A COMPREHENSIVE ANALYSIS OF SUPPLY CHAIN MANAGEMENT PRACTICES IMPACTING MEDICATION AVAILABILITY IN NIGERIAN HEALTHCARE FACILITIES

1.1   Background

It is important to note that supply chain management (SCM) is the process of planning, implementing, and controlling the flow of materials, information, and services from the point of origin to the point of consumption. This is done to meet customer needs and satisfaction. Essentially, SCM ascertains the availability, accessibility, affordability, and quality of health commodities, such as medicines and vaccines, which are significant in the prevention, diagnosing, treatment and management of diseases. This points to the fact that SCM of health commodities is especially expedient for low- and middle-income countries (LMICs), where the burden of disease is high, and the health systems are weak (Chukwu et al., 2017). This is where Nigeria comes in.

One of the major factors affecting the good health status of Nigerians is the inaccessibility to essential medicines and vaccines, which availability is dearth, unaffordable, or of poor quality. Putting this in the perspective of the World Health Organization (WHO), only 34.7% of Nigerians had access to essential medicines in 2015, compared to the global average of 55.9%. Moreover, Nigeria often encounters stock-outs of essential medicines and vaccines, particularly in public health facilities, which account for about 60% of the health service delivery in Nigeria (Olutuase et al., 2022). An instance is the fact that Nigeria experienced stock-outs of antiretroviral drugs, antimalarial drugs, and vaccines for polio, measles, and yellow fever, among others, for

the past few years. Consequently, these stock-outs have challenging implications for the prevention and treatment of communicable and non-communicable diseases, as well as the realisation of universal health coverage and sustainable development (Olutuase et al., 2022).

An overview of the current state and challenges of the SCM practices in Nigeria revealed that the SCM practices in Nigeria are characterised by poor performance, low efficiency, and high wastage, which then lead to frequent stock-outs, expired drugs, and low-quality medicines. Lack of coordination and integration among the SCM actors, such as government agencies, donors, NGOs, manufacturers, suppliers, distributors, and healthcare facilities, leading to duplication, fragmentation, and inconsistency of SCM activities and information is one of the militating challenges (Chukwu et al., 2018). Similarly, there is a lack of adequate and reliable data and information systems for SCM. These include inventory management, forecasting, ordering, and tracking of medicines and vaccines, leading to poor visibility, transparency, and accountability of SCM processes and outcomes (Chukwu et al., 2018).

In their stead, Abdulkadir et al. (2024) provide an evaluation of the SCM performance of four public health programs in Nigeria. Such programmes include malaria, tuberculosis, HIV/AIDS, and immunisation, using a maturity model which is a tool that measures the level of development and improvement of an organisation or a process, based on predefined criteria and indicators, the authors used a five-level maturity model, ranging from initial, repeatable, defined, managed, to optimised, to assess the SCM

performance of the four programmes, which was based on six dimensions, namely strategy, organisation, process, information, technology, and people. The findings from this study corroborate the aforementioned challenges in the sense that the SCM performance of the four programs varies across the dimensions and the levels, but none of them reached the optimized level. It is then important to note that the strategy dimension, which refers to the alignment of the SCM objectives and plans with the program goals and policies, is the most developed among the dimensions, with three programmes reaching the managed level and one programme reaching the defined level (Abdulkadir et al., 2024).

In addition, Chukwu et al. (2017), provide a conceptual framework for SCM of health commodities, such as medicines and vaccines, for reducing the global disease burden, especially in developing countries. To explain this better, the authors propose a four-stage SCM framework. These include selection, procurement, distribution, and use. Identifying the key factors, actors, and relationships that influence each stage of the SCM process is also essential. One of the suggestions here is that the selection of health commodities should be based on the evidence of their efficacy, safety, quality, and cost-effectiveness. Not only that but also, this should be aligned with the national and international guidelines and standards. Similarly, it is vital to note that the selection of health commodities should involve the participation and consultation of the relevant SCM actors and stakeholders, such as government agencies, donors, NGOs, manufacturers, suppliers, distributors, and healthcare facilities (Chukwu et al., 2017).

Therefore, one unequivocal fact is that the supply chain systems for medicines and vaccines in Nigeria are confronted with copious challenges, that include inadequate funding, poor infrastructure, and inadequate human resources.

1.2   Statement of the Problem

Based on the background of this study, it is evident that Nigeria is a low- and middle-income country (LMIC) that faces a high burden of disease and a weak health system. And that numerous challenges hinder the delivery of quality health care in the country. This, in itself, is a problem. Hence, there is a need for a study that will conduct a comprehensive analysis of the SCM practices impacting medication availability in Nigerian healthcare facilities, to identify the current situation, the underlying causes, and the potential solutions for improving the SCM of health commodities in Nigeria. Such an analysis would make provision for a holistic and in-depth understanding of the SCM of health commodities in Nigeria. Not only that, but such also an analysis will inform the development and implementation of evidence-based policies, strategies, and interventions for enhancing the availability, accessibility, affordability, and quality of health commodities in Nigeria, and ultimately, improving the health outcomes and well-being of Nigerians.

1.3   Research Questions

The following are the research questions for this study:

i.   What are the main themes, findings, and gaps in the existing literature on supply chain management practices in the healthcare sector, specifically focusing on medication availability and distribution in Nigerian healthcare facilities?

ii. How do Nigerian healthcare facilities perform in terms of procurement, inventory management, and distribution processes of medications, according to a structured survey of key stakeholders?

iii. What are the patterns and factors of medication availability, stock levels, turnaround times, and shortages within Nigerian healthcare facilities, based on supply chain indicators?

1.4   Aim and Objectives

Largely, the general aim of this study is to comprehensively analyse the impact of supply chain management practices on medication availability and distribution in Nigerian healthcare facilities, while focusing on identifying areas for improvement and enhancing the overall efficiency of healthcare delivery. However, given the research aim, the following are the research objectives:

i.   To critically review existing literature on supply chain management practices in the healthcare sector, identifying gaps in the current knowledge.

ii. To evaluate current supply chain management practices within Nigerian healthcare facilities.

iii. To examine relevant factors responsible for the availability of medications within Nigerian healthcare facilities as well as factors influencing shortages of medications while identifying correlations between supply chain practices and medication availability.

1.5 Significance and Rationale of the Study

The study is significant in the sense that it addresses a major public health problem in Nigeria which is the lack of access to essential medicines and vaccines, especially for the underprivileged and vulnerable citizens. We can observe that the availability of medicines and vaccines is important for the prevention and treatment of diseases, consequently reducing morbidity and mortality, and enhancing the quality of life of Nigerians. However, it is noteworthy to understand that the supply chain management (SCM) of health commodities in Nigeria is faced with numerous challenges, such as inadequate local production, poor storage infrastructure, inefficient procurement and distribution systems, inadequate human resources, and weak policies and regulations. As a result, these challenges lead to frequent stock-outs, wastage, and poor quality of health commodities, which hinder the quality of health and well-being of Nigerians. Therefore, conducting a comprehensive analysis of the SCM practices impacting medication availability in Nigerian healthcare facilities such as this is significant for identifying the current situation, the underlying causes, and the potential

solutions for improving the SCM of health commodities in Nigeria. This would inform the development and implementation of evidence-based policies, strategies, and interventions for enhancing the availability, accessibility, affordability, and quality of health commodities in Nigeria consequently improving the health outcomes and well-being of Nigerians.

The rationale behind this study is to provide a comprehensive analysis of the SCM practices impacting medication availability in Nigerian healthcare facilities, using a mixed-methods approach. The analysis assesses the current situation, the underlying causes, and the potential solutions for improving the SCM of health commodities in Nigeria. In doing this, the analysis draws on the existing literature, such as studies like the systematic reviews by Seidman and Atun (2017) which examined the evidence on the impact of changes to supply chains and procurement processes on the cost savings and availability of pharmaceuticals, vaccines, and health products in LMICs. The authors found that SCM interventions, such as pooled procurement, vendor-managed inventory, and performance-based financing, could improve the availability and reduce the costs of health commodities, but the evidence was limited and heterogeneous.

Studies that explored the role of proprietary and patent medicine vendors (PPMVs) in healthcare provision in Nigeria also contribute to the rationale behind this study. One such study found that PPMVs were widely used and accessible sources of health commodities, especially for common ailments, such as malaria, diarrhoea, and respiratory infections (Beyeler et al., 2015).

Similarly, Olutuase et al. (2022) provide a rationale behind this study by summarizing the available evidence on the challenges of medicines and vaccine supply chain systems in Nigeria. This is in the sense that the identified factors that affected the SCM of health commodities in Nigeria, such as difficulty with medicines or vaccines selection, procurement, distribution, and inventory management are crucial in delving into this study.

CHAPTER TWO

LITERATURE REVIEW

2.1   Introduction

This chapter presents the literature review which establishes a foundation for understanding the complexities of SCM practices in healthcare and their impact on medication availability in Nigeria, offering theoretical perspectives and practical recommendations for improvement.

2.2   Supply Chain Management Practices in Healthcare

Supply chain management practices in healthcare are significant and expedient in the sense that they are the set of activities involved in the planning, procurement, storage, and distribution of medical supplies and equipment. Such practices aim to ascertain that healthcare providers have access to the right products at the right time, in the right quantity, and at the right time. In essence, what we are talking about is the fact that SCM in healthcare is not merely about logistical efficiency but rather; a strategic approach to ascertain that every step in the healthcare delivery process is patient-centric, coordinated, and quality-driven, ultimately leading to better health outcomes and organizational efficiency (Miah et al., 2014: Meijboom et al., 2011; Yap and Tan, 2012; Rakovska and Stratieva, 2018).

