



**ADDIS ABABA UNIVERSITY**

**SCHOOL OF COMMERCE**

**DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT**

**FACTORS AFFECTING DISTRIBUTION PERFORMANCE ON PHARMACEUTICAL  
PRODUCTS: IN CASE OF ETHIOPIA PHARMACEUTICAL SUPPLY SERVICE  
(HEADQUARTER)**

**BY: BEREKET DANSA**

**SEPTEMBER, 2024**

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**Graduate Program**

**Factors Affecting Distribution Performance on Pharmaceutical Products: In Case of Ethiopia Pharmaceutical Supply Service (Headquarter)**

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## DECLARATION

I, Bereket Dansa declare that this research titled “Factors Affecting Distribution Performance for Pharmaceutical Products: In Case of Ethiopia Pharmaceutical Supply Service (Headquarter), is the original work of my own, has not been submitted for any degree in this University or any other University and that all sources of materials used for the study have been duly acknowledged. I have produced it independently except for the guidance and suggestion of the Research Advisor.

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## CERTIFICATION

This is to certify that Bereket Dansa Hidoto has conducted this research work on the topic entitled “Factors Affecting Distribution Performance for Pharmaceutical Products: In Case of Ethiopia Pharmaceutical Supply Service (Headquarter)” under my supervision. This work is original in nature and is suitable for submission for the award of the degree of Master of Arts in Logistics and Supply Chain Management.

Busha Temesgen (Ph.D) \_\_\_\_\_

Date: \_\_\_\_\_



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## Acronym

- CMS-----Central Medical Store
- DFM -----Distribution & Fleet Management
- EDI-----Electronic Data Interchange
- EPSA-----Ethiopian Pharmaceutical Supply Agency
- EPSS-----Ethiopian Pharmaceutical Supply Service
- FMOH-----Federal Ministry of Health
- GDP-----Good Distribution Practices
- GPS-----Global Positioning System
- HSDP-----Health Sector Development Program
- IMP-----Inventory management practices
- KPIs-----Key Performance Indicators
- PFSA-----Pharmaceutical Fund and Supply Agency
- POD-----Proof of Delivery
- RRF-----Report and Requisition Form
- SPSS-----Statistical Package for the Social Sciences
- STV-----Stock Transfer Voucher
- SCM-----Supply Chain Management
- TMP-----Transportation management practices
- WIM -----Warehouse & Inventory Management
- WMP-----Warehouse management practices
- WHO-----World Health Organization

## Abstract

*The general objective of this study was to identify the factors affecting distribution performance in the case of the Ethiopian Pharmaceuticals Supply Service (Headquarter). This study used an explanatory design and a quantitative research approach. Because of the limited population size, the study conducted a sample survey to collect data using a census sample method. With 92 valid responses out of 100 questionnaires, the survey had a 92% response rate. Descriptive statistics and inferential analysis, including Pearson's correlation and multiple linear regression, were used to examine the relationships between the variables. Upon computing Pearson's correlation coefficient, Pearson's correlation results showed significant and positive correlations between distribution performance and inventory management ( $r = 0.689$ ,  $p < 0.01$ ), warehouse management ( $r = 0.577$ ,  $p < 0.01$ ), and transportation management ( $r = 0.612$ ,  $p < 0.01$ ). Multiple linear regression analysis indicated that the model had a strong overall fit, with an  $R^2$  of 0.582, suggesting that 58.2% of the variability in distribution performance was explained by the predictor variables. Inventory management had the strongest effect ( $\beta = 0.433$ ,  $p < 0.001$ ), followed by transportation management ( $\beta = 0.294$ ,  $p = 0.001$ ), and warehouse management ( $\beta = 0.181$ ,  $p = 0.043$ ). These findings confirm that inventory management, transportation management, and warehouse management practices significantly and positively affect distribution performance at EPSS, headquarter. Based on the study findings, the investigator concludes that the strongest and positive association exists between distribution performance and inventory management practices, followed by transportation management and warehouse management practices, respectively. The study found that focusing on inventory management, transportation management, and warehouse management practices was essential for improving distribution performance at EPSS. It was recommended that EPSS enhance inventory management (use advanced forecasting tools and implement real-time inventory tracking systems), optimize warehouse operations (provide staff training, optimize warehouse layouts, and invest in better equipment), revise transportation practices (upgrade vehicles, improve maintenance, and provide training), and streamline overall distribution processes while strengthening coordination among teams.*

*Key Words: Inventory management practices, Warehouse management practices, Transportation management practices, Distribution performance, Ethiopian pharmaceutical supply service.*

# CHAPTER ONE

## 1. INTRODUCTION

This chapter outlines the study by covering the background, problem statement, objectives, research hypothesis, significance, and scope of the study. It also defines key terms and describes the paper's organization.

### 1.1. Background of the Study

Supply Chain Management (SCM) involves planning and managing sourcing, procurement, and logistics activities. It requires collaboration with suppliers, intermediaries, and customers to integrate supply and demand within and across companies. Its primary objective is to facilitate the smooth flow of goods, information, and financial exchanges among channel partners, thereby enhancing productivity and efficiency while minimizing related costs. It finds application across multiple sectors. In healthcare, Pharmaceutical Supply Chain Management (PSCM) encompasses the stakeholders, systems, and processes essential for ensuring the uninterrupted flow of pharmaceuticals from manufacturers to patients (USAID, 2023). The ultimate aim is to ensure that the right products are readily available in the necessary quantities and locations to support optimal patient care (USAID, 2023; Chopra, 2013).

Logistics management, a key SCM component, focuses on the efficient flow and storage of goods, services, and information from origin to consumption. It includes quantification, procurement, inventory management, transportation, fleet management, distribution, data collection, and reporting (USAID, 2011; Prabhakarsri, 2010).

In pharmaceuticals, distribution is a critical aspect of logistics. Distribution encompasses the movement and storage of products from suppliers to customers, playing a vital role in the integrated SCM of pharmaceutical products (Netsanet, 2018; John O., *et al.*, 2012). It involves various stakeholders in handling, storing, and distributing products, demanding strict oversight to maintain drug quality (Snyder & Shen, 2019).

Distribution significantly affects a firm's profitability by influencing supply chain costs and customer experience, accounting for around 20% of manufacturing expenses. Advances in automation, such as Micro Analytics, optimize vehicle usage and routing, potentially reducing distribution costs by up to 30% (Wolpert, 1999).

Distribution is increasingly emerging as a critical element in the execution of a successful organizational strategy. Heightened market competition, globalization, and the demand for rapid response and reduced inventory levels have driven the need for more efficient and effective distribution systems within China's pharmaceutical industry (John et al., 2012).

Performance measurement is crucial for assessing the effectiveness and efficiency of actions within a supply chain (Neely *et al.*, 1995). In the pharmaceutical sector, distribution performance refers to how efficiently and effectively pharmaceutical products are transported from suppliers to end customers, including health facilities, and patients (Jeong & Ji, 2018; Snyder & Shen, 2019). Effective distribution performance is crucial for ensuring patient safety, maintaining business continuity, and achieving regulatory compliance (MSH, 2012).

The warehouse management practices in Africa, finding that efficient inventory management, proper storage layout design, and the utilization of technology are critical for improving distribution performance. The study emphasized the importance of adopting best practices tailored to local contexts to address the unique challenges in the Africa (Kamau *et al.*, 2019).

Effective inventory management practices, including accurate demand forecasting, safety stock optimization, and efficient replenishment strategies, enhances distribution performance by ensuring product availability and reducing stock-related costs (Lambert et al., 1998).

According to Coyle et al. (2017), "Effective order processing and fulfillment practices ensure the right products are delivered to the right customers at the right time, positively impacting distribution performance." Additionally, Electronic Data Interchange has transformed distribution by streamlining order submission, reducing inventory, cutting costs, and speeding up delivery (Netsanet, 2018).

Successful firms must ensure high-quality products and timely, cost-effective delivery. Efficient distribution logistics are crucial, yet many customers still face delays, highlighting gaps in performance (Netsanet, 2018; Ostrow, 2009). This research aimed to investigate the relationship between affecting factors and distribution logistics, and determines their effect.

In Ethiopia, the pharmaceutical supply chain management has also been the subject of recent studies. Tadesse *et al.* (2020) explored the challenges and opportunities in this area, identifying weak infrastructure, poor storage facilities, and inadequate supply chain management practices as significant barriers to effective distribution performance.

The Ethiopia Pharmaceutical Supply Agency (EPSA), now known as the Ethiopia Pharmaceuticals Supply Service (EPSS), is the only public institution mandated to ensure a sustainable supply of medicines and serves as the source of pharmaceuticals throughout the country. A significant reform in this sector was the introduction of the Pharmaceutical Logistics Master Plan (PLMP) in 2009, aimed at ensuring the uninterrupted supply of essential, quality, and cost-effective pharmaceuticals across the health facilities (FMOH, 2009). EPSS has heavily invested in information communication technology (ICT) in recent years as part of its efforts to improve SCM; for example, the implementation of an Integrated Health Commodity Management Information System. It also uses an electronic Logistics Management Information System to track drug orders and deliveries among stakeholders in the medical value chain. In addition, the service completed the preliminary preparation for the Enterprise Resource Planning system. With these technologies and other value-added processes, it aspires to fulfill its mission of ensuring a sustainable supply of quality-assured medicines to the public (EPSA, 2023).

Currently, the EPSS performs pharmaceutical quantification, procurement, warehousing, and distribution activities to supply public health facilities (EPSA, 2020; EMoH, 2022). Distribution within EPSS includes order and fleet management, crucial for transferring products between storage locations, utilizing its 19 hubs and rental warehouses. Its distribution capacity has increased over the past few years and the annual value of distributed products has increased from ETB 500 million at PFSA's establishment to over ETB 17 billion by 2011 EFY (EPSA, 2020).

## 1.2. Problem Statement

Distribution is vital in the pharmaceutical supply chain, involving complex processes, system, and multiple stakeholders, including agencies, ministries, and manufacturers. Due to the sensitivity of pharmaceutical products, meticulous handling, storage, and transportation are crucial to prevent degradation, fraud, and deterioration (WHO, 2010).

Pharmaceutical SCM in Africa has been a significant focus of recent research. Othman *et al.* (2020) explored the challenges and opportunities in this area, highlighting issues such as inadequate infrastructure, poor cold chain management, and limited supply chain visibility.

The supply and distribution of pharmaceutical products are often highly centralized and face challenges such as poor storage facilities, inaccurate demand planning, insufficient human resource management, high stock pilferage, and inadequate financing, all leading to frequent stockouts. Adopting relevant technologies at the distribution channel level can mitigate some of these challenges (Galib Z., 2021).

