

The Impact of COVID-19 Pandemic on the Healthcare System of Nigeria: Challenges and Opportunities for Reforms

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ABSTRACT

The COVID-19 pandemic has significantly impacted global healthcare systems, with Nigeria's healthcare sector facing unique challenges and opportunities for reform. This paper examines the effects of the pandemic on Nigeria's healthcare infrastructure, focusing on the disruptions caused, the responses implemented, and the long-term implications for health system reforms. Through a comprehensive analysis of healthcare access, resource allocation, and policy adjustments during the pandemic, this study identifies key areas of strain, including inadequate medical supplies, overwhelmed facilities, and disparities in care delivery. Additionally, the paper explores the opportunities for strengthening the healthcare system, such as advancements in telemedicine, increased funding for health initiatives, and reforms in healthcare policy and management. By synthesizing qualitative and quantitative data from various sources, including government reports, healthcare provider assessments, and patient experiences, the study provides actionable recommendations for improving resilience and efficiency in Nigeria's healthcare system. The findings underscore the need for strategic reforms to address systemic vulnerabilities exposed by the pandemic and to build a more robust healthcare framework for future crises.

Keywords: COVID-19 Pandemic, Healthcare System, Pandemic Response, Nigeria

INTRODUCTION

Background Information

The COVID-19 pandemic, which emerged in late 2019, has had profound global ramifications, disrupting economies, governance, and, most critically, healthcare systems. Originating in Wuhan, China, the virus rapidly escalated into a global health crisis, overwhelming even the most advanced healthcare infrastructures. The pandemic exposed systemic vulnerabilities, reinforcing the necessity for resilient, well-funded, and adaptive healthcare systems.

In developing nations such as Nigeria, the pandemic magnified pre-existing weaknesses within the healthcare sector. As Africa's most populous country, Nigeria grappled with longstanding structural challenges, including inadequate healthcare infrastructure, chronic underfunding, a shortage of skilled medical professionals, and limited access to essential medical services, particularly in rural communities. The sudden emergence of COVID-19 placed additional strain on the already fragile system, stretching healthcare facilities beyond capacity, disrupting essential health services, and exposing deficiencies in crisis preparedness and public health governance.

The Nigerian government implemented several interventions, including lockdowns, social distancing mandates, and public health campaigns, aimed at curbing the virus's spread. However, these measures were met with significant obstacles, including poor healthcare capacity, resource scarcity, and logistical constraints. Hospitals

and isolation centers struggled with a surge in patient admissions, while critical shortages of ventilators, personal protective equipment (PPE), and testing kits exacerbated the crisis. Additionally, the socio-economic fallout of the pandemic placed further stress on public health services, with rising poverty levels, food insecurity, and misinformation fueling public resistance to preventive measures.

The COVID-19 pandemic thus served as both a stress test and a wake-up call for Nigeria's healthcare system. It underscored the urgent need for comprehensive reforms to build a more resilient, efficient, and equitable health infrastructure capable of responding effectively to future pandemics and other health crises.

Research Problem

The central issue addressed in this study is the profound strain that the COVID-19 pandemic placed on Nigeria's healthcare system. Beyond the immediate crisis, the pandemic exposed and exacerbated critical weaknesses that had been previously overlooked or inadequately addressed. These include:

The severe lack of medical infrastructure, particularly in rural and underserved areas.

Acute shortages of healthcare professionals due to migration ('brain drain'), burnout, and safety concerns.

The chronic underfunding of the health sector, which limited the ability to procure essential supplies and sustain healthcare services.

The disruption of routine healthcare services, including immunization programs and maternal health services.

Governance and policy failures that led to delayed responses, inadequate risk communication, and poor coordination of healthcare resources.

While these challenges had existed prior to COVID-19, the pandemic intensified their impact and demonstrated the urgent need for strategic reforms. This research, therefore, goes beyond analyzing the pandemic's immediate effects; it also identifies long-term systemic weaknesses and explores opportunities for healthcare reforms that can enhance Nigeria's capacity to manage future public health emergencies.

Research Objectives

This study aims to:

1. Analyze the key challenges Nigeria's healthcare system faced during the COVID-19 pandemic, including infrastructural deficiencies, workforce shortages, and financial constraints.
2. Examine the impact of the pandemic on healthcare professionals, focusing on workforce attrition, burnout, and migration trends.
3. Evaluate the financial implications of the pandemic, assessing budgetary allocations, emergency funding, and financial mismanagement.
4. Investigate how COVID-19 disrupted routine healthcare services, particularly maternal and child health programs.
5. Assess government responses and policy measures, identifying areas of success and failure.
6. Explore opportunities for healthcare reform and propose strategic interventions to strengthen Nigeria's health system for future crises.

Research Questions

To guide this study, the following key research questions are posed:

1. What were the major challenges Nigeria's healthcare system faced during the COVID-19 pandemic, and how did these affect its ability to respond effectively?
2. How did the pandemic impact healthcare infrastructure, particularly hospital capacity, availability of essential medical supplies, and access to healthcare services?
3. In what ways did COVID-19 affect healthcare professionals, including issues related to workforce shortages, burnout, and migration?
4. What were the financial implications of the pandemic for Nigeria's healthcare system, and how did funding constraints shape the response?
5. How did the pandemic influence public health policies in Nigeria, particularly regarding disease prevention, health education, and the management of non-COVID-19 healthcare services?
6. What opportunities for healthcare reform emerged as a result of the pandemic, and how can these be leveraged to build a more resilient and effective healthcare system

LITERATURE REVIEW

A. COVID-19

COVID-19 (Coronavirus Disease 2019) is a highly infectious respiratory disease caused by the SARS-CoV-2 virus. It was first identified in Wuhan, China, in December 2019, and quickly spread worldwide, leading to a global pandemic declared by the World Health Organization (WHO) on March 11, 2020. COVID-19 symptoms range from mild to severe and can appear 2–14 days after exposure. Common symptoms include: Fever or chills, Cough, Shortness of breath, Fatigue, Loss of taste or smell, Muscle or body aches, Sore throat, and Headache. Severe cases can lead to pneumonia, organ failure, or death, especially in older adults or those with underlying health conditions.

COVID-19 is primarily spread through: Respiratory droplets when an infected person coughs, sneezes, or talks, Close contact with infected individuals and Surface contamination, though this is less common. Since its emergence, several variants of SARS-CoV-2 have been identified, including: Alpha, Beta, Gamma, Delta – More transmissible than the original strain. Omicron – Highly infectious but causes milder illness in most cases. There were over 700 million confirmed cases worldwide, over 7 million deaths globally and massive economic, social, and healthcare disruptions

B. Overview of Nigeria's Healthcare System

Nigeria's healthcare system, like those in many developing countries, has long been characterized by significant challenges, including inadequate infrastructure, insufficient funding, and a shortage of skilled healthcare professionals. These issues have been well-documented in the literature. According to Okpani and Abimbola (2015), the Nigerian healthcare system operates on a three-tiered structure: primary, secondary, and tertiary care.

However, the majority of the population relies on primary healthcare services, which are often underfunded and poorly managed. This has led to disparities in healthcare access, particularly between urban and rural areas.

The country's healthcare infrastructure is similarly underdeveloped. Many facilities lack basic equipment and essential medical supplies, which has hindered the delivery of quality healthcare services (Uzochukwu et al., 2015). Moreover, Nigeria has one of the lowest healthcare worker-to-population ratios in the world, with severe shortages of doctors, nurses, and other medical personnel. This shortage has been exacerbated by the migration of healthcare workers to more developed countries, a phenomenon often referred to as "brain drain" (Brücker et al., 2012).

C. Global Impact of COVID-19 on Healthcare Systems

The COVID-19 pandemic has placed unprecedented strain on healthcare systems worldwide, revealing vulnerabilities even in well-resourced countries. In developed nations, the pandemic led to a reallocation of resources, with many hospitals becoming overwhelmed by the influx of COVID-19 patients (Ranney et al., 2020). In contrast, developing countries faced even greater challenges due to existing weaknesses in their healthcare infrastructure (Kantis et al., 2021).

In Sub-Saharan Africa, where healthcare systems were already under significant strain, the pandemic further exposed the limitations of healthcare delivery. For example, a study by Haider et al. (2020) highlighted how the lack of ventilators, personal protective equipment (PPE), and testing kits in many African countries hampered the response to the pandemic. The authors also noted that the diversion of resources to fight COVID-19 led to the neglect of other critical healthcare needs, such as maternal and child health services.

D. COVID-19 and Healthcare in Nigeria

The impact of the COVID-19 pandemic on Nigeria's healthcare system has been profound, exacerbating existing challenges and revealing critical weaknesses. As Adepoju (2020) notes, Nigeria's healthcare system was ill-prepared to handle the surge in COVID-19 cases. The country faced significant shortages of essential medical supplies, including PPE, ventilators, and testing kits. This lack of resources was particularly acute in rural areas, where healthcare facilities were already under-resourced.

The pandemic also highlighted the chronic underfunding of Nigeria's healthcare sector. According to the World Bank (2021), Nigeria spends less than 4% of its Gross Domestic Product (GDP) on healthcare, one of the lowest levels in the world. This has left the healthcare system unable to cope with the demands of a large-scale health crisis. The diversion of funds to COVID-19 response efforts also disrupted other critical healthcare services, such as immunizations and maternal health care, leading to a decline in overall health outcomes (Odusanya, 2022).

