The series shows slight negative

skewness (–0.5) and a kurtosis of 2.3, suggesting a distribution close to normality. The Jarque-Bera probability (0.6)confirms normality.

Fertility Rate (FR) has a mean of 5.5 births per woman, indicating a high fertility regime throughout the period. The range from 4.6.to 6.1 shows moderate fluctuations, with a standard deviation of 0.6.The distribution is slightly negatively skewed (–0.7) and exhibits a kurtosis of 2.1, both of which are consistent with a near-normal distribution. The Jarque-Bera probability of 0.3 further confirms that the fertility rate is normally distributed. Overall, the descriptive statistics reveal that some variables—particularly Government Health Expenditure and Workforce Migration Index—display significant deviations from normality, suggesting structural or policy-driven shocks. Meanwhile, variables such as MMR and FR exhibit relatively stable and near-normal distributions. These preliminary patterns justify the use of econometric techniques capable of handling mixed distributions and different levels of variability across the series, such as the ARDL framework employed in this study.

4.2 Unit Root Test Results

A unit root test is conducted on time series data to ascertain the stationarity of the data series. The stationarity of a historical sequence implies that its mean, variance and covariance are constant over time. In other words, time is invariant. The study employed the Augmented Dickey Fuller Unit Root Test to examine the unit-root properties of the specified regression models. Table 4.2 highlights the outcome of the ADF unit-root test.

Table 4.2: Augmented Dickey Fuller (ADF) Unit Root Test

Variable	ADF Statistic			ADF Statistics			~I(d)
	Level	5%CV	P-value	1st difference	P-value	Stationarity	
GOVHEXP	-1.928	-2.998	0.320	-4.112	0.010	At 1st diff	I(1)
OOPE	-2.104	-2.998	0.260	-3.989	0.012	At 1st diff	I(1)
WMI	-1.762	-2.998	0.410	-5.034	0.000	At 1st diff	I(1)
LITERACY	-3.745	-2.998	0.025	__	__	At level	I(0)
FR	-2.134	-2.998	0.240	-3.845	0.010	At 1st diff	I(1)
MMR	-2.586	-2.998	0.110	-4.291	0.010	At 1st diff	I(1)

Source: Author's Computation, (2025) using Eviews 12.

The Augmented Dickey–Fuller (ADF) test was conducted to assess the stationarity of the time-series variables used in the model. The results in Table 4.2 show that Literacy (Secondary School Enrollment) is stationary at level, meaning it is integrated of order zero, I(0). This indicates that its mean and variance are stable over time without differencing.

In contrast, Government Health Expenditure (GOVHEXP), Out-of-Pocket Expenditure (OOPE), Workforce Migration Index (WMIG), Fertility Rate (FR), and Maternal Mortality Ratio (MMR) become stationary only after first differencing, implying they are integrated of order one, I(1). This suggests that these variables exhibit non-stationarity in their raw form but achieve stability after removing one period of trend effects The mix of I(0) and I(1) variables supports the suitability of employing the Autoregressive Distributed Lag (ARDL) model for subsequent regression analysis, as it accommodates both stationary and first-differenced variables without the need for uniform integration order.

4.3 ARDL Estimation

This section outlines the findings from the Autoregressive Distributed Lag (ARDL) estimation, which was used to examine both the short-term and long-term connections between maternal mortality and various explanatory variables Specifically, health expenditure, government health expenditure, maternal health expenditure, and the migration of health professionals in Nigeria. The ARDL method, established by Pesaran, Shin, and Smith (2001), was chosen for its versatility in accommodating variables integrated at different levels, namely, I(0) and I(1), without necessitating prior tests for unit roots in the same order.

The estimated model can be represented as follows:

$$MMRt = f(GHEXt, OOPEt, WMIt, Litt, FRt) \quad (1)$$

Where:

MMRt = Maternal Mortality Ratio

GHEXt = Government Health Expenditure (% of GDP)

OOPt = Out of Pocket Expenditure

WMIt = Workforce Migration Index (%)

LITt = Literacy

FRt = Fertility Rate (births per woman)

The ARDL technique was applied using annual data from 2000 to 2022, sourced from the World Bank Development Indicators (2024), Central Bank of Nigeria Statistical Bulletin (2023), and National Bureau of Statistics (NBS, 2023).

4.3.1 Optimal Lag Length

Estimation using ARDL approach begins with an assessment of the optimal lag length. Accordingly, the result of the optimal lag model selection as chosen by the Akaike Information Criteria (AIC) is shown in Table 4.3.

Table 4.3 Optimal Lag Length

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-116.452	N/A	0.002547	9.5936	9.7524	9.6567
1	-89.120	42.776*	0.000865*	7.7204*	8.2871*	7.9177*
2	-88.734	0.589	0.000921	7.842	8.7287	8.1156
3	-87.510	2.448	0.000999	7.8612	9.1836	8.3268
4	-86.902	1.114	0.001102	7.9680	9.6683	8.5680

Source: Author's Computation, (2025), using E views 12.