In Ethiopia, the Ethiopian Pharmaceuticals Supply Service (EPSS) plays a vital role in ensuring that essential medicines are available throughout the country. With technologies and other value-added processes, EPSS has been striving to fulfill its mission of ensuring a sustainable supply of quality-assured medicines to the public (EPSA, 2023). Despite various initiatives, EPSS has faced significant challenges, with average medicine availability reaching only 75% between 2003 and 2019, and unaffordability (Tewuhibo *et al.*, 2021; Galib Z., 2021). These challenges arise from inefficiencies in inventory management, warehouse operations, information technology, political instability, poor infrastructures, transportation logistics, weak distribution system including weak fleet management, and others (Galib Z., 2021; EPSS, 2023; Netsanet, 2018). Health facilities face challenges in getting the right products in the right quantity and quality at the right time and place, and at the right cost, due to an inefficient distribution system (PFSA, 2015). Problems such as inaccurate demand forecasting, poor visibility of inventory levels and quality in the RRF data, and complex order processing in inventory management result in overstocking, understocking, frequent emergency requests, delay in order fulfillment, and weak stock management. These issues are further compounded by inadequate storage conditions, limited storage space, poorly designed layouts, poor product arrangement, scattered

warehouse locations, and a shortage of material handling equipment (MHE). These challenges are also exacerbated by an outdated fleet of vehicles, insufficient maintenance programs, a shortage of spare parts, and a lack of technological support for scheduling and route planning, untrained drivers, inaccurate volumetric measurements hinder truck loading optimization. This leads to vehicle unavailability, frequent breakdowns, underutilized vehicles, and significant delivery delays, all of which drive up operational costs and hinder the timely distribution of medicines. These combined inefficiencies result in over and under stocking, and delivery delays, higher costs, and ultimately causes disrupt the supply chain, service interruptions, and dissatisfaction among healthcare givers, stakeholders and patients (Dessalegn, 2015; Shewarega, 2015; Ganesh & Ghadially, 2018; PFSA BPR, 2017; EPSA, 2023; Teketel, 2017; Teshome & Bekele, 2020; Galib Z., 2021).

As demonstrated by the above statements, there was a challenge in pharmaceutical products distribution. Addressing these issues is critical for improving EPSS's distribution performance and ensuring reliable access to essential medicines across the country. Research on the factors affecting pharmaceutical distribution performance in Ethiopia is sparse, with only a few studies available (Netsanet, G., 2018; Gulilat, Z., 2018; Admasu, T., 2018). Most of these existing studies were descriptive, providing an overview of practices without explaining how specific practices directly affect distribution performance (Galib Z., 2021; Ermias M., 2020). Thus, this study seeks to fill these existing research gap by investigating the relationships between the predictor variables, i.e., management practices and distribution performance at the EPSS context, headquarter, with explanatory design to quantitatively determine factors effect on distribution performance and distinguish priority areas to propose solutions and recommendations to improve the situation, and ensure reliable access to essential medicines across the country.

### **1.3. Objectives**

#### **1.3.1. General Objective**

The general objective of this study is to identify the factors affecting distribution performance on pharmaceutical products at the Ethiopian Pharmaceuticals Supply Service (Headquarter).

#### **1.3.2. Specific Objectives of the Study**

- To explain the effect of inventory management practices on distribution performance at the EPSS (Headquarter).
- To explain the effect of warehouse management practices on distribution performance at the EPSS (Headquarter).
- To explain the effect of transportation management practices on distribution performance at the EPSS (Headquarter).

### **1.4. Hypotheses for the Study**

From the discussion to answer the research problem the researchers design a number of hypotheses to test the effect of management practices on distribution performance at EPSS, headquarter. The researcher designed a hypothesis as follows:

Ho1: Inventory management practices (IMP) does not significantly affect distribution performance at EPSS, headquarter, ( $\alpha = 0.05$ ).

Ho2: Warehouse management practices (WMP) does not significantly affect distribution performance at EPSS, headquarter, ( $\alpha = 0.05$ ).

Ho3: Transportation management practices (TMP) does not significantly affect distribution performance at EPSS, headquarter, ( $\alpha = 0.05$ ).

### **1.5. Significance of the Study**

This study is significant for its practical implications for the Ethiopian Pharmaceuticals Supply Service (EPSS). By analyzing factors affecting distribution performance, it identifies opportunities for improvement and suggests strategies to enhance the efficiency of pharmaceutical distribution. The potential benefits include cost savings, reduced lead times, and consistent availability of quality-assured medicines and medical supplies, leading to greater

satisfaction among customers and stakeholders. The findings and recommendations contribute to the overall enhancement of healthcare service delivery in Ethiopia.

Additionally, this research expands the existing body of knowledge on pharmaceutical supply chain management, specifically within the Ethiopian context. It sheds light on the unique challenges faced by EPSS and proposes solutions that could be relevant in other resource-limited settings. Finally, given the limited research in this area, the study serves as a valuable resource for academics, policymakers, and researchers, offering a foundation for future investigations.

## 1.6. Scope of the Study

Although numerous factors influence distribution performance, due to time and quality constraints the researcher investigated specifically on only three factors affecting the EPSS distribution systems, such as inventory management, warehouse management, and transportation management practices. Geographically, focuses solely on the EPSS headquarter. Methodologically, this study used an explanatory research design, quantitative research approach, cross-sectional design, and census sampling method. Furthermore, this study examined only some key distribution performance indicators, including on-time delivery, vehicle availability, average delivery time, distribution cost, and proof of delivery. These indicators were utilized by EPSS headquarter to evaluate the distribution performance.

## 1.7. Operational Definitions

- **Pharmaceuticals:** Substance0s used for the treatment, prevention, and diagnosis of diseases. This includes drugs, medical supplies and equipment, and laboratory reagents (Fentahun T., 2022).
- **Supplier:** A person or entity engaged in activity of providing products and/or services (Netsanet, 2018).
- **EPSS Hubs:** Branches of the Ethiopian Pharmaceuticals Supply Service (EPSS) (Netsanet, 2018).
- **Distribution:** The process of moving products from the EPSS warehouse to hubs, health facilities, or the final destination (Netsanet G., 2018).

- **Performance:** The accomplishment of a given task measured against present known standards of accuracy, completeness, cost, and speed (Netsanet G., 2018).
- **On-time Delivery:** The percentage of shipments arriving on time for a set delivery date during a defined period of time (EPSS, 2023).
- **Vehicle Availability:** The percentage of delivery vehicles requested and made available based on the distribution schedule (EPSS, 2023).
- **Distribution Cost:** The ratio of the cost of distributing or transporting orders to the value of those orders (EPSS, 2023).
- **Average Delivery Time:** The average time it takes to deliver an order to a facility from dispatch to receipt at the destination (EPSS, 2023).
- **Percentage of Proof of Delivery:** The percentage value of Model 19 collected out of the total Stock Transfer Vouchers (STVs) distributed to health facilities (EPSS, 2023).

### 1.8. Organization of the Study

This study report was organized into five chapters that guide the reader through the research journey. Chapter one sets the stage by introducing the background, problem statement, research hypotheses, objectives, significance, scope, and key definitions, providing a solid foundation for the study. The second chapter covered reviews of the theoretical and empirical literature, a conceptual framework, and research gap. Chapter three detailed the research methodology, including the study area, approach and design, population and sampling methods, data collection and analysis, and ethical considerations. Results and analysis of the research were in Chapter 4. The summary, conclusion, and recommendations were covered in the last chapter five.

## **CHAPTER TWO**

### **2. RELATED LITERATURE REVIEWS**

This chapter presents a review of the literature related to the study's purpose, encompassing a theoretical review, empirical literature review, and conceptual framework.

#### **2.1. Literature Reviews**

##### **2.1.1. Effective Pharmaceutical Distribution Management**

Effective distribution management is crucial in the pharmaceutical sector, as it ensures that finished products are conveyed from manufacturers to final consumers. Without efficient distribution, even the best products may fail to reach consumers, leading to a breakdown in the marketing mix (Wengelawit, 2022). A well-established drug supply management system optimizes the use of financial and human resources, ensures the continuous supply of affordable drugs, promotes the rational use of medicines, and generally enhances the quality of the healthcare system and access to essential medicines (Getachew, 2009).

Proper management of medicine distribution requires a deep understanding of its complexities. The pharmaceutical supply chain is particularly challenging due to the specified shelf life and storage conditions required for various drug forms, such as tablets, syrups, and injectables. Ensuring the quality of pharmaceuticals during distribution is critical, as different forms require different storage conditions based on drug stability. These requirements demand rigorous supply chain management and planning to maintain availability in health facilities while minimizing product waste (Kumar and Jha, 2015).

According to Management Sciences for Health (MSH, 2012), effective pharmaceutical distribution management should maintain a constant supply of medicines, ensure their proper condition throughout the distribution process, minimize losses due to spoilage and expiry, maintain accurate inventory records, store medicines appropriately, reduce theft and fraud, and provide reliable information for forecasting medicine needs.

### **2.1.2. Distribution Performance**

Performance measurement is crucial for assessing the effectiveness and efficiency of actions within a supply chain, as defined by Neely *et al.* (1995). This process is essential for identifying successful management strategies, understanding current situations, and improving supply chain management. Companies often utilize continuous improvement to enhance their core competitiveness through supply chain management. However, many firms fail to fully realize their supply chain potential due to inadequately developed performance measures and metrics, which hinders the integration necessary for optimizing effectiveness and efficiency. Lee and Billington (1992) emphasize that individual sites within a supply chain cannot achieve maximum efficiency if each operates independently towards its own goals.

Distribution performance, as outlined by Houlihan (1985), involves the system-wide flow of materials from suppliers to customers, with information flowing bi-directionally. In the pharmaceutical sector, distribution performance refers to the efficiency and effectiveness of transporting pharmaceutical products from suppliers to end customers, such as pharmacies, hospitals, and patients.

Effective distribution performance is crucial for ensuring patient safety, maintaining business continuity, and achieving regulatory compliance. This requires a well-coordinated supply chain, advanced technology, and ongoing process improvement, with the primary objective of ensuring a consistent supply of medications to healthcare facilities (MSH, 2012).

### **2.1.3. Factors Affecting Pharmaceutical Distribution Performance**

The distribution performance of pharmaceutical products is shaped by multiple factors, including financial capacity, transport outsourcing, information systems, and the integration of donors and governments, as well as storage practices, warehouse management, and transportation (Netsanet, 2018; John *et al.*, 2012; Wengelawit, 2022). This study covers the crucial role of inventory management, warehouse management, and transportation management in optimizing distribution performance. These practices improve order accuracy, minimize stockouts, reduce costs and lead times, and enhance overall responsiveness, thus significantly boosting distribution efficiency.

### **2.1.3.1. Inventory management and distribution performance**

Effective inventory management is crucial in pharmaceutical distribution, where the timely and accurate delivery of medications is vital for patient care. This involves managing various processes, including ordering, receiving, storing, issuing, and reordering pharmaceutical goods to meet the fluctuating demands of healthcare providers and patients. Proper inventory management mitigates the risks associated with stock imbalances, such as shortages and surpluses, which can disrupt patient care, lead to significant financial losses, and contribute to the wastage of medications (Rägo *et al.*, 2017).

Techniques such as accurate demand forecasting and just-in-time inventory management are essential to avoid overstocking or stockouts, thereby optimizing distribution performance and reducing associated carrying costs. Additionally, maintaining precise inventory records and utilizing advanced inventory management systems are critical for ensuring the smooth coordination of pharmaceutical flows through the distribution network. These systems play a pivotal role in safeguarding against theft and ensuring the quality of medications, which is particularly important given the sensitive nature of pharmaceutical products (Chopra & Meindl, 2021; Kouhkan *et al.*, 2022; Kang & Gershwin, 2020). Through these practices, inventory management not only supports the efficiency of pharmaceutical distribution but also ensures that essential medications are consistently available, thereby enhancing the overall effectiveness of the supply chain.

