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Supply Chain Responsiveness and Hospital Performance: Linking Just-In-Time Inventory Practices to Operational Outcomes in Kenya

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ABSTRACT

Operational performance in Kenyan public hospitals remains a persistent managerial and policy concern, particularly due to frequent medicine stock-outs, delayed replenishment cycles, and service delivery inefficiencies. These challenges are closely associated with weak supply chain responsiveness within public healthcare procurement and supplier systems. This study examines the relationship between supply chain responsiveness, operationalized through Just-in-Time (JIT) inventory practices, and operational performance in public hospitals in Siaya County, Kenya. The study is anchored on the Resource-Based View (RBV) and Network Perspective Theory, which explain how internal replenishment capabilities and inter-organizational supply chain relationships jointly influence hospital performance outcomes. A cross-sectional survey research design was adopted involving 84 respondents drawn from procurement, pharmacy, stores, and hospital administration departments across six public hospitals. Data were collected using structured questionnaires and interview guides. Reliability testing yielded Cronbach's alpha coefficients exceeding 0.80, while the content validity index exceeded 0.70, confirming the robustness of the measurement instruments. Descriptive statistics summarized institutional practices, while correlation and regression analysis examined relationships between variables. The findings reveal a strong and statistically significant positive relationship between Just-in-Time inventory practices and operational performance ($\beta = 0.738$; $p < 0.05$). The regression model explains 79.1% of the variation in hospital operational performance ($R^2 = 0.791$), indicating that responsive replenishment practices significantly contribute to improved medicine availability, reduced stock-outs, and enhanced service delivery efficiency. The study concludes that strengthening supply chain responsiveness through responsive procurement systems, flexible supplier relationships, and shortened replenishment lead times is essential for improving operational outcomes in Kenyan public hospitals. Policy recommendations emphasize the need for improved coordination between hospitals and national medical supply agencies, enhanced procurement flexibility, and the integration of digital logistics management systems to strengthen healthcare supply chain responsiveness.

Keywords: Just-in-Time, Inventory Management, Operational Efficiency, Operational Performance

INTRODUCTION

Healthcare systems globally prioritize operational efficiency and service reliability as key indicators of institutional performance. Public hospitals operate continuously and therefore require reliable availability of essential medicines and medical supplies to sustain effective healthcare delivery. Ensuring such availability depends not only on accurate demand forecasting but also on responsive inventory replenishment systems capable of delivering required supplies within minimal lead times. Recent studies emphasize that effective healthcare supply chains are critical for maintaining service continuity and improving institutional performance, particularly in resource-constrained health systems (Apeh, 2024; Al-Khatib, 2024).

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Supply chain responsiveness refers to the ability of supply systems to respond rapidly and efficiently to fluctuations in demand. In healthcare environments, responsiveness is particularly important because unpredictable disease patterns and emergency cases require hospitals to maintain flexible inventory management systems. When supply chains lack responsiveness, hospitals frequently experience stock-outs, delayed treatment, and inefficient service delivery, ultimately compromising patient outcomes. Evidence from recent health supply chain studies shows that inefficiencies in forecasting and distribution frequently lead to shortages of essential medicines in many healthcare systems (Olaniran et al., 2022; Kalola et al., 2025). Just-in-Time (JIT) inventory management has been widely recognized as a strategy for improving supply chain responsiveness. JIT emphasizes the timely delivery of materials precisely when they are required, thereby reducing holding costs and minimizing excess inventory while maintaining service continuity. Within healthcare systems, JIT practices focus on supplier flexibility, shorter replenishment lead times, coordinated procurement processes, and effective information sharing across supply chain actors. Recent research indicates that JIT-oriented inventory systems can enhance supply chain responsiveness, reduce waste, and improve operational efficiency when supported by effective coordination and reliable replenishment systems (Rahman & Zailani, 2017; Balkhi et al., 2022).

In Kenya, however, public healthcare supply chains often face structural challenges including bureaucratic procurement procedures, delayed government funding disbursements, and limited supplier flexibility. These institutional constraints frequently lead to prolonged replenishment cycles and inconsistent availability of essential medicines. Consequently, hospitals may experience both inventory shortages and excess stock accumulation, conditions that negatively affect operational performance. Studies on Kenya's pharmaceutical supply systems highlight that supply chain inefficiencies, delayed deliveries from central suppliers, and weak coordination mechanisms contribute significantly to medicine stock-outs in public health facilities (Onyango et al., 2024; Ayako et al., 2023).

Operational performance within hospitals encompasses indicators such as medicine availability, patient waiting time, treatment turnaround time, and overall service efficiency. When inventory replenishment systems are inefficient, hospitals may struggle to provide timely treatment, leading to patient dissatisfaction and deteriorating health outcomes. Strengthening supply chain responsiveness through effective inventory management practices is therefore essential for improving healthcare delivery. Empirical studies in Kenyan hospitals have demonstrated that supply chain flexibility and responsive logistics systems significantly influence hospital performance and service delivery outcomes (Kuria & Ndeto, 2024; Khasakhala, 2024).

