

# Impact of Third–Party Logistics (3PL) Collaboration and Supply Chain Performance in Public Health Management in South-South, Nigeria

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**Abstract:** *The study examines the impact of third-party logistics (3PL) collaboration and supply chain performance in public health management in South-South, Nigeria. The study employed a cross-sectional survey research approach. The study's sample size is 330 healthcare workers selected from a population of 2,600 in South-South Nigeria. A stratified random sampling technique was adopted. The sample size of the study was calculated using Krejcie and Morgan's sample size table, and Bowley's sample size allocation formula. A structured questionnaire was used as the research instrument, with a 5-point Likert ranking as follows: strongly agree (5), agree (4), undecided (3), disagree (2), and strongly disagree (1). The data was analyzed with the use of IBM SPSS software version 21 for descriptive statistics and multiple regression. Findings show that there is a strong and positive correlation between inventory management,  $r (.513)$ ,  $p < 0.1$ , warehousing management,  $r (.453)$ ,  $p < 0.1$ , transportation management,  $r (.647)$ ,  $p < 0.1$ , logistics management information system,  $r (.500)$ ,  $p < 0.1$ , and supply chain performance. Based on the findings, the study concludes that there is a strong positive correlation between 3PL collaboration and supply chain performance. The researchers, therefore, recommended that public health managers or administrators integrate 3PL providers into their logistical activities and foster long-term partnerships in supply chain logistical operations. Furthermore, they should exploit the potentials of 3PL collaboration to improve supply chain performance in public health management.*

**Keywords:** *third–party logistics, supply chain performance, public health management.*

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## INTRODUCTION

Today's healthcare system is undergoing changes as a result of the current shift in logistical operations. The idea of logistics in healthcare has drawn a lot of concern in recent times. It has given the healthcare industry precious unheard-of opportunity to adopt supply chain management. Healthcare managers are now applying logistics concepts as a strategic tool to reduce cost and improve healthcare service delivery. Logistic practices have been recognized as a means for the healthcare sector to optimize healthcare delivery. Logistics optimization has been

earmarked as a key driver for achieving a sustainable supply chain (Umoren *et al.*, 2021). Supply chain logistics is concentrated on a strategic application system for the dynamic flow of commodities from manufacturers to customers and end-users (Okwubali *et al.*, 2023).

Researchers have advocated that healthcare providers should streamline logistic practices and linkages seamlessly; providing optimum service delivery in healthcare institutions. To perform particular activities and to manage the linkages between these activities is a source of advantage (Quinton, 2013). Healthcare professionals in developed countries are working hard to ensure that the finest logistical operations are possible. This has a significant impact on the effectiveness of supply chain management in the delivery of healthcare services. Public healthcare institutions can gain from 3PL collaboration; providing an innovative link between or among patients, customers, practitioners, and healthcare commodities manufacturers.

Managing the smooth forward and backward movement of goods and information through logistics networking is a major challenge for every industrial business (Dhake *et al.*, 2011). There have been several reports of both public healthcare providers and management and healthcare users experiencing serious deprivation. Healthcare administrators are unable to do their jobs; while the poor and other healthcare users face health issues and even death (Umoren *et al.*, 2021). The main problem may be the result of inadequate 3PL collaborations and the scarcity of necessary healthcare commodities. Ejiofor (2013) stated that the number of health facilities and adherence to modern medicine are two significant indicators of a country's good healthcare system. On this premise, this study investigates the effect of 3PL collaboration and supply chain performance in public health management in South-South, Nigeria.

### **Objective of the Study**

The following are the specific objectives of the study:

- i. examine the effect of inventory management on supply chain performance in public health management in South-South Nigeria.
- ii. examine the effect of warehousing management on supply chain performance in public health management in South-South Nigeria.
- iii. examine the effect of transportation management on supply chain performance in public health management in South-South Nigeria.
- iv. examine the effect of logistics management information system on supply chain performance in public health management in South-South Nigeria.