In addition, effective inventory management practices are crucial for optimizing distribution performance metrics such as on-time arrivals, average delivery time, distribution cost, vehicle use availability, and proof of delivery (POD). Accurate inventory control ensures that stock levels align with demand, reducing stockouts and overstocking, thus improving on-time arrival rates by making products available when needed (Kouhkan *et al.*, 2022). Efficient inventory practices streamline order processing and reduce average delivery times (Kang & Gershwin, 2020). Proper inventory management also minimizes holding costs and avoids expedited shipping expenses, thereby lowering distribution costs (Sharma *et al.*, 2020). Furthermore, precise inventory records contribute to accurate POD by ensuring the correct products are shipped and delivered, reducing discrepancies (Cheru *et al.*, 2018).

### 2.1.3.2. *Warehouse management and distribution performance*

Warehouse management is a cornerstone of the pharmaceutical distribution process, playing a pivotal role in ensuring that medications are delivered accurately and on time to meet the needs of healthcare providers and patients. A sophisticated Warehouse Management System (WMS) is crucial for coordinating the complex logistics of pharmaceutical distribution, where the timely availability of medications can be a matter of life and death. The WMS oversees the entire process of storing and moving goods within the warehouse, including tasks such as inventory tracking, order picking, packing, and shipping, all of which must be performed with a high degree of precision to maintain product integrity and meet regulatory requirements (Sharma *et al.*, 2020).

Operationalizing warehouse management in the pharmaceutical distribution context involves implementing a WMS that is tailored to the specific needs of the industry. This includes integrating real-time tracking systems like Radio Frequency Identification (RFID) and barcode scanning to monitor inventory levels continuously, using data analytics to forecast demand and adjust stock levels proactively, and establishing protocols for the safe handling and storage of medications, particularly those that require controlled environments. Furthermore, regular audits and compliance checks are necessary to ensure that the warehouse operations align with the stringent regulations governing pharmaceutical products. By embedding these practices into their operations, pharmaceutical distributors can not only improve their distribution performance but also enhance the overall reliability and efficiency of the supply chain, ultimately leading to better patient outcomes (Pharmaceutical Technology, 2021; European Medicines Agency, 2022; Logistics Management, 2023).

Research specific to Ethiopia's healthcare supply chain has highlighted the direct impact of warehouse management on distribution performance. For instance, well-implemented warehouse management practices significantly enhance key distribution performance metrics, such as order fulfillment accuracy and on-time delivery. These practices include optimizing the warehouse layout to reduce travel time for picking and packing, automating processes to reduce human error, and implementing stringent quality control measures to ensure that only products that meet safety standards are distributed. Additionally, a focus on employee training and risk management

within the warehouse environment can prevent accidents and maintain high levels of productivity, further supporting the smooth flow of pharmaceuticals through the supply chain (Cheru *et al.*, 2018).

Warehouse management practices affect distribution performance metrics such as on-time arrivals, average delivery time, distribution cost, vehicle use availability, and POD. Efficient warehouse operations, including optimized layouts and advanced picking technologies, enhance order fulfillment speed, improving on-time arrivals and reducing average delivery times (Muhalia *et al.*, 2021). Effective space utilization and streamlined processes reduce operational costs, translating into lower distribution expenses (Sharma *et al.*, 2020). Additionally, efficient warehouse management supports better coordination with transportation, ensuring vehicles are used efficiently and are available when needed (Cheru *et al.*, 2018). Accurate picking and packing driven by good warehouse management also ensure reliable POD, minimizing errors and disputes (Rägo *et al.*, 2017).

### ***2.1.3.3. Transportation management and distribution performance***

Transportation is a crucial element of every supply chain, responsible for moving products from initial production to final delivery. Efficient transportation is vital for ensuring timely, cost-effective, and reliable delivery, which is essential for maintaining competitiveness in the global market (Fekadu, 2013).

In the pharmaceutical sector, transportation significantly impacts delivery timelines, costs, and product integrity. Pharmaceuticals, especially those containing hazardous substances or controlled materials, require secure and specially designed containers and vehicles for safe transportation. This ensures compliance with safety standards and prevents potential abuse (WHO, 2010). Key factors such as transportation routes, carrier reliability, and lead times must be meticulously managed to optimize distribution performance. Fleet management, a critical aspect of transportation, involves overseeing various functions such as vehicle financing, maintenance, tracking, driver scheduling, and fuel management. Effective fleet management minimizes investment risks, enhances productivity, and reduces transportation costs. These functions can be handled internally or outsourced to specialized providers (PFSA, 2016).

Operationalization in the pharmaceutical distribution context involves defining and measuring key transportation-related concepts to improve distribution performance. For transportation management practices, this includes metrics like on-time delivery rates, transportation costs per unit, and vehicle maintenance records. Data for these metrics can be gathered through transportation management systems and performance analytics. By assessing these variables, organizations can enhance the efficiency, cost-effectiveness, and reliability of their pharmaceutical distribution systems (PFSA, 2016).

Transportation management practices significantly affect distribution performance metrics such as on-time arrivals, average delivery time, distribution cost, vehicle use availability, and POD. Effective transportation management involves optimizing routes, selecting reliable carriers, and maintaining a well-managed fleet, enhancing on-time arrivals and reducing average delivery times (Chopra & Meindl, 2021). Improving route efficiency and reducing fuel consumption helps lower overall distribution costs (Kang & Gershwin, 2020). Strategic scheduling and regular maintenance ensure high vehicle availability and reliability (Public Fleet Safety Association, 2016). Proper management of transportation activities also supports accurate and timely POD, ensuring shipments are correctly documented and delivered as planned (Rägo *et al.*, 2017).

**Synergy in Operations:** IMP, WMP, and TMP must work in harmony to optimize distribution performance. Inefficiencies in one area can cause bottlenecks in others, leading to delays, increased costs, and reduced service levels. For example, poor inventory management can lead to stockouts, which disrupt warehouse operations and delay transportation, ultimately affecting the entire supply chain (Christopher, 2016).

**Effect on Distribution Performance:** The combined effectiveness of IMP, WMP, and TMP determines the efficiency, reliability, and responsiveness of the EPSS distribution system. By improving practices in these areas, EPSS can enhance its distribution performance, leading to better service delivery and reduced operational costs (Ketzenberg *et al.*, 2021).

#### 2.1.4. Measurements of Distribution Performance

Distribution plays a critical role in the integrated supply chain management of pharmaceutical products. Monitoring and evaluation are essential for measuring the performance of distribution

activities against established plans and identifying any significant gaps during operations. Key indicators, such as the condition and availability of transport vehicles and staff performance, can be used to measure these activities. Implementing these indicators and metrics helps to assess and demonstrate improvements in system operations (PFSA, 2016).

Positive health outcomes are closely tied to the performance of the supply chain, particularly the distribution segment. To enhance distribution system performance, it is crucial to assess how well it is currently functioning. This evaluation reveals inefficiencies within the supply chain and provides insights into addressing these deficiencies. The supply chain's performance should be evaluated based on its ability to deliver the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, and to the correct customer (PFSA, 2016).

Various indicators have been developed to measure different aspects of distribution activities. Selecting the right indicators can be challenging, and focusing solely on one area can be misleading. Therefore, a holistic approach is recommended when choosing indicators (PFSA, 2016). This study considers the following indicators, which are currently used by the Ethiopian Pharmaceutical Supply Service (EPSS) to measure distribution performance:

**On-Time Arrivals:** This key performance indicator (KPI) measures the percentage of shipments arriving on time for a set delivery date within a defined period (PFSA, 2016).

**Average Delivery Time:** This KPI measures the average time it takes to deliver an order to a facility, calculated as the total time from dispatch to receipt for all shipments within a specified period (PFSA, 2016).

**Distribution Cost:** Distribution cost refers to the expenses incurred in delivering goods from the manufacturer or supplier to the end customer. This KPI measures the total transportation costs associated with a specific driver, vehicle type, carrier (if outsourced), route, or region/district/facility over a defined period, including inbound and outbound transport, fuel, tires, maintenance, fleet acquisition, staffing, or freight bills (PFSA, 2016).

**Vehicle Use Availability:** This KPI measures the availability of a vehicle for use during a defined period, reflecting the efficiency and reliability of the distribution fleet in meeting transportation demands (PFSA, 2016).

**Proof of Delivery (POD):** This KPI is used to measure distribution performance within the EPSS, headquarter. Proof of Delivery (POD) is a crucial process that provides confirmation that goods have been delivered to the intended recipient. It serves as evidence of successful delivery and is often required for billing, invoicing, and resolving disputes related to shipments.

### 2.1.5. Theoretical literature

#### 2.1.5.1. *Supply Chain Management (SCM) Theory*

SCM theory emphasizes the holistic management of all activities involved in the supply chain, from procurement of raw materials to the delivery of final products. It highlights the importance of integration and coordination among various stakeholders and processes to optimize performance. The goal of SCM is to optimize these processes to achieve the best combination of efficiency and responsiveness (Mentzer *et al.*, 2001).

Application as follows:

- **Holistic Analysis:** Use SCM theory to analyze the entire supply chain at EPSS, from procurement to delivery. Assess how well different components (inventory, warehousing, and transportation) are integrated and coordinated (Mentzer *et al.*, 2001).
- **Performance Metrics:** Evaluate key performance metrics (efficiency, responsiveness, and cost) to understand the effectiveness of SCM practices at EPSS (Christopher, 2016).
- **Interconnectedness:** Investigate how improvements in inventory management, warehouse operations, and transportation influence overall SC performance. Look for areas where better coordination could lead to enhanced performance (Hugos, 2018).

**Example:** Analyze how delays in inventory replenishment affect warehousing operations and, subsequently, distribution efficiency.

### *2.1.5.2. Just-in-Time (JIT) Theory*

JIT theory aims to minimize inventory levels and reduce waste by receiving goods only when they are needed in the production process. It focuses on improving efficiency and reducing holding costs (Ohno, 1988).

JIT principles are relevant for inventory management practices at EPSS, helping to reduce excess stock, minimize waste, and enhance supply chain responsiveness. Application as follows:

- **Inventory Management:** Assess the current inventory management practices at EPSS and determine how closely they align with JIT principles (Ohno, 1988).
- **Waste Reduction:** Identify areas where excess inventory or waste occurs and explore strategies to minimize these issues (Ohno, 1988).
- **Efficiency Improvement:** Evaluate how adopting JIT practices could enhance responsiveness and reduce holding costs at EPSS (Ohno, 1988).

### *2.1.5.3. Theory of Constraints (TOC)*

TOC identifies the most significant constraint or bottleneck in a system and aims to improve that constraint to enhance the overall performance of the system. It focuses on optimizing the weakest link in the process (Goldratt, 1990).

TOC can be applied to identify and address bottlenecks in the distribution processes of EPSS, including inventory management and transportation, to improve overall efficiency and effectiveness. Application as follows:

- **Constraint Identification:** Identify and analyze the main constraints or bottlenecks in the EPSS distribution process. Focus on inventory, warehousing, and transportation constraints (Goldratt, 1990).
- **Improvement Strategies:** Develop strategies to address these constraints and improve overall system performance (Goldratt, 1990).
- **Process Optimization:** Apply TOC to optimize the weakest link in the SC, such as outdated transportation methods or inefficient warehouse layouts (Goldratt, 1990).

