

Investigation of supply chain challenges in public health sector development projects in Nigeria; current issues, structure, performance and implications: a narrative review

Abstract

Background: Nigeria's public health sector development projects face significant supply chain challenges that critically hinder the efficiency and effectiveness of healthcare delivery.

Objective: This study examined the supply chain challenges facing public health development projects in Nigeria by synthesizing existing literature to identify the current issues and structure, examining their impact on performance and implications for healthcare service delivery.

Methods: A comprehensive literature search was conducted across multiple databases yielding a total of 14 relevant studies. Literature sources include academic journals, governmental and non-governmental organizations' reports, and health sector reviews.

Results: The review revealed that Nigeria's public health supply chain is characterized by inadequate infrastructure, inefficient logistics, and governance and management issues. Poor road networks, insufficient storage facilities, corruption, insecurity, and delays in transportation were the major issues identified. Key organizations and programs such as the National Primary Health Care Development Agency (NPHCDA), National Malaria Control Program (NMCP), National Immunization Coverage Survey (NICS), Saving One Million Lives (SOML) initiative, and National Health Insurance Scheme (NHIS) play key roles but face lack of inter-organizational coordination and challenges.

Conclusion: Inefficiencies in supply chains were observed to lead to frequent stockouts, poor program performance, and prolonged lead time for procurement. This narrative review highlights the critical need for supply chain strengthening in Nigeria's public health sector. This will require a multifaceted approach involving reforms in infrastructure development and stakeholder collaboration. By prioritizing supply chain improvement, Nigeria can enhance healthcare outcomes and achieve its health development goals.

Keywords: supply chain, Nigeria, logistics, supply chain challenges, public health, health sector development, supply chain structure, supply chain performance, supply chain implications

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Introduction

Nigeria is a rapidly growing economy with huge population growth, from 186,987,640 in 2016 to 200,962,417 in the first quarter of 2019.¹ The rapid growth contributes to economic dynamism, and the United Nations has projected that Nigeria's population will reach over 400 million by 2050. This definitely will project economic growth and by extension lead to supply chain dynamism.² Supply chain services in Nigeria is marked by a series of developments that are affected by economic, political, and social factors. Understanding these factors will provide insights into the current issues, structure, performance, and implications of supply chains in Nigeria. It describes the links and the interrelationships among many organizations, people, resources, and procedures involved in getting goods and services to a customer or healthcare system. It is a system that puts together promptly all resources and processes required to promote, restore, or maintain health.^{3,4}

The public health sector development projects in Nigeria face significant supply chain challenges that impede their effectiveness

and efficiency. These challenges range from inefficiencies in logistics, and inadequate infrastructure to poor governance. All these harm the delivery of health services and overall public health outcomes.^{5,6} The supply chain in the health sector involves procurement, storage, transportation, storage, and distribution of essential health commodities. These are critical for the success of public health projects.⁷ Nevertheless, persistent problems such as lack of planning, inefficiencies in transportation, stocking, deliveries, poor storage conditions as well as limited investment in logistics systems and processes contribute to sub-optimal health outcomes and undermine the progress of development projects in Nigeria.^{8,9,10}

Nigeria has undertaken various public health sector development projects which are aimed at improving healthcare delivery, and health outcomes, and addressing specific health challenges. Some of these major initiatives include:

I. National Primary Healthcare Development Agency (NPHCDA), which implements programs that strengthen primary healthcare services in Nigeria.¹¹

- II. National Malaria Control Program (NMCP).** This program is supported by international partners like the Global Fund. Their main goal is to lessen malaria’s impact in Nigeria.¹²
- III. National Immunization Coverage Survey (NICS).** This is conducted to evaluate immunization coverage rates among children in Nigeria.¹³
- IV. Saving One Million Lives (SOML) Initiative.** This initiative aims to save the lives of mothers and children by scaling up access to essential services.¹⁴
- V. National Health Insurance Scheme (NHIS).** This program is designed to provide accessible and affordable health insurance coverage to Nigerians with a focus on reducing out-of-pocket expenses on healthcare and improving health outcomes.¹⁵