## **CONCEPTUAL REVIEW**

### **Overview of 3PL collaborations**

The 3PL collaboration has emerged in various businesses in the world, growing increasingly with a shared vision, principles, and values of supply chain management. Most studies have stated the relevance of 3PL providers (Viachos & Polichronidou, 2020; Zaryab & Shafaq, 2012). 3PL are subcontractors/service providers who specialize in supply chain functions (Ogbolu, 2018). Most businesses realize that the quality of business partner relationships is one of the most precious assets in this volatile and unpredictable world of change (Jamaluddin & Saibani, 2021). Collaboration in the supply chain refers to a long-term connection between supply chain partners

in which partners cooperate, share information, and work together to design and implement a business strategy that improves joint performance. A good objective alignment between two logistic partners would create the impression that the firms were "in this together," resulting in reciprocal interest in the overall supply chain performance (Barnes & Liao, 2012).

3PL is a concept that emphasizes collaboration to complete tasks as a single, unified system. Collaboration of 3PL (Darko & Viachos, 2022) is built on trust and allows for seamless information sharing among partners. For instance, 3PL partners must achieve sustainability in their interactions with healthcare providers, manufacturers, customers, and users across the supply chain network. The involvement of 3PL providers is an external cooperation, a driving force, and a critical capability in the supply chain network. Outsourcing logistical activities to 3PL allows healthcare providers to focus on core strategic functions. Is a well-established strategy for businesses to improve emphasis on core competencies and strategic initiatives (Arcelly *et al.*, 2017). Gu *et al.*, (2017) found that a rising percentage of organizations globally have outsourced or are considering outsourcing logistics activities to third-party logistics providers.

### **3PL and Areas of Business Collaboration in Supply Chain**

#### **i. Inventory Management**

A critical aspect of inventory management is ensuring smooth operation and efficiency of healthcare inventories. The healthcare industry is using inventory management applications to achieve efficiency and effectiveness in its supply chains (Leaven *et al.*, 2017). The management of inventory entails monitoring, analyzing, and keeping tracks of inventory and turnover rates against demand patterns to enable informed-decisions. These decisions will help to bring down costs and prevent stockout risk. Research findings depicted that more than half (13, 56.52%) of the respondents had sometimes experienced stockouts in their various facilities (Anyona *et al.*, 2021). Strategies are employed in inventory management such as just-in-time (JIT), lean inventory management, and reverse logistics. These strategies allow healthcare providers to reduce costs, improve cash flow, ensure timely delivery, and increase customer/patient satisfaction. Inventory planning and control must be implemented to guarantee that enough stocks exist, failing to do so might result in overstocking or understocking of inventories (Noun, 2013).

#### **ii. Warehousing Management**

Warehousing is an important activity that involves storing and conserving products from the moment they are manufactured until they are consumed. Warehousing is crucial because no supply chain can work without proper warehouse design and management (Abdelrahman & Yonis, 2020). Warehousing management plays a key role in maintaining a smooth flow of health commodities through the supply chain; it links materials from suppliers to buyers, Oladunni (2020). Space utilization and layout optimization are important aspects of warehouse management for maximum efficiency. This is done with various warehouse techniques such as shelves, pallet racking, and mezzanine floors. Space management does not only ensure maximum storage capacity, seamless flow of goods but improves the total flow, cost reduction, and productivity. In general, warehouse management processes are complex, a critical component of supply chain logistics management. Efficient warehousing minimizes movement while making necessary movements as efficient as possible (Waters, 2003).

### iii. **Transportation Management**

Transportation in the supply chain has become crucial as the global healthcare industry has grown and expanded over the years. Transportation refers to all economic activities that involve transferring a product from producers to consumers (Onu *et al.*, 2019). This optimizes transportation management strategies such as route planning, coordination, and execution of other transportation tasks. Kamruzzaman and Amirul (2015) averred that transportation in the supply chain system is crucial since no modern organization can run without providing for the movement of raw materials or finished goods. A successful transportation system should ensure that healthcare commodities move quickly, easily, and safely. The technological advancement and data analytics in recent years have significantly improved the transportation system. Data-driven decisions have helped 3PL providers improve the transportation system, reduce costs, and boost customers' satisfaction. The ability to provide and ensure safe, swift, reliable, and affordable health commodities remains a critical issue in health management. Bowersox *et al.*, (2002) claimed that in designing a logistical system, a delicate balance must be maintained between transportation cost and service quality. Zaryab *et al.*, (2012) affirmed that 3PL can perform this job of transportation much better than that of the company's own transport system without any hurdles.