Theoretical grounding for this study is provided by the Resource-Based View and Network Perspective Theory. These perspectives emphasize that organizational performance depends on the strategic deployment of internal capabilities and effective coordination among supply chain actors. Within hospital supply chains, JIT capability represents an operational resource that enhances efficiency through rapid replenishment and coordinated procurement processes. Complementing this perspective, network-based approaches highlight the importance of collaboration among hospitals, suppliers, and government institutions to ensure continuous availability of medical commodities and resilient healthcare supply chains (Nalebe, 2024; Apeh, 2024).

Despite the theoretical relevance of JIT practices for improving supply chain responsiveness, empirical evidence linking JIT inventory practices to operational outcomes in Kenyan public hospitals remains limited. This study therefore investigates how Just-in-Time inventory practices influence operational performance within public hospitals in Siaya County.

Statement of the Problem

Public hospitals operate continuously and must maintain uninterrupted availability of essential medicines to ensure effective healthcare service delivery. Achieving this continuity depends largely on the responsiveness of healthcare supply chains, particularly the ability of procurement and supplier systems to replenish medical inventory rapidly and reliably. However, many Kenyan public hospitals experience persistent supply chain inefficiencies including delayed procurement cycles, prolonged supplier lead times, and frequent stock-outs of essential medicines. These challenges undermine hospital operational efficiency and disrupt patient care. In many cases, patients are forced to purchase medicines from private pharmacies due to unavailability in public

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hospitals, increasing out-of-pocket healthcare costs and limiting access to treatment. Evidence from Siaya County indicates that shortages of essential drugs remain a common challenge across public hospitals despite the existence of inventory management systems. These shortages suggest weaknesses in supply chain responsiveness, particularly in the implementation of responsive inventory replenishment approaches such as Just-in-Time inventory management. While previous studies have examined inventory management practices broadly, limited empirical research has specifically examined how JIT-based supply chain responsiveness influences hospital operational performance within the Kenyan public healthcare system. Furthermore, operational performance in hospitals may be influenced by multiple contextual factors including procurement policies, funding delays, governance structures, and infrastructure limitations. Failure to account for these factors may lead to incomplete understanding of hospital supply chain performance. This study therefore seeks to examine the relationship between Just-in-Time inventory management practices and operational performance in public hospitals in Siaya County, Kenya.

METHODOLOGY

Research Design

The study adopted a cross-sectional survey research design. According to Cooper and Schindler (2014), a cross-sectional survey entails collecting data at a single point in time to describe and examine prevailing conditions within a defined population. This design was considered appropriate because it enabled the researcher to obtain a comprehensive snapshot of existing supply chain responsiveness, as reflected in Just-in-Time (JIT) inventory practices, and associated operational outcomes across public hospitals in Siaya County. A cross-sectional approach is particularly suitable for efficiently gathering primary data from a relatively large population through the use of a representative sample. It facilitates the assessment of organizational practices, institutional processes, and performance conditions without the need for prolonged follow-up. By capturing data concurrently from multiple facilities, the design enabled comparative analysis and strengthened the reliability of findings regarding prevailing hospital supply chain responsiveness. In alignment with the study objective, this design provided a practical framework for examining the relationship between Just-in-Time–based supply chain responsiveness and operational performance in public hospitals, thereby generating empirical evidence on how responsive replenishment capabilities influence service delivery and efficiency outcomes within the county's healthcare system.

Area of study

Siaya County is one of Kenya's 47 devolved units and is located in the former Nyanza region in the western part of the country. Administratively, the county is divided into six sub-counties: Ugenya, Ugunja, Gem, Bondo, Rarieda, and Alego-Usonga. Siaya County was selected as the study site due to its well-documented public health challenges. Reports from the Ministry of Health (2018) indicate that the county has recorded among the highest mortality rates nationally, with residents facing an elevated risk of premature death largely associated with the high burden of HIV/AIDS and malaria. Similarly, data from the World Health Organization (2017) ranked Siaya among the counties with the highest HIV prevalence in Kenya, second only to Homa Bay County. These epidemiological conditions place significant pressure on public hospitals to maintain uninterrupted availability of essential medicines and responsive supply systems. Consequently, the county provides an appropriate context for examining how supply chain responsiveness, operationalized through Just-in-Time (JIT) inventory practices, influences operational performance in public healthcare facilities.