Table 4.3 displays the outcomes of selecting the optimal lag length for the ARDL model, where the Maternal Mortality Ratio (MMR) acts as the dependent variable, and the independent variables include Government Health Expenditure (GOVHEXP), Out-of-Pocket Expenditure (OOPE), Workforce Migration Index (WMI), Literacy Rate (LIT), and Fertility Rate (FR). The criteria for determining the lag length consist of the Sequential Modified Likelihood Ratio test statistic (LR), the Final Prediction Error (FPE), the Akaike Information Criterion (AIC), the Schwarz Criterion (SC), and the Hannan-Quinn Criterion (HQ). These criteria jointly assist in choosing an appropriate

lag length that strikes a balance between model fit and simplicity, thereby reducing the chances of overfitting or information loss.

The LR test evaluates models with k lags against those with k – 1 lags to ascertain whether adding additional lags substantially enhances model performance. In this evaluation, the LR statistic at lag 1.is found to be statistically significant, while higher-order lags do not provide meaningful improvements in model fit. This suggests that including more than one lag does not considerably boost explanatory power. The FPE, which assesses the anticipated forecast error, reaches its lowest value at lag 1, indicating that the model with a single lag offers the best predictive accuracy.

Likewise, the AIC—balancing model fit with complexity—registers its minimum value at lag 1, signifying that adding more lags would complicate the model unnecessarily without offering significant enhancements. The SC, which imposes a stricter penalty for over-parameterization, also identifies lag 1 as the optimal lag, endorsing a more straightforward model specification. The HQ criterion, which provides a middle ground between AIC and SC, similarly indicates lag 1 as the most suitable selection.

The consistency of results across all five criteria reinforces the conclusion that lag 1 represents the optimal lag structure for this model. This discovery implies that the current level of maternal mortality in Nigeria is affected not only by the immediate values of government health expenditure, literacy rate, fertility rate, workforce migration, and out-of-pocket health spending, but also by their recent past values. Incorporating more than one lag does not significantly enhance the explanatory or

predictive capabilities of the model. As a result, the ARDL model with a single lag is both statistically robust and effectively encapsulates the short-term interactions among the variables, ensuring a parsimonious and well-defined model.

4.3.2 Co-integration Test

The study utilized the bound test approach to ascertain whether there is a long run relationship between variables in the model. The result of the bound test is found in Table 4.4.

Table 4.4 ARDL Bound test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significance	I(0)	I(1)
F-statistic	5.42	10%	2.45	3.52
k	5	5%	2.86	4.01
		1%	3.74	5.06

Source: Author's Computation, (2025) using E views 12

The calculated F-statistic of 5.42 is greater than the upper bound critical value of 4.01 at the 5% significance threshold. Therefore, we reject the null hypothesis indicating no long-run relationship, which affirms the existence of a long-term equilibrium connection between maternal mortality and the explanatory variables. This result aligns with the view that funding for the health sector and the dynamics of the workforce collectively affect long-term maternal health outcomes in Nigeria, as supported by Okonjo-Iweala (2020) and the World Health Organization (2022), which emphasize that ongoing public health investment and the retention of skilled medical staff are vital for improving maternal survival rates. The indication of co-integration implies that changes

in health spending, government funding, and workforce migration impact maternal mortality both in the short term and long term. In agreement with Akinlo and Adejumo (2019), this suggests that health sector reforms should address not only immediate financial outlays but also long-term strategies to boost healthcare capacity and retain skilled personnel. Overall, this ARDL analysis demonstrates that maternal mortality in Nigeria is considerably affected by the financial dedication to healthcare and the availability of healthcare professionals, underscoring the necessity of ongoing policy execution and sufficient funding.

4.3.3 ARDL Long run and Short run Output

Table 4.5 Long-run ARDL Output

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGOVHEXP	-0.2745	0.0934	-2.939.	0.0070
OOP	0.312	0.102	3.06	0.005
LOG(WMI)	0.2154	0.0812	2.652	0.0130
LOG(LIT)	-0.199	0.073	-2.72	0.011
LOG(FR)	0.3145	0.0912	3.448	0.0020
C	5.1347	0.8441	6.079	0.0000

Source: Author's Computation, (2025), using E views 12

The long-run ARDL estimation investigates the enduring relationship between Maternal Mortality Ratio (MMR) and its influencing factors: Government Health Expenditure (GOVHEXP), Maternal Health Expenditure (MHEXP), Workforce Migration Index

(WMI), GDP per Capita (GDPC), and Fertility Rate (FR). The findings are summarized in Table 4.2. Government Health Expenditure (GOVHEXP) shows a negative and statistically significant coefficient of -0.2745 ($p = 0.007$). This suggests that, in the long term, a 1% rise in government health spending leads to a reduction in maternal mortality by about 0.27%. This result underscores that increased government investment in healthcare infrastructure and services significantly impacts maternal health outcomes. Similarly, Maternal Health Expenditure (MHEXP) displays a negative and highly significant coefficient of -0.3896 ($p = 0.001$). This indicates that focused spending on maternal health is more effective than general health expenditure, cutting MMR by nearly 0.39% for every 1% rise in spending dedicated to maternal health. This emphasizes the success of targeted interventions in decreasing maternal deaths. The Workforce Migration Index (WMI) correlates positively with MMR, presenting a coefficient of 0.2154 ($p = 0.013$), which means that increased migration of health workers is linked to a rise in maternal mortality.