### iv. **Logistics Management Information System**

The efficient and effective management of health commodities is critical for ensuring quality healthcare services and better health outcomes. Within public health systems, 3PL providers can play a key role in helping to actualize the estimate of quantities of health supplies needed through LMIS. LMIS ensures data capture during transactions, data collection, data processing, and data analytics in relation to procurement, storage, and distribution of healthcare commodities to the last mile. A typical LMIS system enables real-time visibility, informed decision-making, and improves the efficiency of logistics management processes in a health setting. LMIS is a system that records and stores information related to the supply chain, provides analytical tools for monitoring, managing the supply chain, and generates accurate and timely reports to support decision-making (USAID, 2007). The following are the impacts of LMIS on quantifying health supplies:

**Accurate data collection and analysis:** Effective LMIS facilitates the systematic collection of data on commodity consumption, stock levels, and distribution. By standardizing data collection processes and ensuring data accuracy, LMIS provides reliable information for quantification purposes. Advanced analytics capabilities enable LMIS to identify consumption patterns, seasonal variations, and other factors influencing commodity demand, thus improving the accuracy of forecasting models. Mugisha *et al.*, (2020) demonstrated that the implementation of an electronic LMIS in Uganda improved data accuracy and timeliness, leading to more accurate quantification of essential medicines.

**Improved forecasting:** LMIS enhances forecasting accuracy by incorporating real-time data and advanced forecasting algorithms. By analyzing historical consumption data and trends, LMIS generates more accurate demand forecasts, taking into account factors such as population growth, disease burden, and programmatic changes. This enables health authorities to anticipate future commodity needs more effectively, reducing the risk of stockouts or excess stock. Akiyama

et al., (2018) conducted their study in Nigeria and found that the implementation of an LMIS-based forecasting system improved forecast accuracy by 30%, leading to better quantification of essential medicines and vaccines.

**Optimized inventory management:** Effective LMIS optimizes inventory management practices to ensure the efficient use of resources. LMIS minimizes stockouts while avoiding overstock situations. Real-time visibility into stock levels and consumption patterns enables health authorities to make informed decisions regarding inventory replenishment, reducing wastage, and carrying costs. Yadav *et al.*, (2019) in India demonstrated that the implementation of an LMIS resulted in a 20% reduction in stockouts and a 15% reduction in excess stock, leading to cost savings and improved commodity availability.

**Timely replenishment:** LMIS facilitates timely replenishment of health commodities by enabling an effective supply planning system, effective procurement processes, and streamlining order processing. LMIS ensures that orders are placed with suppliers in a timely manner. Integration with procurement systems and supply chain partners enables faster order processing and delivery, reducing lead times and ensuring continuous availability of commodities. WHO (2017) on LMIS implementation in Tanzania reported a significant reduction in lead times for commodity procurement and distribution, leading to improved availability of essential medicines and vaccines at health facilities.