#### *2.1.5.4. Total Quality Management (TQM)*

TQM is a comprehensive management approach focusing on continuous improvement, customer satisfaction, and quality in all aspects of an organization's operations (Deming, 1986).

TQM principles are relevant for enhancing management practices at EPSS by fostering a culture of continuous improvement and quality enhancement in distribution processes. Application as follows:

- **Continuous Improvement:** Apply TQM principles to foster a culture of continuous improvement in EPSS operations (Deming, 1986).
- **Quality Enhancement:** Focus on improving the quality of management practices by implementing TQM practices (Deming, 1986).
- **Customer Satisfaction:** Measure how improvements in distribution practices contribute to better service quality and customer satisfaction (Deming, 1986).

#### *2.1.5.5. Logistics Performance Theory*

This theory evaluates how logistics practices affect overall performance metrics, such as cost, speed, and service quality. It focuses on optimizing logistics functions to improve distribution performance (Christopher, 2016).

Logistics Performance Theory is directly applicable to assessing and improving the distribution performance of EPSS, including evaluating the impact of inventory, warehouse, and transportation management practices. Application as follows:

- **Performance Metrics:** Use logistics performance metrics (cost, speed, service quality) to evaluate the effectiveness of current logistics practices at EPSS (Christopher, 2016).
- **Optimization Opportunities:** Identify opportunities to optimize logistics functions based on performance evaluations (Christopher, 2016).
- **Impact Analysis:** Assess how changes in inventory management, warehousing, and transportation impact overall logistics performance (Christopher, 2016).

However, applying these theories by integrative approach, EPSS can develop a comprehensive understanding of the distribution performance issues. Each theory provides a different lens through which to analyze and improve various aspects of the supply chain. Combining insights from all these theories will enable EPSS to formulate a well-rounded strategy for enhancing distribution performance.

Alternatively, Supply Chain Management (SCM) Theory is particularly suitable for addressing distribution performance issues at the Ethiopian Pharmaceuticals Supply Service (headquarter) because it offers comprehensive and a holistic framework that integrates inventory management, warehousing, and transportation. SCM Theory emphasizes the importance of coordinating and optimizing these interconnected elements to improve overall efficiency and effectiveness (Mentzer *et al.*, 2001). It specifically addresses challenges such as inadequate data visibility, inefficient fleet management, and suboptimal warehousing practices by promoting data-driven decision-making and enhanced stakeholder collaboration (Christopher, 2016). By adopting SCM principles, EPSS can achieve better resource utilization, reduce operational costs, and improve service delivery, making it an effective framework for tackling complex supply chain problems (Hugos, 2018).

## **2.2. Empirical Literature Review**

Pharmaceutical supply chain management in Africa has been a significant focus of recent research. Othman *et al.* (2020) explored the challenges and opportunities in this area, highlighting issues such as inadequate infrastructure, poor cold chain management, and limited supply chain visibility.

A study on the quality perspective of Good Distribution Practices in the Indian pharmaceutical industry revealed that the quality of pharmaceutical products is often compromised during distribution. The survey indicated that exposure to direct sunlight during transportation frequently leads to the generation of impurities and product degradation (Kumaar & Jha, 2015).

Kamau *et al.* (2019) examined warehouse management practices in Africa, finding that efficient inventory management, proper storage layout design, and the utilization of technology are

critical for improving distribution performance. The study emphasized the importance of adopting best practices tailored to local contexts to address the unique challenges of the Africa.

The choice of inventory control systems significantly influences the volume of commodities stored and distributed through the supply chain. Shorter review periods reduce storage space needs but increase transportation demands, as smaller quantities of products are moved more frequently. Conversely, longer review periods require more storage capacity and larger vehicles to transport larger stock volumes, though deliveries occur less often (PSFA, 2016).

In Ethiopia, the pharmaceutical supply chain has also been the subject of recent studies. Tadesse *et al.* (2020) explored the challenges and opportunities in this area, identifying weak infrastructure, poor storage facilities, and inadequate supply chain management practices as significant barriers to effective distribution performance.

According to Dessalegn (2015), EPSA faces significant challenges with data visibility due to poor coordination, lack of accountability, and insufficient data management and dissemination skills. Consequently, stock levels, procurement and pipeline information, and stock-out notifications were not consistently organized or shared with the Federal Ministry of Health (FMOH) and stakeholders. At the health facility level, data visibility issues were mainly due to lack of accountability, poor adherence to schedules, and incomplete or low-quality reports.

Several studies have explored factors influencing the distribution performance of pharmaceutical products. For example, John *et al.* (2012), Wengelawit (2022) and Netsanet G. (2018) examined how financial capacity, transport outsourcing, information technology, and relationships with government and donors, storage practices, warehouse management, transportation facilities, and product timeliness affect distribution performance.

However, there is a noticeable gap in the research, as no prior studies have specifically investigated the effect of inventory management practices (IMP) on distribution performance within the EPSS context. This research, therefore, aims to examine factors effect, including IMP, on distribution performance at the EPSS, headquarter.

### 2.3. Conceptual Framework

A conceptual framework visually represents the relationship between dependent and independent variables, as described by Mugenda O. and Mugenda B. (2003). It can be depicted graphically or explained narratively, highlighting the key factors, concepts, or variables to be studied and their presumed relationships. In this study, the conceptual framework illustrates the relationship between the independent variables and the dependent variable. The framework is based on insights from the literature, the problem statement, and the study's objectives.

**Figure 2.1: Conceptual framework**

#### **Independent Variable (Factors)**

**Inventory Management Practices**

**Warehouse Management Practices**

**Transportation Management Practices**



#### **Dependent Variable**

**Distribution Performance**

Source: Adapted from Netsanet G. (2018) & John *et al.* (2012).

### 2.4. Research Gap

Despite the importance of addressing factors affecting the distribution performance on pharmaceutical products within the EPSS (headquarter), there is a lack of comprehensive research examining the various factors affecting distribution performance. Existing literature tends to focus more broadly on supply chain management, but there is a need for a study that specifically investigates the relationship between various factors and distribution performance in the context of EPSS. This research gap highlights the need for a detailed assessment of how effectively addressing various factors can contribute to improving distribution performance within the Ethiopian pharmaceutical supply chain.

## **CHAPTER THREE**

### **3. RESEARCH METHODOLOGY**

This chapter outlines the methods used to gather and analyze data in line with the study's objectives. It covers the study area, research approach and design, target population, data collection techniques, and analysis procedures.

#### **3.1. Description of the Study Area**

The study was conducted in Addis Ababa, the capital of Ethiopia, covering 540 square kilometers with a population of about 4.8 million (Population Stat & City Population, 2024). The city is administratively divided into 11 sub-cities. The focus is on the Ethiopian Pharmaceuticals Supply Service (EPSS), headquartered in Addis Ababa, which manages pharmaceutical distribution through 19 hubs (2 in Addis Ababa and 17 in other regions). This research particularly targets the Warehouse and Inventory Management (WIM) and Distribution and Fleet Management (DFM) directorates within EPSS, which oversee outbound logistics operations.

#### **3.2. Research Approach**

A quantitative approach was used to collect numerical data, which was analyzed using multiple regression modeling. This statistical method helped to understand the relationships between variables. The results were organized in tables and figures, based on responses to structured questionnaires. Quantitative data is suitable for highly structured research that can be statistically measured, providing the potential for generalized findings (Chinnathambi, 2023).

#### **3.3. Research Design**

An explanatory research design was utilized to investigate the factors affecting pharmaceutical distribution performance. This design aims to explain how and why certain variables affect distribution (Athumani, 2012). This approach helps establish causal relationships between variables, showing how one variable affects or causes changes in another. The research used descriptive analysis to summarize and characterize the data with key metrics like the mean and standard deviation to show the current state of the problem and aided in interpreting the characteristics of the population or phenomenon being studied (Creswell, 2014). Data was

collected in a cross-sectional manner, meaning it was gathered at a single point in time. The research was conducted from January 2024 to September 2024.

### **3.4. The Study Population**

The study targeted all staff involved in pharmaceutical distribution at EPSS, including officers, team leaders, technical advisors, directors, and warehouse managers from the WIM and DFM directorates. The total population was 100 individuals (69 from WIM and 31 from DFM), all of whom participate in outbound logistics.

Given the small size of the target population, a census method was conducted to collect the necessary and relevant quantitative data. This method ensured that every member of the population was included, providing a comprehensive and accurate dataset for analysis.

#### **3.4.1. Study Variables**

##### **Dependent Variable:**

- Distribution Performance

##### **Independent Variables:**

- Inventory Management Practices
- Warehouse Management Practices
- Transportation Management Practices

### **3.5. Data Type and Source**

The researcher utilized both primary and secondary sources of data.

#### **3.5.1. Primary Source**

Primary data were collected using structured questionnaires with closed-ended questions from both directorates. According to Malhotra (2005), primary data were collected by the researcher specifically to address the research problem.

### **3.5.2. Secondary Source**

Secondary data were gathered from existing articles, journals, reports, and government publications, including those from organizations such as the EPSS, the Federal Ministry of Health (FMOH), and the World Health Organization (WHO). These sources provided essential background information and supported the research findings.

### **3.6. Data Collection Procedure and Instrument**

Prior to data collection, participants were contacted to obtain their consent. Once consent was confirmed, each respondent received a self-administered structured questionnaire. After a specified period, completed questionnaires were collected, and participants were thanked for their participation and time.

The primary data collection instrument was a structured questionnaire. To study this, 28 targeted questions were developed through an extensive review of literature and evaluated by experts such as advisor. The questionnaire addressed each specific objective and was organized clearly and logically, with concise and consistent wording to facilitate respondent participation and ensure ease of understanding.

### **3.7. Validity and Reliability**

#### **3.7.1. Validity**

Validity refers to the extent to which a measurement instrument accurately measures what it is intended to measure. It ensures that the instrument truly reflects the construct or variable it aims to assess (Creswell, 2014). To ensure the validity of the questionnaires, a pilot test was conducted with a sample of respondents. This process assessed the readability, ambiguity, and clarity of the questions. The feedback received from the advisor allowed for necessary revisions to ensure the questionnaire was clear and accurate. Additionally, data were collected from reliable sources with relevant experience to further ensure validity (Bryman, 2016).

#### **3.7.2. Reliability**

Reliability refers to the consistency and stability of a measurement instrument, indicating the extent to which the instrument yields the same results under consistent conditions (Creswell, 2014). This concept encompasses various forms, such as internal consistency, which measures how well items on a test or questionnaire correlate with each other (George & Mallery, 2016),

and test-retest reliability, which assesses the stability of the measurement over time (Salkind, 2017). Additionally, inter-rater reliability evaluates the consistency among different raters or observers (Landis & Koch, 1977).