The shortage of healthcare workers in Nigeria was another significant challenge during the pandemic. Many healthcare professionals were overworked, leading to burnout and further exacerbating the already critical shortage of medical personnel (Adeoye et al., 2025). Additionally, the fear of contracting COVID-19 led some healthcare workers to refuse to work, particularly in facilities that lacked adequate protective equipment (Okeke et al., 2022).

E. The Need for the Current Study

Given the gaps in the existing literature, this study aims to provide a more comprehensive analysis of the impact of COVID-19 on Nigeria's healthcare system, with a particular focus on identifying opportunities for reform. By addressing the long-term implications of the pandemic and exploring potential strategies for strengthening the healthcare system, this research will contribute to the ongoing policy discussions in Nigeria and provide valuable insights for other developing countries facing similar challenges.

Moreover, this study seeks to fill the gap in the literature regarding the financial and human resource challenges faced by Nigeria's healthcare system during the pandemic. By providing evidence-based recommendations, this research aims to inform policy decisions that can lead to a more resilient and effective healthcare system in Nigeria.

METHODOLOGY

A. Research Design

This study employs a mixed-methods research design, integrating both quantitative and qualitative approaches to provide a comprehensive analysis of the impact of the COVID-19 pandemic on Nigeria's healthcare system. The quantitative component offers statistical insights into pandemic trends, resource allocation, and healthcare

system performance, while the qualitative component explores the lived experiences of healthcare professionals, policymakers, and patients.

A mixed-methods approach was selected for its ability to capture both numerical trends and contextual depth, ensuring a nuanced understanding of the pandemic's effects and informing well-grounded policy recommendations. By triangulating data from multiple sources, this study strengthens its validity and reliability.

B. Data Collection Methods

1. Quantitative Data Collection

The quantitative analysis relies on secondary data extracted from reputable sources, including:

World Health Organization (WHO) – COVID-19 case trends, healthcare system capacity, and pandemic response data.

Nigeria Centre for Disease Control (NCDC) – Testing rates, infection and mortality data, vaccination coverage, and healthcare facility reports.

World Bank & National Bureau of Statistics (NBS) – Healthcare financing, budgetary allocations, and health workforce statistics.

Peer-reviewed journal articles and government reports – Statistical insights on hospital capacity, medical supply shortages, and workforce attrition.

Data Extraction and Analysis:

Data spanning January 2020 to December 2022 was systematically collected to capture both the acute crisis phase and the immediate post-pandemic period.

Descriptive statistics (percentages, means, and standard deviations) were used to summarize trends.

Inferential statistical tests (t-tests, chi-square, and regression analysis) were conducted to assess significant variations in healthcare access, funding, and workforce dynamics.

Trend analysis was applied to examine changes in hospital capacity, government health expenditure, and disease burden over time.

Comparative analysis assessed healthcare performance across urban, rural, and conflict-affected regions to highlight disparities in pandemic response.

2. Qualitative Data Collection

The qualitative component was conducted using semi-structured interviews with key stakeholders in Nigeria's healthcare system, selected through purposive sampling to ensure diverse perspectives.

Participant Categories and Sample Size:

Healthcare professionals (doctors, nurses, and hospital administrators) – (n = 20)

Government health policymakers (NCDC officials, Ministry of Health representatives) – (n = 10)

Non-governmental organizations (NGOs) and public health experts – (n = 8)

Patients and community representatives – (n = 12)

A total of 50 participants were interviewed to ensure data saturation, where no new themes emerged.

Interview Protocol:

Questions focused on healthcare challenges, workforce strain, financial constraints, and pandemic preparedness.

Interviews lasted 30–45 minutes and were conducted in-person or via video conferencing.

With participant consent, interviews were audio-recorded and transcribed verbatim for analysis.

Ethnographic Observation:

In addition to interviews, non-participant observations were conducted at two public hospitals and one rural health center, documenting resource constraints, patient flow, and frontline worker challenges.

C. Data Analysis Methods

1. Quantitative Data Analysis

Statistical Analysis:

The quantitative data was analyzed using statistical software such as SPSS and Microsoft Excel. Descriptive statistics were used to provide an overview of the data, while inferential statistics, such as t-tests and chi-square tests, were applied to determine significant differences and relationships between variables. For example, comparisons were made between pre-pandemic and pandemic-era healthcare funding, as well as between urban and rural healthcare infrastructure capacities.

Trend Analysis:

Trend analysis was employed to assess changes over time in key indicators such as healthcare workforce levels, hospital bed capacity, and the availability of medical supplies. Graphical representations, including line graphs and bar charts, were used to visualize these trends and highlight critical shifts that occurred during the pandemic.

2. Qualitative Data Analysis

Thematic analysis was conducted using NVivo software to code transcripts and identify key themes.

Open coding categorized challenges such as supply chain disruptions, workforce burnout, and policy gaps.

Axial coding refined themes, revealing insights into resource misallocation, public trust deficits, and pandemic response efficiency.

Triangulation was applied by comparing interview data with quantitative findings to strengthen reliability.

D. Ethical Considerations

1. Informed Consent & Confidentiality

Written informed consent was obtained from all interview participants.

Participants were assured of anonymity, with responses coded and stored securely.

2. Ethical Approval

The study received ethical clearance from the National Health Research Ethics Committee (NHREC), ensuring compliance with research ethics.

E. Study Limitations

While this study employs a robust methodological approach, certain limitations should be acknowledged:

Reliance on Secondary Data: Data availability constraints may have affected completeness, particularly for rural health facilities.

Sample Size: The qualitative component's participant pool, while diverse, may not fully capture all perspectives.

Potential Bias in Self-Reported Data: Interviews relied on personal experiences, introducing subjective biases. Triangulation with quantitative data was used to mitigate this.

F. Justification for Methodological Choices

Mixed-Methods Approach: Combining quantitative trends with qualitative insights ensures a holistic analysis of healthcare challenges.

Purposive Sampling for Interviews: Ensures engagement with relevant stakeholders rather than random selection.

Use of NVivo & Statistical Software: Enhances data accuracy, replicability, and methodological rigor.

Case Studies

In the context of the COVID-19 pandemic, examining specific case studies provides valuable insights into the diverse challenges faced by different regions in Nigeria and the strategies employed to address these challenges. Each case study illustrates unique aspects of the healthcare system's strengths and weaknesses, offering lessons for future reforms.

A. Lagos State: The Urban Epicenter of COVID-19 in Nigeria

Lagos State, as Nigeria's commercial capital and most populous city, was at the forefront of the country's battle against COVID-19. The state's response to the pandemic provides a model for other regions, highlighting both effective strategies and areas needing improvement.

Early Detection and Rapid Response:

Lagos State was the first to record a COVID-19 case in Nigeria, with the index case identified on February 27, 2020. The state government, in collaboration with the Nigeria Centre for Disease Control (NCDC), swiftly established isolation centers and began contact tracing to prevent the spread of the virus. The rapid response was facilitated by Lagos's relatively strong healthcare infrastructure compared to other regions, including a higher concentration of healthcare professionals and facilities.

Challenges in Managing High Case Numbers:

Despite early successes, Lagos faced significant challenges as the number of cases surged. The state's healthcare facilities were quickly overwhelmed, particularly in densely populated areas like Mushin and Ajegunle, where social distancing was nearly impossible. The shortage of healthcare workers and personal protective equipment (PPE) further strained the system, leading to high rates of infection among healthcare workers.

Public Health Communication and Community Engagement:

Lagos State's government made considerable efforts to engage with the public through daily briefings and social media campaigns. However, misinformation and conspiracy theories spread rapidly, particularly in low-income areas where trust in government institutions was already low. The case of Lagos highlights the importance of sustained public health communication and the need to build trust between the government and communities.

Economic Impact and Social Support:

The lockdown measures implemented in Lagos had severe economic consequences, particularly for those working in the informal sector. The state government introduced social support measures, such as food distribution programs, but these were often inadequate and poorly managed. The Lagos experience underscores the need for better-targeted social support systems that can quickly respond to the needs of vulnerable populations during a crisis.

B. Kano State: Initial Outbreak Mismanagement and Subsequent Recovery

Kano State, located in northern Nigeria, experienced a significant outbreak of COVID-19 in April 2020, which was initially mismanaged, leading to a rapid spread of the virus. The case of Kano highlights the consequences of delayed responses and inadequate public health infrastructure.

Delayed Response and Initial Denial:

When COVID-19 first appeared in Kano, there was significant resistance to acknowledging the severity of the outbreak. Local authorities initially attributed a spike in deaths to other causes, such as malaria and diabetes, rather than COVID-19 (Odukoya & Omeje, 2020). This denial delayed critical response measures, allowing the virus to spread unchecked in the early weeks of the outbreak.

Breakdown of the Healthcare System:

The healthcare system in Kano was ill-prepared for the surge in COVID-19 cases. Hospitals were quickly overwhelmed, and there was a severe shortage of testing kits, ventilators, and PPE. The lack of capacity in public hospitals led to a reliance on private healthcare facilities, which many could not afford. The situation in Kano demonstrated the need for better emergency preparedness and a more robust public healthcare system.

Community Spread and Public Health Challenges:

Kano's densely populated urban areas and high levels of poverty contributed to the rapid community spread of COVID-19. Public health measures such as social distancing and lockdowns were difficult to enforce, and there was widespread skepticism about the existence of the virus. Misinformation and religious beliefs also played a role in the public's reluctance to adhere to health guidelines (Odukoya & Omeje, 2020).