2.2.1 Procurement Processes

In order for us to examine, accurately, supply chain management practices in healthcare, we must first assess the procurement process. This is because it

is crucial in supply chain management practices within the healthcare based on the fact that it is the process of acquiring goods and services from external sources to meet the needs of an organisation. This translates to the fact that in healthcare, procurement is a crucial function that influences the quality, cost, and availability of healthcare services. However, procurement in healthcare supply chain management (HSCM) involves the coordination of varying activities. Such activities include sourcing, contracting, ordering, receiving, payment, and inventory management, among diverse stakeholders, such as healthcare providers, suppliers, distributors, and regulators (Ahmadi, Pishvaee, and Torabi, 2018). One must understand the fact that procurement in HSCM requires a strategic and holistic approach that considers the objectives and constraints of all the parties involved, as well as the trade-offs and synergies among them (Harland et al., 2021). These then culminate into challenges, one of which is to balance the conflicting goals of cost reduction and quality enhancement. Observations have proven that healthcare organizations are pressurised to reduce costs and improve quality. This is a result of the rising healthcare expenditures and the availability of limited resources. These notwithstanding, healthcare organisations must ascertain the quality and safety of healthcare products and services, as well as the satisfaction and well-being of relevant individuals such as their patients and staff.

This may, however, entail higher costs and risks (Miah et al., 2014). However, to address such a challenge, procurement in HSCM should adopt a value-based approach, which translates to the fact that procurement decisions

should be in tandem with the value that the products and services provided to the patients and the healthcare system, rather than being solely based on price. It should be added that value can be defined as the ratio of outcomes to costs, where outcomes include both clinical and non-clinical aspects, such as effectiveness, efficiency, accessibility, equity, and sustainability (Miah et al., 2014: Meijboom et al., 2011). A value-based procurement process should involve the identification of the needs and expectations of the patients and the healthcare system and specify the desired outcomes and performance indicators for the products and services (Miah et al., 2014: Meijboom et al., 2011; Yap and Tan, 2012; Rakovska and Stratieva, 2018).

2.2.2 Inventory Management Strategies

In addition to the procurement process, it is important to note that inventory management is equally vital in supply chain management practices in healthcare. Researchers defined this as the process of planning, controlling, and monitoring the flow of goods and materials from the point of origin to the point of consumption (Leaven et al., 2017). It is no gainsaying that in healthcare, inventory management is a critical function that affects the availability, accessibility, and quality of healthcare products and services, such as drugs, medical devices, and equipment. Also, inventory management in healthcare supply chain management (HSCM) involves the coordination of varying activities, such as forecasting, ordering, replenishing, storing, distributing, and disposing of inventory items, among various stakeholders.

Such stakeholders include healthcare providers, suppliers, distributors, and regulators (Leaven et al., 2017).

To reinforce, the inventory management strategies in HSCM are impacted by varying factors such as the characteristics and requirements of healthcare products and services, the demand and supply uncertainty and variability, the trade-offs and constraints of inventory costs and benefits, as well as the objectives and performance measures of inventory management (Leaven et al., 2017). Therefore, there is a need for a systematic and comprehensive approach regarding HSCM. Such an approach would consider the strategic, tactical, and operational aspects of inventory management, the incorporation and collaboration among the stakeholders, and the alignment and optimisation of inventory management in tandem with the overall HSCM goals and practices (Uthayakumar and Priyanka, 2013).

It is, however, expedient to note that one of the challenges of inventory management in HSCM is to ascertain the availability and accessibility of healthcare products and services, particularly in emergency and critical situations, such as pandemics, and disasters. All these notwithstanding, healthcare organisations must maintain enough inventory levels to meet the current and future demand and to curb stock-outs and shortages. As mentioned earlier, stockouts and shortages are factors that can compromise the quality and safety of healthcare services, as well as endanger the lives and health of patients and staff. Hence, healthcare organisations must avoid excess inventory levels, which can increase inventory holding and logistics

costs, and cause wastage and obsolescence because of the expiration and deterioration of healthcare products, and the changes in technology and regulations (Rachmania et al., 2013; Uthayakumar et al., 2013). This can then be addressed by analysing the demand and supply patterns. This means the identification and quantification of the current and future demand and supply of healthcare products and services and the factors that influence them. We can then conclude that the adoption of an appropriate combination of modern inventory management approaches can assist healthcare practitioners to improve corporate service delivery in terms ensuring steady flow of drugs and medical supplies while also minimizing the attendant carrying costs.

2.2.3 Distribution Mechanisms

Distribution Mechanisms follows inventory management practices because the adoption of an appropriate combination of modern inventory management approaches will help in the distribution mechanism which is the process of delivering goods and services from the point of production to the point of consumption. One must understand that in healthcare, distribution is an important function that influences the accessibility, availability, and quality of healthcare products and services, such as drugs, medical devices, and equipment. By distribution in healthcare supply chain management (HSCM), we mean the coordination of various activities, such as transportation, warehousing, inventory management, order fulfilment, and reverse logistics, among varying stakeholders, such as healthcare providers, suppliers, distributors, and regulators (Ageron, Benzidia & Bourlakis, 2018).

In addition, the distribution mechanisms in HSCM are influenced by some factors. that include the characteristics and requirements of healthcare products and services, the demand and supply uncertainty and variability, the trade-offs and constraints of distribution costs and benefits, and the objectives and performance measures of distribution (Ageron et al., 2018).

To emphasise, it is important to adopt a lean and green approach, which means that distribution decisions should be based on the elimination of waste and the reduction of environmental and social harm while maintaining or improving the accessibility and availability of healthcare products and services. This translates to the fact that a lean and green distribution approach should eliminate or minimise the non-value-added activities and resources, and the waste, in the distribution process, as well as optimise the value-added activities and resources, and the value, in the distribution process, such as by applying the just-in-time, pull, and kanban principles, and by implementing the continuous improvement and problem-solving techniques (Ageron et al., 2018).

Also, there should be a reduction or mitigation of the environmental and social harm caused by the distribution process. Such harm includes greenhouse gas emissions, energy and water consumption, noise and air pollution, traffic congestion and accidents, and improving the environmental and social benefits of the distribution process, such as by applying green transportation, warehousing, inventory management, order fulfilment, and reverse logistics practices, and by implementing the environmental and social responsibility

and sustainability programs. Similarly, there should be adequate monitoring and measurement of the performance of the distribution process. This will be based on the lean and green indicators and targets, such as the distribution costs, quality, efficiency, effectiveness, reliability, responsiveness, flexibility, agility, resilience, environmental impact, and social impact, and provide feedback and corrective actions, if needed, to ascertain the continuous improvement and optimisation of the lean and green distribution approach (Ageron et al., 2018).

2.3   Medication Availability in Nigerian Healthcare Facilities

Whether the challenges that bedevil supply chain management practices in healthcare are mitigated or not, there will be either positive or negative effects on medication availability. By medication availability, we mean the extent to which essential medicines are accessible and affordable to the patients who need them. This points to the fact that medication availability is a key indicator of the performance and quality of healthcare services, as it affects the health outcomes and satisfaction of patients, as well as the efficiency and efficacy of healthcare providers. Medication availability itself is influenced by various factors, such as the demand and supply of medicines, the procurement and distribution processes, the inventory management and stock control practices, and the regulatory and policy frameworks (Seidman et al., 2017; Okubadejo et al., 2019). One inescapable fact about Nigeria is the fact that medication availability is limited. Therefore strategies, including engagement of

stakeholders to consider interventions to improve and prioritize medication availability should be urgently warranted.

2.3.1 Stock Levels and Turnaround Times

Having stated that medication availability is a serious challenge in Nigeria, especially in public healthcare facilities across the country, and the we must state the stock levels and turnaround times. Public healthcare facilities are places where many patients depend on subsidised or free medicines. According to a study by Ikoh et al. (2009), about 70% of low-income women in Uyo urban, Akwa Ibom State, Nigeria, reported experiencing stock-outs of essential medicines in public healthcare facilities, which affected their health-seeking behaviour and satisfaction. It was then found that the main reasons for the stock-outs were inadequate funding, poor procurement planning, inefficient distribution systems, and weak monitoring and evaluation mechanisms (Ikoh et al., 2009). This then reinforces the fact that one of the aspects of medication availability that needs improvement in Nigeria is the stock levels and turnaround times of medicines in public healthcare facilities. One can refer to the stock levels as the quantity of medicines that are available in the facilities at any given time, whereas turnaround times refer to the duration between the placement of an order and the receipt of such an order. It is important to note then that stock levels and turnaround times are important measures of the responsiveness and reliability of the medication supply chain, as they show the ability of the facilities to align with the current

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and future demand of the patients and to militate or limit stock-outs and shortages (Seidman et al., 2017).

However, it is vital to improve the stock levels and turnaround times of medicines in Nigerian public healthcare facilities. One of the best ways to do this is via a centralized and coordinated system that can assist in the reduction of the duplication and fragmentation of the procurement and distribution activities, consequently achieving economies of scale and scope, as well as better bargaining power and quality assurance, with the suppliers. A centralised and coordinated system in this sense can also aid in enhancing the visibility and transparency of the medication supply chain and foster the sharing of information and resources among the stakeholders, such as the Ministry of Health, the National Agency for Food and Drug Administration and Control, the National Primary Health Care Development Agency, the State Ministries of Health, and the public healthcare facilities (Seidman et al., 2017).