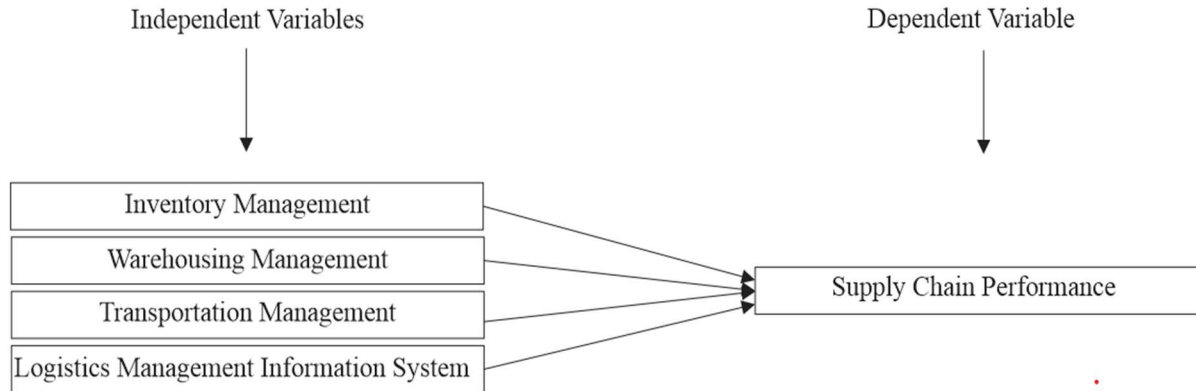
**Improved decision-making:** LMIS provides decision-makers with access to timely and actionable information for strategic planning and resource allocation. LMIS enables stakeholders to monitor key performance indicators, track commodity utilization, and identify supply chain bottlenecks. This empowers decision-makers to prioritize investments, allocate resources effectively, and respond promptly to emerging health challenges. USAID (2019) study emphasized how LMIS played a role in enhancing decision-making processes related to commodity quantification, procurement, and distribution, leading to more streamlined supply chain management.

### **Supply Chain Performance in Public Health**

The significant outcome of public health management is a function of successful logistical operations. Kwon *et al.*, (2016) stated that the healthcare supply chain industry is relatively new compared to commercial supply chains. Nevertheless, there is a growing attention to supply chain performance. Healthcare practitioners prioritize cost-oriented solutions and operational efficiency, adhering to supply chain transparency in order to increase patient satisfaction while prioritizing human life (Arora & Gigras, 2018). Improving hospital supply chain performance has become increasingly crucial as healthcare organizations strive for greater operational efficiency and cost savings; ensure that healthcare items are available to users at service delivery sites (Chena *et al.*, 2013; Nsikan *et al.*, 2019). According to studies, supply chain management is more complex in the healthcare industry; it directly involves patient care, which is a vital function that must be handled with care (Musttaffa & Potter, 2009; Gbadeyan *et al.*, 2017). According to APICS (2020), the performance of supply chain is measured by the following five key performance metrics: (i) Reliability (ii) Responsiveness (iii) Agility (iv) Cost and (v) Asset Management Efficiency. However, in another opinion, the following performance metrics were

listed as a measure for production performance (Kalyani, 2021): (i) Quality (ii) Flexibility (iii) Cost, and (iv) Delivery

#### 2.1.4 Conceptual Framework



Research Model: Researchers (2024)

and supply chain performance have revealed that good inventory management practices can significantly improve healthcare delivery performance. Furthermore, researchers discovered that using inventory control systems such as just-in-time (JIT), among others, can drastically cut costs while increasing efficiency. Inventory management issues include insufficient staff and training, a lack of efficient storage, and an unstable supply of pharmaceuticals (Anyona *et al.*, 2021). The findings of studies have provided vital insights for healthcare businesses trying to optimize their inventory management methods and improve overall supply chain performance.

**HO<sub>1</sub>:** *There is no significant effect of inventory management on supply chain performance in public health management in South-South Nigeria.*

#### Warehousing Management and Supply Chain Performance

Achieving supply chain effectiveness requires careful consideration of storage management techniques. Warehouse management activities have a direct impact on supply chain performance. It is crucial because no supply chain can function without proper warehouse design and administration, which connect material flows from suppliers to purchasers (Abdelrahman *et al.*, 2020; Oladunni, 2020). Improved inventory management, faster order fulfillment, and higher customer satisfaction are manifestations of effective warehousing management. Integrating good storage management techniques is critical for improving supply chain performance.