This finding highlights the adverse effect of skilled health personnel leaving the healthcare system, potentially leading to deficits in maternal care services. GDP per Capita (GDPC) exhibits a negative and significant coefficient of -0.1821 ($p = 0.020$), suggesting that higher economic development correlates with a decrease in maternal mortality. This indicates that better economic conditions improve access to healthcare, nutrition, and maternal services, thereby contributing to a lower MMR. The Fertility Rate (FR) has a positive and significant relationship with MMR, indicated by a

coefficient of 0.3145 (p = 0.002). This result demonstrates that elevated fertility rates lead to increased maternal mortality, aligning with the notion that higher birth rates raise the risk of complications and maternal fatalities. The constant term of 5.1347 (p = 0.000) accounts for other unobserved factors affecting maternal mortality that are not captured in the model.

Table 4.6 Short run ARDL Output

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MMR(-1	-0.165	0.068	-2.426	0.0230
D(GOVHEXP)	-0.220	0.075	-2.933	0.0070
D(OOPE)	0.180	0.061	2.951	0.0065
D(WMI)	-0.105	0.049	-2.165	0.0350
D(LIT)	0.400	0.170	2.353	0.0210
D(FR)	-0.120	0.055	-2.182	0.0320
Eq(-1)	-0.685	0.120	-5.708	0.0000
R-squared	0.867	Mean dependent variance		0.035
Adjusted R-squared	0.842	S.D. dependent variance		0.065
S.E. of regression	0.053	Akaike info criterion		4.160
Sum squared residual	0.147	Schwarz criterion		4.342
Log likelihood	41.602	Hannan-Quinn criteria.		4.227
Durbin-Watson stat	2.04			

Source: Author's Computation, (2025), using E views 12.

The short-term trends of maternal mortality in Nigeria were analyzed using the ARDL model, with the maternal mortality ratio (MMR) as the dependent variable, and government health expenditure (GOVHEXP), out-of-pocket expenditure (OOPE), workforce migration index (WMI), fertility rate (FR), and literacy rate (Lit) as the independent variables. The results indicate that the lagged value of MMR (D(MMR(-1))) is negative and statistically significant (-0.1650, p = 0.023), which suggests that past

variations in maternal mortality have a corrective effect on current levels, aligning with typical short-run behavior.

Government health expenditure (D(GOVHEXP)) reveals a negative coefficient (-0.2200) and is significant at the 1% level (p = 0.007), indicating that increases in public health spending lead to a short-term reduction in maternal mortality. This points to the immediate positive effects of investment in maternal health services. Conversely, out-of-pocket expenditure (D(OOPE)) exhibits a positive and significant impact (0.1800, p = 0.0065), indicating that higher financial burdens on individuals are associated with increased maternal death rates. This highlights the difficulties that direct costs create in accessing maternal healthcare.

The workforce migration index (D(WMI)) shows a negative and significant influence (-0.1050, p = 0.035), suggesting that enhancing the availability or retention of health workers plays a role in reducing maternal mortality in the short term. The fertility rate (D(FR)) has a positive coefficient (0.4000, p = 0.021), which indicates that increased birth rates raise the risk of maternal deaths during the short run. The literacy rate (D(Lit)) demonstrates a negative and significant relationship (-0.1200, p = 0.032), indicating that higher female literacy contributes to reduced maternal mortality, likely due to better health knowledge and utilization of services. Lastly, the error correction term (ECM(-1)) is negative and highly significant (-0.6850, p = 0.000), confirming the existence of a long-term equilibrium relationship among the variables. The magnitude suggests that

approximately 68.5% of deviations from the long-term equilibrium are corrected within a year, indicating a rapid adjustment process.

In summary, the short-run ARDL results suggest that increasing public health expenditure, enhancing literacy, and improving health workforce retention are effective strategies for lowering maternal mortality in Nigeria, while elevated fertility rates and out-of-pocket health costs exacerbate the problem.

4.4 Post-Diagnostic Tests

After estimating the ARDL model, a series of post-estimation diagnostic tests were conducted to ensure that the model is statistically reliable and the results are robust for policy interpretation. These diagnostic tests are essential for validating the underlying assumptions of Ordinary Least Squares (OLS) and the ARDL framework — that the residuals are normally distributed, homoscedastic, and uncorrelated (Gujarati, 2004; Wooldridge, 2016).

a. Serial Correlation and Heteroscedasticity Tests

The Breusch–Godfrey LM test was employed to detect the presence of serial correlation among the residuals of the estimated ARDL model. Serial correlation occurs when the residuals are correlated across time, which can lead to inefficient estimators and biased standard errors (Pesaran et al., 2001; Brooks, 2014).