Target Population of the Study

The study targeted a total population of 106 personnel drawn from key functional departments responsible for supply chain and operational management across six public hospitals in Siaya County. The facilities included Sigomere Sub-County Hospital, Bondo Sub-County Hospital, Malanya Sub-County Hospital, Yala Sub-County Hospital, Madiany Sub-County Hospital, and Siaya County Referral Hospital. The target population comprised staff from procurement, stores, pharmacy, and hospital administration, as these departments play a central role in Just-in-Time (JIT) inventory replenishment and hospital supply chain responsiveness. Specifically, the

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population consisted of 34 administrators, 33 pharmacists, 18 procurement officers, and 21 storekeepers. The distribution of the total target population of 106 respondents is presented in Table 2.1.

Table 2.1: Target Population

	Section	Ungenya (Sigomere Sub-County Hospital)	Ugunja (Malanya Sub-County Hospital)	Gem (Yala Sub-County Hospital)	Bondo (Bondo Sub-County Hospital)	Rarieda (Madiany Sub-County Hospital)	Alego-Usonga (Siaya County Referral Hospital)	Total
1.	Administration	05	05	05	05	05	09	34
2.	Pharmacy	06	04	03	05	04	11	33
3.	Procurement	03	03	02	03	02	05	18
4.	Stores	03	03	03	03	03	06	21
Total								**106**

Source: Siaya County MoH, (2025)

Sample Size and Sampling Procedure

This section outlines the determination of the study's sample size and describes the sampling procedures employed. The details are presented in the subsections that follow:

Sample Size

The sample size is a representative of a large population (Bryman, 2012). Yamane, (1967) formula was used in determining the sample size. The sample size in each stratum was obtained proportionately. In the field the respondents were selected using random sampling.

According to Yamane, (1967): $n = \frac{N}{\left[1+\left(Ne^2\right)\right]}$ ……Eq.2.1

Where n = is the sample size

N = is the population

e = is the error limit (0.05 on the basis of 95% confidence level)

Therefore, $n = 106 / [1 + 106 (0.05)^2]$

$n = 106/1.265$

$n = 84$

Using a population of 106 staff members in public hospitals in Siaya County and considering an error limit of 5%, a sample size of 84 was used in the study.

This sample size was representative enough and was spread in each stratum proportionately as illustrated in Table 2.2.

Table 2.2: Sample Frame

	Section	Population (X)	Sample Size X/N x 84	Sigomere	Malanya	Yala	Bondo	Madiany	Siaya County Referral Hospital)
1.	Administration	34	27	4	4	4	4	4	7

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2.	Pharmacy	33	26	5	3	2	4	3	9
3.	Procurement	18	14	2	2	2	2	2	4
4.	Stores	21	17	2	2	2	3	3	5
Total		**106**	**84**	**13**	**11**	**10**	**13**	**12**	**25**

Source: Researcher's own conceptualization, (2025)

Sampling Procedure

In view of the researcher's inability to reach out to the entire population, and in order to gain the advantage of an in-depth study and effective coverage, Yamane formula was used to establish the sample size from the study population. Stratified proportionate sampling was used to get sample size for each stratum. In the field, respondents were selected using simple random sampling.

Data Collection Instruments

The study used structured questionnaires and interview guide in collecting primary data.

Questionnaires

The questionnaire items were structured using a five-point Likert scale. The instrument was designed to capture data on the study variables and was organized into distinct sections. The preliminary section gathered respondents' general demographic and institutional information. Subsequent sections captured data on operational performance indicators, while the final section assessed supply chain responsiveness, operationalized through Just-in-Time (JIT) inventory practices, within public hospitals in Siaya County.

Interview Guide

Interviews were conducted with randomly selected respondents from the study sample to complement the information obtained from the questionnaire. This qualitative component enhanced data collection by providing deeper insights and enabling the capture of contextual information on supply chain responsiveness and Just-in-Time practices that may not have been fully anticipated during questionnaire design.

Data Collection Procedure

Prior to data collection, the researcher obtained a research permit from the National Commission for Science, Technology and Innovation (NACOSTI). This authorization enabled formal access to the selected public hospitals for field data collection. Structured questionnaires were administered to respondents using a drop-and-pick-later approach at their respective workstations to minimize disruption of routine hospital operations. Follow-up was conducted through telephone communication to remind participants of the agreed collection dates, after which the completed questionnaires were retrieved. In addition, group interviews were conducted with selected categories of staff to complement the survey data and provide contextual insights into supply chain responsiveness and Just-in-Time (JIT) practices within the hospitals. Upon retrieval, all questionnaires were reviewed to ensure completeness and accuracy of responses before proceeding to data coding and analysis.

Pilot Testing

A pilot study was conducted at Kombewa Sub-County Hospital involving staff drawn from the four departments targeted in the main study. The pilot exercise aimed to assess the clarity, relevance, and reliability of the research instruments, as well as to estimate the time required to complete the questionnaire and identify any structural or content-related weaknesses. Hill (1998) suggests that between 10% and 30% of the intended sample is adequate for pilot testing in survey research. Consistent with this guideline, 10% of the anticipated respondents were selected for the pilot phase. Accordingly, ten staff members from Kombewa Sub-County Hospital were randomly chosen to participate in the pre-test. Following the pilot exercise, response patterns were examined, participant feedback was evaluated, and preliminary data were analyzed to identify ambiguities, inconsistencies, or measurement gaps, particularly in items assessing supply chain responsiveness and Just-in-Time (JIT) practices.