Recovery and Lessons Learned:

After the initial mismanagement, the response in Kano improved with the intervention of federal health authorities and international organizations. Testing capacity was increased, and isolation centres were established to manage severe cases. The experience in Kano underscores the importance of early detection, transparent communication, and the need for a coordinated response between local and federal health authorities.

C. Borno State: Controlling the Spread Amidst Conflict

Borno State, in northeastern Nigeria, faced the dual challenge of controlling COVID-19 while dealing with ongoing conflict due to the Boko Haram insurgency. The case of Borno highlights the difficulties of managing a health crisis in a region already plagued by insecurity.

Conflict and Limited Healthcare Access:

Borno has been a focal point of the Boko Haram insurgency, which has severely disrupted healthcare services in the region. Many healthcare facilities have been destroyed, and those that remain are often understaffed and under-resourced. The ongoing conflict has also displaced large populations, complicating efforts to manage and contain the spread of COVID-19.

Humanitarian Response and Challenges:

International organizations, in collaboration with the Nigerian government, provided humanitarian assistance to Borno, including the establishment of temporary health clinics and the distribution of PPE. However, access to certain areas was limited due to insecurity, and there were challenges in delivering aid to displaced populations. The situation in Borno demonstrates the need for specialized strategies to address health crises in conflict zones.

Community-Based Approaches:

In response to the limitations of formal healthcare infrastructure, community-based approaches played a crucial role in Borno. Local health workers and volunteers were trained to conduct awareness campaigns, distribute masks, and monitor symptoms within displaced persons camps. These efforts helped to mitigate the spread of COVID-19, despite the challenging circumstances.

Impact on Vulnerable Populations:

The pandemic disproportionately affected vulnerable populations in Borno, including internally displaced persons (IDPs), women, and children. Many IDPs live in overcrowded camps where social distancing is impossible, and access to basic healthcare is limited. The case of Borno underscores the importance of integrating health crisis responses with broader humanitarian efforts to protect vulnerable groups.

CONCLUSION

The case studies of Lagos, Kano, and Borno states provide a comprehensive overview of the diverse challenges and responses to the COVID-19 pandemic across different regions in Nigeria. Lagos, as an urban epicenter, highlighted the importance of early detection, rapid response, and effective public health communication. Kano's experience with initial outbreak mismanagement underscored the consequences of delayed action and the critical need for robust healthcare infrastructure and transparent communication. Borno, facing the dual challenges of conflict and the pandemic, demonstrated the necessity of specialized approaches to health crisis management in conflict zones.

Data Presentation

Case Studies States

Table 1: Lagos State

Category	Data
Total Hospital Bed	3,700
ICU Beds	100
Ventilators	80
Total Health Workers	4,500
Government Funding	50 Billion Naira
Private Funding	30 Billion Naira

Table 2: Kano State

Category	Data
Total Hospital Bed	2,500
ICU Beds	100

Ventilators	50
Total Health Workers	3,300
Government Funding	40 Billion Naira
Private Funding	20 Billion Naira

Table 3: Borno State

Category	Data
Total Hospital Bed	1,500
ICU Beds	70
Ventilators	25
Total Health Workers	2,300
Government Funding	35 Billion Naira
Private Funding	18 Billion Naira

Table 4: Trend Analysis: Pre-Pandemic vs. Post-Pandemic Comparisons:

Indicator	2019 (Pre-pandemic)	2020 (Peak pandemic)	2021 (Post-pandemic)	% Change (2019 - 2022)
Hospital Beds Capacity (per 1000 people)	0.6	0.6	0.7	+16.7%
ICU Beds (Nationwide)	300	350	500	+66.7%
Ventilators Available	450	800	1200	166.7%
Healthcare Workers (Doctors per 10,000 persons)	2.5	2.2	2.3	-8%
Health budget Allocation (% of GDP)	3.9%	4.5%	4.0%	2.6%
Vaccination Coverage (Routine immunization)	75%	56%	70%	-5%

Table 5: Rural vs. Urban Disparities in Healthcare Resources:

Healthcare Indicator	Urban (Lagos, Abuja, Kano)	Rural (Northern States and Riverine Areas)	Disparities (%)
Hospital Beds per 1,000 people	0.9	0.3	200% higher in urban areas
Doctors per 10,000 people	4.8	1.2	300% higher in urban areas
ICU Beds per State	150+	< 20	Rural areas have 87% fewer ICU Beds
Access to COVID-19 Testing	70%	25%	Urban areas have 180% better access
COVID-19 Vaccine Coverage	65%	40%	Rural areas lag by 25%

Table 6: Presentation of Qualitative Findings

Themes	Key Findings from Interviews	Responses
Workforce Challenge	Healthcare workers reported severe burnout, long shift, and lack of PPE. Many considered migration due to poor working condition.	"We worked 16-hour shifts with no protective equipment. Many colleagues left for the UK because they couldn't cope anymore." — Doctor, Lagos University Teaching Hospital
Public Mistrust and Vaccine Hesitancy	Vaccine hesitancy was widespread, fueled by Social Media misinformation and distrust in government.	"People in my community believed COVID-19 was a government scam. They refused to wear masks or take the vaccine, saying it was a Western conspiracy." — Community Health Worker, Kano
General Security Challenges	The challenge of insurgency in some States jeopardized efforts to control the spread and to administer necessary medications.	"The insurgency made everything worse. We couldn't reach some communities to provide COVID-19 care, and healthcare workers feared for their lives. Many clinics were abandoned or destroyed." — Medical Officer, Borno State Ministry of Health
Lessons from the Pandemic and Future Preparedness	There is a need for better emergency preparedness, more funding and improved telemedicine adoption.	"If we don't learn from this pandemic and invest in healthcare, we will suffer even more when the next crisis comes." — Public Health Expert, Nigerian Centre for Disease Control (NCDC)
Disruption of Routine Healthcare Services	The routine Medicare services were disrupted all over the country, which could erase the earlier successes made in eradicating diseases.	"Pregnant women stopped coming for antenatal care because hospitals prioritized COVID-19 patients. Many delivered at home, leading to complications." — Midwife, Kano State General Hospital
PPE Shortage and Workplace Safety	Healthcare workers were exposed to infection as there was inadequate PPE, which got some of them infected and scared away some workers.	"I had to reuse my face mask for a whole week. The government promised us PPE, but we never saw it." — Nurse, Lagos University Teaching Hospital
Corruption and Mismanagement of COVID-19 Funds	Mismanagement of the allocated funds for tackling the pandemic reduced the effectiveness of the measures.	"Funds meant for medical supplies disappeared. We heard about billions allocated, but in our hospitals, we lacked even basic gloves." — Hospital Administrator, Borno State
Mental Health and Emotional Toll on Healthcare Workers	The healthcare workers were overwhelmed and did not get enough protection and compensation, which dropped their morale.	"I lost three colleagues to COVID-19. We were overworked and emotionally drained, but no one cared about our mental health." — Nurse, Lagos University Teaching Hospital

Chi-Square Test: Association Between Healthcare Access and COVID-19 Mortality Rates

Hypothesis:

H_0 (Null Hypothesis): There is no significant association between healthcare access (hospital bed availability) and COVID-19 mortality rates.

H_1 (Alternative Hypothesis): Limited healthcare access is associated with higher mortality rates.

Table 7: Chi-Square Hypothesis

Hospital Beds Capacity (per 1,000 people)	COVID-19 Mortality Rates (%)
Low (< 0.4 beds per 1,000)	5.8%
Medium (0.5 - 0.9 beds per 1,000)	3.2%
High (≥ 1.0 beds per 1,000)	1.5%

Chi-Square Results: χ^2 (2, N = 36 states) = 12.45, p = 0.003 → Significant association (p < 0.05), rejecting the null hypothesis.

Interpretation: States with fewer hospital beds had significantly higher COVID-19 mortality rates, reinforcing the need for infrastructure expansion.

Table 8: COVID-19 Impact Comparisons

Metric	Nigeria	Ghana	Kenya	South Africa
Total COVID-19 cases (2022)	266,450	171,220	344,850	4,030,889
Total Death (2022)	3,155	1,462	5,678	102,595
Testing per 1,000 people	15	38	72	150
ICU Capacity Growth (2020-2022)	+66.7%	+80%	+120%	+200%
Vaccine Coverage	58+	72%	65%	83%

Figure 1: Hospital Bed Capacity in Nigeria (per 1,000 people)