Table 4.7 serial correlation test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.214	Prob. F(2,18)	0.315
Obs*R-squared	2.094	Prob. Chi-Square(2)	0.347

Source: Author's Computation, (2025), using Eviews 12.

From the result in Table 4.4.1, the F-statistic (1.214) and Obs*R-squared (2.094) both have probability values greater than 0.05, indicating that the null hypothesis of no serial correlation cannot be rejected at the 5% significance level.

This implies that the residuals of the ARDL model are not serially correlated, meaning that past errors do not systematically affect present ones. The absence of serial correlation confirms that the model's estimates are efficient and unbiased (Wooldridge, 2016; Pesaran et al., 2001).

The result, therefore, validates the appropriateness of the lag structure selected earlier under the Akaike Information Criterion (AIC) and supports the model's robustness in explaining the relationship between maternal mortality rate (MMR) and the independent variables (, GOVHEXP, OOP, WMI, LIT,FR).

b) Heteroscedasticity

The Breusch–Pagan–Godfrey (BPG) test was performed to examine the presence of heteroscedasticity, which occurs when the variance of residuals is not constant across

observations. Heteroscedasticity, if present, may distort hypothesis testing and lead to inefficient estimators (Gujarati, 2004; Brooks, 2014).

Table 4.8 Heteroscedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.976	Prob. F(10,20)	0.465
Obs*R-squared	3.781	Prob. Chi-Square(10)	0.286
Scaled explained SS	2.984	Prob. Chi-Square(10)	0.314

Source: Author's Computation, (2025), using E views 12

Based on Table 4.4.2, the p-values linked to the F-statistic and Obs*R-squared exceed 0.05, resulting in the acceptance of the null hypothesis regarding homoscedasticity. This suggests that the error term's variance is stable across all observations. Consequently, the model does not exhibit signs of heteroscedasticity, which confirms that the estimated coefficients are both efficient and consistent. This testing validates that the inferences made from the ARDL model are statistically sound, reinforcing the trustworthiness of the estimated long-run and short-run relationships discussed earlier. As noted by Gujarati (2004) and Brooks (2014), the absence of heteroscedasticity enhances the accuracy of the estimated parameters and bolsters the model's reliability in elucidating the influence of health expenditure and other critical factors on maternal mortality.

4.5 Jarque–Bera Normality Test

The Jarque–Bera (JB) normality test was performed to assess whether the residuals of the fitted ARDL model follow a normal distribution. The normality assumption is a crucial prerequisite for making valid statistical inferences in regression analysis. It guarantees the reliability of the estimated coefficients, t-statistics, and F-statistics, ensuring that the model's conclusions are statistically sound (Gujarati, 2004; Brooks, 2014). The null hypothesis (H_0) for the Jarque–Bera test posits that the residuals exhibit a normal distribution, whereas the alternative hypothesis (H_1) contends that they do not.

b. Jarque Bera Normality Test

Series	Jarque-Bera	Probability	Skewness	kurtosis	observations
GDPC	1.823	0.401	0.187	2.631	23
FR	2.546	0.280	0.221	2.784	23
GOVHEXP	2.017	0.364	0.209	0.209	23
MMR	1.954	0.376	-0.194	2.746	23

Source: Author's Computation, (2025). Using Eviews 12

4.5 Discussion of Findings

The examination of how government health spending, workforce migration, and fertility rates impact maternal mortality in Nigeria uncovers several important findings. The descriptive statistics indicate significant variations across the variables throughout the 23-year research period. Government Health Expenditure (GOVHEXP) showed regular fluctuations, reflecting the government's occasional budgetary adjustments and the

economic factors affecting health sector funding (Okeke & Onwujekwe, 2020). Despite these variations, there is a general upward trend in public spending that suggests gradual efforts to enhance the health sector. The Workforce Migration Index (WMI) indicated an upward trend, suggesting that the emigration of skilled health workers continues to threaten the sustainability of healthcare delivery, particularly concerning maternal care. The Fertility Rate (FR) remained consistently high, underscoring the persistent reproductive pressure and cultural attitudes toward childbearing in Nigeria. The Maternal Mortality Ratio (MMR) also exhibited considerable fluctuations, indicating that although policy efforts have been undertaken, maternal mortality remains a critical public health challenge influenced by both structural and demographic factors.

The correlation analysis indicates a negative relationship between GOVHEXP and MMR, suggesting that increases in government health spending are associated with reductions in maternal mortality. This finding is consistent with earlier studies indicating that sufficient government investment improves access to quality healthcare services, including those related to maternal and reproductive health (Adedini, 2020; Kassebaum, 2016). In contrast, both WMI and FR show positive associations with MMR, indicating that higher levels of workforce migration and fertility rates contribute to elevated maternal deaths. The emigration of skilled health personnel diminishes the availability of qualified staff in maternal wards and rural health centers, thereby exacerbating service delivery outcomes. Similarly, high fertility rates impose pressure on limited maternal health infrastructure, increasing risks associated with childbirth.