2.3.2 Factors Influencing Medication Shortages

Failure to improve the stock levels and turnaround times of medicines in Nigeria will result in medication shortages. Hence, medication shortages are defined as situations where the demand for a medicine exceeds its supply. Consequently, this leads to inadequate or no availability of medicine for patients who need it. There are varying serious consequences of medication Shortages for the health of patients. One such consequence is the fact that medication shortages can affect the treatment outcomes, safety, and

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satisfaction of patients, as well as the costs, efficiency, and effectiveness of healthcare providers (Phuong et al., 2019).

It is also important to note that medication shortages are a global problem. This means that it affects both developed and developing countries, and involves different forms and classes of medicines, such as antibiotics, antiretrovirals, vaccines, and cancer drugs. However, one certain observation is that the causes and impacts of medication shortages vary across different regions and contexts. Such variation depends on the characteristics and dynamics of the medication supply chain, as well as the regulatory and policy frameworks (Phuong et al., 2019).

Its variation in global effects notwithstanding, medication shortages in Nigeria are a prevalent and persistent challenge, largely in public healthcare facilities, where there are a plethora of patients who rely on subsidized or free medicines. According to a scoping review by Olutuase et al. (2022), Nigeria faces numerous challenges in its medicines and vaccines supply chain, which affect the availability, accessibility, and affordability of essential medicines and vaccines for the population. The review, however, identified inadequate funding as one of the causes. This is because funding for the procurement and distribution of medicines and vaccines in Nigeria is insufficient and irregular.

Consequently, there are frequent stock-outs and shortages of essential medicines and vaccines in public healthcare facilities. It has been observed that the funding gap is mainly due to the low budgetary allocation and

expenditure for the health sector, as well as the dependence on external donors and partners, who may have different priorities and conditions for their support. Additionally, inadequate funding also affects the infrastructure and capacity of public healthcare facilities, such as the storage and transportation facilities, the human and financial resources, and the information and communication systems, which are essential for the effective management of the medication supply chain (Olutuase et al., 2022).

2.4 Integration of Supply Chain Management and Medication Availability

Since it has been established that supply chain management practices influence medication availability, it is then appropriate for us to examine the integration of supply chain management and medication availability. In this sense, one can integrate SCM and medication availability. We can do this in the form of aligning and optimizing the SCM activities and functions with the medication availability objectives and indicators, to achieve better outcomes and reduced costs for the patients and the healthcare system. The integration of SCM and medication availability can help us overcome the observed challenges and barriers that affect the availability, accessibility, quality, and safety of medicines, such as inadequate funding, poor planning, inefficient systems, security instability, and quality issues (Abdulkadir et al., 2024). How can SCM be integrated with medication availability?

It is best to first adopt a maturity model for SCM. By maturity model, we mean a tool that assesses the current state and performance of SCM and identifies

the gaps and areas for improvement. This will be based on a set of criteria and standards. A maturity model can assist a country like Nigeria to benchmark and monitor the progress and impact of SCM on medication availability, and for the country to prioritize and implement the best practices and interventions for SCM improvement (Abdulkadir et al., 2024; Steele et al., 2019).

Also, observations have proven that the maturity model can also help to foster a culture and commitment to continuous learning and achievement among the SCM stakeholders and to improve collaboration and coordination among them (Abdulkadir et al., 2024). Similarly, Nigeria should map the SCM functions and the WHO building blocks: The SCM functions are: the core activities and processes that are involved in the SCM as mentioned earlier, procurement, distribution, inventory management, quality assurance, and information management. Whereas, WHO building blocks are the six components of the health system that influence the performance and efficiency of healthcare services, such as leadership and governance, financing, service delivery, human resources, information, and medical products. By mapping the SCM functions and the WHO building blocks, the country will be able to identify the linkages and interdependencies among them, as well as align and optimise the SCM functions with the WHO building blocks, to enhance the availability, accessibility, quality, and safety of medicines (Steele et al., 2019).

Also, the implementation of digital transformation for SCM. Digital transformation means the process of using digital technologies and

innovations to improve and develop the SCM activities and functions, and to establish value and competitive advantage for the SCM stakeholders. Digital transformation can assist the concerned country to improve the efficiency and effectiveness of SCM and to increase the availability, accessibility, quality, and safety of medicines. This can be done by enabling the automation and optimization of the SCM processes, the integration and collaboration of the SCM systems, the visibility and transparency of the SCM data, and the innovation and improvement of the SCM practices (Ashiwaju et al., 2024).

Lastly, what we can deduce from the aforementioned is that SCM is vital in the availability, accessibility, quality, and safety of healthcare products and services, such as medicines, vaccines, and medical devices especially in Nigeria. This led us to establish the fact that medication availability is a key indicator of the performance and quality of healthcare services. This is because it affects the health outcomes and satisfaction of patients, as well as the efficiency and effectiveness of healthcare providers. Therefore, the integration of SCM and medication availability will translate into the process of aligning and optimising the SCM activities and functions with the medication availability objectives and indicators, to achieve better outcomes and lower costs for the patients and the healthcare system.

2.5   Identifying Determinants of Successful Medication Distribution

Having established the fact that medication distribution is the process of delivering medicines from the suppliers to the healthcare facilities and ultimately to the patients who need them, and that medication distribution is a

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vital component of the healthcare system, as it affects the availability, accessibility, quality, and safety of medicines, as well as the health outcomes and satisfaction of patients, and the costs and efficiency of healthcare providers (Chukwu et al., 2018). It is then essential for us to identify the determinants of successful medication distribution. By definition, successful medication distribution is the process of delivering medicines in a timely, reliable, and cost-effective manner in such a way that it does not mitigate the quality and safety of medicines, and that it meets the needs and expectations of the patients and the healthcare providers. This is observably beneficial in the sense that it helps to enhance the performance and quality of the healthcare system, by enhancing the availability, accessibility, quality, and safety of medicines, by improving the health outcomes and satisfaction of patients, and by reducing the costs and wastage of healthcare providers (Chukwu et al., 2018).

However, the following can be identified as determinants of successful medication distribution:

- **Demand and supply of medicines:** our analysis so far has pointed to the fact that demand and supply of medicines are the key drivers of the medication distribution process. This is because they determine the quantity and quality of medicines that are needed and available for the patients and the healthcare providers. One should then note that demand and supply of medicines are influenced by various factors, such as the epidemiology and prevalence of diseases, the clinical

guidelines and protocols, the consumption and utilization patterns, the forecasting and quantification methods, the availability and reliability of suppliers, and the price and quality of medicines. To be successful, medication distribution needs a balance between the demand and supply of medicines, by ascertaining that the medicines are procured and distributed according to the actual and projected needs of the patients and the healthcare providers, and by preventing the overstocking or understocking of medicines, which can cause wastage or shortages, respectively (Olutuase et al., 2022).

- **Procurement and distribution systems:** Also, the procurement and distribution systems are the core activities and processes that are involved in the medication distribution process. They are determined by the acquisition and delivery of medicines from the suppliers to the healthcare facilities and ultimately to the patients. We must then make it noteworthy that procurement and distribution systems are influenced by various factors, such as the procurement and distribution methods, the procurement and distribution policies and regulations, the procurement and distribution contracts and agreements, the procurement and distribution standards and criteria, and the procurement and distribution performance and monitoring. To make it successful, the concerned country must ensure that medication distribution is efficient and effective in procurement and distribution systems, This can be done by ensuring that the medicines are

procured and distributed in a timely, reliable, and cost-effective manner, and by complying with the quality and safety standards and regulations, and by monitoring and evaluating the procurement and distribution performance and outcomes (Olutuase et al., 2022)

- **Inventory management and stock control practices:** Inventory management and stock control practices are the activities and processes that are involved in the management and control of the medicines that are stored and dispensed in healthcare facilities. It is no gainsaying that the inventory management and stock control practices are influenced by various factors, which include the inventory management and stock control methods, the inventory management and stock control policies and regulations, the inventory management and stock control standards and criteria, and the inventory management and stock control performance and monitoring. Successful medication distribution unequivocally requires quality and efficient inventory management and stock control practices, by ascertaining that the medicines are stored and dispensed securely and by maintaining the optimal stock levels and turnaround times of medicines, and by preventing or limiting the wastage and expiry of medicines (Chukwu et al., 2018).

- **Regulatory and policy frameworks:** These translate into the rules and guidelines that govern the medication distribution process, and that influence the rights and responsibilities of the stakeholders involved in

the medication distribution process, such as the healthcare providers, the suppliers, the distributors, and the regulators. The regulatory and policy frameworks are influenced by different factors, such as the legal and ethical standards and requirements, the registration and licensing procedures, the quality assurance and control mechanisms, the traceability and accountability systems, and the security and privacy measures. For a particular country to achieve successful medication distribution, such a country must be supportive and have consistent regulatory and policy frameworks. To do this, the country must ensure that the medication distribution process is compliant and transparent by protecting the interests and welfare of the patients and the healthcare providers, and by preventing and mitigating the errors and risks of the medication distribution process (Chukwu et al., 2018).

- **Human and financial resources:** The human and financial resources are the individuals and money that are involved in the medication distribution process respectively. However, they affect the capacity and capability of the medication distribution process. Various factors influence the human and financial resources part of which are: the availability and allocation of the human and financial resources, the training and motivation of the human resources, the reward and recognition of the human resources, and the monitoring and evaluation of the human and financial resources. What we can deduce from this is that successful medication distribution requires adequate and

appropriate human and financial resources, by ensuring that the medication distribution process is staffed and funded adequately and effectively and by improving the skills and performance of the human resources, and by optimizing the costs and benefits of the medication distribution process (Daini et al., 2021).