Cronbach’s alpha coefficient was used to assess internal consistency between items (Cronbach, 1951). This statistic estimates the extent to which variations in scores among different variables are attributable to chance or random errors (Nguyen, 2010). A coefficient of 0.7 or higher was generally considered acceptable (Nguyen, 2010). Table 3.1 presented the reliability test results, with Cronbach’s alpha coefficients for various factors exceeding the 0.7 threshold, indicating strong instrument reliability and reinforcing the trustworthiness of the data and study conclusions.

**Table 3.1: Cronbach’s Alpha Coefficients**

No	Variables	N of Items	Cronbach's Alpha	Internal consistency
1	Inventory management practices	8	<b>.720</b>	<b>Acceptable</b>
2	Warehouse management practices	7	<b>.714</b>	<b>Acceptable</b>
3	Transportation management practices	8	<b>.721</b>	<b>Acceptable</b>
4	Distribution performance	5	<b>.752</b>	<b>Acceptable</b>

Source: Own Survey, 2024 – SPSS 25

### **3.8. Data Processing and Analysis**

Data analysis requires a range of decisions and specific procedures, some of which might be unique to a particular research topic. Data analysis, in particular, involves several tasks that might call for the use of different statistical methods in various contexts. Initially, the collected data were reviewed for accuracy, consistency, and completeness before being entered into SPSS version 25. To ensure data quality, any discrepancies or missing data were addressed during this

review process. The analysis was aligned with the research objectives by categorizing the data according to the study's variables. Quantitative data from the questionnaire were coded systematically and analyzed using both descriptive statistics, such as mean and standard deviation, to summarize the data, and inferential statistics, including correlation and regression analyses, to explain relationships between the variables. The results were then presented through tables and figures, providing a clear and comprehensive visualization of the study's findings, making it easier for readers to interpret and understand the outcomes.

Based on the current study, which examines the effect of IMP, WMP, and TMP on distribution performance at EPSS (headquarter), a quantitative model using multiple linear regression can be formulated. A multiple linear regression model was developed to predict distribution performance based on three key variables: inventory management, warehouse management, and transportation management.

### Multiple Linear Regression Model

Dependent Variable (Y): Distribution Performance (DP)

Independent Variables (X):

- Inventory Management Practices ( $X_1$ )
- Warehouse Management Practices ( $X_2$ ).
- Transportation Management Practices ( $X_3$ )

### Regression Equation

The multiple linear regression equation is expressed as:

$$Y (DP) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

Where:

- **DP:** Distribution Performance (Dependent Variable)
- **$\beta_0$ :** Intercept term (constant)
- **$\beta_1, \beta_2, \beta_3$ :** Coefficients for the independent variables (IMP, WMP, TMP)

- $\epsilon$ : Error term, representing the difference between observed and predicted values

### **Interpretation:**

- $\beta_1$ : Measures the change in distribution performance for a one-unit change in inventory management practices, holding other factors constant.
- $\beta_2$ : Measures the change in distribution performance for a one-unit change in warehouse management practices, holding other factors constant.
- $\beta_3$ : Measures the change in distribution performance for a one-unit change in transportation management practices, holding other factors constant (Field, 2013).

### **Model Application:**

- **Significance Testing:** Determine whether the independent variables significantly affect distribution performance by examining the p-values for  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$ .
- **Coefficient Analysis:** Analyze the coefficients ( $\beta$ ) to understand the strength and direction of the relationships between each independent variable and distribution performance.
- **Goodness of Fit:** Assess the model's overall fit using R-squared and the significance of the F-statistic to ensure the model explains a significant portion of the variance in distribution performance (Hair *et al.*, 2019).

This model helps quantify the effect of each management practice on distribution performance.

### **3.9. Ethical Considerations**

Ethical considerations were rigorously addressed in the study. Approval was secured from EPSS before data collection, and participants were clearly informed about the study's purpose to ensure informed consent. Their confidentiality and anonymity were safeguarded, with assurances that their identities remained private and data not shared with third parties. The researcher maintained ethical integrity by reporting results honestly, avoiding bias, ensuring objectivity, and upholding commitments throughout the research process.

## **CHAPTER FOUR**

### **4. RESULTS AND DISCUSSION**

This chapter provides a comprehensive analysis of the data, presenting the results and offering a detailed interpretation based on the findings from the questionnaires. The analysis is aligned with the objectives of the study and utilized IBM Statistical Package for the Social Sciences (SPSS) Version 25 to perform statistical analyses. It structured as follows: first, it examines the response rate and socio-demographic characteristics of the survey participants. Next, it describes the factors affecting the distribution performance of EPSS using descriptive statistics. Finally, it analyzes the relationships between independent variables and dependent variable and their effect, through correlation and regression analysis.

#### **4.1. Response Rate**

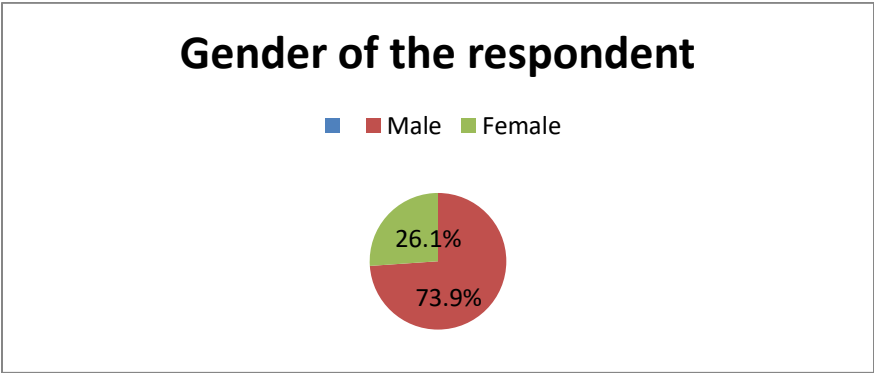
The study targeted employees from the warehouse and inventory directorate teams, as well as the distribution and fleet management directorate teams. A total of 100 questionnaires were distributed, of which 8 were either not returned or inadequately completed and thus excluded from the analysis. Consequently, the final dataset included 92 completed responses. According to Mugenda (1999), a response rate of 70% or higher is considered excellent. With a response rate of 92%, this study achieved a level of engagement that exceeds the benchmark, demonstrating that the data collected is robust and representative of the target population.

#### **4.2. Socio-Demographic Characteristics of the Respondents**

##### **4.2.1. Gender of the Respondents**

Among the 92 respondents, 68 employees (73.9%) were male, while 24 employees (26.1%) were female, indicating a predominance of male respondents in the sample.

**Figure 4.1: Gender of Respondents**

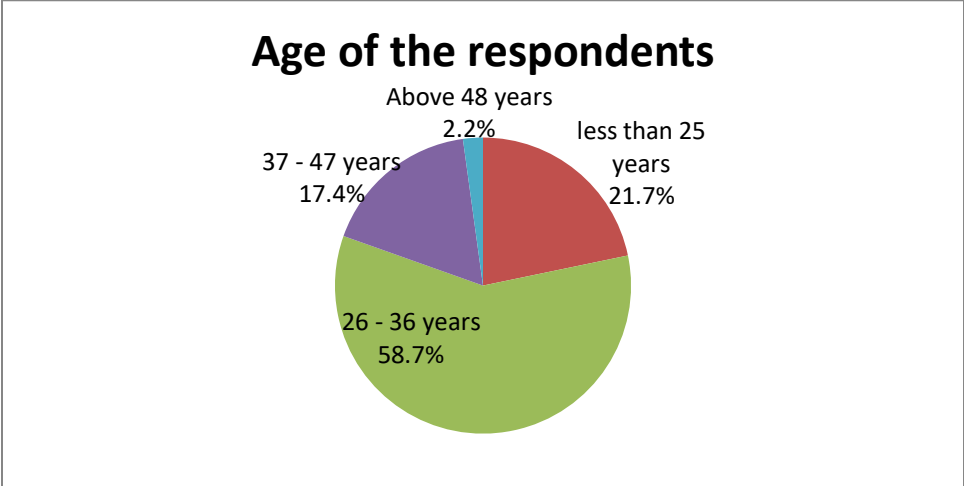


Source: Own Survey, 2024 – SPSS 25

**4.2.2. Age of the Respondents**

The respondents were grouped into four age categories: under 25 years, 26-36 years, 37-47 years, and above 48 years. Among them, 20 (21.7%) were under 25 years, 54 (58.7%) were between 26 and 36 years, 16 (17.4%) were between 37 and 47 years, and just 2 (2.2%) were above 48 years. The pie chart below vividly shows that the majority of respondents are in the 26-36 ages, highlighting a strong presence of young to mid-career professionals in the workforce.

**Figure 4.2: Age of the Respondents**

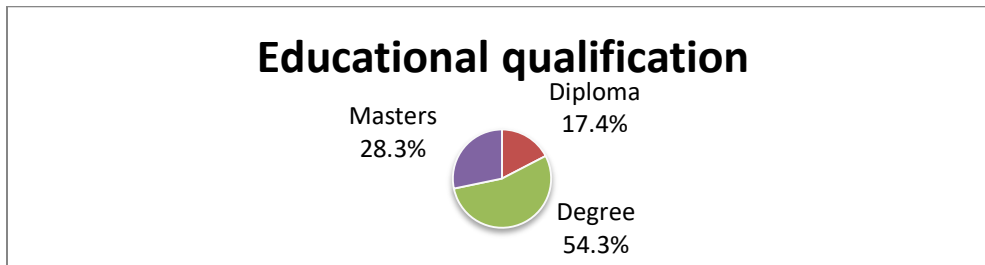


Source: Own Survey, 2024 – SPSS 25

### 4.2.3. Educational Background/Qualification

The educational qualifications of respondents from both departments of EPSS (headquarter) were as follows: 16 (17.4%) held diplomas, 50 (54.3%) held degrees and 26 (28.3%) held master's degrees. As shown in the pie chart below, the majority of respondents were degree holders (BSc or BA), with no respondents holding a PhD.

**Figure 4.3: Educational Background/Qualification**

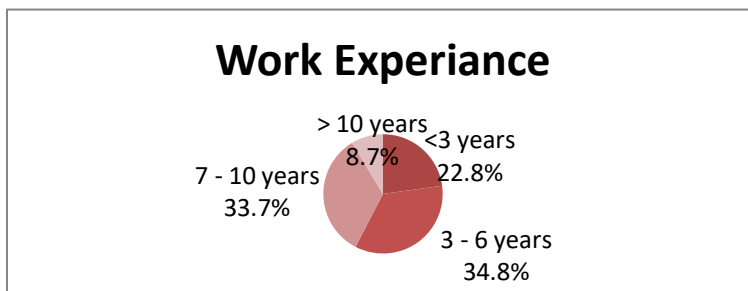


Source: Own Survey, 2024 – SPSS 25

### 4.2.4. Working Experience of the Respondents

Out of the total respondents, 21 (22.8%) had less than 3 years of experience, 32 (34.8%) had 3-6 years of experience, 31 (33.7%) had 7-10 years of experience, and 8 (8.7%) had more than 10 years of experience. The pie chart below shows that the majority of respondents, 34.8%, had between 3 to 6 years, followed closely by 33.7%, which was 7 to 10 years of experience. This suggests that the respondents' deeper understanding of distribution challenges and complexities enhances the study's findings and recommendations.