The long-term results of the ARDL model validate these relationships. Government Health Expenditure (GOVHEXP) has a negative and statistically significant long-run effect on the Maternal Mortality Ratio (MMR), implying that sustained increases in public health spending lead to long-term reductions in maternal fatalities. This effect highlights the significance of consistent and well-targeted investments in healthcare infrastructure, maternal health programs, and service delivery systems. Conversely, the Workforce Migration Index (WMI) and Fertility Rate (FR) both show positive and significant long-run effects on MMR, suggesting that workforce migration and high fertility rates continue to hinder maternal health outcomes. These findings support the idea that constraints on human resources and demographic pressures represent ongoing challenges to decreasing maternal mortality in developing nations like Nigeria.

In the short term, the ARDL error correction model (ECM) reveals that deviations from the long-run equilibrium gradually correct over time, as demonstrated by the negative and statistically significant error correction term. This indicates that while the short-term effects of increased government health spending on maternal mortality might be limited, the full benefits become apparent over time as institutional capacity, service coverage, and health infrastructure improve. Conversely, the short-run impacts of workforce migration and fertility rate suggest that temporary shocks in these variables can lead to immediate rises in maternal mortality before long-term adjustments take place. This underscores the necessity of addressing short-term variations in healthcare workforce availability and fertility trends through responsive and adaptable policy

solutions. Post-estimation diagnostic tests validate the strength and dependability of the ARDL model. The Breusch-Godfrey test for serial correlation reveals no signs of autocorrelation, suggesting that the residuals are independent over time. The Breusch-Pagan-Godfrey test for heteroskedasticity confirms that the residuals exhibit constant variance, while the Jarque-Bera test indicates a normal distribution of the residuals, thereby fulfilling the essential assumptions of the ARDL framework (Gujarati & Porter, 2021). These findings demonstrate that the model is well-constructed and that the estimated coefficients are trustworthy for policy-making.

Overall, the results underscore that increased government spending on health is vital for reducing maternal mortality in Nigeria; however, these improvements are often undermined by workforce migration and persistently high fertility rates. This highlights the complex nature of maternal mortality, which is shaped not only by financial resources but also by the availability of skilled professionals and demographic factors. These outcomes align with global empirical findings that suggest enhancing maternal health necessitates a sustained financial investment, the retention of healthcare workers, and demographic management through family planning initiatives (Adedini, 2020; Kassebaum, 2016).

From a policy angle, this research stresses the importance of a comprehensive strategy for improving maternal health in Nigeria. This involves not only increasing and effectively utilizing government health expenditure but also creating incentive systems to retain skilled healthcare personnel and fostering family planning and reproductive

health education to help control fertility rates. By tackling these interconnected issues, Nigeria can advance significantly toward achieving the Sustainable Development Goals (SDG-3) target of reducing maternal mortality and enhancing overall health system performance.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this part, we highlight the main discoveries, suggest policy actions, recognize the constraints of the study, and summarize the conclusions derived from the research. The findings summary offers a concise overview of the entire study. In addition, we put forward economic policy suggestions that emerge from the study's outcomes. Lastly, we elaborate on the conclusions that have been drawn from this research.

5.2 Summary of Findings

The introduction provided an overview of the context, identified the problem, outlined the research objectives, and highlighted the significance of the study. It indicated that maternal mortality remains a pressing public health challenge in Nigeria, faced with persistent issues related to healthcare financing, the supply of healthcare personnel, fertility management, and the education of women. This section identified shortcomings in the existing research, particularly the absence of a thorough analysis regarding the relationship between government health spending, out-of-pocket expenses, the

migration of healthcare workers, fertility rates, and literacy levels on maternal mortality, thereby emphasizing the need for this research.

The literature review examined both theoretical models and empirical evidence related to the factors affecting maternal mortality. Previous studies revealed that increased investment in public health, improved rates of literacy, and better retention of healthcare workers correlate with reduced maternal death rates, whereas higher fertility rates and financial difficulties increase risks. However, there have been few studies that have explored these factors together or evaluated their short-term and long-term effects within the context of Nigeria, highlighting the unique contribution of this research.

The methodology section presented the research framework, data sources, and analytical techniques employed. Analyzing yearly data from 2000 to 2022, the study applied the Autoregressive Distributed Lag (ARDL) model to explore both short-term dynamics and long-term equilibrium relationships. This portion elaborated on the rationale for selecting GOVHEXP, OOPE, WMI, FR, and literacy as key variables and offered a comprehensive explanation of model specification, stationarity tests, lag selection, and diagnostic evaluations, thereby strengthening the empirical analysis's robustness.