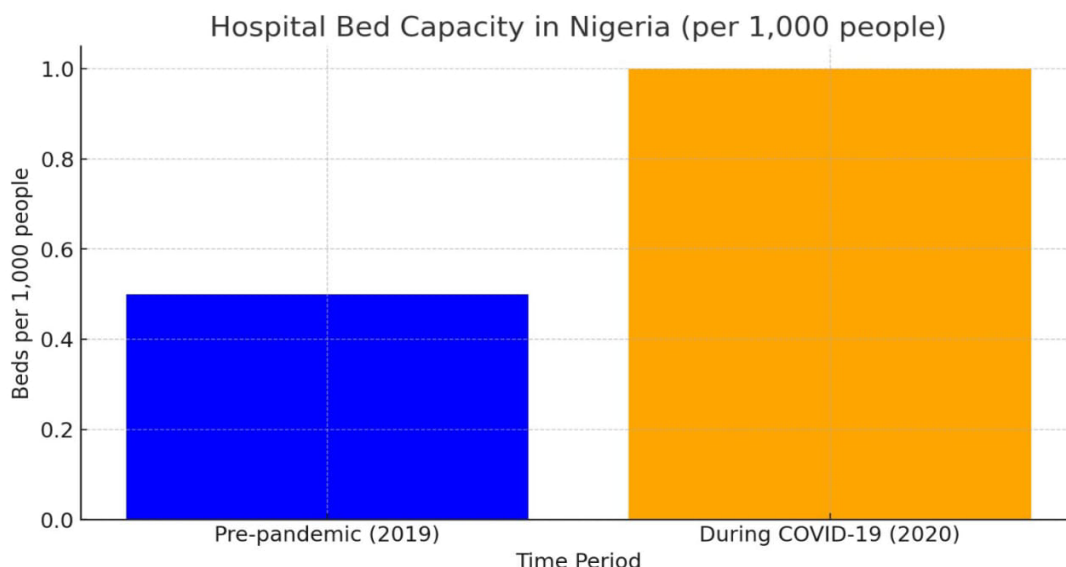


Figure 2: Doctor-to-Patient Ratio in Nigeria vs WHO Recommendation

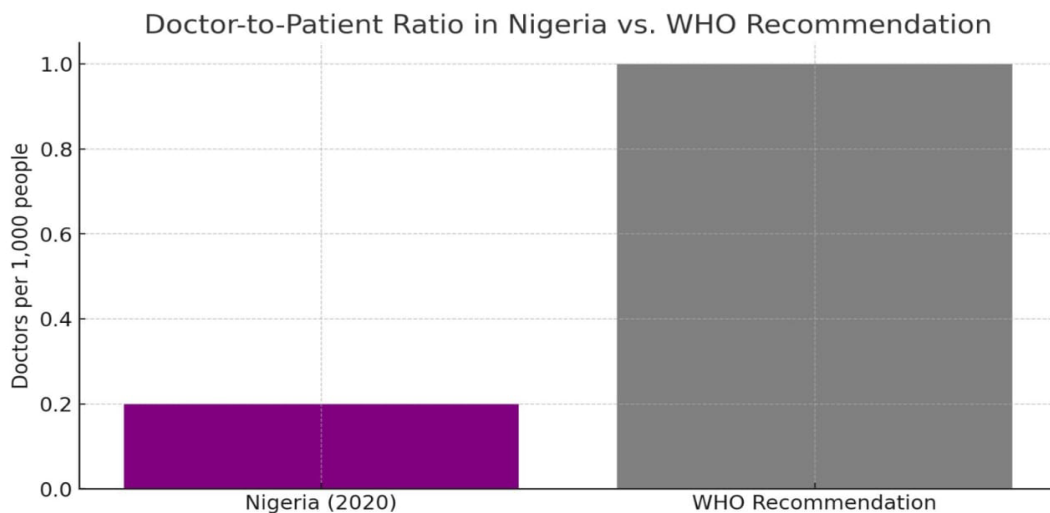


Figure 3: Growth in Ventilator and ICU Capacity (July to December 2020)

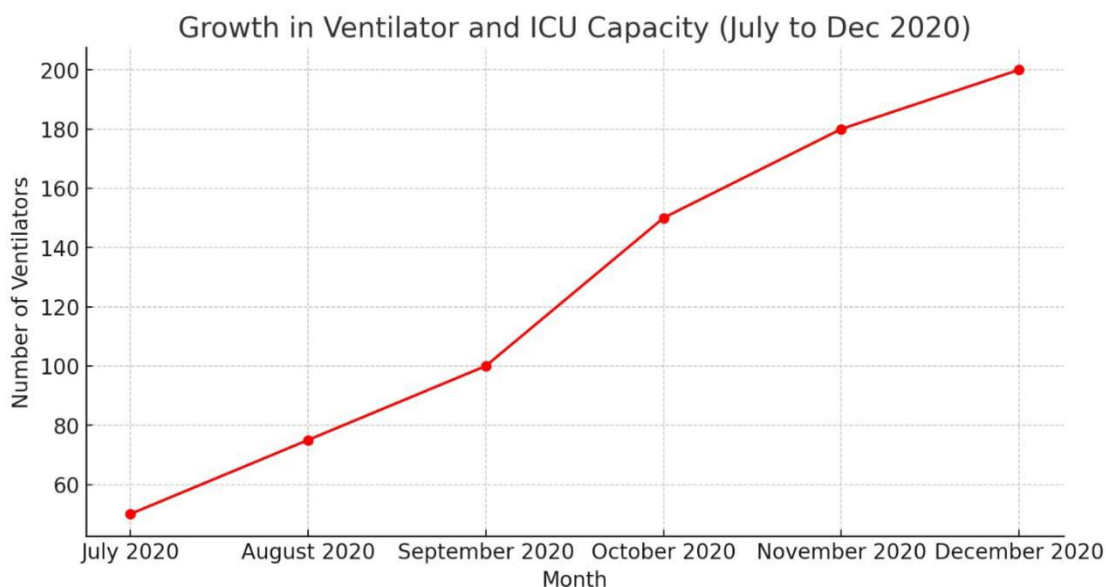


Figure 4: Healthcare Financing Trends in Nigeria (1% of GDP)

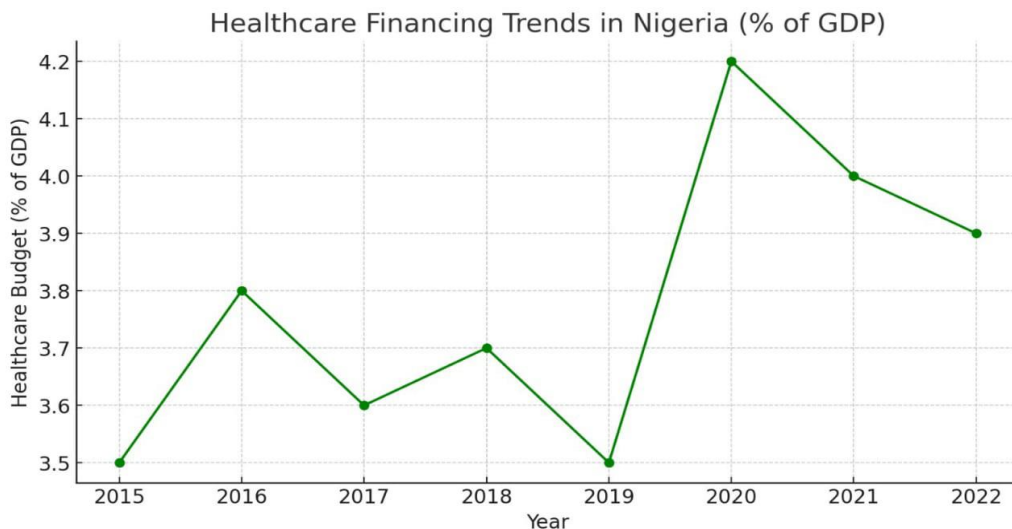


Figure 5: Comparison of Healthcare Resources (Pre-Pandemic vs During Pandemic)

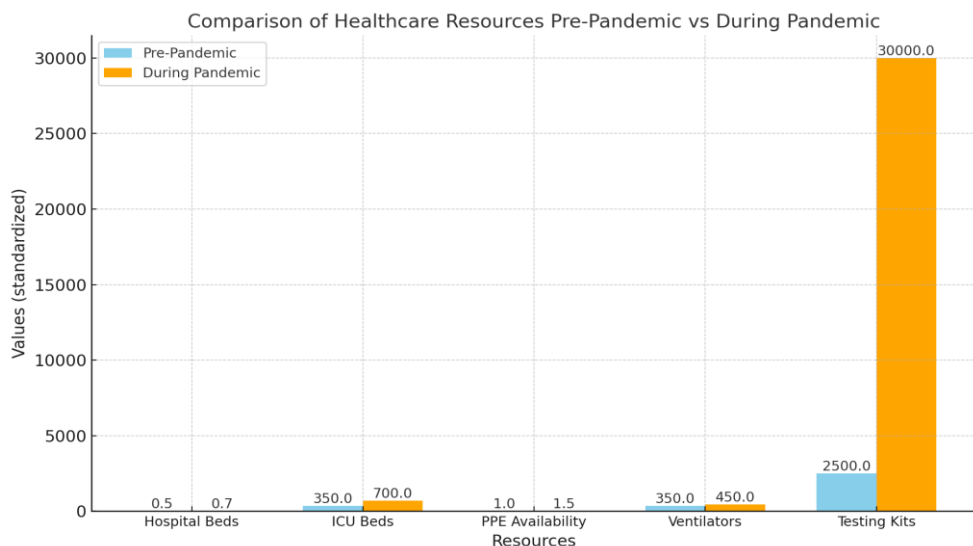


Figure 6: Healthcare Workforce (Pre-Pandemic vs During Pandemic)