**HO<sub>2</sub>:** *There is no significant effect of warehousing management on supply chain performance in public health management in South-South Nigeria.*

## **Transportation Management and Supply Chain Performance**

Transportation management has a substantial impact on supply chain performance. Transportation is so important that no modern business can function without the ability to move raw materials or completed goods quickly, easily, safely, and affordably (Kamruzzaman *et al.*, 2015; Odunjo *et al.*, 2015). To attain a high degree of supply chain performance, it is critical to use effective transportation management practices. This includes smart route planning, carrier selection optimization, and real-time shipment tracking. Furthermore, the application of advanced technology and data analytics to transportation management can improve supply chain efficiency and effectiveness. Overall, good transportation management methods are critical for optimizing supply chain performance.

*HO<sub>3</sub>: There is no significant effect of transportation management on supply chain performance in public health management in South-South Nigeria.*

## **Logistics Management Information System and Supply Chain Performance**

The integration of a LMIS has had a major influence on supply chain performance, enhancing the quantification of health commodities. LMIS improves supply chain performance by providing data that improves forecasting accuracy, optimizes inventory control, simplifies restocking operations, and allows for informed decision-making methods. Implementing an LMIS reduced stockouts and excess stock, resulting in cost savings and enhanced commodity availability. Investing in LMIS infrastructure and capabilities is critical for maximizing the system's benefits and ensuring the availability of critical medications, vaccinations, and other health supplies.

*HO<sub>4</sub>: There is no significant effect of logistics management information system on supply chain performance in public health management in South-South Nigeria.*

## **Theoretical Review**

### **Resource-Based Theory (RBT)**

According to RBT, for an organization to survive and increase its operational performance, it must have the appropriate bundled resources, with efficient movement between them. Penrose created this theory for optimal resource management, diversification strategy, and productive prospects. This theory emphasizes the significance of using external resources to gain a competitive advantage in today's economic environment. Companies access 3PL provider resources to save cost for their logistics needs and also improve their logistics services (Etokudoh *et al.*, 2017). The RBT approach analyzes the firm's resources and skills and enables 3PL providers to create synergy within the areas of collaborations to drive overall supply chain performance.

### **Network Theory (NT)**

According to network theory, 3PL service providers play an important role in supply chain management, serving as intermediates between producers and retailers. They serve as a bridge between different nodes in the network, facilitating the flow of commodities and information.

Network theory enables 3PL providers to detect potential risks and disruptions, resulting in better contingency planning and risk management. Network theory emphasizes collaborations from relationship management resulting in economic gain (Etokudoh *et al.*, 2017). Using the network theory approach, 3PL providers can provide more complete and strategic services to their clients, resulting in higher overall performance and customer satisfaction.

### Empirical Review

Munanira, and Mulyungi (2018) seeks to find out the impact of third party logistics service providers on the supply chain performance of the manufacturing companies in Rwanda. The specific objectives of the study are as follows: To determine the effect of lead time, warehousing management, cost reduction, and transportation management on the procurement performance of BRALIRWA Ltd. The study used a descriptive research design. The target population is 580, while the sample size considered is 58, which represents 10% of the target population. Data was processed using descriptive statistics, where SPSS version 23 was adopted, establishing the effect of independent variables on the dependent variable. The study found that lead-time, warehousing management, cost reduction, and transportation management influenced supply chain performance. The study findings revealed the influence of 51.6% of third party logistics on supply chain performance at Bralirwa Ltd.

Biruk, (2020) investigated the effect of logistics management practices on organizational performance. The primary goal of this study was to investigate the impact of logistics management strategies on organizational performance in the case of the Ethiopian Pharmaceuticals Supply Agency. The study's population consisted of Ethiopian Pharmaceuticals Supply Agency personnel. A self-administered questionnaire was created to elicit pertinent information from the 148 respondents. 140 questionnaires were returned and analyzed using the Statistical Package for Social Sciences (SPSS) version 24. The analysis demonstrates that logistics management strategies have a considerable positive effect on organizational performance at the Agency. The study recommends improving logistics management techniques.