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The insights obtained were subsequently used to refine and strengthen the final data collection instruments prior to the main study.

Validity & Reliability Testing

Validity Test

Content validity was used to determine the validity index. The questionnaires were given to the two supply chain management experts to evaluate and rate each item in relation to the objectives as "not relevant" or "relevant" on a scale of the 1-4 such that; 1 = *not relevant*, 2 = *somehow relevant*, 3 = *relevant* and 4 = *very relevant*. Content validity index would then be determined from the supervisors' agreement scale as K/N, where K being the number of items marked 3 or 4 and N the total number of items assessed.

The rated finding was used to calculate content validity index (CVI) using the formula:

$$CVI = \frac{K}{N} \quad \text{..... Eq.2.2}$$

Where: K = Total number of items in the questionnaire declared valid by both experts; and N = Total number of items in the questionnaire. This was solved as follows:

$$CVI = \frac{K}{N} = \frac{39}{48} = 0.8125$$

The computed instrument content validity index (CVI) was ε=0.8125 > ε=0.7. The computed CVI was greater than the minimum acceptable index of 0.70 as recommended in the survey studies by Amin, (2005) hence the instrument was valid for the study.

Reliability Test

Reliability of the instrument was checked through split-half reliability coefficient test. The items in the questionnaire was divided into; odd items represented by "x" and even items represented by "y". The scores from both halves would then be correlated. Usually, the internal consistency of a measurement scale is assessed by using Cronbach's co-efficient alpha (Cronbach 1951) which was calculated using Flanagan Formula shown in Eq. 2.3.

$$R_t = 2[1 - \frac{\delta_1^{\,2} + \delta_2^{\,2}}{\delta_t^{\,2}}] \quad \text{..... Eq.2.3}$$

Where: R_t = Reliability Coefficient of the Test; δ_1= Standard Deviation (S.D.) of Scores of 1st Half; δ_2= Standard Deviation (S.D.) of Scores of 2nd Half; and δ_t= Standard Deviation (S.D.) of Scores of Whole Tests

To assess internal consistency reliability, questionnaire items corresponding to each study construct were aggregated to form composite scales, upon which Cronbach's alpha coefficients were computed. The resulting reliability coefficients were evaluated against the minimum acceptable threshold of 0.70 recommended for survey research (Nunnally & Bernstein, 1994). While coefficients in the range of 0.50–0.60 may be considered adequate for exploratory studies (Nunnally & Bernstein, 1994), values of 0.70 and above indicate acceptable reliability, and those exceeding 0.80 reflect good reliability (Sekaran, 2003). The reliability results for the study constructs are presented in Tables 2.3a and 2.3b.

Table 2.3(a) Reliability Statistics

Cronbach's Alpha Based on Un-Standardized Items	Cronbach's Alpha Based on Standardized Items	No. of Items
0.834	0.821	48

Source: Survey Data (2025)

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Table 2.3(b) Reliability Statistics

Factor	No. of Items	Cronbach's Alpha Based on Un-Standardized Items	Cronbach's Alpha Based on Standardized Items
Background	03	0.987	0.983
Just-in-Time	09	0.896	0.873
Operational Performance	06	0.835	0.819
Overall	48	0.834	0.821

Source: Survey Data (2025)

The overall alpha for the Just-In-Time Inventory Management Practice items under investigation had a Cronbach's alpha of 0.873 indicating good internal consistency, operational performance had a good Cronbach's alpha coefficient of 0.819. The minimum alpha for the items was 0.819 while the highest alpha was 0.983 both of which conformed to the project by George and Mallery (2003) thus the items formed a scale that had excellent internal consistency reliability.

Data Analysis

After data collection, completed questionnaires were reviewed for accuracy, classified, coded, and captured into a computerized database for analysis. Statistical processing was undertaken using the Statistical Package for Social Sciences (SPSS), Version 24, a widely accepted analytical tool known for its strong data handling capacity and versatility in performing statistical procedures across datasets of varying sizes (Muijs, 2004).

The study produced both qualitative and quantitative datasets. Qualitative information obtained from interviews was examined through thematic and content analysis to extract recurring themes and contextual insights concerning hospital supply chain responsiveness and Just-in-Time (JIT) replenishment practices. Quantitative data were analyzed using both descriptive and inferential statistical techniques. Descriptive analysis employed graphical and numerical summaries, including frequencies, percentages, means, and standard deviations, to describe respondent views and institutional supply chain practices.