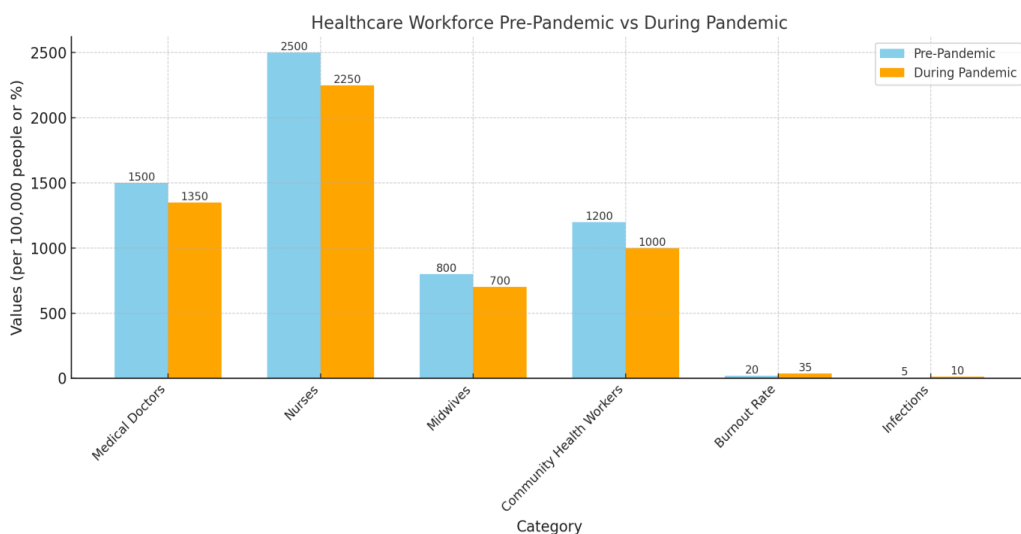


Figure 7: Child Health Services (Pre-Pandemic vs During Pandemic)

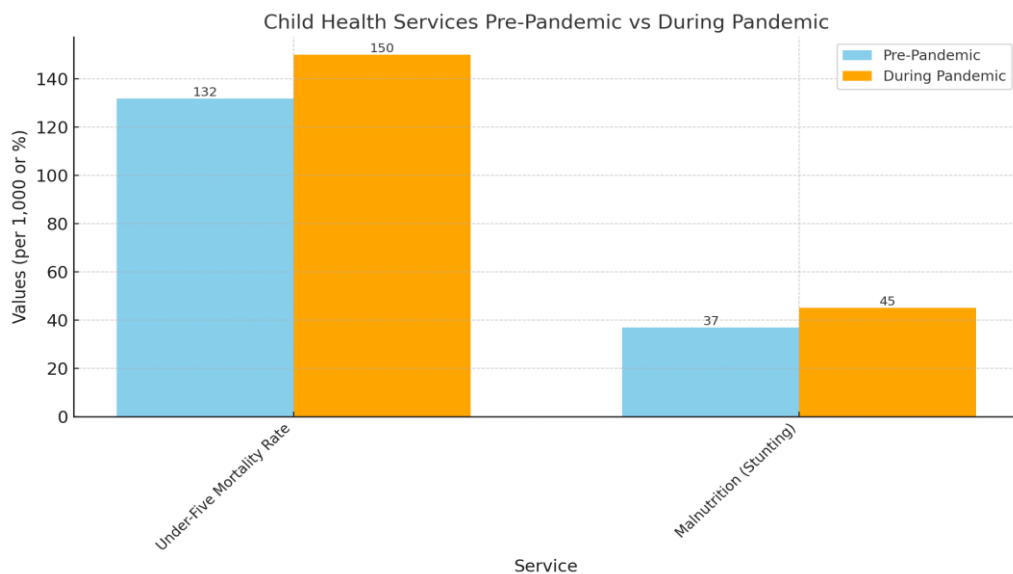


Figure 8: International Funding (2015 - 2021)

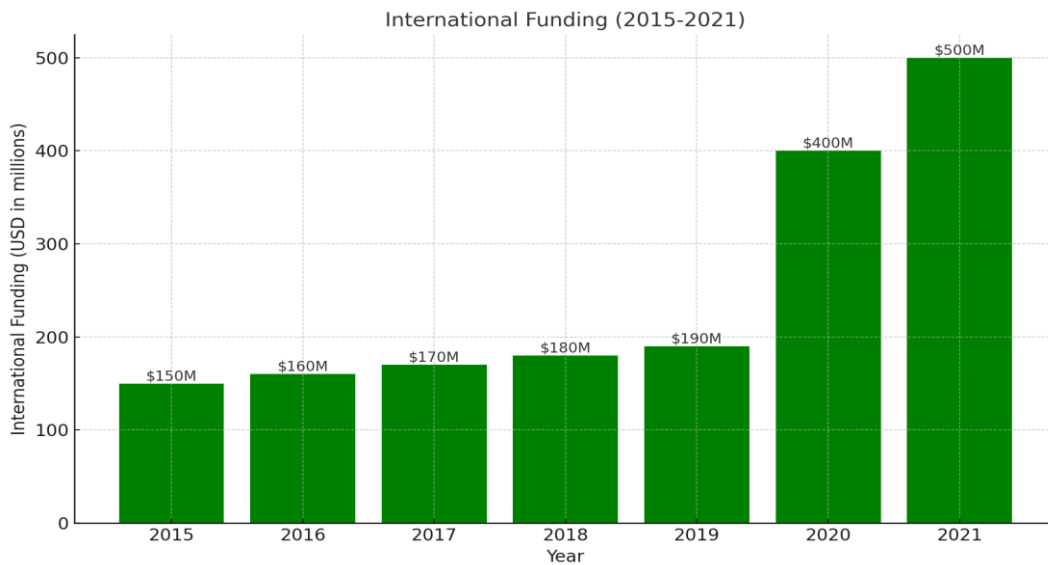


Figure 9: Changes in Immunization Rates (Pre-Pandemic vs During Pandemic)

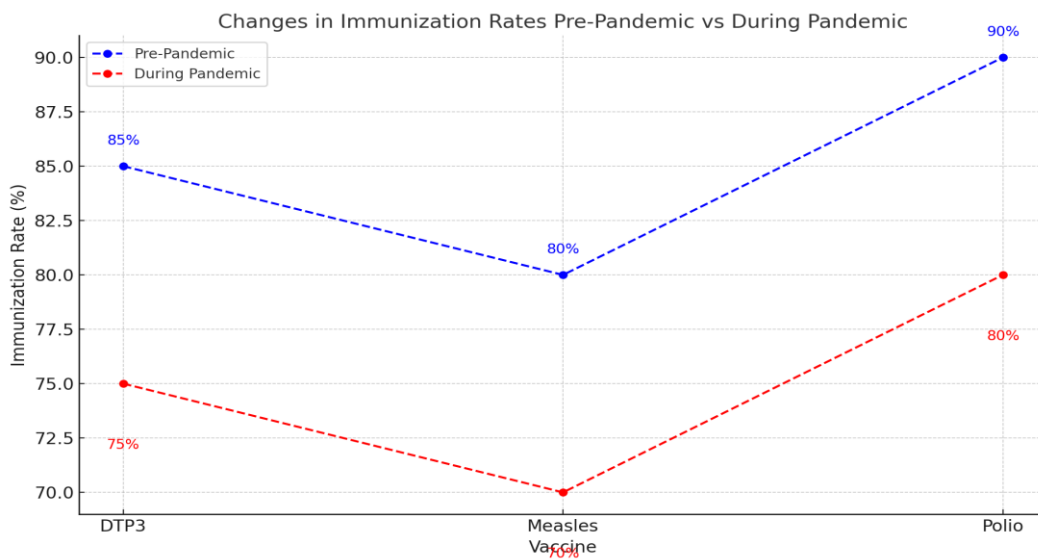


Figure 10: Health Expenditure as a percentage of GDP (2015 - 2021)

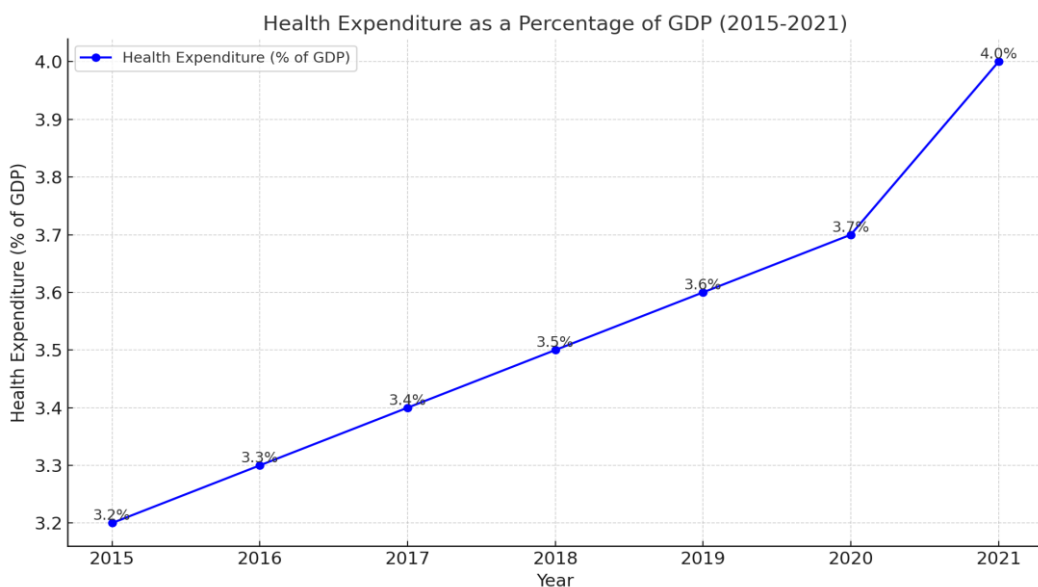


Figure 11: Trend Analysis of Healthcare Resources (2019 - 2022)