**Figure 4.4: Working Experience of the Respondents**

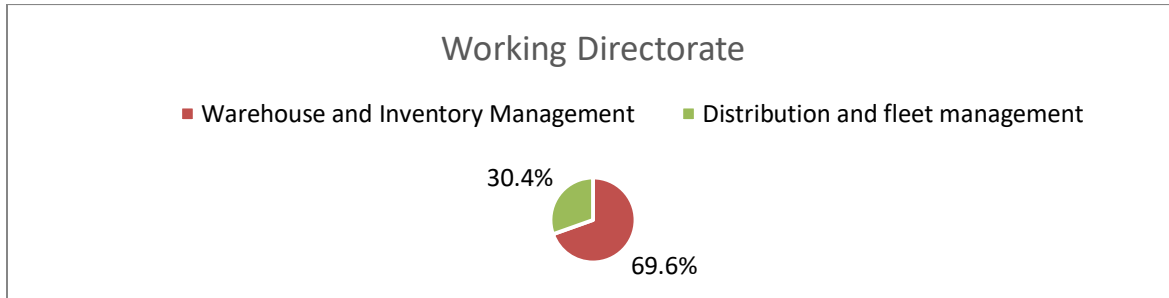


Source: Own Survey, 2024 – SPSS 25

#### 4.2.5. Working Department/Directorate of the Respondents

Of the total respondents, 64 (69.6%) were from the Warehouse and Inventory Management directorate, while 28 (30.4%) were from the Distribution and Fleet Management directorate. The pie chart below illustrates that the majority of respondents, 69.6%, were from the WIM.

**Figure 4.5: Working Department/Directorate of the Respondents**

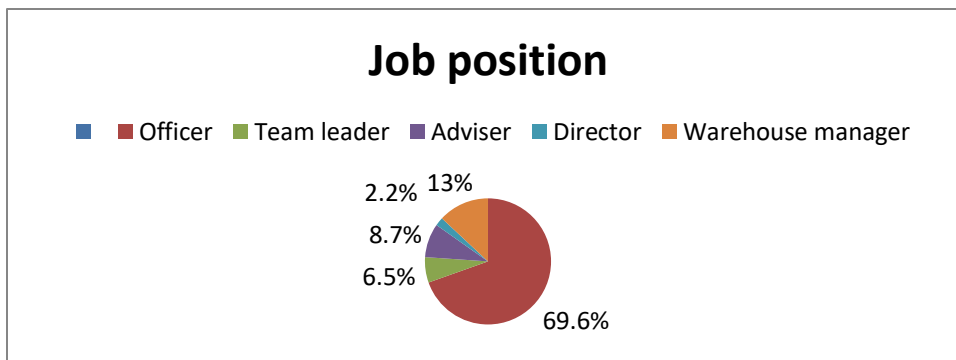


Source: Own Survey, 2024 – SPSS 25

#### 4.2.6. Job Position of the Respondents

Among the total respondents, 64 (69.6%) held officer-level positions. Six respondents (6.5%) were team leaders, eight (8.7%) were advisers, two (2.2%) were directors, and twelve (13.0%) were warehouse managers. The pie chart below illustrates that the majority of respondents occupied officer-level positions, comprising 69.6% of the sample.

**Figure 4.6: Job Position of the Respondents**



Source: Own Survey, 2024 – SPSS 25

The socio-demographic profiles show that most respondents have significant expertise, ensuring they provide reliable and insightful information on factors and distribution performance.

### 4.3. Descriptive Analysis

The research focused on identifying key factors affecting EPSS's distribution performance, specifically how Inventory, Warehouse, and Transportation Management Practices influence pharmaceutical distribution performance. To study this, 28 targeted questions were developed. The questionnaire utilized Likert scales with five response options, ranging from strongly disagree (1) to strongly agree (5), allowing respondents to express varying levels of agreement. The mean value of the Likert scale was calculated to determine the central tendency, with scores from 1 to 5. The scale's range was calculated by dividing the difference between the highest and lowest values by the number of scale points to determine the minimum and maximum length.

Furthermore, this analysis aims to examine how the Service perceives various factors using statistical tools such as mean and standard deviation. The mean value represents the average response on specific dimensions, while the standard deviation measures response variability. A smaller standard deviation indicates more consistent opinions among respondents, whereas a larger standard deviation shows greater variation (Zaidatol & Bagheri, 2009).

**Table 4.1: Mean and standard deviation of variables from SPSS descriptive data analysis**

Variables	N	Mean	Standard Deviation
IMP	92	2.5054	.48071
WMP	92	2.6522	.49365
TMP	92	2.5883	.47265
DP	92	2.6630	.51178
Valid N (listwise)	92		

Source: Own Survey, 2024 – SPSS 25

#### 4.3.1. Inventory Management Practices effect on Distribution Performance

The study aimed to examine the influence of inventory management practices on distribution performance within the EPSS (headquarter). The findings were presented in the table 4.3 below.

**Table 4.3: Inventory Management Practices Factors on Distribution Performance**

<b>Statements</b>	<b>Mean</b>	<b>Std. Dvn</b>
EPSS applies accurate demand forecasting to meet customer demand.	2.67	.891
EPSS allows for real-time visibility of inventory throughout the supply chain.	2.83	.921
Hub-sent report and requisition form (RRF) data is of excellent quality.	2.62	.837
Hubs or customers did not frequently send requests for emergency.	2.18	.678
Current order processing in EPSS is not time consuming.	2.17	.720
Resupply intervals is appropriate.	2.48	.777
The inventory management teams consistently adhere to the predetermined schedules set by the distribution teams.	2.23	.840
EPSS always deliver exactly needed products by hubs/customers.	2.86	.921
	<b>2.505</b>	<b>0.4807</b>

Source: Own Survey, 2024 – SPSS 25

As shown in Table 4.3, the analysis of Inventory Management Practices at EPSS revealed a mean score of 2.505, indicating a high influence on distribution performance, with a standard deviation of 0.4807 reflecting moderate consistency in responses. Inefficiencies are evident in emergency requests, adherence to schedules, order processing delays, and resupply intervals. Additionally, issues with RRF data quality, demand forecasting, inventory visibility, and delivering unneeded products show moderate performance but require improvement. These inefficiencies directly affect distribution performance by increasing delays, costs, and the risk of stockouts. Addressing these issues is crucial for improving the overall efficiency and effectiveness of EPSS’s distribution system, ensuring timely and accurate delivery.

#### **4.3.2. Warehouse Management Practices and Distribution Performance**

The analysis investigated the influence of WMP on distribution performance at EPSS (headquarter), Table 4.4 provided key insights into respondents' perceptions of these practices.

**Table 4.4: Respondents' Perceptions of Warehouse Management Practices**

<b>Statements</b>	<b>Mean</b>	<b>Std. Dvn</b>
Warehouses have enough qualified people to efficiently handle pharmaceutical delivery.	3.40	.865
Warehouse workforces are committed to work.	2.45	.817
In EPSS warehouses, there is a well-designed warehouse layout.	2.99	.932
There is effective collaboration between the warehouse and distribution teams.	2.49	.832
The medical handling equipment at EPSS warehouses is well functional.	2.63	.848
The current dispatch process is efficient.	2.39	.741
The geographically location of warehouses has facilitated timely product delivery.	2.22	.626
	<b>2.652</b>	<b>.4936</b>

Source: Own Survey, 2024 – SPSS 25

As shown in Table 4.4, the analysis of Warehouse Management Practices at EPSS, head office, revealed a mean score of 2.652, indicating a moderate influence on distribution performance, with a standard deviation of 0.4936 showing somewhat consistency in responses. While the presence of qualified personnel (mean = 3.40) is a strength, inefficiencies are noted in staff commitment, dispatch efficiency, collaboration between warehouse and distribution teams, and warehouse location. Additional issues include medical handling equipment and warehouse layout design highlight areas that require improvement. Addressing these challenges is crucial to improving warehouse management, which will directly enhance the overall distribution performance by ensuring smoother, faster, and more reliable product flow across the supply chain.

### 4.3.3. Transportation Management Practices on Distribution Performance

The analysis examined the influence of TMP on distribution performance at EPSS (headquarter).

**Table 4.5: Respondents' Perceptions of Transportation Management Practices**

Statements	Mean	Std. Dvn
EPSS has a standardized tool for vehicle scheduling and route planning.	2.67	.878
There is effective communication between EPSS fleet and distribution teams.	2.87	1.051
All vehicles in EPSS are integrated with advanced technology, like GPS.	3.53	.988
The bulk of EPSS's delivery vehicles are less than 5 years old.	2.18	.573
Spare parts for vehicles are readily available on the market.	2.35	.748
There is efficiency in loading the trucks to their optimum capacity due to accurate volumetric measurements.	2.16	.598
The vehicle maintenance program of EPSS ensures the availability of the vehicles.	2.32	.694
Drivers are well-trained enough to successfully distribute pharmaceutical supplies.	2.62	.837
	<b>2.588</b>	<b>.4726</b>

Source: Own Survey, 2024 – SPSS 25

As shown in Table 4.5, the average mean of 2.588 for TMP indicated a high influence on distribution performance, with a standard deviation of 0.4726, reflecting relatively consistent responses. While advanced vehicle technology integration is a strength (mean = 3.53), critical issues such as aging delivery vehicles, limited spare parts, inefficient loading practices, and inadequate maintenance programs negatively affect distribution performance. Additionally, the absence of standardized vehicle scheduling and routing tools, insufficient driver training, and poor communication between fleet and distribution teams further reduce efficiency. Addressing these challenges is essential to enhance transportation management, which in turn will improve overall distribution performance and ensure timely, cost-effective delivery of pharmaceuticals.

Descriptive statistics showed that IMP has the greatest influence on distribution performance, with the lowest mean value of 2.505. TMP, with a mean of 2.588, have a high influence but are the second influential. WMP are the least influential, with the highest mean score of 2.652.

#### 4.3.4. Distribution Performance Indicators

The distribution performance of EPSS (headquarter) was assessed based on the following indicators: on-time delivery, average delivery time, vehicle availability, distribution cost, &POD.

**Table 4.6: Respondents’ Perception of Distribution Performance Indicators**

Statements	Mean	Std.
Shipments from EPSS are delivered to the intended hubs/facilities on the scheduled date.	2.49	.734
The average time between dispatching and receipt is within the agreed-upon service level agreements.	3.12	.768
A vehicle is ready as soon as it requested for distribution purpose.	2.52	.654
The distribution costs for pharmaceutical deliveries are reasonable.	2.40	.630
Hubs/healthcare facilities consistently provide proof of delivery (POD) documentation for all pharmaceutical deliveries.	2.78	.810
	<b>2.663</b>	<b>.519</b>

Source: Own Survey, 2024 – SPSS 25

Table 4.6 revealed an average mean of 2.663 for distribution performance indicators, suggesting that EPSS’s overall distribution performance is moderate and below expectations. The standard deviation of 0.519 indicates fairly consistent with limited variation. Key concerns include on-time delivery (mean = 2.49), vehicle availability (mean = 2.52), and distribution costs (mean = 2.40), all of which are identified as inefficiency areas with average means ranging from 1.80 to 2.59. While average delivery time (mean = 3.12) and proof of delivery (POD) documentation (mean = 2.78) show moderate performance. However, addressing all issues effectively could lead to significant enhancements in EPSS’s distribution processes.