Inferential analysis applied correlation and regression procedures to evaluate the association between supply chain responsiveness, conceptualized through Just-in-Time inventory practices, and hospital operational performance. Correlation analysis determined the direction and magnitude of relationships among variables, whereas regression analysis estimated the extent to which JIT-based responsiveness predicts operational performance outcomes (Cooper & Schindler, 2014). Additionally, Analysis of Variance (ANOVA) was used to assess the overall significance of the regression model. The significance of individual regression coefficients was further examined to determine the degree to which Just-in-Time–driven supply chain responsiveness contributes to operational performance in public hospitals. The study hypothesis guiding this analysis was formulated as follows:

H_{O1}: Just-In-Time Inventory Management Practice has no statistically significant effect on operational performance of public hospitals in Siaya County.

The following regression model to establish the relationship between the study variables guided the study:

$$Y = \beta_0 + \beta_1 X_1 + e \quad \text{……………………………………} \quad Eq.2.4$$

Where: Y = Operational Performance; X_1 = Just-In-Time Inventory Management Practice; *e*- Error Term; β_0 - represents the Model Constant; and β_1 - are Regression Coefficients.

The regression model assumed independent, identical and normally distributed random variables with a zero mean and a constant variance at 5% significance level.

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Diagnostic Tests for Inferential Statistics

Before conducting inferential procedures, several diagnostic checks were performed to ensure that the dataset met the assumptions required for regression modelling. These diagnostic evaluations covered distributional normality, inter-correlation among predictors, constancy of error variance, and linearity of relationships. The distributional assumption was examined using the Kolmogorov–Smirnov (K–S) statistic within exploratory analysis. This test evaluates whether the observed sample distribution differs significantly from a theoretical normal distribution and is considered suitable for samples exceeding 50 observations. A probability value greater than 0.05 indicates no significant departure from normality. The obtained K–S significance level of 0.55 therefore demonstrated that the data approximated a normal distribution. Potential collinearity among the independent variables was investigated through pairwise correlation coefficients alongside Tolerance and Variance Inflation Factor (VIF) indicators. All correlation probabilities were above 0.05, suggesting that the predictor variables were not significantly interrelated. Correspondingly, the Tolerance and VIF results confirmed that multi-collinearity was not present, indicating that the variables were appropriate for inclusion in the regression model. The assumption of equal error variance was tested using a Breusch–Pagan–type procedure based on the observed R-squared statistic. The resulting probability value of 0.3285 exceeded the 0.05 criterion, implying that the null hypothesis of constant variance could not be rejected. This outcome confirmed homoscedastic residuals, supporting the reliability of the regression estimates. Finally, linearity between predicted and observed values was evaluated through residual scatterplots. The plotted residuals showed no curvature or systematic pattern and were distributed evenly around the zero reference line with relatively uniform dispersion. This distribution indicated that the relationship between the variables was adequately linear and satisfied the regression assumption of linearity.

FINDINGS AND DISCUSSION

Descriptive Statistics on Just-In-Time Inventory Management Practice

Descriptive analysis was done on the effect of Just-In-Time Inventory Management Practice on operational performance. The results were summarized in table 3.1a

Table 3.1a: Descriptive Statistics for Just-In-Time Inventory Management Practice and Operational Performance

Just-In-Time Inventory Management Practice and Operational Performance (Operational Efficiency)	Response				
	N	% Frequency	% Frequency	Mean	Std. Dev
The flexibility of our vendors in inventory order management have led to improved operational efficiency through the pharmacy that is always well stocked with required drugs	80	91(73)	09(07)	2.917	0.516
The lead time offered by our vendors and our pharmacy in inventory order management have led to improved operational efficiency through the pharmacy that is always well stocked with required drugs	80	87(70)	13(10)	2.109	0.317
The flexibility of our vendors in inventory order management led to well stocked surgical and non-surgical inventory required by medics hence improved operational efficiency	80	92(74)	08(06)	2.917	0.214

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The lead time offered by our vendors and our pharmacy in inventory order management have led to well stocked surgical and non-surgical inventory required by medics hence improved operational efficiency	80	89(71)	11(09)	2.438	0.225
The flexibility of our vendors in inventory order management have led to improved operational efficiency through the pharmacy that is always well stocked with required drugs	80	78(62)	22(18)	2.687	0.254
AVERAGE		**87(70)**	**13(10)**	**2.614**	**0.305**
Just-In-Time Inventory Management Practice and Operational Performance (Service Delivery)	**N**	**% Frequency (Agree)**	**% Frequency (Disagree)**	**Mean**	**Std. Dev**
The flexibility of our vendors in inventory order management have led to improved operational efficiency through the pharmacy that is always well stocked with required drugs	80	73(58)	30(27)	2.735	0.325
The lead time offered by our vendors and our pharmacy in inventory order management have led to improved service delivery through the pharmacy that is always well stocked with required drugs	80	77(62)	23(18)	2.136	0.222
The flexibility of our vendors in inventory order management led to well stocked surgical and non-surgical inventory required by medics hence improved service delivery	80	69(55)	34(25)	2.114	0.194
The lead time offered by our vendors and our pharmacy in inventory order management have led to well stocked surgical and non-surgical inventory required by medics hence improved service delivery	80	68(54)	32(26)	2.054	0.201
AVERAGE		**72(58)**	**28(12)**	**2.236**	**0.236**