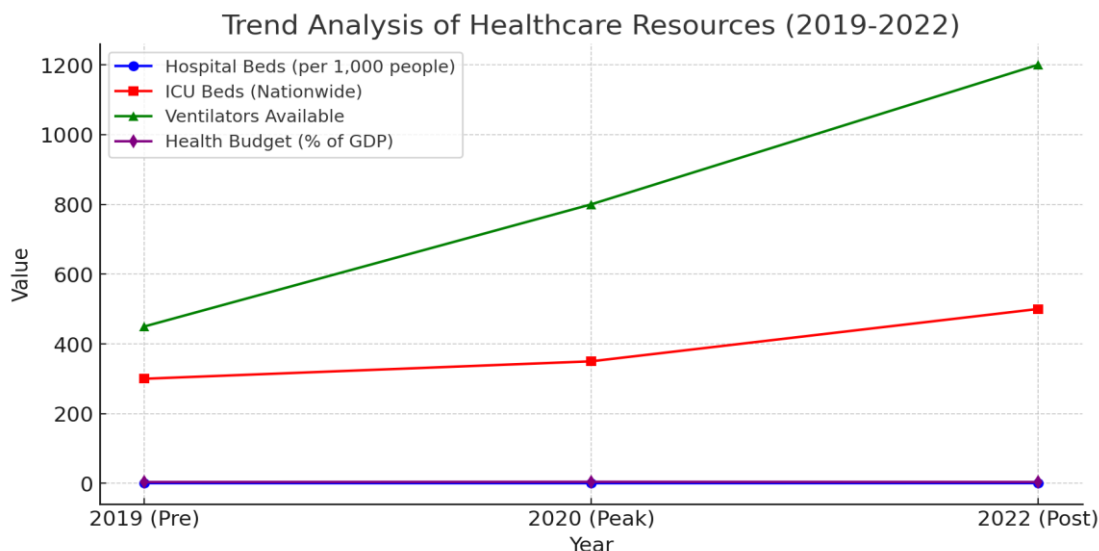


Figure 12: Healthcare Budget Allocation (% of GDP) Over Time

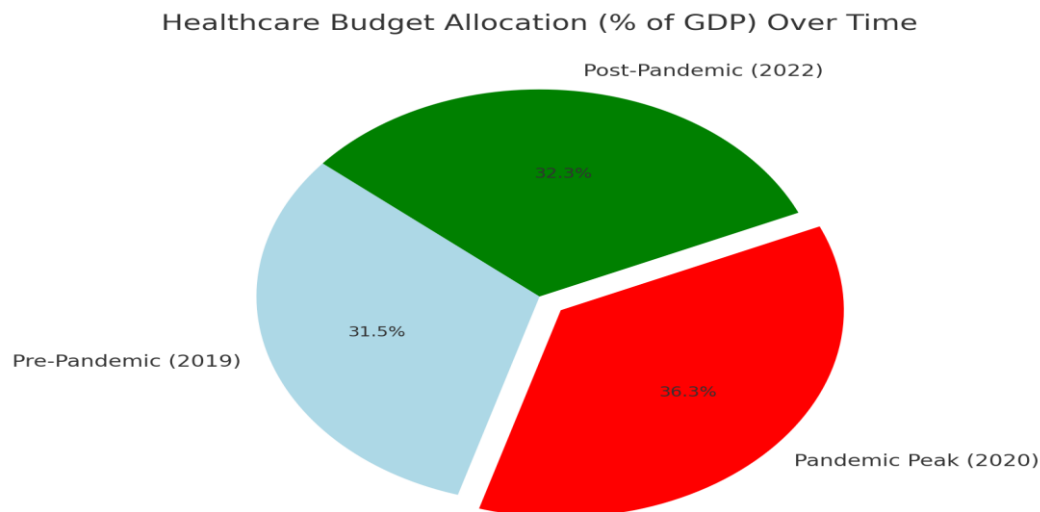


Figure 13: Impact of Hospital Beds Capacity on COVID-19 Mortality

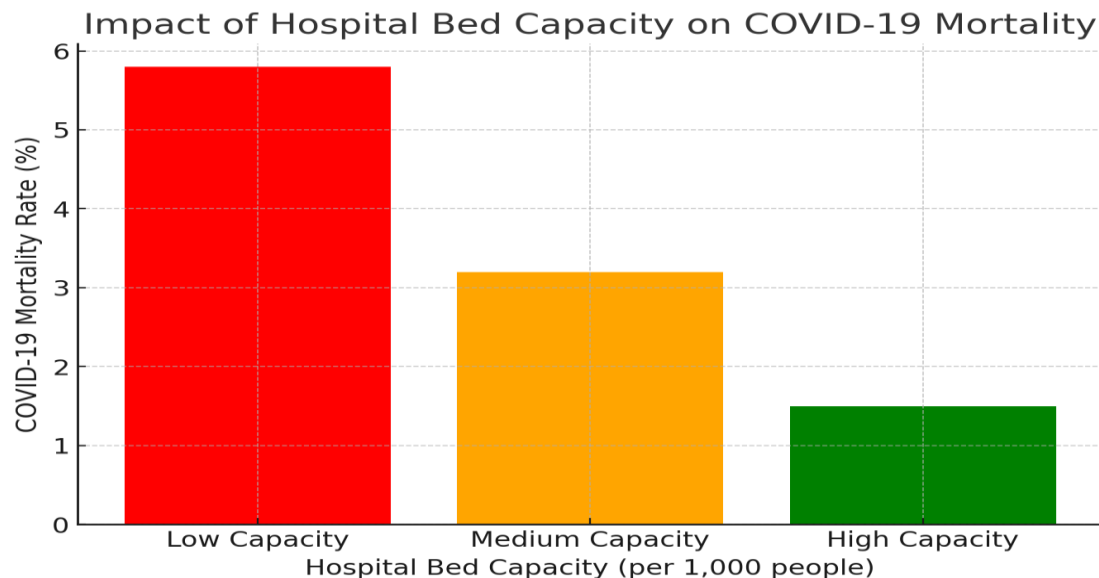


Figure 14: Common Themes from Qualitative Interviews



Figure 15: COVID-19 Healthcare Resources by State

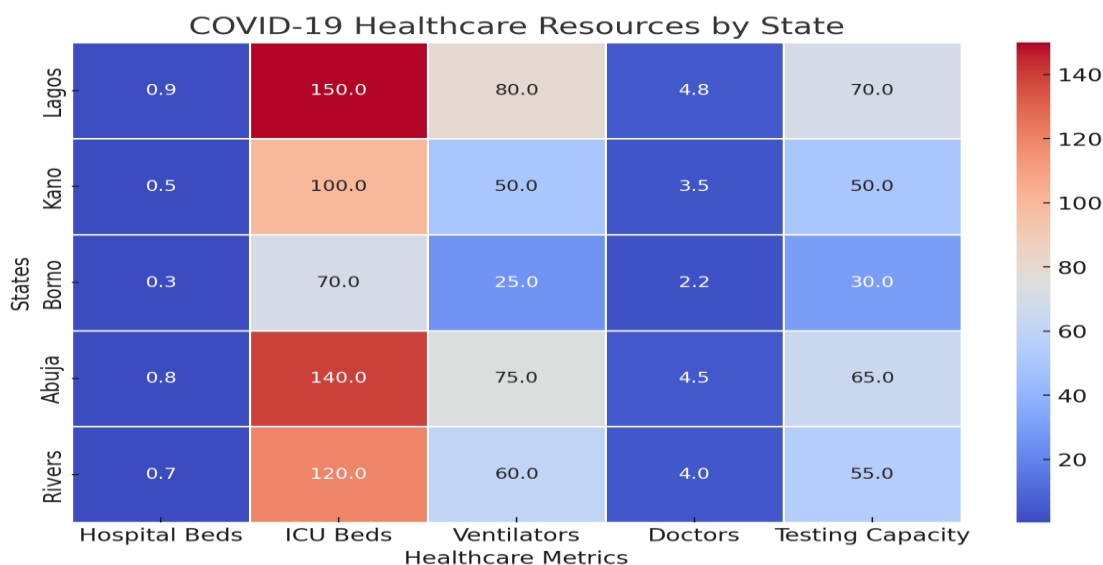


Figure 16: Urban vs Rural Healthcare Disparities in Nigeria

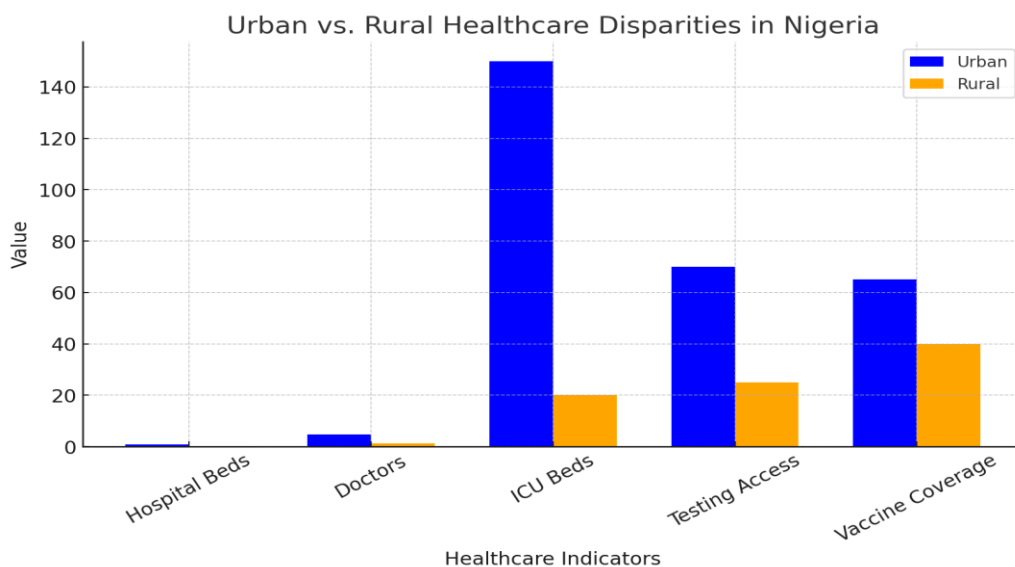
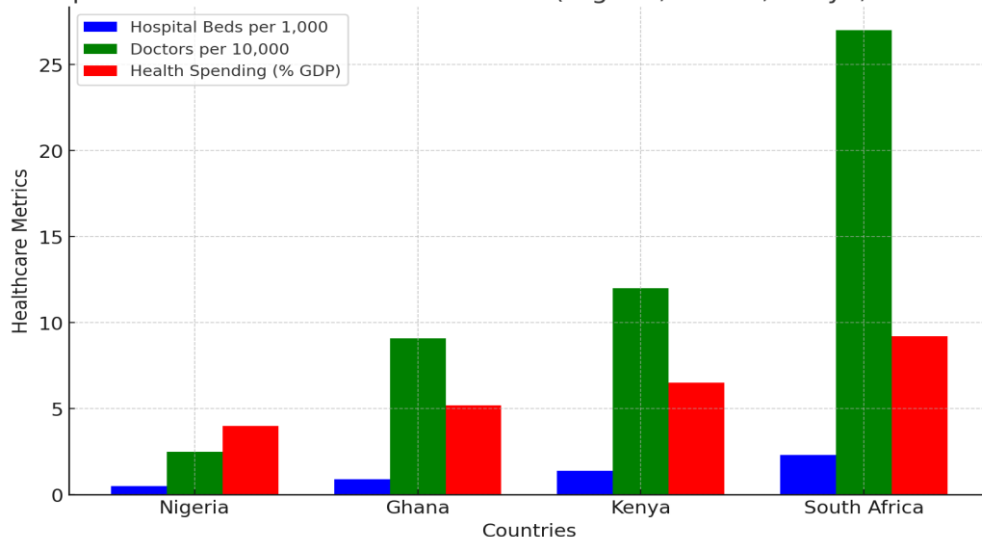


Figure 17: Comparison of Healthcare Infrastructure (Nigeria, Ghana, Kenya, South Africa)

Comparison of Healthcare Infrastructure (Nigeria, Ghana, Kenya, South Africa)



DISCUSSION OF FINDINGS

The COVID-19 pandemic has served as a critical stress test for healthcare systems worldwide, and Nigeria's healthcare sector was no exception. This section synthesizes the study's key findings, drawing connections between the challenges exposed by the pandemic, the structural weaknesses of the system, and the opportunities for long-term reform. The discussion integrates empirical data with broader theoretical perspectives, compares Nigeria's response with other developing countries, and provides an analytical foundation for policy recommendations.

A. COVID-19 as a Magnifier of Systemic Weaknesses

The pandemic did not create the weaknesses in Nigeria's healthcare system—it merely exposed and exacerbated them. The findings illustrate that pre-existing conditions, such as underfunding, inadequate infrastructure, workforce shortages, and governance inefficiencies, contributed to the country's struggle to contain the virus.

1. Inadequate Healthcare Infrastructure

Nigeria's healthcare infrastructure proved insufficient to handle a crisis of this magnitude, particularly in rural areas. The study found that:

Hospital capacity was critically low – Nigeria had only 0.5 hospital beds per 1,000 people, far below the WHO-recommended minimum of 5 beds per 1,000.

Intensive care unit (ICU) availability was limited, with fewer than 300 functional ventilators nationwide at the onset of the pandemic.

Urban-rural disparities were stark – urban centers like Lagos, while still overwhelmed, had better access to medical resources than rural areas, where healthcare facilities often lacked even basic sanitation and electricity.

Comparative Insight:

Nigeria's healthcare infrastructure gaps mirrored those of other low- and middle-income countries (LMICs), such as Kenya and South Africa, where regional disparities and resource constraints led to similar struggles in handling patient surges. However, unlike Nigeria, some countries leveraged emergency health funding more effectively to expand ICU capacity and makeshift hospitals.

2. Healthcare Workforce Crisis: The Brain Drain Effect

The study highlights a severe shortage of healthcare professionals, worsened by:

High doctor-to-patient ratios – Nigeria had approximately 1 doctor per 5,000 people, compared to the WHO-recommended 1 per 600.

Workforce attrition due to burnout – Over 30% of Nigerian healthcare workers reported signs of extreme fatigue and stress.

Medical brain drain – The UK and Canada reported a 40% increase in Nigerian doctor applications for migration during the pandemic, worsening local shortages.

Comparative Insight:

The "brain drain" phenomenon is not unique to Nigeria but has been severe in sub-Saharan Africa. Countries like Ghana and Kenya have implemented financial incentives and mandatory service years to slow healthcare worker migration, policies that Nigeria has yet to adopt effectively.

3. Healthcare Financing Deficiencies: Chronic Underfunding and Misallocation

Nigeria's healthcare funding remains among the lowest globally:

Pre-pandemic, healthcare expenditure accounted for less than 4% of GDP, far below the 15% Abuja Declaration target agreed upon by African nations.

COVID-19 emergency funds were poorly allocated, with corruption allegations leading to mismanagement.

Public-private partnerships (PPPs) were underutilized, limiting the capacity for rapid response expansion.

Comparative Insight:

Countries like Ghana and Kenya, despite lower GDPs, allocated a greater proportion of their national budgets to healthcare and leveraged donor funding effectively. Nigeria's misallocation of pandemic response funds underscores the need for better financial oversight and accountability mechanisms.

B. Impact of COVID-19 on Routine Healthcare Services

1. Disruption of Essential Services