2.6 Gaps in Current Knowledge: Unexplored Areas in Supply Chain Management and Medication Availability

Despite the importance of SCM in healthcare as we have observed in the aforementioned, one could still observe that there are several gaps in the current knowledge and research on this topic, especially when the context we're relating it to is Nigeria, which is not only the most populous country in Africa but also one of the most disease burdened (Olutuase et al., 2022). One of the major gaps is the lack of comprehensive and systematic reviews that synthesise the existing literature and evidence on the medicines and vaccine supply chain challenges in Nigeria and the potential solutions and interventions to address them. Such kind of review will help in mapping the key concepts, sources, and types of evidence on this topic and identify the gaps and priorities for future research (Olutuase et al., 2022). This translates into the fact that such a review can help provide a comprehensive and updated overview of the medicines and vaccine supply chain challenges in Nigeria. As mentioned earlier, such challenges include the demand and supply mismatch, the poor quality and safety of medicines and vaccines, the inadequate infrastructure and human resources, the weak governance and

regulation, corruption and fraud, and the external dependence and donor influence (Olutuase et al., 2022). Similarly, such review can help researchers identify the potential solutions and interventions that have been proposed or implemented to address these challenges, such as the strengthening of the national and local supply chain systems, the improvement of the procurement and distribution processes, the enhancement of the quality assurance and pharmacovigilance mechanisms, the development of the local production and innovation capacities, and the promotion of the public-private partnerships and stakeholder collaboration (Olutuase et al., 2022).

In addition, another observable gap in the current knowledge and research on SCM in healthcare is the lack of studies that apply the resource dependence theory (RDT) to explain and analyse the behaviour and performance of the actors and organisations involved in the medicines and vaccines supply chains in Nigeria. If applied appropriately for such explanation, RDT can help researchers understand the power dynamics, the inter-organizational relations, and the strategic actions of the actors and organizations in the medicines and vaccines supply chains, such as the government, the donors, the manufacturers, the distributors, the retailers, and the consumers (Jiang et al., 2023).

Moreover, a third gap in the current knowledge and research on SCM in healthcare is the lack of studies that explore the impact and implications of the sustainable closed-loop supply chains (SCSCs) and their optimisation models for the medicines and vaccine supply chains in Nigeria. It is expedient for one

to note that SCSCs are supply chains that integrate the forward and reverse flows of materials, information, and services, and that consider the environmental, social, and economic aspects of the supply chain activities, such as the procurement, production, distribution, consumption, recovery, and disposal of the products (Lozano-Oviedo et al., 2024). This means that SCSCs can offer benefits such as improved resource efficiency, reduced environmental impact, increased customer satisfaction, and enhanced competitive advantage (Lozano-Oviedo et al., 2024).

However, the advantages notwithstanding, SCSCs also pose challenges and complexities. Such challenges include uncertainty, variability, and coordination of the forward and reverse flows, the trade-offs and conflicts between the environmental, social, and economic objectives, and the integration and alignment of the multiple stakeholders and decision-makers involved in the supply chain activities (Lozano-Oviedo et al., 2024). Hence, SCSCs require optimization models that can help us design and plan the optimal configuration and operation of the SCSCs and assist researchers in evaluating and comparing the performance and outcomes of the SCSCs under varying scenarios and conditions (Lozano-Oviedo et al., 2024).

2.7   Theoretical Framework

This study employed two theoretical foundations. These are the Resource Dependence Theory (RDT) and the Institutional Theory. Their propositions are briefly discussed below:

2.6.1 Resource Dependence Theory (RDT)

The choice of this theory is based on the fact that RDT is a social theory that explains how organisations interact with their external environment, and how they manage their dependence on critical resources that are controlled by other organisations (Hillman et al., 2009). In this sense, RDT assumes that organisations are open systems that need to acquire and maintain resources from their environment to survive and grow and that these resources are scarce, valuable, and unevenly distributed among different actors (Biermann and Harsch, 2017). Therefore, it is important to note that organisations seek to reduce their dependence on external entities and increase their power and influence over them, by adopting varying strategies, such as mergers and acquisitions, joint ventures, alliances, contracts, lobbying, and advocacy (Hillman et al., 2009).

It can then be inferred that RDT can be applied to the topic of SCM practices impacting medication availability in Nigerian healthcare facilities. One of the reasons for such applicability is the fact that it can help us identify and explain the key factors, actors, and relationships that affect the access and distribution of essential drugs in the country. According to RDT, the healthcare facilities in Nigeria are dependent on varying external entities for obtaining the medications they need, such as pharmaceutical manufacturers, suppliers, distributors, wholesalers, retailers, government agencies, donors, and non-governmental organizations (NGOs). These entities have different interests, goals, and capabilities, and they may exert power and influence over the

healthcare facilities, or vice versa, depending on the degree of dependence and interdependence between them (Biermann and Harsch, 2017; Jiang et al., 2023; Hillman et al., 2009).

Fig.1 Resource Dependence Theory
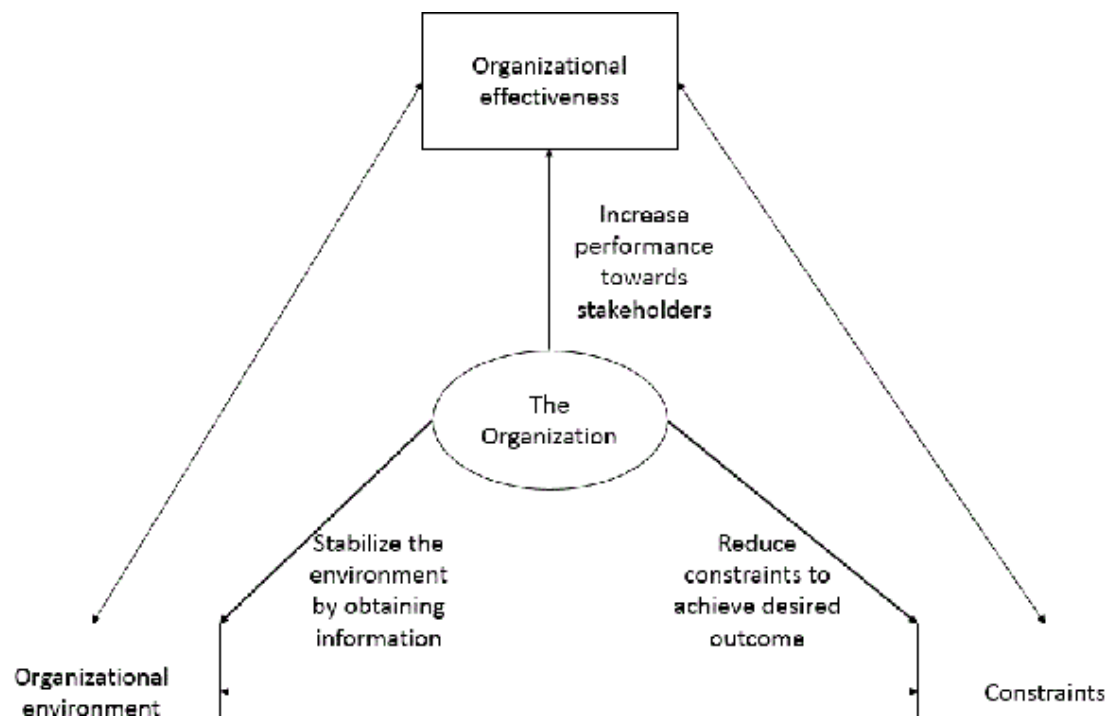
2.6.2 Institutional Theory

One other theoretical model that was also used to analyse and understand the SCM practices in healthcare is the institutional theory. Institutional theory is employed because it is a social theory that explains how organisations conform to the norms, values, and expectations of their external environment, and how they adopt and diffuse the practices and structures that are considered legitimate and appropriate by their stakeholders (Liao et al., 2020). It is important to understand that institutional theory assumes that organizations are influenced by various institutional pressures, such as

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coercive, normative, and mimetic, that shape their behaviour and decision-making, and that organisations seek to gain legitimacy and support from their environment by aligning their practices and structures with the institutional norms and expectations (Singh and Jayanti, 2013).

If we apply institutional theory to this study, SCM practices impact medication availability in Nigerian healthcare facilities. This is because it can help to identify and explain the key factors, actors, and relationships that affect the adoption and implementation of effective and efficient SCM practices in the country. According to this theory, the healthcare facilities in Nigeria are subject to various institutional pressures from their external environment, such as government agencies, donors, NGOs, professional associations, customers, competitors, and media, that influence their SCM practices and outcomes (Liao et al., 2020).

Typical examples of the above are the government agencies, such as NAFDAC, FMoH, and NHIS, that exert coercive pressure on healthcare facilities, by imposing rules, standards, and sanctions on their SCM practices, such as licensing, accreditation, inspection, or penalty. These coercive pressures aim to ensure the safety, quality, and affordability of the medications that are supplied and distributed in the country, and to prevent the proliferation of counterfeit and substandard drugs (Singh and Jayanti, 2013).

Another example is the relationship between the healthcare facilities and the donors and NGOs, such as the World Health Organization (WHO), the United

Nations Children's Fund (UNICEF), and the Global Fund. These donors and NGOs exert normative pressure on the healthcare facilities, by providing guidance, training, and funding for their SCM practices, such as procurement, inventory management, distribution, and monitoring. These normative pressures aim to improve the access and availability of essential drugs, especially for vulnerable and marginalised populations, and to promote the best practices and standards of SCM in healthcare (Liao et al., 2020).