### RESEARCH METHODOLOGY

The study employed a cross-sectional survey research approach. The research study has a sample size of 330 respondents selected from a population of 2,600 healthcare practitioners in South-South, Nigeria. A stratified random sampling technique was adopted. The population was broken into homogeneous groups. The sample size of the study was calculated using Krejice & Morgan's sample size table and Bowley's sample size allocation formula was adopted to calculate the actual number of the sample size for each stratum. A structured questionnaire was used as the research instrument, with a 5-point Likert ranking as follows: *strongly agree* (5), *agree* (4), *undecided* (3), *disagree* (2), and *strongly disagree* (1). The data was analyzed with the use of IBM SPSS software version 21 for descriptive statistics and multiple regression.

The equation used to predict SCP is shown below:

$$Y = f(X) \dots\dots\dots (i)$$

$$Y = f(IMP, WMP,TMP, LMIS) \dots\dots\dots (ii)$$



$$SCP = \beta_0 + \beta_1IMP + \beta_2WMP + \beta_3TMP + \beta_4LMIS + \varepsilon. \dots\dots\dots (iii)$$

Whereby:

- SCP = Supply Chain Performance (Dependent variable)
- IM = Inventory Management (Independent variable)
- WM = Warehousing Management (Independent variable)
- TM = Transportation Management (Independent variable)
- LMIS = Logistics Management Information System (Independent variable)
- $\varepsilon$  = Error Term
- $\beta$  = Beta Coefficient
- $f$  = Function Notation

#### 4.0 Result of data analysis

##### Correlations

		IM	WM	TM	LMIS	SCP
Inventory management	Pearson Correlation	1	.063	.427**	.024	.513**
	Sig. (2-tailed)		.255	.000	.658	.000
	N	330	330	330	330	330
Warehousing management	Pearson Correlation	.063	1	.115*	.547**	.453**
	Sig. (2-tailed)	.255		.036	.000	.000
	N	330	330	330	330	330
Transportation management	Pearson Correlation	.427**	.115*	1	-.077	.647**
	Sig. (2-tailed)	.000	.036		.162	.000
	N	330	330	330	330	330
Logistics management information system	Pearson Correlation	.024	.547**	-.077	1	.500**
	Sig. (2-tailed)	.658	.000	.162		.000
	N	330	330	330	330	330
Supply chain performance	Pearson Correlation	.513**	.453**	.647**	.500**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	330	330	330	330	330

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

\* . Correlation is significant at the 0.05 level (2-tailed).

Source: IBM SPSS, Version 21

**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-17.455	1.244		-14.034	.000
1 Inventory management	.292	.033	.255	8.891	.000
Warehousing management	.141	.039	.113	3.586	.000
Transportation management	.699	.036	.561	19.190	.000
Logistics management information system	.572	.038	.475	15.114	.000

a. Dependent Variable: Supply chain performance

Source: IBM SPSS, Version 21

From the findings based on the correlation analysis, the predictors of 3PLs collaboration exhibited a significant positive correlation with supply chain performance. This simply means that the predictors: inventory management ( $\beta = 0.255$ ,  $p > 0.01$ ), warehousing management ( $\beta = .113$ ,  $p > 0.01$ ), transportation management ( $\beta = .561$ ,  $p > 0.01$ ), and logistics management information system ( $\beta = .475$ ,  $p > 0.01$ ) are strong elements of supply chain performance. However, the result from the multiple regressions showed that all the predictors have a positive effect on supply chain performance. The prediction of supply chain performance using the statistical model is presented as follows:  $SCP = -17.455 + (0.292 \times IM) + (0.141 \times WM) + (0.561 \times TM) + (0.572 \times CS)$ .

**ANOVA<sup>a</sup>**

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	231.465	4	57.866	291.911	.000 <sup>b</sup>
Residual	64.426	325	.198		
Total	295.891	329			

a. Dependent Variable: Supply chain performance

b. Predictors: (Constant), Inventory management, Warehousing management, Transportation management, Logistics management information system

Source: IBM SPSS, Version 21

The F-ratio of the ANOVA table depicts that third-party logistics collaboration significantly predicts supply chain performance,  $F = 291,911$ ,  $0.000 < 0.05$ . The implication of this is that the regression model is statistically significant. It shows that the combined effect of the variables is statistically significant in supply chain performance with an F statistic of 291.911 and a p-value of 0.05. By implication, the regression model is a good fit for the data and highly significant for the study.