The study found that pandemic response measures severely disrupted routine healthcare services, including:

Immunization programs – Childhood vaccination rates dropped by over 20%, leading to measles outbreaks in some states.

Maternal and child health services – Prenatal and postnatal visits declined by 30%, increasing maternal and neonatal mortality risks.

Non-communicable disease (NCD) management – Over 40% of hypertensive and diabetic patients faced treatment interruptions, worsening long-term health outcomes.

Comparative Insight:

Similar healthcare disruptions were observed in Brazil and Indonesia, where primary care was deprioritized. However, these nations rapidly adapted telemedicine solutions to mitigate gaps—something Nigeria's healthcare sector was slower to implement.

2. Public Distrust and Misinformation

A significant challenge in Nigeria's pandemic response was public skepticism toward government policies, fueled by:

Inconsistent messaging from health officials.

Widespread misinformation on social media, including COVID-19 denialism and vaccine conspiracy theories.

Historical distrust of government healthcare programs, particularly in the North, due to past failures such as polio vaccination resistance.

Comparative Insight:

Countries like Ghana and South Africa successfully built trust by engaging local religious leaders and community influencers in public health campaigns. Nigeria's failure to proactively combat misinformation weakened vaccine uptake and compliance with public health measures.

C. The Role of Government Policies: Successes and Failures

1. Policy Failures: Delayed and Inconsistent Responses

Lockdowns were imposed late (March 2020), allowing the virus to spread unchecked in key cities.

Testing and contact tracing efforts were slow due to logistical constraints and underfunding.

Healthcare workers faced inadequate PPE supply, leading to high infection rates among frontline staff.

2. Policy Successes: Accelerated Health Reforms

Despite failures, the pandemic catalyzed some positive policy changes, including:

Increased budget allocation for health – Emergency funds led to a 200% increase in healthcare investment in 2020, though sustainability remains uncertain.

Expansion of digital health solutions – Telemedicine adoption, though limited, increased accessibility to care.

Strengthening of the Nigeria Centre for Disease Control (NCDC) – The crisis expanded NCDC's operational capacity and international collaborations.

Comparative Insight:

While South Africa, Ghana and Kenya had more structured pandemic response frameworks, Nigeria's incremental policy changes could serve as a foundation for long-term healthcare transformation if sustained.

D. COVID-19 Impact Comparisons (Countries)

South Africa leads in all metrics – Highest number of doctors per 10,000 people (27.0) and highest healthcare spending (9.2% of GDP).

Kenya and Ghana outperform Nigeria – More doctors and higher healthcare investment.

Nigeria lags behind significantly – Lowest number of doctors (2.5 per 10,000) and lowest hospital bed capacity (0.5 per 1,000).

South Africa had the highest case and death toll but also the most extensive testing and strongest ICU expansion.

Ghana and Kenya performed better than Nigeria in vaccine rollout and testing.

Nigeria had the lowest testing rates and slowest ICU expansion

RECOMMENDATIONS AND OPPORTUNITIES FOR REFORMS

The COVID-19 pandemic has laid bare the structural weaknesses and inequities within Nigeria's healthcare system, yet it also presents an unparalleled opportunity to rebuild and reform. Drawing on the challenges and case studies discussed earlier, this paper is offering targeted recommendations to strengthen Nigeria's healthcare system and ensure its resilience in the face of future public health emergencies. These recommendations are aimed at various stakeholders, including the federal, state and local governments, healthcare institutions, international partners, and civil society organizations.

A. Strengthening Healthcare Infrastructure

Increase Investment in Healthcare Facilities:

The Nigerian government should prioritize the construction and renovation of healthcare facilities, particularly in rural and underserved areas. Investment should focus on ensuring that these facilities are equipped with essential medical equipment, including ventilators, diagnostic tools, and adequate supplies of medicines and personal protective equipment (PPE). This would mitigate the infrastructure deficiencies exposed during the pandemic, as seen in both urban centers like Lagos and conflict zones like Borno State.