A third example is the relationship between healthcare facilities and their customers and competitors, such as patients, physicians, pharmacists, and other healthcare providers. These customers and competitors exert mimetic pressure on the healthcare facilities, by creating demand, preference, and expectation for their SCM practices, such as traceability, transparency, and accountability. These mimetic pressures aim to enhance the trust, satisfaction, and loyalty of the customers, and to increase the competitiveness and performance of the healthcare facilities in the market (Singh and Jayanti, 2013).

Fig 2. Institutional Theory
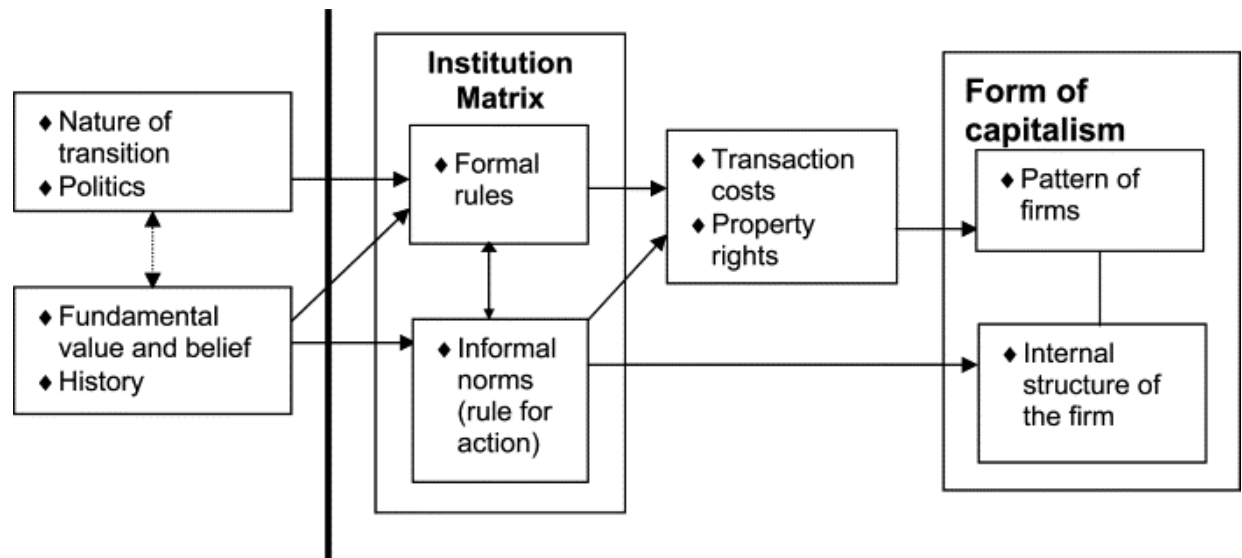
Therefore, institutional theory provides a useful framework for analysing and understanding the SCM practices impacting medication availability in Nigerian healthcare facilities, as it can highlight the complex and dynamic influences and interactions between the healthcare facilities and their external environment, and how they affect the adoption and implementation of effective and efficient SCM practices in the country. Institutional theory also suggests some possible strategies and solutions for improving SCM performance and outcomes in healthcare, such as enhancing the legitimacy and support of the healthcare facilities from their environment, reducing the institutional pressures and conflicts on their SCM practices, increasing the institutional learning and innovation in their SCM systems, and strengthening the institutional collaboration and coordination among the SCM actors (Liao et al., 2020).

CHAPTER 3

METHODOLOGY

3.1 Research Philosophy

This study adopts a social constructivist research philosophy. According to Amineh, and Asl (2015), social constructivism emphasises the role of social interactions, context, and the construction of meaning in knowledge development. That is, it recognises that knowledge is constructed through social processes and interactions by combining a positivist paradigm (quantitative) and an interpretivist paradigm (qualitative). This philosophical framework was selected for this study ? because of its ability to address the research questions raised in a pragmatic way (Prasad, 2021). The philosophical leaning will also help integrate qualitative and quantitative components into the research problem, providing detailed insights into findings.

3.2 Research Approach

The study uses a mixed-method research approach. This approach combines qualitative and quantitative research methods to investigate phenomena. The mixed methods for this study include survey and in-depth interview (IDI) respectively. A mixed method is adopted because of its many benefits to the current study. First, it provides a comprehensive understanding of the variables investigated from different voices and perspectives. Second, it ensures that data are obtained from different sources, thereby enhancing validity and credibility. Third, it makes the study more applied or practical. Last,

it addresses the research questions from different perspectives or research paradigms (Malina, Nørreklit & Selto, 2011).

In addition, both deductive and inductive techniques are used to drive the study. For the survey part, the deductive technique is employed. This involves testing assumptions derived from existing theories and concepts (Armat et al., 2018) related to supply chain management practices and medication availability in healthcare settings. On the other hand, the inductive technique is employed to drive the IDI. In this technique, the study explores and explains the richness of qualitative data that cannot be explained by a quantitative method. It is also an approach that adopts a bottom-up technique that begins with specific details before making some data-informed conclusions. It is equally a flexible approach that allows researchers to modify variables based on collected data (Woo, O'Boyle & Spector, 2017).

mixed method parallel / sequential

3.3 Research Design

A mixed-methods research design is employed for the study—survey (QUANT) and IDI (QUAL). The survey part involves numerical data collection on supply chain practices and medication availability in Nigeria. The qualitative phase includes in-depth interviews with key stakeholders to provide a richer understanding of the contextual factors influencing supply chain management and medication distribution. These methods are selected because they are the best fit that can empirically answer the three research questions this study seeks to investigate. Also, a mixed-methods approach

provides in-depth and constructive results from different perspectives or voices (Curry et al., 2009; Clark & Ivankova, 2015).

The electronic questionnaire, which serves as the survey's research instrument, is designed using closed-ended questions. The researcher used closed-ended questions because they save time, eliminate ambiguity, simplify data collection, increase response rates, and improve data quality. They also simplify analysis by providing structured and quantifiable data, achieve consistency by giving all respondents the same response options, and achieve consistency. Additionally, quantitative data from closed-ended questions can be statistically evaluated. Also, a Likert Scale technique was used in the design of several of the questions. The Likert Scale approach enables the researcher to quantify respondents' answers to questions, methodically maintain consistency, balance respondents' response alternatives, and produce a straightforward and adaptable interpretation of findings.

For IDI, however, a semi-structured questioning approach is adopted. This means the researcher is free to ask follow-up questions. Because of distance and attaining convenience, the interviews are conducted virtually using both synchronous and asynchronous techniques.

3.4   Data Collection

The quantitative data (survey) is collected through a structured online survey administered to a purposeful and convenient sample of healthcare professionals in Nigerian healthcare facilities. Likewise, the IDI data are

collected remotely via an online platform agreed upon by the interviewees. The survey's and the IDI's instruments (questionnaire and interview guide respectively) comprise questions on supply chain practices, and medication availability, among others.

3.5   Sampling Approach

The study adopts a non-random sampling that includes purposeful and convenience sampling techniques. It is purposeful because only the respondents and the participants who work or have worked as pharmacists, supply chain managers or supervisors, and healthcare administrators are qualified to fill out the online questionnaire and respond to interview questions. However, a convenient sampling is included because only those who are willing to participate in the study are ethically considered and included in data collection.

3.6   Inclusion and Exclusion Criteria

Inclusion criteria for survey respondents and interview participants include being healthcare professionals (pharmacists, supply chain managers or supervisors, or healthcare administrators) working in Nigerian private or public healthcare facilities. The exclusion criteria include professionals who have no direct involvement in supply chain management or medication distribution.

3.7   Data Analysis Method

The quantitative data are analysed on SPSS software using regression analysis, as this helps identify correlations between supply chain practices

and medication availability. Also, descriptive statistics is used to analyse some portion of the data. For qualitative data, however, the researcher adopts thematic analysis to extract patterns, themes, and insights. Relevant quotes from the interviews are used as a form of synthesis to explicate the quantitative analysis. Essentially, these analytical approaches allow for triangulation of findings, thereby enriching the overall validity and reliability of results.

3.8 Validity and Reliability

Content and face validity techniques are used for the study's validity. For content validity, the researcher ensures that the survey questions and interview protocols are not only exhaustive but also relevant to the study's objectives. For face validity, however, the researcher ensures that the research instruments are checked and reviewed by an expert to allow for the identification and rectification of any ambiguities or concerns regarding question clarity and appropriateness. The survey's reliability is carried out using McHugh's (2012) Cohen's Kappa co-efficient inter-coder reliability test. Cohen's Kappa states that Kappa values of 0-.20 are considered "None,".21-.39 are "Minimal,".40-.59 are "Weak,".60-.79 are "Moderate," and.80-.90 are "Strong" over 90 is described as "Almost Perfect".

3.9 Ethical Consideration

Research ethics encompasses the crucial ethical principles that researchers must consistently adhere to throughout their investigations. Given that this

research will include human participants, it is essential to adhere to certain ethical principles. Consent is the first principle adhered to. This ensures that participants and respondents are provided with accurate information on the study's goals prior to the administration of the electronic questionnaire and the interview protocol. This is akin to obtaining their approval before their responses to the research instruments. For example, the introductory section of the questionnaire clearly outlines the study's objectives and the intended use of the gathered data.

Another ethical requirement that is ensured is the preservation of respondents' identities—confidentiality. The researcher assures the respondents that the information they provided will be used only for study's purposes. Therefore, respondents' demographic information such as names, e-mail addresses and other private identities are excluded from the collected data. According to Wimmer and Dominick (2013), these ethical norms are customarily used in research to protect research subjects and respect their right to make informed decisions.