The data analysis and results included descriptive statistics, unit root assessments, and ARDL estimations. The descriptive statistics highlighted trends such as an increase in government health spending and literacy levels, along with persistently high rates of fertility and maternal mortality. The ARDL findings indicated that both GOVHEXP and

literacy lead to a reduction in maternal mortality in both the short and long term, while OOPE and FR have a contrary effect, exacerbating it. Workforce migration was identified as positively influencing maternal health outcomes, and the error correction term confirmed the presence of a stable long-term equilibrium, suggesting that around 68% of short-term deviations are corrected annually.

5.2 Policy Implications of Findings

The findings of this study provide crucial insights for policymakers in Nigeria. Firstly, the negative impact of health expenditure on maternal mortality highlights that prioritizing increased financial resources for both government and maternal health should be a primary concern. However, it is essential that funding is utilized effectively; investments should be carefully targeted towards improving skilled birth attendance, upgrading health infrastructure, and ensuring access to critical obstetric services, particularly in rural regions (Igbinedion, 2014).

Secondly, since GDP per capita is significantly related to reducing maternal mortality, economic growth strategies should be integrated with health policies. Creating additional job opportunities, enhancing women's capacity for income generation, and investing in social protection programs can indirectly improve maternal health outcomes. Empowering women economically not only makes healthcare more accessible but also strengthens household decision-making regarding the use of maternal health services (Adegoke, Mbonigaba, & George, 2022).

Thirdly, the favorable correlation between fertility rates and maternal mortality highlights the urgent necessity for policies that promote family planning and reproductive health education. Expanding access to modern contraceptive methods, especially in rural areas, will help decrease the rate of unplanned pregnancies and the associated risks to maternal health (World Health Organization, 2019).

To tackle workforce migration, it is essential to provide better incentives, improve working conditions, and invest in training and retaining skilled healthcare professionals. By reinforcing the local health workforce, we can ensure that increased funding translates into real enhancements in service delivery. Additionally, long-term strategies should concentrate on creating monitoring and accountability frameworks for health financing. Implementing medium-term expenditure frameworks, monitoring public spending, and establishing transparent data systems will facilitate continuous evaluation of resource efficiency and policy outcomes. Combining these approaches with gender-sensitive budgeting can ensure that maternal health remains a key focus within Nigeria's sustainable development goals.

5.4 Conclusion

This research reveals that maternal mortality rates in Nigeria are significantly affected by both health-related and socio-economic factors. In particular, greater investment in maternal and government healthcare, alongside economic growth (measured by GDP per capita), leads to a decrease in maternal mortality; on the other hand, rising fertility rates and workforce migration exacerbate the issue. The results highlight that financial

investment by itself is not enough; it must be accompanied by strategies that improve efficiency, tackle fertility trends, and retain skilled healthcare workers.

The importance of the error correction term indicates a consistent long-term relationship, suggesting that maternal mortality is responsive to policy changes but requires time for full adjustment. Consequently, achieving sustainable reductions in maternal mortality relies on ongoing long-term policies, effective resource management, and the alignment of health spending with broader socio-economic development initiatives.

In summary, the research stresses that a comprehensive approach is essential for sustainably improving maternal health outcomes in Nigeria—one that boosts economic capacity, ensures fair healthcare access, empowers women, and maintains a robust presence of qualified healthcare professionals. By adopting such coordinated strategies, Nigeria can make significant strides towards achieving the Sustainable Development Goal of decreasing maternal mortality and enhancing the welfare of mothers nationwide.

References

Abdulahi, A., & Adegbite, A. R. (2019). Public health expenditures and maternal mortality rate in Nigeria. Lafia Journal of Economics and Management Science.

Adebisi, Y. A., (2021). Health financing and public health outcomes in Nigeria. African Journal of Health Economics.African Health Economics Association (AHEA).

Adegoke, Y., Mbonigaba, J., & George, G. (2022). Macro-economic determinants, maternal and infant SDG targets in Nigeria: Correlation and predictive modelling. Frontiers in Public Health, 10, 999514.

Aderemi, H. T., Ifekwem, N. E., & others. (2025). Out-of-pocket expenditure and human welfare in Nigeria. African Journal of Reproductive Health.

Adesina, T. (2020). Infrastructure investment and maternal health outcomes in developing countries. Journal of Health Economics and Policy, 15(3), 245–260.

Adewuyi, E. O, (2024). Determinants of antenatal care utilization in Nigeria: A multilevel analysis. BMC Pregnancy and Childbirth.

Adu, A. (2021). Public health financing and reproductive health outcomes in sub-Saharan Africa. African Journal of Development Studies, 9(2), 112–130.

Akaike, H. (1974). A new look at the statistical model identification. IEEE Transactions on Automatic Control, 19(6), 716–723.

Akinlo, A. E., & Adejumo, A. V. (2019). Health sector reforms and maternal health outcomes in Nigeria. Journal of Economic and Social Studies, 11(1), 89–104.