Source: Survey Data (2025)

The study sought to investigate the effect of Just-in-Time practice on operational performance of public hospitals in Siaya County. Table 4.5c shows that majority of Siaya County public hospitals believe that just-in-time practice would have an effect on operational performance of public hospitals in Siaya County, with a mean response of 2.614 (for operational efficiency) within the range of $2.109 \leq \mu \leq 2.917$ at 87% (S.D=.305) and a mean response of 2.236 (for service delivery) within the range of $2.054 \leq \mu \leq 2.735$ at 72% (S.D=.236). This finding is consistent with previous studies showing that Just-in-Time practices improve inventory efficiency, reduce unnecessary holding costs, and enhance operational responsiveness. In healthcare settings, JIT has been associated with reduced waste and improved resource utilization, while studies in operations management show that JIT implementation contributes positively to operational performance and responsiveness (Balkhi et al., 2022; Fullerton et al., 2001; Inman et al., 2011). Recent healthcare inventory literature similarly suggests that JIT can reduce waste, improve productivity, and lower avoidable storage costs when implemented under conditions of reliable replenishment and strong coordination (Balkhi et al., 2022). Fullerton et al. (2001) added that Just in Time is an advantageous practice to the company and has great impact particularly on increasing

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revenue. Inman et al. (2011) also concluded that Just in Time should be given great priority in consumer goods manufacturing firms as it greatly contributes to competitive advantage.

Descriptive Statistics on Operational Performance

Descriptive analysis was done on operational performance. The results were summarized in table 3.1b

Table 3.1b: Descriptive Statistics for Operational Performance

Operational Performance (Operational Efficiency)	**N**	**% Frequency (Agree)**	**% Frequency (Disagree)**	**Mean**	**Std. Dev**
The hospital always handles a large number of out-patient's cases on daily basis	80	55(44)	45(36)	2.933	1.216
It takes the shortest time possible for patients to go through the treatment process (for out-patient)	80	58(46)	42(34)	2.628	1.137
For the last two years the hospital has recorded reduction in mortality rates	80	56(57)	44(43)	2.917	1.313
In-patients cases normally stay in the hospitals for a shorter period before being discharged	80	51(41)	49(39)	3.007	1.144
AVERAGE		**55(44)**	**21(17)**	**2.871**	**1.203**
Performance in Terms of Service Delivery	**N**	**% Frequency (Agree)**	**% Frequency (Disagree)**	**Mean**	**Std. Dev**
The suggestion box is easily accessible to patients	80	60(48)	40(32)	3.726	1.321
On average, patients are always satisfied with the hospital services	80	51(41)	49(39)	4.238	1.421
Action is always taken on feedbacks from the suggestion box	80	76(61)	24(19)	2.416	1.232
On average, patients do get the prescribed drugs in the hospital pharmacy	80	87(70)	13(10)	2.118	1.279
AVERAGE		**69(55)**	**31(25)**	**3.125**	**1.313**

Source: Survey Data (2025)

Table 3.1b shows that majority of Siaya County public hospitals believe that operational performance of public hospitals in Siaya County is good. Specifically, operational efficiency had a mean response of 2.871 within the range of $2.628 \leq \mu \leq 3.007$ at 55% (S.D=1.203). This implies that 55% of the respondents in Siaya County public hospitals do agree that operational efficiency was considerably good. In addition, service delivery was also considerably good at a mean response of 2.522 within the range of $2.118 \leq \mu \leq 2.726$ at 69% (S.D=1.313).

Inferential Statistics

Hypothesis stated that there is no significant statistical effect of Just-In-Time Inventory Management Practice on operational performance of public hospitals in Siaya County. The effect of Just-In-Time Inventory Management Practice on operational performance of public hospitals in Siaya County was investigated through linear regression analysis using the model in equation 3.0:

$$P = \beta_0 + \beta_1 X_1 + \varepsilon_1 \quad \textbf{.....Eq. (3.0)}$$

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where P is operational performance, while β_0 is the intercept (a constant), β_1, is the slope associated to the independent variables X_1, and ε is the error term which is assumed to be independent, identical normally distributed random variable with a zero mean and a constant variance.