## 4.4. Inferential Statistics

Inferential statistics involve statistical procedures used to draw conclusions about the relationships between variables. Unlike descriptive statistics, which summarize data, inferential statistics are specifically designed to test hypotheses (Abdurezak M. *et al.*, 2014).

### 4.4.1. Correlation Analysis

Correlation analysis is a common research method used to evaluate the strength and direction of relationships between two variables, measuring how closely related two sets of data are. A higher correlation value indicates a stronger relationship, with a correlation of 1 or -1 representing a perfect positive or negative linear relationship, respectively, and a correlation of 0 indicating no relationship (Vignaswaran, 2005). This study employed Pearson's correlation coefficient ( $r$ ) to investigate the relationships among all variables.

#### 4.4.1.1. Relationship between the Factors and Distribution Performance

This section analyzes the relationship between three factors and distribution performance using Pearson correlation. Pearson's correlation coefficient ( $r$ ) measures the strength and direction of the linear relationship between variables, with values ranging from -1 to 1. The p-value is compared to the significance level alpha ( $\alpha$ ), typically set at 0.05. An alpha of 0.05 means accepting a 5% chance of incorrectly rejecting the null hypothesis when it is true, which is generally considered a manageable level of risk in many research contexts (Fisher, R. A., 1925; Abdurezak M. *et al.*, 2014). If the p-value is less than 0.05, it provides sufficient statistical evidence to reject the null hypothesis and accept the alternative hypothesis. If the p-value exceeds 0.05, there is insufficient evidence to reject the null hypothesis.

The strength of the relationship between variables was interpreted as follows:

- **0.00 to 0.10:** Very weak relationship (Field, 2013)
- **0.10 to 0.30:** Weak relationship (Field, 2013)
- **0.30 to 0.50:** Moderate relationship (Field, 2013)
- **0.50 to 0.70:** Strong relationship (Cohen, 1988)
- **0.70 to 0.90:** Very strong relationship (Cohen, 1988)
- **0.90 to 1.00:** Extremely strong relationship (Field, 2013)

**Table 4.7: Correlations of the Study Variables**

		<b>IMP</b>	<b>WMP</b>	<b>TMP</b>	<b>DP</b>
Inventory management practices	Pearson Correlation	1			
	Sig. (2-tailed)				
Warehouse management practices	Pearson Correlation	.570**	1		
	Sig. (2-tailed)	.000			
Transportation management practices	Pearson Correlation	.521**	.512**	1	
	Sig. (2-tailed)	.000	.000		
Distribution performance	Pearson Correlation	.689**	.577**	.612**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	92	92	92	92
**. Correlation is significant at the 0.01 level (2-tailed).					

Source: Own Survey, 2024 – SPSS 25

#### 4.4.1.1.1. Inventory Management Practices and Distribution Performance

Table 4.7 demonstrated a strong and statistically significant positive correlation between Inventory Management Practices and distribution performance, with a correlation coefficient of  $r = 0.689$  and a p-value of  $p < 0.01$ . This indicated that improvements in inventory management practices lead to significant improvements in distribution performance. The strong correlation and a highly significant p-value of 0.000 (less than 0.01) provide compelling evidence that effective inventory management has a substantial effect on distribution performance at EPSS, head office, leading to the *rejection* of the null hypothesis.

#### 4.4.1.1.2. Warehouse Management Practices and Distribution Performance

The correlation coefficient of 0.577 between Warehouse Management Practices and Distribution Performance revealed a strong and statistically significant positive relationship ( $p < 0.01$ ). This indicated that effective warehouse management was closely linked to improved distribution performance. The significance of this correlation, confirmed by a p-value of 0.000, which is less than 0.01, indicates that better WMP substantially enhances distribution performance at EPSS, headquarter. Consequently, the null hypothesis was *rejected*, highlighting the crucial role of warehouse management in optimizing distribution outcomes.

#### 4.4.1.1.3. Transportation Management Practices and Distribution Performance

Pearson correlation analysis revealed strong and significant positive relationship between Transportation Management Practices and Distribution Performance, with a correlation coefficient of  $r=0.612$  and a p-value of  $p<0.01$ . This indicated that effective TMP was strongly associated with improved distribution performance. The coefficient of 0.612 was statistically significant at the 0.01 level, and the p-value of 0.000, which is below 0.01, the null hypothesis was *rejected*, underscoring the importance of effective TMP in enhancing distribution outcomes.

Table 4.7 revealed that IMP had the strongest positive correlation with distribution performance ( $r=0.689$ ), followed by TMP ( $r=0.612$ ), and WMP ( $r=0.577$ ), respectively. All correlations were statistically significant with a p-value of 0.000, indicates that while IMP had the strongest effect on distribution performance, TMP and WMP also significantly contributed to improving DP.

### 4.4.2. Regression

#### *Multiple Regression Model Assumptions*

Statistical tests often rely on certain assumptions about the variables used in the analysis. When these assumptions are not met, the results may become unreliable, leading to potential Type I or Type II errors, or the misestimating of significance or effect sizes (Osborne *et al.*, 2002).

In regression analysis, several key assumptions must be considered, including normality, multicollinearity, linearity, homoscedasticity, and autocorrelation (Jamal I., 2017; Osborne *et al.*, 2002)..

### *Normality Assumption*

Regression analysis assumes that variables are normally distributed. Non-normally distributed variables - those that are highly skewed, kurtotic, or contain significant outliers - can distort relationships and significance tests. To test this assumption, researchers use methods such as visual inspection of data plots, skewness and kurtosis analysis, and examination of P-P plots (Osborne *et al.*, 2002). Skewness indicates the symmetry of the distribution, while kurtosis reflects provides insight into its peakedness. According to Hair (2010), as cited in Netsanet G. (2018), skewness and kurtosis values should generally fall within the range of  $\pm 2.58$ .

As shown in Table 4.8, the skewness and kurtosis values in this study fall within  $\pm 1$ , indicating an acceptable level of normality. Further assessment using normal probability plots, specifically P-P plots, displayed an approximately straight line rather than a curve, supporting the normality assumption. For more details, please refer to the Annex section.

**Table 4.8: Skewness/Kurtosis Presentation**

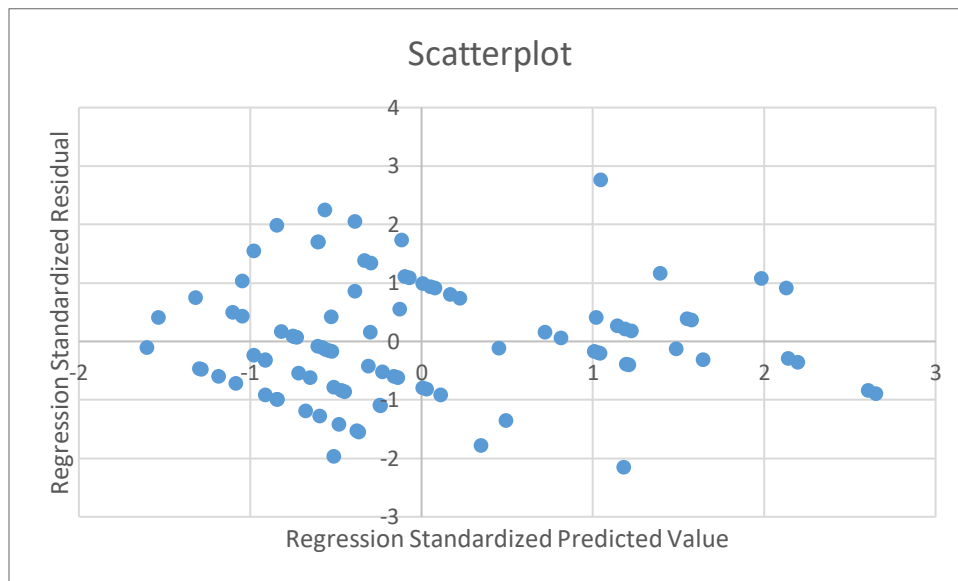
	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Inventory management practices	92	<b>.780</b>	.251	<b>.076</b>	.498
Warehouse management practices	92	<b>.300</b>	.251	<b>1.008</b>	.498
Transportation management practices	92	<b>.937</b>	.251	<b>.495</b>	.498
Distribution performance	92	<b>.392</b>	.251	<b>-.742</b>	.498

Source: Own survey, 2024, SPSS 25

### *Homoscedasticity Assumption*

Homoscedasticity refers to the assumption that the variance of residuals (errors) remains constant across all levels of the independent variables. If the variance of errors changes with different values of the independent variables, this indicates heteroscedasticity. According to Berry and Feldman (1985), slight heteroscedasticity has minimal impact on significance tests; however, pronounced heteroscedasticity can significantly distort findings, weaken analysis, and increase the risk of a Type I error. This assumption can be assessed by visually examining a scatter plot of the regression standardized residuals against the regression standardized predicted values. The residuals should be randomly dispersed around the horizontal line (zero point) and evenly spread without noticeable deviations from the expected pattern (Osborne *et al.*, 2002, p. 4). In this study, figure 4.7 showed no evidence of heteroscedasticity, indicating that the homoscedasticity assumption holds.

**Figure 4.7: Scatter plot for homoscedasticity test**



### *Linearity assumption*

The linearity assumption in statistical modeling requires that the relationship between independent and dependent variables be linear, meaning that changes in independent variables lead to proportional changes in the dependent variable (Hair *et al.*, 2010). When this assumption

holds, the model is simpler and more interpretable, providing reliable predictions. If the relationship is not linear, the model may yield inaccurate results, making it essential to test for linearity using scatterplots (Hair *et al.*, 2010). To check this assumption in SPSS, scatter plots are used by plotting the dependent variable against each independent variable. In this study, the scatter plots demonstrated that the relationship between the dependent variable and each independent variable was linear, indicating that the linearity assumption was met. Refer to the Annex portion for detailed plots and analysis for each variables and performance.

**Multi-collinearity Assumption**

Multi-collinearity occurs when independent variables are highly inter-correlated (Abdurezak M. *et al.*, 2014). It must be addressed before data modeling to avoid complications in result interpretation and reduced reliability of regression coefficients (Jamal I., 2017; Dillon, 1993). In this study, the tolerance and Variance Inflation Factor (VIF) values were used to check for multi-collinearity among the variables. The VIF is calculated as "1/Tolerance," and it is generally recommended that predictor variables with VIF values greater than 10 should be further investigated or considered problematic (Robert, 2006).

**Table 4.9: Collinearity Statistics Presentation**

<b>Coefficients<sup>a</sup></b>			
<b>Model</b>		<b>Collinearity Statistics</b>	
		<b>Tolerance</b>	<b>VIF</b>
1	Inventory management practices	.604	1.655
	Warehouse management practices	.612	1.633
	Transportation management practices	.660	1.514
a. Dependent Variable: Distribution performance			

Source: Own survey, 2024, SPSS 25

However, as the table 4.9 above indicated, there was no significant linear interference between the independent variables. The VIF values ranged from 1.514 to 1.655, all of which are well below the threshold of 10, indicating no significant multi-collinearity among the variables.

Additionally, the tolerance values ranged from 0.6040 to 0.660, all of which are greater than 0.1, further confirming the absence of multi-collinearity concerns.