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.884 <sup>a</sup>	.782	.780	.44523

a. Predictors: (Constant), Inventory management, Warehousing management, Transportation management, Logistics management information system

**Source:** IBM SPSS, Version 21

It reported that 78% (.780) of the change in supply chain performance was brought by the predictors of 3PLs collaborative practices. That is so say that only 22% of the predictors of the effect of 3PL collaboration are not able to explain the variation in the response variables.

**Discussion of Findings**

**Inventory Management and Supply Chain Performance**

The study shows a positive correlation between inventory management and supply chain performance,  $r (.513)$ ,  $p < 0.1$ . The findings are consistent with Bugri *et al.*, (2023), who stated that inventory management has a positive and significant impact on enterprise performance in Ghana. Similarly, Nyaberi and Mwangangi (2014) research indicated that inventory management improves performance. Inventory strategies are widely recognized as critical variables in determining supply chain effectiveness. A study found a strong positive correlation between inventory management and logistics performance (Wasike & Juma, 2020).

**Warehousing Management and Supply Chain Performance**

The study shows that warehousing management had a positive relationship with supply chain performance,  $r (.453)$ ,  $p < 0.1$ . Bugri *et al.*, (2023) depict that warehousing management has an influence on organization results. Warehousing management helps product delivery to clients in the appropriate quantity (Wasike *et al.*, 2020). Warehousing management methods are essential components of logistics strategies that improve time efficiency, bridging the time gap between production and consumption. The effectiveness of warehouse techniques is critical to the success of any company's logistical operations.

**Transportation Management and Supply Chain Performance**

The study found a positive correlation between transportation management and supply chain performance,  $r (.647)$ ,  $p < 0.1$ . This is consistent with Bugri *et al.*, (2023) stating that transportation management has an adverse relationship with the performance of roofing sheet manufacturing businesses. Nyaberi and Mwangangi (2014), transportation logistics management practices have an impact on performance. Adopting transportation management strategies inside logistics management is expected to improve the performance of manufacturing firms (Wasike *et al.*, 2020). Bashuna (2013; as cited in Muema & Achuora (2020), transport management is one of the

most important aspects of logistic practice in which the majority of enterprises have extensively spent in order to attain supply chain performance.

### **Logistics Management Information System and Supply Chain Performance**

The findings indicated that LMIS possesses a significant positive relationship with supply chain performance,  $r (.500)$ ,  $p < 0.1$ . This is supported by Bouzida and Merzoug (2001), stating that the use of LMIS is seen as an influencing factor on internal and external coordination, operational strategies, and logistics activities, mainly due to the use of early requirement planning (ERP). If a company's LMIS is optimized, supply chain performance will be enhanced. It is better to have supply chain optimization with the aid of LMIS. It is imperative to adapt to new techniques and technologies to meet customers constantly changing needs (Bouzida *et al.*, 2001). The real essence of LMIS is to avert failure of service delivery and ensure that service quality with speed and creativity. Okpighe and Ogundare (2020) opined that more customers are becoming desirous of fast and dependable delivery of services.

### **CONCLUSION**

This study investigated the effect of 3PL collaboration and supply chain performance in public health management in South-South, Nigeria. In this research work, inventory management, warehousing management, transportation management, and logistics management information system were adopted as 3PL collaboration predictors. The study found a strong positive and correlational relationship between 3PL collaboration and supply chain performance of public health management. It is worth emphasizing that 3PL providers play a vital role in helping healthcare organizations achieve more efficient logistics management systems. The strategic usage of 3PL providers, however, would allow healthcare practitioners to focus more on core healthcare concerns while also increasing innovation in Nigeria's healthcare delivery system.

### **RECOMMENDATIONS**

Based on the findings, the researchers recommended that healthcare organizations should integrate 3PL providers into their logistical activities and foster long-term partnership in their supply chain logistical operations. Furthermore, they should exploit the potentials of 3PL collaboration to improve supply chain performance in public health.

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