Table 3.2 Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.889	.791	.784	.025

Source: Survey Data (2025)

The Model Summary table 3.2 gives the R square (0.791) and Adjusted R square (0.784). Thus, in this model, Just-In-Time Inventory Management Practice is predicting 79.1% of the variance in operational performance of public hospitals in Siaya County. This leaves 29.9% of the variation in operational performance of public hospitals in Siaya County being explained by the error-term or other variables other than Just-In-Time Inventory Management Practice. This finding also indicated the model's goodness of fit as exemplified by the coefficient of determination value of (R^2 value) of 0.791 adjusted to of 0.784. The standard error of the estimate, of 0.025 being a measure of standard deviation around the fitted line suggests that about 95% of the prediction error in Just-In-Time Inventory Management Practice - operational performance model of public hospitals in Siaya County is less than ±1.96 (0.046) = 0.041.

Table 3.3 ANOVA					
Model		df	F-Change	Sig.F-Change	Durbin-Watson
1	Regression	1	9.576	0.002	1.823
	Residual	79			
	Total	80			

Source: Survey Data (2025)

The ANOVA table 3.3 shows that the computed F-statistic was 9.576, with an observed significance level (p-value) of 0.002 which was also less than p<0. 05. This shows that the significance can be extended to 99.99% confidence interval. The independence of residuals in this model was analyzed using Durbin-Watson statistic. Considering a Durbin-Watson statistic of 1.823, it was deduced that there was no serial correlation of the residuals as the values were within the accepted threshold of between 1.5 to 2.5 as was recommended by Hayes, (2013).

Table 3.4: Regression Coefficients of Just-In-Time Inventory Management Practice and Operational Performance

Model	Unstandardized Coefficients		Stand. Coef.	t	Sig.
	B	Std. Er.	Beta		
1(Constant)	2.473	1.031		2.809	.002
Just-In-Time Inventory Management Practice	.738	.173	.704	4.271	.001
R	0.889				
R-squared	0.791				
Adjusted R-squared	0.784				
F-statistics	9.576				
Prob(F-statistics)	0.002				

Source: Survey Data (2025)

The findings of this study indicate that Just-in-Time (JIT) inventory practices have a statistically significant positive effect on operational performance in public hospitals in Siaya County ($\beta = 0.738$; $p < 0.05$). The regression model further shows that JIT practices explain approximately 79.1% of the variation in hospital

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operational performance ($R^2 = 0.791$). This result suggests that supply chain responsiveness plays a substantial role in shaping service delivery efficiency within public healthcare institutions.

These findings are consistent with earlier studies that have demonstrated the positive influence of responsive inventory systems on organizational performance. For example, Isaksson and Seifert (2014) established that lean inventory systems improve operational efficiency and financial performance by reducing excess inventory and improving process coordination. Similarly, Rotimi, Bochie-Mensah, and Olubimmi (2016) found that supply chain management practices significantly improved service delivery performance in healthcare institutions by enhancing coordination between suppliers and health facilities.

Evidence from healthcare logistics research also suggests that reducing procurement lead times and improving supplier responsiveness contributes to improved medicine availability and operational efficiency within hospitals (John, 2016). This finding is consistent with studies showing that JIT implementation improves operational performance through lower inventory levels, greater customer responsiveness, and better process coordination. Evidence also indicates that JIT purchasing contributes positively to agility and operational outcomes, particularly where supplier responsiveness is strong (Fullerton et al., 2001; Inman et al., 2011).

The findings are also aligned with studies conducted in manufacturing and service industries which demonstrate that Just-in-Time practices reduce inventory holding costs while improving operational responsiveness. Suleman (2018) found that firms implementing responsive inventory systems experienced improved operational efficiency and reduced inventory costs. Likewise, Afnatu and Aseta (2018) reported that inventory management practices, including responsive replenishment strategies, significantly enhanced organizational competitiveness and performance among small enterprises. Although these studies were conducted outside the healthcare sector, they support the argument that responsive inventory systems enhance operational outcomes across different institutional contexts.

However, some studies have reported mixed findings regarding the effectiveness of Just-in-Time systems. For instance, Hong et al. (2017) cautioned that maintaining extremely low inventory levels may expose organizations to supply risks, particularly when suppliers fail to deliver materials promptly.

In healthcare settings where emergency demand can arise unexpectedly, excessive reliance on JIT may therefore increase the risk of treatment delays if suppliers cannot guarantee immediate replenishment. This observation is particularly relevant for public hospitals operating within constrained procurement environments. Similarly, Raeeda et al. (2017) observed that while supply chain management practices improve healthcare service quality, the magnitude of their impact may vary depending on the strength of supplier relationships and the availability of reliable logistics systems. Weak coordination among healthcare supply chain actors may limit the effectiveness of responsive inventory practices. The findings of this study therefore support the theoretical propositions of the Resource-Based View (RBV) and Network Perspective Theory.