In considering the above described health sector development projects, we can better appreciate the relevance of the present study. The review findings will have implications for policymakers, health professionals, and researchers working to strengthen Nigeria’s public health sector supply chain. Based on the findings, the stakeholders can develop targeted interventions to improve performance and ultimately enhance healthcare outcomes in Nigeria. This study examined the supply chain challenges faced by public health sector development projects in Nigeria and to understand the current issues, structure, performance, and implications of these challenges identify and analyze the prevailing challenges within the supply chain of public health sector development projects in Nigeria. We examined the existing structure of the supply chain in the public health sector and its impact on project implementation and outcomes and the performance of the supply chain in terms of efficiency, effectiveness, and reliability in delivering health services and commodities. The implications of supply chain challenges on the overall success and sustainability of public health sector development projects were assessed to provide

information for improving supply chain management practices in the public healthcare sector.

Methods

Searches were made on Google Scholar, ResearchGate, AJOL, PubMed Central, African Journals Online, JSTOR, and Relevant publications on the topic of interest relating to the organizations in Nigeria. Organizations such as the World Health Organization, Federal Ministry of Health, Nigeria Centre for Disease Control, National Health Insurance Scheme, and Health Organizations in Nigeria were also searched for relevant literature. The methodology followed includes starting with a broad base. Wide search using the keywords to identify related articles on Google Scholar, ResearchGate, PubMed Central, AJOL, JSTOR, and IJSCM. A total of 1320 articles popped up. To choose the most pertinent items, the recognized publications were combed through. Selection criteria were based initially on the titles relevant to the challenges of supply chains in public health sector development projects in Nigeria. Thereafter screening was based on the assessment of the abstracts of the related articles. Those that were found to be relevant were selected.

The publications that the evaluation of abstracts determined to be unnecessary were not included in the analysis. Articles not carried out in Nigeria were also excluded. At the end of the screening process, only 14 related articles were finally included in the review. The search for literature from health organizations in Nigeria was randomly done on websites of key organizations, ministries, and agencies in Nigeria were searched. Such as the World Health Organization, National Health Insurance Scheme, National Primary Health Development Agency, National Centre for Disease Control, and Federal Ministry of Health. Once relevant literature was identified, it was archived for review of relevant information relating to public health sector development projects in Nigeria.

Results

Table I Characteristics of the study on Supply Chain Challenges in Nigeria’s Public Health Sector development projects

| Characteristics | Description |
|---------------------------|---|
| 1. Study designs | Narrative reviews |
| 2. Focus area | Supply Chain Challenges of public health sector development projects in Nigeria |
| 3. Key topics covered | Current Issues structure, performance, implication. Nigeria |
| 4. Geographical location | Recent literature and data up to 2024 |
| 5. Time frame | Peer-reviewed journals, government and non - governmental organization reports expert analysis |
| 6. Data sources | Qualitative review of existing literature and reports |
| 7. Methodology | Federal and state health departments, International donors, healthcare providers, patients |
| 8. Primary stakeholders | |
| 9. Main issues identified | Fragmentation, inadequate infrastructure, funding constraints, corruption, human resource challenge, regulatory and policy bottlenecks, lack of planning and insecurity |
| 10. Key performance | Cost efficiency, medicine availability, quality of commodities, lead time for delivery. |
| 11. Major implications | Impact on health outcomes, trust in health system, equity in health access, economic burden |

Table 2 Current issues of supply chain in public health sector development projects in Nigeria

| Issues | Description | Reference |
|--|---|-----------|
| 1. Lack of coordination and fragmentation | Lack of coordination among stakeholders leads to duplication of efforts and wastage of resources. | 16 |
| 2. Corruption | Corruption leads to mismanagement of financial resources and diversion of health commodities. | 19 |
| 3. Poor/inadequate infrastructure and lack of planning | Epileptic power supply, poor storage facilities, inadequate transport network leads to inefficient distribution. | 8,31,32 |
| 4. Human resource challenge | Lack of trained supply chain personnel and movement of staff have a negative impact on procurement and distribution planning. | 33 |
| 5. Cold chain logistics | Temperature-sensitive products are compromised in the face of frequent power outages and inadequate refrigeration. | 22 |
| 6. Last mile delivery challenge | Poor road networks and limited transportation options hinder effective delivery. | 34 |
| 7. Deficiencies in information systems | Lack of efficient health information systems leads to poor inventory management and inaccurate data. | 21 |
| 8. Insecurity | Suboptimal availability of life-saving antimalarial commodities | 28 |