3.10   Limitation of the Research Method

Although mixed-method research that combines surveys and interviews offers a comprehensive understanding of research questions by capturing both quantitative and qualitative data, some limitations exist. One, it is time-consuming and requires many resources for data management. Two, synthesising quantitative and qualitative data during analysis is also cumbersome. Three, sampling issues present another limitation. Selecting a

representative sample for both survey and interviews is challenging. Finally,

the study is faced with response bias, a concept that is commonly attributed to

mixed-method studies.

CHAPTER FOUR

RESULT AND DISCUSSION

Introduction

This chapter contains the analysis of the mixed method study. The chapter analyses the supply chain management practices within Nigerian healthcare facilities and their consequential impact on the availability of medications. Through a lens focused on stakeholders' perceptions, the data used comprises ordinal responses, capturing a spectrum of agreement and disagreement. In this section, a range of statistical techniques tailored to the ordinal nature of the data is presented. The analysis unveils patterns and correlations as well as contributes valuable insights to the enhancement of healthcare supply chains in Nigeria.

Descriptive statistics

To describe the dataset, percentages, mean, median and mode, standard deviations and variance were calculated. The following figures represent the study's demographic distributions:

Figure 1: Gender
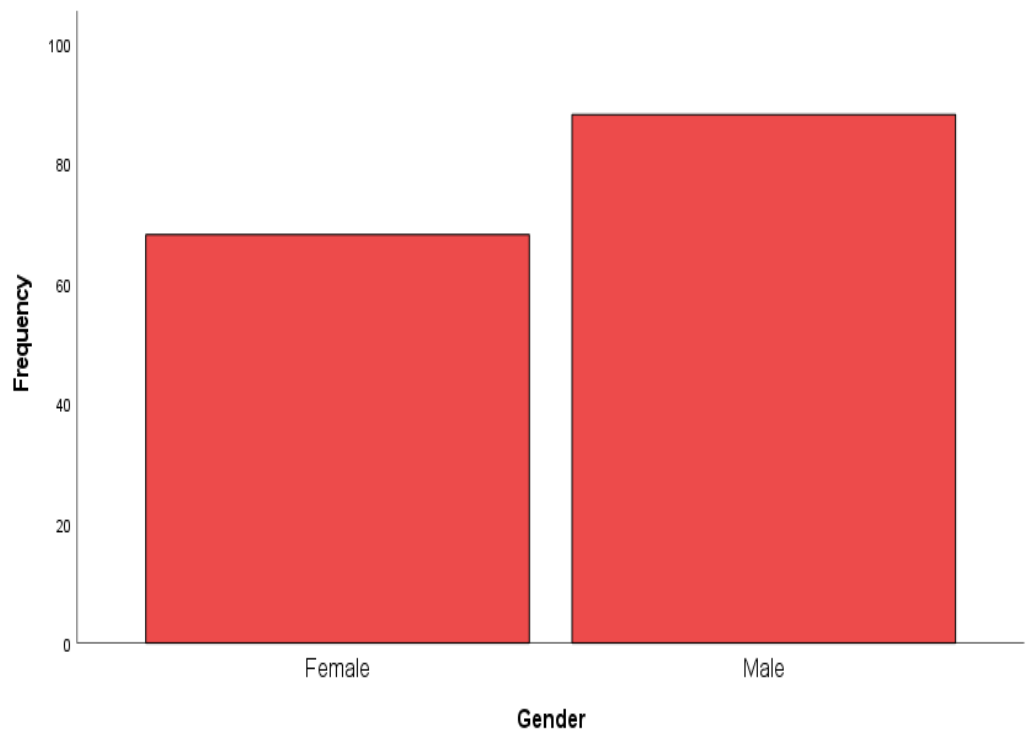
Source: Author's analysis, 2024

The respondents in this study exhibited a diverse representation in terms of gender. Out of the total sample (156), 43.6% identified as female, while 56.4% identified as male. This means the sample is not biased as the gender is almost 50/50 %, and the sample is random as ascertained by the runs test of hypothesis. This gender distribution also provides an opportunity to explore potential variations in perceptions of medication availability within Nigerian healthcare facilities. The significant Z-score and p-value indicate a non-random pattern, which is due to some systematic factors of having more males in the medical/pharmaceutical field than females.

Figure 2: Occupational distribution
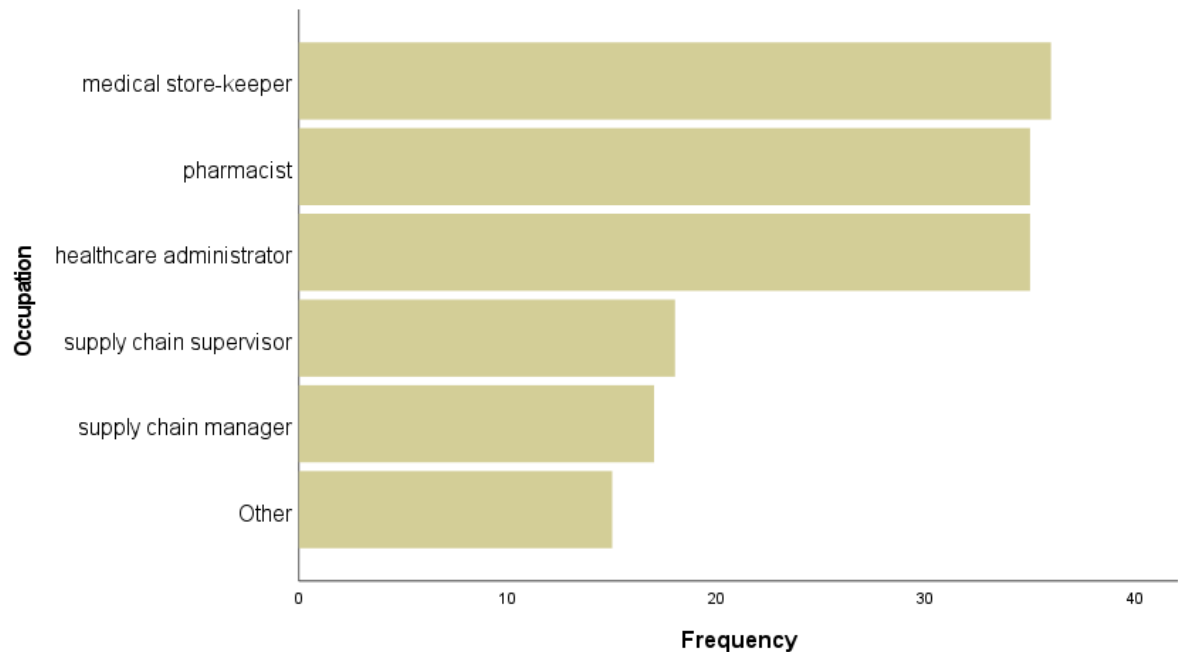
Source: Author's analysis, 2024

The distribution of occupational backgrounds among respondents in the sample is notably diverse, encompassing various professions within the healthcare and non-healthcare sectors. Healthcare administrators, medical storekeepers, and pharmacists emerge as the predominant occupational groups, collectively constituting a substantial portion of the sample. The diversity in occupation reflects perspectives from professionals engaged in healthcare management, logistics, and pharmaceutical services. The presence of supply chain managers and supervisors further adds depth to the insights, providing perspectives from individuals directly involved in supply chain processes. The inclusion of respondents from diverse backgrounds highlights a holistic approach to understanding supply chain management practices in Nigerian healthcare facilities.

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4.2.1 Evaluating current supply chain management practices within Nigerian healthcare facilities.

	Mean	Mode	Std. Deviation	Variance
Inventory management practices in healthcare facilities adequately meet medication demand	1.81	1	1.131	1.279
The distribution process of medications in Nigerian healthcare facilities is well-organised	1.71	1	.985	.971
From my experience, stakeholders are satisfied with the current procurement procedures in healthcare facilities.	1.82	1	1.050	1.103
Medication distribution timelines are consistently met in Nigerian healthcare facilities	1.72	1	.994	.988
In Nigeria, stakeholders perceive the inventory tracking systems in healthcare facilities as ineffective	3.15	5	1.665	2.772
The communication channels between procurement and distribution departments are seamless	2.31	1	1.501	2.253
The training programs for staff involved in procurement and distribution are sufficient	2.21	1	1.462	2.138
Our healthcare facility relies on external suppliers for the procurement of medications	3.67	5	1.542	2.378
Resource availability strongly influences our distribution processes	3.84	5	1.461	2.135

External stakeholders have limited influence on decision-making in our healthcare facility during the procurement process	3.81	5	1.345	1.808
Regulatory pressures have minimal impact on our medication procurement strategies	3.85	5	1.330	1.770
Industry trends have a substantial impact on our medication procurement and distribution strategies	4.06	5	1.162	1.351
Medication availability in Nigerian healthcare facilities is consistent	1.56	1	.859	.738
Shortages of critical medications are rare in Nigerian healthcare facilities	1.65	1	1.045	1.092
Stakeholders perceive the supply chain monitoring systems as reliable	1.83	1	1.124	1.262
Factors contributing to medication shortages are well-understood by healthcare facility staff	2.55	1	1.504	2.262
Information flow within the supply chain is effective in preventing medication shortages	2.47	1	1.517	2.303
External factors have minimal influence on the availability of medications in our healthcare facility	2.84	1	1.576	2.484
External dependencies have no impact on the turnaround times for receiving medication supplies	2.92	1	1.590	2.528

Industry norms have minimal guidance on our healthcare facility in managing medication shortages	3.67	5	1.447	2.092
Adherence to institutional norms does not significantly affect our response to stock-level fluctuations.	3.50	5	1.584	2.510
Industry trends do not influence our facility's response to medication shortages	3.69	5	1.523	2.320
Our healthcare facility addresses shortages in compliance with external regulations	4.02	5	1.356	1.838

Source: Author's analysis, 2024

Exploring responses where respondents expressed strong disagreement illuminates critical areas of concern within the surveyed healthcare facilities. Firstly, respondents strongly disagreed with the assertion that inventory management practices adequately meet medication demand, suggesting potential shortcomings or dissatisfaction with the existing inventory management procedures. According to the two interviewees, despite that the general motive of the inventory system is to ensure that procurement makes provision of medication available to hospitals, the process can be "frustrating and so annoying." When such frustration sets in, it hampers "the medications available in the hospital which in turn affect the patients" (Interview 2, 5 March 2024). They identified a lack of accountability and maintenance culture as the greatest challenges creating dissatisfaction in Nigeria's healthcare inventory management system. One of them states:

> It [the inventory system] is very poor because no one is accountable for anything, and no one wants to take charge i.e., there is a lack of accountability and responsibility in the system.