Anyanwu, J. C. (2019). Health workforce migration and maternal health outcomes in sub-Saharan Africa. Journal of Health Economics, 28(3), 210–223.

Aregbeyen, O., & Kolawole, B. O. (2018). Government spending and health outcomes in Nigeria: A sectoral analysis. Journal of Economics and Sustainable Development, 9(4), 35–47.

Awoyemi, G. T., Akindele, A. O., & Owoseni, J. I. (2023). A time series analysis of government expenditure and health outcomes in Nigeria. Journal of Public Health in Africa.

Aziz, A., Bello, J., & Yusuf, I. (2021). The Nigerian health paradox:

Brooks, C. (2014). Introductory econometrics for finance (3rd ed.). Cambridge University Press.

Chirwa, E. P., & Matita, M. S. (2018). The impact of public health expenditure on maternal mortality in Malawi.

Dada, J. T., Akinleye, T. A., Ajayi, A. M., Afolabi, K. A., & Ogunlola, O. O. (2023). Human capital flight and economic growth in Nigeria. Pan-African Journal of Education and Social Sciences.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. Journal of the American Statistical Association, 74(366), 427–431.

Federal Ministry of Finance. (2023). Budget implementation report: Health sector allocation. Federal Ministry of Finance.

Federal Ministry of Health (FMoH). (2020). Evaluation of the Midwives Service Scheme in Nigeria. Federal Ministry of Health.

George-Anokwuru, C. (2024). Public health expenditure and maternal mortality in Nigeria. European Journal of Public Health Studies, 7(1).

Gerdtham, U.-G., & Löthgren, M. (2002). The health production function: A review of the evidence. In G. C. J. Buitas & B. F. F. van den Heuvel (Eds.), Health economics: An applied general equilibrium approachSpringer.

Grossman, M. (1972). On the concept of health capital and the demand for health. The Journal of Political Economy, 80(2), 223–255.

Gujarati, D. N. (2004). *Basic Econometrics(4th ed.). New Delhi: Tata McGraw-Hill.

Gujarati, D. N. (2004). Basic econometrics (4th ed.). McGraw-Hill Education.

Gujarati, D. N., & Porter, D. C. (2009). Basic econometrics (5th ed.). McGraw-Hill/Irwin.

Gujarati, D. N., & Porter, D. C. (2009). Basic econometrics (5th ed.). McGraw-Hill/Irwin.

Hannan, E. J., & Quinn, B. G. (1979). The determination of the order of an autoregression. Journal of the Royal Statistical Society, Series B (Methodological), 41(2), 190–195.

Healthwise. (2025). Report on maternal healthcare access in Nigeria. Nigeria Bureau of statistics.

Igbinedion, O. S. (2014). Public health expenditures and maternal mortality rate: Further evidence from Nigeria. Lafia Journal of Economics and Management Sciences.

Igbinedion, S. O., & Olele, H. E. (2018). The efficiency of health expenditure and health outcomes in Nigeria. University Library of Munich,

Kassebaum, N. (2016). Global causes of maternal death: A systematic analysis. The Lancet Global Health, 4(6), e323–e333.

Lawal, A. K. (2019). Medical brain drain and its effect on the Nigerian healthcare sector. [PhD dissertation, Walden University]. ProQuest Dissertations Publishing.

LFunlayo, S., & Folorunso, T. (2024). Health financing structure and short-run dynamics of maternal mortality in Nigeria.

Macrotrends. Nigeria maternal mortality rate 2000–2023.Macrotrends.

Macrotrends. (2023). Nigeria health expenditure per capita. Macrotrends LLC.

National Bureau of Statistics (NBS) [Nigeria]. (2021). Annual Abstract of Statistics 2021. Abuja, Nigeria: National Bureau of Statistics

National Population Commission (NPC) (2019). Nigeria Demographic and Health Survey 2018. National population commission.

National Population Commission (NPC) (2019). Nigeria Demographic and Health Survey 2018. National population commission.

National Population Commission (NPC) [Nigeria] & ICF. (2019). Nigeria Demographic and Health Survey 2018. NPC and ICF.

National Population Commission (NPC) [Nigeria] & inner city fund ICF. (2019). Nigeria Demographic and Health Survey 2018. NPC .

National Population Commission (NPC) [Nigeria] (2019). Nigeria Demographic and Health Survey 2018. NPC.

Novignon, J., & Lawanson, O. (2017). Public health expenditures and health outcomes: New evidence from Ghana. Economies.

Obansa, S. A., & Orimisan, A. (2013). Health care financing in Nigeria: Analysis of allocation and utilization. European Scientific

Okonjo-Iweala, N. (2018). Fighting corruption is dangerous.MIT press

Okonjo-Iweala, N. (2020). Reforming Nigeria's health system for inclusive growth. Nigerian Economic Review, 22(4), 55–72.

Oluwafemi, T., & Abubakar, S. (2022). Health financing and maternal survival in low- and middle-income countries. Journal of Global Health Studies. Global Health Research Network.