Table 3 Structure of Supply Chain in Nigeria

| Component | Description | Reference |
|-----------------------------|--|-----------|
| 1. Procurement | Managed by the Federal Government and international donors; lack of integration into State and local procurement processes. | 16,19 |
| 2. Storage and distribution | Initial distribution handled by Central Medical Store; State and local government stores lack modern inventory management systems. | 25,33 |
| 3. Information systems | Inaccurate data and poor inventory management result from inadequate health information systems. | 32 |
| 4. Last mile delivery | Logistic challenges are faced in local distribution especially in rural areas. Community health workers often used. | 32 |

Table 4 Performance of Supply Chain in Nigeria

| Metric | Description | Reference |
|---------------------------------------|--|-----------|
| 1. Cost efficiency | Inefficiencies, poor procurement processes, and corruption reduce cost efficiency in distribution. | 19,23 |
| 2. Availability of essential medicine | Stockout rates for essential drugs and medical supplies can be as high as 40-50% | 26 |
| 3. Quality of health commodities | Poor handling and storage conditions, especially for temperature-sensitive products, can reduce quality. | 22,23 |
| 4. Lead time for delivery | Long lead time from procurement to delivery often exceeds three months due to bureaucracy | 21,25 |

Table 5 Implications of Supply Chain in Nigeria

| Implications | Description | Reference |
|-------------------------------|---|-----------|
| 1. Health outcomes | Frequent stockouts which impact chronic disease management, emergence care and common diseases like malaria management. | 21,28,35 |
| 2. Trust in the health system | Supply chain challenges reduce public trust leading to less utilization of health services | 29 |
| 3. Equity in health access | Inefficient supply chain adversely affect rural population leading to increase in health disparities | 36 |
| 4. Economic burden | Higher Healthcare costs, increase morbidity and mortality rates reduce workforce productivity and economic growth | 37 |



Figure 1 Adopted from Rotimi K, Review of public health commodity distribution models in Nigeria.³³

Discussion

Supply chains in Nigeria's public health sector face numerous challenges impacting the availability of essential healthcare commodities. These challenges are the result of limitations associated with supply chain management and lead to stockouts, wastages, and poor coverage.¹

Table 2 provides a summary of the existing issues that these reviews have identified. The challenges of supply chains in Nigeria's public health sector development projects are multifaceted. As can be seen in Table 1, a lack of coordination and fragmentation among stakeholders has led to a lot of wastage of resources. Supply chain describes the interrelationship and linkages among many stakeholders, resources, and processes involved in getting commodities to the consumers.^{3,16} Also, there are huge infrastructural deficiencies in the healthcare delivery system, especially in hard-to-reach areas, remote and rural areas. This manifests in the form of poor road networks, and insufficient storage facilities for medical commodities and logistics. The impact on the supply chain is that timely and safe delivery of healthcare commodities is hindered. Infrastructural deficiencies remain a major bottleneck in the public health sector supply chain.¹⁷

Logistics and distribution challenges were also observed, and they manifested in delays in procurement processes, which led to stockouts of commodities. Poor road networks and increased costs of transportation affect the stockout of essential medicines and medical supplies. Hence, the lack of streamlined logistics contributes significantly to the unreliable supply of healthcare commodities.¹⁸ The reviews also identified the issue of management and governance. The supply chain's worst enemies include incompetent management techniques, corruption, and a lack of openness. Issues such as mismanagement of funds, poor procurement practices, inadequate inventory management, and diversion of healthcare commodities and products are prevalent. Governance issues undermine the trust and efficiency of the supply chain.^{19,20}

Structure

The structural framework of the public health supply chain in Nigeria involves the federal government and several key agencies and programs. They each have clearly defined roles but often face a lack of integration and operational challenges.^{16,19} The structure is summarized in Table 3. These agencies and programs include the National Primary Healthcare Development Agency, the National