Despite these challenges, however, the interviewees identified some advantages. One, "they help to bridge the gap between procurement department and drug distributors" (Interview 1, 5 March 2024). Also, "their strength is group work (team of doctors)" (Interview 2, 5 March 2024).

Similarly, respondents conveyed a pronounced disagreement regarding the organisation of medication distribution processes, indicating perceived inefficiencies or challenges in the distribution system. Notably, there is a significant disagreement concerning stakeholders' satisfaction with current procurement procedures, implying a prevailing sense of discontent among stakeholders.

Additionally, respondents strongly disagreed with the statement that medication distribution timelines are consistently met, hinting at perceived inconsistencies or delays in the distribution process. Both interviewees, on the contrary, had mixed responses. The first one described the timelines as "not fully satisfactory." For the second interviewee, on the contrary, "It is fair but the agency (NDLEA) needs to curb fake drugs in the country and also see to it that expired drugs are pushed out of healthcare facilities." The interpretation is nuanced for the question about stakeholders' perception of inventory tracking system effectiveness, where respondents did not strongly agree on the ineffectiveness, revealing a more complex view of these tracking systems.

In examining the responses where most respondents displayed strong agreement, several noteworthy trends emerged. Firstly, respondents strongly concurred with the statement that their healthcare facility relies on external suppliers for medication procurement, although the mean fell slightly below 4. This suggests a significant dependence on external sources for medications. Additionally, respondents indicated robust agreement regarding the substantial impact of industry trends on medication procurement and distribution strategies, underscoring a keen awareness and consideration of industry dynamics.

Furthermore, there is a strong alignment with compliance with external regulations in addressing medication shortages, reflecting a commitment to regulatory adherence. Notably, respondents believed that regulatory pressures minimally affect medication procurement strategies, indicating a perceived independence from regulatory constraints. However, a nuanced perspective arises concerning the understanding of factors contributing to medication shortages by healthcare facility staff, as the mean for this question fell below 4, suggesting a less unanimous consensus on this aspect. The two interviewees corroborated the survey findings by identifying "poor communication, poor means of transportation, environment, selling drugs without a medical license and lack of power supply" as key factors leading to the shortage of critical medications that jeopardise Nigeria's healthcare facilities. Specifically, whenever the power supply is not steady, the second interviewer submitted that it negatively affects the healthcare sector in areas "such as X-ray, ultrasound surgeries and some other health attentions."

Most responses tend to cluster toward the lower end of the scale, indicating a general tendency for disagreement or lower agreement with the statements. Questions related to inventory management, distribution processes, and stakeholder satisfaction show a consistent trend of lower agreement. Questions assessing perceptions of external influences and industry-related factors exhibit a more diverse range of responses, reflecting varied perspectives within the sample.

4.2.2 Examining relevant factors responsible for the availability of medications within Nigerian healthcare facilities and factors influencing shortages of medications.

Our healthcare facility addresses shortages in compliance with external regulations			**Medication availability in Nigerian healthcare facilities is consistent**			**Inventory management practices in healthcare facilities adequately meet medication demand**		
	N	%		N	%		N	%
D	10	6.4%	SA	2	1.3%	U	3	1.9%
U	15	9.6%	U	5	3.2%	SA	7	4.5%
SD	16	10.3%	A	7	4.5%	A	14	9.0%
A	29	18.6%	D	49	31.4%	D	50	32.1%
SA	86	55.1%	SD	93	59.6%	SD	82	52.6%

Author's analysis, 20

Correlations

			The distribution process of medications in Nigerian healthcare facilities is well-organised	From my experience, stakeholders are satisfied with the current procurement procedures in healthcare facilities.	Medication distribution timelines are consistently met in Nigerian healthcare facilities
Spearman's rho	From my experience, stakeholders are satisfied with the current procurement procedures in healthcare facilities.	Correlation Coefficient	.810**		
		Sig. (2-tailed)	.000		
		N	156		
	Medication distribution timelines are consistently met in Nigerian healthcare facilities	Correlation Coefficient	.715**	.724**	
		Sig. (2-tailed)	.000	.000	
		N	156	156	
	Medication availability in Nigerian healthcare facilities is consistent	Correlation Coefficient	.527**	.489**	.465**
		Sig. (2-tailed)	.000	.000	.000
		N	156	156	156

**. Correlation is significant at the 0.01 level (2-tailed).

Author's analysis, 2024

The correlation analysis reveals compelling insights into the interconnected dynamics within the healthcare supply chain in Nigerian facilities. Notably, a robust and positive correlation is observed between stakeholders' satisfaction with current procurement procedures and their perception of the well-organised distribution process of medications, emphasising a mutually reinforcing relationship. Similarly, stakeholders who express higher

satisfaction with procurement procedures are inclined to perceive medication distribution timelines as consistently met. Moreover, moderate to strong positive correlations exist between stakeholders' satisfaction, the distribution process, and distribution timelines with the perceived consistency of medication availability. According to one of the interviewees, "it is fairly reliable" to say that the supply chain monitoring systems ensure medication availability in Nigeria. Similarly, the second interviewee gave NAFDAC, the government agency in charge of drug monitoring and legalization, a 45% pass mark in that regard. When medication is not available as it is supposed to be, the patient suffers. One of the interviewees captured this thus:

> It (slow or lack of medication distribution) makes patients not to get medication on time. Sometimes, it could just be because the drug personnel resumes work late or absent for unknown cause (Interview 1, 3 March 2024)

These findings underscore the pivotal role of stakeholders' contentment with procurement processes in shaping perceptions of the overall efficacy of the distribution system and its impact on medication availability.

4.2.2.1 Ordinal Regression

Ordinal regression is a statistical technique used when the dependent variable is ordinal, meaning it has ordered categories, but the intervals between the categories are not assumed to be equal. In other words, the response variable has a meaningful order, but the differences between the categories may not be uniform or known. Examples of ordinal variables include educational levels (e.g., high school, bachelor's degree, master's degree), Likert scale responses (e.g., strongly disagree, disagree, neutral, agree, strongly agre

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Threshold	[Q18 = 1]	-16.653	4.002	17.312	1	.000	-24.497	-8.808
	[Q18 = 2]	-8.207	3.608	5.174	1	.023	-15.279	-1.136
	[Q18 = 3]	-6.360	3.525	3.255	1	.071	-13.269	.549
	[Q18 = 4]	-2.165	3.198	.458	1	.498	-8.433	4.103
Location	[Q6=1]	-8.527	5.284	2.604	1	.107	-18.883	1.829
	[Q6=2]	-5.142	5.761	.797	1	.372	-16.433	6.150
	[Q6=3]	9.929	8.266	1.443	1	.230	-6.272	26.130
	[Q6=4]	-5.888	6.372	.854	1	.355	-18.376	6.600
	[Q6=5]	0[a]	.	.	0	.	.	.
	[Q7=1]	-13.250	13.482	.966	1	.326	-39.674	13.174
	[Q7=2]	-12.109	12.849	.888	1	.346	-37.292	13.073
	[Q7=3]	-5.768	14.966	.149	1	.700	-35.101	23.565
	[Q7=4]	-10.530	16.775	.394	1	.530	-43.409	22.348
	[Q7=5]	0[a]	.	.	0	.	.	.
	[Q8=1]	-1.313	14.411	.008	1	.927	-29.559	26.932
	[Q8=2]	-1.195	14.301	.007	1	.933	-29.225	26.836
	[Q8=3]	1.492	13.814	.012	1	.914	-25.583	28.567
	[Q8=4]	-3.323	15.315	.047	1	.828	-33.340	26.694
	[Q8=5]	0[a]	.	.	0	.	.	.
	[Q9=1]	2.476	7.183	.119	1	.730	-11.603	16.555
	[Q9=2]	-4.378	7.832	.312	1	.576	-19.728	10.973
	[Q9=3]	-10.122	9.777	1.072	1	.301	-29.283	9.040
	[Q9=4]	13.523	9.086	2.215	1	.137	-4.285	31.331
	[Q9=5]	0[a]	.	.	0	.	.	.
	[Q10=1]	-1.666	2.690	.384	1	.536	-6.937	3.606
	[Q10=2]	-3.838	2.498	2.360	1	.124	-8.733	1.058
	[Q10=3]	-1.261	6.490	.038	1	.846	-13.981	11.460
	[Q10=4]	-2.252	2.871	.615	1	.433	-7.880	3.376
	[Q10=5]	0[a]	.	.	0	.	.	.
	[Q11=1]	1.721	2.815	.374	1	.541	-3.796	7.239
	[Q11=2]	1.313	4.196	.098	1	.754	-6.912	9.538
	[Q11=3]	7.899	4.937	2.559	1	.110	-1.778	17.575
	[Q11=4]	3.068	3.501	.768	1	.381	-3.793	9.930
	[Q11=5]	0[a]	.	.	0	.	.	.