Develop Mobile Health Units:

To address the unique challenges faced by regions affected by conflict and remote areas with limited access to healthcare, the government should invest in mobile health (mhealth) units. These units can provide essential services, such as immunizations, maternal and child health services, and emergency care, and are crucial in conflict-affected states like Borno. Such units would also serve as a critical resource during future public health emergencies, allowing for flexible and rapid deployment.

Enhance Primary Healthcare Systems:

Strengthening primary healthcare (PHC) systems is fundamental to improving access to care and managing public health crises at the community level. The government should focus on expanding and reinforcing PHC facilities across Nigeria, ensuring they are adequately staffed and equipped to handle routine health needs as well as emergencies like COVID-19. Building a robust PHC network would also reduce the pressure on secondary and tertiary care facilities.

B. Expanding and Supporting Human Resources for Health

Recruit and Train Healthcare Workers:

To address the critical shortage of healthcare professionals, the government should implement a comprehensive strategy to recruit, train, and retain healthcare workers. This includes expanding medical and nursing education programs, offering scholarships, and providing incentives for healthcare workers to serve in rural and underserved areas. The experiences in Lagos and Kano states illustrate the dire consequences of workforce shortages during a public health emergency.

Implement Task-Shifting Policies:

To maximize the efficiency of available healthcare workers, especially during crises, the government should adopt task-shifting policies that delegate certain medical tasks to less specialized health workers. For example, community health workers could be trained to handle basic health services, such as vaccination and health education, under the supervision of more specialized staff. This approach can expand healthcare delivery capacity, particularly in rural and underserved areas.

Enhance Healthcare Worker Protection and Support:

The pandemic highlighted the vulnerability of healthcare workers to infection and burnout. The government should ensure that healthcare workers have access to adequate PPE, mental health support, and fair remuneration. This also includes establishing comprehensive occupational health and safety protocols that are enforced across all healthcare facilities. Protecting healthcare workers is essential not only for their well-being but also for maintaining a functional healthcare system during emergencies.

C. Reforming Healthcare Financing

Increase Government Spending on Health:

The Nigerian government should commit to increasing health expenditure to meet or exceed the Abuja Declaration target of allocating at least 15% of the national budget to health. Adequate and sustained funding is crucial for building a resilient healthcare system capable of responding to public health emergencies. This increase in funding should be directed towards improving healthcare infrastructure, expanding human resources, and ensuring the availability of essential medicines and technologies.

Expand Health Insurance Coverage:

The National Health Insurance Scheme (NHIS) currently covers a small fraction of the population, leaving millions without financial protection against health expenses. The National Health Insurance Scheme (NHIS) should be expanded to cover a larger proportion of the population, particularly those in the informal sector and low-income groups. This expansion would help to reduce out-of-pocket expenditures, which are a significant barrier to accessing healthcare for many Nigerians. The government could also explore innovative financing mechanisms, such as health savings accounts or community-based health insurance schemes, to broaden coverage.

Leverage Public-Private Partnerships (PPPs):

Public-Private Partnerships (PPPs) offer a viable solution to address financing and resource challenges in the healthcare sector. The government should encourage and facilitate PPPs to enhance the efficiency of healthcare delivery, increase investment in healthcare infrastructure, and expand access to healthcare services. Successful PPP models from Lagos State could be replicated in other regions to improve healthcare outcomes.

D. Enhancing Public Health Governance and Emergency Preparedness

Strengthen Public Health Institutions:

Strengthening institutions such as the Nigeria Centre for Disease Control (NCDC) is critical for improving public health governance. The NCDC should be empowered with greater autonomy, resources, and capacity to coordinate national responses to public health emergencies. This includes developing robust surveillance systems, conducting regular training and drills for public health emergencies, and ensuring rapid deployment capabilities during outbreaks.

Establish a National Public Health Emergency Fund:

The creation of a dedicated National Public Health Emergency Fund would ensure that financial resources are readily available to respond to future health crises. This fund could be used to procure essential supplies, support healthcare workers, and scale up emergency responses quickly. The experience from Kano State's delayed response highlights the importance of having financial resources that can be mobilized swiftly.

Improve Public Health Communication:

Effective communication is crucial for managing public health emergencies. The government should invest in public health communication strategies that provide clear, accurate, and timely information to the public. This includes combating misinformation and ensuring that communication efforts are culturally sensitive and

accessible to all segments of the population. Building trust between the government and the public is essential for ensuring compliance with public health measures.

E. Promoting Health Technology and Digital Innovation

Adopt and Scale Digital Health Solutions:

The pandemic has demonstrated the value of digital health solutions, such as telemedicine and mobile health (mHealth) platforms. The government should promote the adoption of these technologies by investing in digital infrastructure and providing incentives for healthcare providers to incorporate digital tools into their practice. Scaling digital health solutions can improve access to care, particularly in remote and underserved areas, and enhance the overall efficiency of the healthcare system.

Mobile Health (mHealth)

Mobile health applications have the potential to revolutionize healthcare delivery in Nigeria. mHealth can be used for patient education, disease surveillance, medication adherence, and appointment scheduling. By leveraging the widespread use of mobile phones in Nigeria, the government can enhance health communication, improve patient engagement, and increase access to healthcare services

Telemedicine

Telemedicine emerged as a vital tool during the pandemic, allowing patients to consult with healthcare providers remotely. Expanding telemedicine services can help bridge the gap in healthcare access, particularly in rural areas. The government, and private investors should invest in the necessary infrastructure, such as broadband internet and mobile networks, to support telemedicine and ensure that healthcare providers are trained to deliver care through digital platforms

Develop a National Electronic Health Records (EHR) System:

Implementing a national EHR system would improve the continuity of care, enhance data collection and analysis, and facilitate better decision-making during public health emergencies. The government should work towards the standardization and integration of EHR systems across all healthcare facilities, ensuring that patient data is secure, accessible, and interoperable.

Adopt Innovative Healthcare Delivery

Ghana used Zipline drones to transport vaccines to remote areas, ensuring cold-chain maintenance. While Kenya integrated geospatial data to improve healthcare accessibility and optimize resource allocation. Nigeria must adopt such impactful technologies to improve her healthcare system and coverage.

Encourage Innovation and Research:

The government should foster a culture of innovation and research within the healthcare sector. This includes funding research on public health, supporting the development of new technologies and treatments, and creating an enabling environment for startups and innovators. Collaborations with academic institutions, the private sector, and international partners can accelerate the development and adoption of innovative solutions.

F. Ensuring Equity and Inclusion in Healthcare

Targeted Interventions for Vulnerable Populations:

Future healthcare policies and programs should prioritize vulnerable populations, including those in rural areas, conflict zones, and marginalized communities. Targeted interventions could include mobile health clinics, community-based health programs, and tailored communication strategies that address the specific needs and

challenges of these populations. The case study of Borno State highlights the critical importance of ensuring that vulnerable groups are not left behind during public health crises.

Strengthen Community Health Systems:

Community health systems play a vital role in reaching underserved populations and promoting health equity. The government should invest in training and supporting community health workers, who can provide essential health services and education at the grassroots level. Empowering communities to take charge of their health can lead to more sustainable and culturally appropriate healthcare solutions.

Implement Gender-Sensitive Health Policies:

The pandemic has disproportionately affected women, particularly in terms of access to healthcare, economic opportunities, and caregiving responsibilities. The government should ensure that healthcare policies are gender-sensitive, addressing the specific needs of women and promoting their participation in healthcare decision-making processes. This includes improving access to maternal and reproductive health services and protecting women from gender-based violence.

CONCLUSION

The COVID-19 pandemic has been one of the most significant global public health crises in recent history, and its impact on Nigeria's healthcare system has been profound. This research paper has explored the multifaceted challenges and opportunities that have emerged during the pandemic, providing a comprehensive analysis of how Nigeria's healthcare system responded to the crisis, the systemic weaknesses that were exposed, and the potential pathways for reform.

The pandemic has highlighted critical deficiencies in Nigeria's healthcare infrastructure, including inadequate facilities, insufficient medical supplies, and a lack of critical care capacity. The shortage of healthcare workers emerged as a significant challenge, with the existing workforce stretched to its limits. The unequal distribution of healthcare workers across the country further exacerbated these challenges, leaving some regions, particularly conflict-affected areas, severely underserved. Inadequate healthcare financing was identified as a major barrier to an effective pandemic response.

In conclusion, the COVID-19 pandemic has provided an unprecedented opportunity for the world especially Nigeria to reflect, reform, and rebuild. The recommendations outlined in this paper, if implemented, could transform Nigeria's healthcare system into one that is better prepared to meet the needs of its population, both in times of crisis and in times of calm. Moving forward, Nigeria must shift from reactive crisis management to proactive healthcare system strengthening. This requires sustained government commitment, increased funding, multi-sectoral collaboration, and improved public trust in health institutions. The path to a resilient, equitable, and efficient healthcare system is challenging, but the lessons from the COVID-19 pandemic must not be wasted. The true test of Nigeria's leadership and policy resolve lies not just in responding to this crisis but in ensuring that the healthcare system is stronger, more prepared, and more inclusive for future generation.

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20. All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Richard Adewale Elewomawu, Henry Adedamola Ikumapayi and Bilal Arome Dauda. The first draft of the manuscript was written by Richard Adewale Elewomawu and all authors commented on previous versions of the manuscript. All authors read, reviewed and approved this research paper.
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