Malaria Control Program, the National Immunization Coverage Survey, the Saving One Million Lives Initiative, and the National Health Insurance Scheme.¹¹⁻¹⁵ The National Malaria Control Program is supported by international partners like Global Funds. These agencies and programs carry out their activities with the overall aim of improving health outcomes. Other components of the structure identified are poor storage and distribution networks, a lack of modern inventory management systems as a result of inadequate health information systems.²¹

Performance

The performance metrics reveal critical areas of under-performance that impact overall health outcomes, as seen in Table 4. Cost inefficiency is a significant issue. Cost inefficiency is precipitated by factors such as poor procurement processes, high rates of wastage, and poor inventory management practices. The end effect is an ineffective utilization of the available resources. Poor handling and poor storage conditions not only result in losses in medical supplies but also impact the quality of healthcare commodities, especially temperature-sensitive products.²²⁻²⁴

The lead time from procurement to delivery is prolonged and often exceeds three months due to bureaucracy resulting in unnecessary delays.^{21,25} A lot of these issues require special attention because things can go wrong especially for the medicines of public health interest like antimalarial, medicines for chronic ailments, and emergency drugs.

On assessments of the availability of essential medicines as a performance index, the study revealed that stockout rates for essential medicines and supplies can be as high as (40-50%).²⁶ This is quite alarming considering the implications for overall health outcomes. The success of any public health program is based on the efficiency of the supply chain system necessary for the provision of uninterrupted program commodities. Inadequate or stockout of these commodities will translate to a poor supply chain system for the end user. A study by Onwujekwe et al highlighted that many health facilities experience regular shortages of essential medicines which undermine healthcare delivery.²⁷

Implications

The implications of the findings of these reviews are enormous as shown in Table 5. The numerous supply chain challenges identified in this review have negative implications on the overall health outcomes. Morbidity and death rates may rise as a result. Essential medicines availability is key to achieving universal health coverage, hence frequent stockouts, which impact the management of common diseases like malaria, will no doubt result in a negative health outcome.²⁸ In turn, these challenges reduce public trust in public health sector development projects, thereby discouraging the utilization of health services.²⁹ The rural population and those living in hard-to-reach areas are adversely affected; there is an increase in health disparities. Logistic challenges and insecurity make it difficult to make available essential medicines such as antimalarial.³⁰

There is an increased economic burden on the healthcare consumers. As a result of stockouts, out-of-pocket expenditure on health will increase, especially for those under the National Health Insurance Scheme. There will be an increased burden on workers, ultimately reducing their productivity and economic growth.³¹⁻³⁷

Limitations

This review is limited by time constraints giving less time for robust literature reviews to be done. The articles assessed were

only those that are available free. Most articles searched in PubMed Central gave access to only the abstract, limiting the extensive review. There was an issue with network access, especially with articles in ScienceDirect, which kept on verifying if the researcher is a robot without success. This limited the related articles that could have been of use. The articles selected for review were not extensively reviewed because of time constraints. More research is recommended to overcome the above limitations.

Recommendations

Addressing the identified challenges requires comprehensive reforms that target the root causes of inefficiencies in infrastructure, logistics systems, and governance practices. The goal of the policy should be to improve the health system as a whole. There should be strengthening the capacity of healthcare workers and supply chain managers through targeted training and development programs. There should be enhanced stakeholder collaboration among government agencies, international donors, and private sector partners to foster streamlined efforts and resources.

Conclusion

The prevailing challenges identified and analyzed within the supply chains of public health sector development projects in Nigeria are a lack of coordination and frequent stockouts, limited investment in logistics systems and processes, corruption, inadequate infrastructure, and lack of planning. Human resource challenges, poor cold chain logistics, last-mile delivery challenges, deficiency in information systems, and insecurity. The existing structure identified was based on the management of the federal government of Nigeria and international donors using the platform of key agencies and programs. There was generally a poor performance index characterized by cost inefficiency, poor availability of essential medicines, reduction in quality of health commodities, and long lead time for delivery of commodities. The general implications are poor health outcomes, reduction in trust in the health system, lack of equity in health access, and increased economic burden. The critical supply chain challenges facing the public health sector development projects in Nigeria were highlighted. By addressing these challenges through the implementation of the recommended strategies, Nigeria can improve the efficiency and effectiveness of its healthcare delivery system.

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Conflicts of interest

The authors declare there is no conflict of interest.

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