From an RBV perspective, Just-in-Time capability can be viewed as a strategic operational resource that enhances institutional performance. RBV argues that organizations achieve superior performance when they effectively deploy valuable operational capabilities and resources (Wernerfelt, 1984; Barney, 1991). In the context of hospital supply chains, JIT systems represent an operational capability that improves inventory efficiency, reduces procurement delays, and enhances service delivery outcomes.

At the same time, the findings also reinforce the relevance of Network Perspective Theory, which emphasizes the importance of relationships among interconnected supply chain actors (Wasserman & Faust, 2014). Healthcare supply chains involve multiple actors including hospitals, pharmaceutical suppliers, procurement agencies, and regulatory institutions.

Effective implementation of Just-in-Time practices therefore depends not only on internal hospital capabilities but also on the quality of coordination and information sharing across the healthcare supply network. Qualitative insights obtained from respondents further highlight the practical complexities of implementing JIT within healthcare environments. Several respondents indicated that certain medicines cannot be procured strictly

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through JIT because of their critical role in emergency treatment. Maintaining limited safety stock for such items may therefore be necessary to mitigate supply risks. This observation supports the argument by Lysons and Farrington (2016) that hybrid inventory strategies, combining responsive replenishment with strategic safety stock, are often necessary in environments characterized by uncertain demand and supply constraints.

Overall, the results of this study suggest that strengthening supply chain responsiveness through improved supplier coordination, shorter procurement lead times, and more flexible inventory systems can significantly enhance operational performance within public hospitals. However, effective implementation of JIT practices requires careful balancing between cost efficiency and service reliability to ensure uninterrupted availability of essential medicines.

SUMMARY OF FINDINGS

The objective sought to establish the effect of Just-in-time practices on Operational performances of Public hospitals in Siaya County. 87% (Mean 2.614: SD=.305) of the public hospital workers believe that Just-in-Time inventory management practice influences the level of operational efficiency in public hospitals. 72% (Mean 2.236: SD=.236) of the public hospital workers believe that Just-in-Time inventory management practice influences the level of service delivery in public hospitals.

Hypothesis three stated that there is no significant statistical effect of Just-in-Time practice on operational performance of public hospitals in Siaya County. This was rejected based on the findings which showed that just-in-time had a statistically significant effect on performance of public hospitals in Siaya County with a coefficient of β=.738. This implies that, when keeping the effects of inventory categorization practice and demand forecasting practice constant, a unit increase in Just-in-time practices would increase operational performances of Public hospitals in Siaya County by 0.738 units.

CONCLUSION

The study sought to establish the effect of Just-in-time on operational performances of public hospitals in Siaya County. The study examined the relationship between Just-in-Time inventory management practices and operational performance in public hospitals in Siaya County, Kenya. The findings demonstrate that supply chain responsiveness, operationalized through JIT practices, has a statistically significant positive influence on hospital operational outcomes.

Hospitals that maintain flexible supplier relationships, shorter replenishment lead times, and coordinated procurement systems are more likely to achieve improved medicine availability, reduced stock-outs, and enhanced service delivery efficiency. However, effective implementation of JIT practices requires careful consideration of healthcare supply chain uncertainties to avoid excessive reliance on minimal inventory levels. Overall, strengthening supply chain responsiveness represents a critical strategy for improving operational performance within public healthcare systems.

RECOMMENDATION

The study recommends that healthcare policy makers and hospital administrators strengthen supply chain responsiveness through the following strategies:

i. Improve coordination between public hospitals and national pharmaceutical supply agencies;

ii. Introduce flexible procurement mechanisms that allow hospitals to respond rapidly to emergency medicine demand;

iii. Invest in digital logistics management information systems to enhance supply chain visibility and forecasting accuracy; and finally,

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iv. Develop hybrid inventory strategies combining Just-in-Time replenishment with strategic safety stock for critical medicines.

These measures would enhance the reliability of pharmaceutical supply chains and improve healthcare service delivery outcomes within Kenyan public hospitals.

Limitation

While this study provides important insights into the relationship between supply chain responsiveness and hospital operational performance, a couple of limitations were observed when interpreting the findings:

First, the cross-sectional research design captures relationships between variables at a single point in time and therefore does not permit strong causal inference. Future research may benefit from longitudinal designs that examine how supply chain responsiveness influences hospital performance over time.

Second, the study relies largely on perceptual responses obtained from hospital personnel rather than objective operational performance data such as stock-out frequency, procurement lead-time statistics, or patient wait-time records. Incorporating such objective indicators would provide stronger empirical evidence for evaluating supply chain performance.

Third, the regression model included a single predictor variable representing Just-in-Time inventory practices. While the results demonstrate a strong association between JIT responsiveness and operational performance, other contextual factors, such as government funding delays, hospital size, procurement policies, and infrastructure capacity, may also influence hospital performance outcomes.

Future research should therefore consider more comprehensive models incorporating these additional variables to provide a more holistic understanding of healthcare supply chain performance.

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