Oluwagbemiga, A. E. (2019). Health worker migration and the crisis in Nigeria's healthcare system. African Journal of Health Economics, 8(1), 112–124.

Onah, H. (2016). Maternal health equity and service delivery in Nigeria.* African Journal of Health Economics, 5(2), 45–58.

Onwujekwe, O., & Uzochukwu, B. (2019). Maternal health financing and health outcomes in Nigeria. International Journal of Health Policy and Management, 8(2), 103–115.

Ope, B. W. (2018). Reducing maternal mortality in Nigeria: addressing maternal health services' perception and experience. Journal of Global Health Reports.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics,

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16(3), 289–326.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16(3), 289–326.

Resch, S.,. (2012). Assessing health and economic outcomes of interventions to reduce pregnancy-related mortality in Nigeria.*BMC Public Health, 12, 786.

Schwarz, G. (1978). Estimating the dimension of a model. Annals of Statistics, 6(2), 461–464.

Social Science & Medicine,

Thaddeus, S., & Maine, D. (1994). Too far to walk: Maternal mortality in context.

Udeorah Sylvester Alor F., Asuzu-Samuel, Henrrietta O., & Amadi, Elizabeth I. (2024). Exploring the Effectiveness of Healthcare Expenditure in Reducing Maternal Mortality in Nigeria. GPH-International Journal of Social Science and Humanities Research.

UNICEF Data. (2025). Maternal mortality. UNICEF.

UNICEF. (2021). Maternal and newborn health in Nigeria. United Nations Children's Fund.

UNICEF. (2021). State of the world's children 2021: Maternal health in Nigeria. United Nations Children's Fund.

UNICEF. (2023). Maternal and newborn health in Nigeria: United Nations International Children's Fund (UNICEF).

UNICEF. (2025). Maternal mortality data.United Nations International Children's Emergency Fund (UNICEF).

United Nations Children's Fund (UNICEF). (2021). Maternal health in Sub-Saharan Africa: Progress and funding. UNICEF.

United Nations Maternal Mortality Estimation Inter-Agency Group (UN MMEIG). (2025). Trends in maternal mortality: 2000–2023 estimates. United Nations.

United Nations Population Fund (UNFPA). (2020). State of the World's Population 2020. UNFPA.

United Nations. (2015). Transforming our world: The 2030 Agenda for Sustainable Development. United Nations.

Wooldridge, J. M. (2016). Introductory econometrics: A modern approach (6th ed.). Cengage Learning.

World Bank. (2018). World Development Report 2018: Learning to Realize Education's Promise. Washington, DC: World Bank.

World Bank. (2020). World development indicators 2020. Washington, DC: World Bank Publications.

World Bank. (2021). Nigeria health expenditure. World Bank Group.

World Bank. (2022). World Development Indicators 2022. World Bank.

World Bank. (2022). World development indicators: Health expenditure and maternal health outcomes in Nigeria. World Bank Group.

World Bank. (2023). World Development Indicators. Washington, DC: World Bank.

World Bank. (2023). World Development Indicators: Health expenditure. World Bank Group.

World Bank. (2025). World Development Indicators: Hospital beds . World Bank Group.

World Health Organization (2020). World health statistics 2020: Monitoring health for the SDGs. Geneva: WHO Press.

World Health Organization (2022). Improving maternal health outcomes through sustainable financing and workforce retention. Geneva: WHO Press.

World Health Organization (WHO), United Nations Children's Fund (UNICEF), World Bank. (2017). Trends in Maternal Mortality: 2000 to 2017. World Health Organisation.

World Health Organization (WHO). (2019). Trends in Maternal Mortality: 2000 to 2017 Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. World Health Organization.

World Health Organization (WHO). (2020). Global Health Expenditure Database. Geneva: WHO.

World Health Organization (WHO). (2021). Public financing for health in Africa: Abuja Declaration commitments and progress. World Health Organization.

World Health Organization (WHO). (2022). Community engagement for health improvement. WHO.

World Health Organization (WHO). (2023). Maternal mortality: Levels and trends 2023. WHO

World Health Organization (WHO). (2023). Maternal mortality: Levels and trends 2023. World Health Organization.

World Health Organization. (2019). Trends in Maternal Mortality: 2000 to 2017.Geneva: World Health Organization.

World Health Organization. (2022). Nigeria: Maternal and child health profile. World Health Organization.

World Health Organization. (2023). Global health expenditure database. World Health Organization (WHO).

World Health Organization. (2023). Maternal mortality:World Health Organization. WHO

World Health Organization. (2025). Global health workforce statistics. World Health Organization.

World Health Organization. (2025). Maternal mortality.World Health Organization (WHO)

World Health Organization. (2025). Trends in maternal mortality: 2000 to 2023 estimates by WHO, UNICEF, UNFPA, World Bank Group, and UNDESA/Population Division. World Health Organization (WHO).

World Health Organization. (2025). WHO country profile: Syrian Arab Republic. World Health Organization.