	B	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
[Q12=1]	2.017	3.334	.366	1	.545	-4.518	8.551
[Q12=2]	3.224	4.834	.445	1	.505	-6.250	12.698
[Q12=3]	7.511	4.817	2.431	1	.119	-1.931	16.953
[Q12=4]	.137	4.969	.001	1	.978	-9.603	9.877
[Q12=5]	0[a]	.	.	0	.	.	.
[Q13=1]	-1.027	3.036	.114	1	.735	-6.977	4.924
[Q13=2]	1.682	5.901	.081	1	.776	-9.884	13.249
[Q13=3]	-5.885	5.434	1.173	1	.279	-16.536	4.766
[Q13=4]	-3.757	2.607	2.077	1	.149	-8.865	1.352
[Q13=5]	0[a]	.	.	0	.	.	.
[Q14=1]	-1.707	4.541	.141	1	.707	-10.608	7.193
[Q14=2]	8.812	5.644	2.438	1	.118	-2.250	19.875
[Q14=3]	2.982	4.085	.533	1	.465	-5.025	10.989
[Q14=4]	1.598	2.465	.420	1	.517	-3.234	6.430
[Q14=5]	0[a]	.	.	0	.	.	.
[Q15=1]	4.497	4.092	1.208	1	.272	-3.523	12.516
[Q15=2]	-7.457	5.863	1.618	1	.203	-18.948	4.034
[Q15=3]	-.084	3.136	.001	1	.979	-6.230	6.061
[Q15=4]	-3.350	3.401	.970	1	.325	-10.015	3.316
[Q15=5]	0[a]	.	.	0	.	.	.
[Q16=1]	-7.756	4.899	2.506	1	.113	-17.358	1.847
[Q16=2]	-2.435	7.740	.099	1	.753	-17.605	12.735
[Q16=3]	-3.501	4.164	.707	1	.400	-11.662	4.659
[Q16=4]	1.489	3.897	.146	1	.702	-6.150	9.128
[Q16=5]	0[a]	.	.	0	.	.	.
[Q17=1]	4.050	3.682	1.210	1	.271	-3.167	11.267
[Q17=2]	14.003	15.786	.787	1	.375	-16.937	44.942
[Q17=3]	-1.685	4.276	.155	1	.694	-10.066	6.696
[Q17=4]	-.476	2.757	.030	1	.863	-5.879	4.927
[Q17=5]	0[a]	.	.	0	.	.	.
[Q19=1]	-20.744	8.307	6.236	1	.013	-37.025	-4.462
[Q19=2]	-10.617	8.701	1.489	1	.222	-27.669	6.436
[Q19=3]	-3.551	5.949	.356	1	.551	-15.211	8.109
[Q19=4]	-17.335	9.194	3.555	1	.059	-35.354	.684
[Q19=5]	0[a]	.	.	0	.	.	.
[Q20=1]	16.706	8.898	3.525	1	.060	-.733	34.145
[Q20=2]	17.000	10.029	2.873	1	.090	-2.657	36.657
[Q20=3]	12.591	7.763	2.631	1	.105	-2.623	27.805

	B	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
[Q20=4]	15.932	8.727	3.333	1	.068	-1.172	33.036
[Q20=5]	0^a	.	.	0	.	.	.
[Q21=1]	-.618	4.407	.020	1	.888	-9.257	8.020
[Q21=2]	-.856	4.939	.030	1	.862	-10.536	8.824
[Q21=3]	-.403	4.493	.008	1	.929	-9.208	8.402
[Q21=4]	-.328	4.634	.005	1	.944	-9.410	8.754
[Q21=5]	0^a	.	.	0	.	.	.
[Q22=1]	1.054	3.897	.073	1	.787	-6.584	8.691
[Q22=2]	1.754	4.687	.140	1	.708	-7.433	10.940
[Q22=3]	2.529	5.695	.197	1	.657	-8.633	13.692
[Q22=4]	1.334	3.916	.116	1	.733	-6.342	9.010
[Q22=5]	0^a	.	.	0	.	.	.
[Q23=1]	4.424	2.963	2.230	1	.135	-1.383	10.231
[Q23=2]	.932	4.355	.046	1	.831	-7.605	9.469
[Q23=3]	1.420	3.683	.149	1	.700	-5.799	8.639
[Q23=4]	1.023	3.301	.096	1	.757	-5.446	7.492
[Q23=5]	0^a	.	.	0	.	.	.
[Q24=1]	-2.090	3.638	.330	1	.566	-9.219	5.039
[Q24=2]	1.645	6.311	.068	1	.794	-10.725	14.015
[Q24=3]	3.995	3.003	1.770	1	.183	-1.890	9.881
[Q24=4]	-2.147	4.440	.234	1	.629	-10.849	6.554
[Q24=5]	0^a	.	.	0	.	.	.
[Q25=1]	-3.121	3.865	.652	1	.419	-10.696	4.454
[Q25=2]	.763	7.837	.009	1	.922	-14.597	16.123
[Q25=3]	-6.104	3.945	2.394	1	.122	-13.835	1.628
[Q25=4]	-4.231	2.914	2.108	1	.146	-9.941	1.480
[Q25=5]	0^a	.	.	0	.	.	.
[Q26=1]	-.831	2.756	.091	1	.763	-6.232	4.570
[Q26=2]	-1.639	6.857	.057	1	.811	-15.079	11.801
[Q26=3]	-2.360	3.811	.383	1	.536	-9.830	5.110
[Q26=4]	2.658	3.866	.473	1	.492	-4.920	10.236
[Q26=5]	0^a	.	.	0	.	.	.
[Q27=1]	5.135	2.857	3.231	1	.072	-.464	10.734
[Q27=2]	4.216	5.125	.677	1	.411	-5.829	14.261
[Q27=3]	-2.794	3.913	.510	1	.475	-10.464	4.875
[Q27=4]	5.758	3.643	2.497	1	.114	-1.383	12.899
[Q27=5]	0^a	.	.	0	.	.	.
[Q28=1]	-1.980	4.669	.180	1	.672	-11.131	7.171

[Q28=2]	5.037	7.322	.473	1	.491	-9.313	19.387
[Q28=3]	-.367	4.121	.008	1	.929	-8.445	7.711
[Q28=4]	-2.022	3.570	.321	1	.571	-9.018	4.975
[Q28=5]	0ª	.	.	0	.	.	.

Link function: Logit.

a. This parameter is set to zero because it is redundant.

The parameter estimates from the ordinal regression analysis provide valuable insights into the factors influencing the perception of medication availability in Nigerian healthcare facilities. For instance, regarding the thresholds for medication availability (Q18), negative estimates across categories indicate a decreasing log-odds of perceiving higher medication availability compared to the reference category of strongly agreeing. Location variables (Q6, Q7, Q8, Q9, Q10) demonstrate varied impacts, with positive coefficients suggesting an increase in the log odds of perceiving higher medication availability and negative coefficients indicating a decrease. These results suggest that respondents' geographical locations play a role in shaping their perceptions. Similarly, variables related to industry trends (Q11, Q12, Q13) show varying impacts on medication availability perception. Statistically significant coefficients highlight the significance of these variables in influencing respondents' perceptions.

The findings from this in-depth analysis of healthcare supply chain practices in Nigerian facilities uncovered a noteworthy trend regarding the perception of consistent medication availability. Most respondents strongly disagreed with the notion that medication availability is consistent. The regression analysis identified several significant variables influencing this perception. Notably, participants expressing reluctance towards heavy reliance on external

suppliers, recognising the impact of resource availability on distribution processes, and minimising the influence of external stakeholders during procurement tended to have a more positive view of medication availability. Additionally, those who disagreed with external dependencies affecting turnaround times and compliance with external regulations for addressing shortages also leaned towards perceiving medication availability as more consistent. These findings suggest specific areas within the supply chain that, when addressed, could contribute to enhancing the perceived consistency of medication availability in Nigerian healthcare facilities. To solve these myriads of challenges, the two interviewees suggested the following:

Interviewer 1	Interviewer 2
- Nigeria should be able to produce her own drugs. - Power supply needs to be made constant in the country. - The roads need to be fixed to reduce accidents or theft on the road, making these drugs not available.	- Teamwork - Relearning and unlearning and then keep learning the right way - Being dedicated

Author's analysis, 2024

CHAPTER FIVE

DISCUSSION OF FINDINGS

Paragraph: Summary of Results •

The analysis explains prominent challenges in Nigerian Healthcare supply chains. Respondents strongly disagreed on Inventory Management adequacy (32.1% disagreement) and distribution process efficiency (31.4% disagreement). Correlation analysis shows a significant positive correlation (Spearman's rho = 0.810, $p < 0.01$) between stakeholders' satisfaction with the procurement procedures and perceived well-organized medication distribution. Also, Ordinal Regression identified significant variables influencing medication availability perception.

Negative coefficients indicated decreasing log-odds of higher availability, with location variables showing varied impacts. Notably, participants expressing reluctance towards external reliance and minimizing external stakeholder influence leaned towards perceiving more consistent medication availability.

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