#### *Autocorrelation Assumption*

The Durbin-Watson statistic tests for autocorrelation (correlation between residuals from different observations) in the residuals of the model. A value close to 2 suggests that there is no significant autocorrelation.

As table 4.10 below indicated a Durbin-Watson value of 1.922 is very close to 2, indicating that autocorrelation is not a concern in this model. This suggested that the residuals were independent of each other, and the assumption of independent errors is satisfied.

#### **4.4.2.1. Regression Analysis**

Regression Analysis is a statistical procedure for analyzing associative relationships between a metric dependent variable and one or more independent variable (Abdurezak M. *et al.*, 2014). The R square value represents the proportion of variance in the dependent variable that is explained by the regression model derived from the sample (Field, 2006). In contrast, the adjusted R square value indicates the proportion of variance in the dependent variable that would be explained if the model were applied to the entire population from which the sample was drawn. The following table 4.10 presented a detailed discussion of the regression coefficients (R) and R square values used to test the main hypothesis.

**Table 4.10: Coefficient of determination (R<sup>2</sup>)**

<b>Model Summary<sup>b</sup></b>					
<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>	<b>Durbin-Watson</b>
<b>1</b>	.763 <sup>a</sup>	.582	.568	.33645	1.922
<b>a. Predictors: (Constant), TMP, WMP, IMP</b>					
<b>b. Dependent Variable: Distribution performance</b>					

Source: Own survey, 2024, SPSS 25.

Table 4.10 presented the results of the multiple correlation coefficient (R) between the independent variables and the dependent variable, which is 0.763, indicating a strong positive relationship. This suggests that the independent variables combined were highly associated with changes in distribution performance. The R square value, representing the coefficient of determination, is 0.582. An R<sup>2</sup> value of 0.582 means that 58.2% of the variability in distribution performance can be explained by the combination of transportation, warehouse, and inventory management practices. This suggests that the model has a good explanatory power, though it also leaves 41.8% of the variance in distribution performance unexplained, which could be due to factors not included in the model. The adjusted R square value is 0.568, which provides a more accurate estimate of the true population value by correcting the R square. The slight difference of 0.014 (or 1.4%) between the R square and the adjusted R square value suggests minimal shrinkage. This indicates that if the model were applied to the entire population, it would explain only 1.4% less variance in the outcome than if it were developed from the sample.

#### 4.4.2.2. ANOVA table

The significance of the regression in the ANOVA table allowed us to determine whether a relationship exists between the independent and the dependent variable (Netsanet G., 2018).

**Table 4.11: ANOVA table**

ANOVA <sup>a</sup>						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	13.873	3	4.624	40.852	.000 <sup>b</sup>
	Residual	9.961	88	.113		
	Total	23.834	91			
<b>a. Dependent Variable: Distribution performance</b>						
<b>b. Predictors: (Constant), TMP, WMP, IMP</b>						

Source: Own survey, 2024, SPSS 25.

The ANOVA table in table 4.11 outlined the overall variance explained by the model. If the significance value of the F-ratio statistic is small (less than 0.05), it indicates that the independent variables effectively explain the variation in the dependent variable. The F-ratio, which is the ratio of between-group variability to within-group variability, helps assess whether the group means differ. A higher F-ratio suggests a significant difference between the groups. The ANOVA table confirms that the model's explained variance genuinely accounts for the changes in distribution performance (F-ratio = 40.852;  $P < 0.01$ ). Therefore, the null hypothesis was *rejected*, and the alternative hypothesis was *accepted*, indicating a statistically significant effect at the 0.05 level of significance ( $\alpha$ ) of factors on the distribution performance at EPSS (headquarter).

#### **4.4.2.3. Multiple Regression Analysis**

A multiple regression model is an equation used to explain the results of multiple regression analysis (Abdurezak M. *et al.*, 2014). Regression analysis fits a predictive model to the data, allowing predictions of the dependent variable's values based on one or more independent variables (Andy, 2005). In linear regression, the coefficients of the linear equation are estimated, which involve one or more independent variables that best predict the value of the dependent variable among the three independent variables.

**Table 4.12: Regression Coefficient or Model**

<b>Coefficients<sup>a</sup></b>						
<b>Model</b>		<b>Unstandardized Coefficients</b>		<b>Standardized Coefficients</b>	<b>T</b>	<b>Sig.</b>
		<b>B</b>	<b>Std. Error</b>	<b>Beta</b>		
<b>1</b>	(Constant)	.189	.231		.818	.416
	IMP	.461	.094	.433	4.883	.000
	WMP	.187	.091	.181	2.050	.043
	TMP	.318	.092	.294	3.464	.001
<b>a. Dependent Variable: Distribution performance</b>						

Source: Own survey, 2024, SPSS 25.

To rank and compare the factors affecting distribution performance, the standardized beta coefficients provided a clear picture, with higher values indicating stronger effect. As shown in Table 13, IMP, WMP, and TMP all have a statistically significant positive effect on distribution performance, supported by their respective t-values (4.883, 2.050, and 3.464) and p-values (0.000, 0.043, and 0.001), each well below the 0.05 threshold.

Among these, IMP stands out with the greatest effect, boasting a standardized beta of 0.433, followed by TMP at 0.294, and WMP at 0.181. This ranking underscores the importance of focusing on inventory management to achieve substantial improvements in distribution performance. The positive coefficients across all factors highlight that enhancing practices in these areas directly correlates with better distribution outcomes for EPSS. The multiple regression analysis effectively reveals that strengthening IMP, TMP, and WMP will significantly boost the distribution performance of pharmaceutical products within EPSS (headquarter).

### **Unstandardized Coefficient ( $\beta$ ):**

The unstandardized coefficients from the regression model provide a clear understanding of how each independent variable such as IMP, WMP, and TMP affects distribution performance. These coefficients quantify the expected change in distribution performance for each one-unit change in the independent variables.

The regression equation derived from the analysis is:

$$Y (\text{Distribution performance}) = 0.189 + 0.461 (\text{IMP}) + 0.187 (\text{WMP}) + 0.318 (\text{TMP}) + \text{error}$$

In this equation:

0.189 represents the constant, which indicates that if all other factors (IMP, WMP, and TMP) are absent or zero, the baseline distribution performance of the Ethiopian Pharmaceuticals Supply Service (EPSS) would be 0.189.

0.461 for IMP means that for every one-unit increase in inventory management practices, the distribution performance is expected to improve by 46.1%, making IMP the most affecting factor.

0.187 for WMP indicates that a one-unit increase in warehouse management practices would result in an 18.7% increase in distribution performance.

0.318 for TMP shows that an increase in transportation management practices by one unit would lead to a 31.8% improvement in distribution performance.

Each of these variables is statistically significant, with p-values below 0.05, affirming that they are meaningful predictors of distribution performance. This analysis highlights that improving inventory management yields the greatest gains, followed by transportation and warehouse management, all of which contribute significantly to enhancing distribution performance within the EPSS (headquarter). The equation offers a valuable tool for predicting distribution outcomes based on changes in these key operational areas.

#### 4.4.2.4. Hypothesis test

### Overall Outcome of the Hypothesized Research for hypotheses

H1: Inventory management practices significantly and directly affect distribution performance, with a correlation coefficient of 0.689 ( $p < 0.01$ ). This leads to the *rejection* of the null hypothesis and acceptance of the alternative hypothesis. The Beta value of 0.433 further supports, at  $P < 0.01$ .

H2: Warehouse management practices significantly and directly affect distribution performance, with a correlation coefficient of 0.577 ( $p < 0.01$ ). This leads to the *rejection* of the null hypothesis and acceptance of the alternative hypothesis. The Beta value of 0.181 further supports, at  $P < 0.05$ .

H3: Transportation management practices significantly and directly affect distribution performance, with a correlation coefficient of 0.612 ( $p < 0.01$ ). This leads to the *rejection* of the null hypothesis and acceptance of the alternative hypothesis. The Beta value of 0.294 further supports, at  $P < 0.01$ .

### 4.5. Discussion of Findings

The study aimed to identify and analyze the variables affecting the distribution performance of pharmaceutical products at the EPSS (headquarter), utilizing both descriptive and inferential statistics from SPSS data analysis. The result revealed that:

Inventory Management Practices has the most substantial effect on distribution performance, with a mean value of 2.505 and a standard deviation of 0.480. The key factors causing this influence include emergency requests, longer order processing times, inappropriate resupply intervals, and non-adherence to distribution schedules. Moderately influencing factors such as inaccurate demand forecasting, lack of real-time inventory visibility, poor quality of RRF data, and unnecessary product deliveries also contribute to IMP and require improvement. This strong influence is reflected in the inferential analysis, where IMP shows the highest effect with a standardized beta coefficient of 0.433 and a correlation coefficient of 0.689, both statistically significant at the 0.01 level, indicating a strong positive relationship. Previous research by Netsanet G. (2018) supports these findings, identifying similar challenges in inventory

management such as inaccurate requests, emergency orders and poor demand forecasting. Bowersox et al. (2013) and Chopra and Meindl (2016) further reinforce this by highlighting the critical role of efficient inventory management including real-time visibility and accurate forecasting in minimizing stockouts, reducing lead times, and ensuring timely distribution.

Warehouse Management Practices has a slightly higher mean value of 2.652, indicating a moderate effect on distribution performance, with a standard deviation of 0.4936 showing somewhat consistency in responses. While the presence of qualified personnel (mean = 3.40) is a strength, significant inefficiencies are noted in staff commitment, dispatch efficiency, collaboration between warehouse and distribution teams, and warehouse location. Additional issues include medical handling equipment and warehouse layout design highlight areas that require improvement. The inferential analysis also reveals a standardized beta coefficient of 0.181 and a correlation coefficient of 0.577, statistically significant at the 0.05 level, reflecting a strong positive relationship. These results are corroborated by Van der Meer and Tjahjono (2015), who identified similar issues related to ineffective warehouse processes and poor integration between teams. Koster *et al.* (2014), Netsanet (2018) and PFSA BPR (2017) report also found that inadequacies in warehouse facilities and scattered warehouses significantly affect distribution efficiency, reinforcing the moderate influence of WMP observed in this study.

Transportation Management Practices has a mean value of 2.588 and a standard deviation of 0.473, indicates a high effect and relatively consistent responses. Despite positive views on advanced vehicle technology integration (mean = 3.53), several critical issues affect performance. These include the age of delivery vehicles, limited availability of spare parts, inefficient loading practices, and inadequate vehicle maintenance programs. The lack of a standardized vehicle scheduling and routing tool, insufficient driver training, and ineffective communication between fleet and distribution teams also negatively affect overall efficiency. The inferential analysis shows a standardized beta coefficient of 0.294 and a correlation coefficient of 0.612, both statistically significant at the 0.01 level, reflecting a strong positive relationship. Research by John *et al.* (2012) highlights similar issues in Kenya, emphasizing the impact of inadequate vehicle maintenance and routing on distribution performance. Arvis *et al.* (2018) stresses the importance of vehicle maintenance and route optimization, further supporting the significant role of TMP in enhancing distribution performance as identified in this study.

Overall Analysis: The multiple correlation coefficient ( $R = 0.763$ ) and the coefficient of determination ( $R^2 = 0.582$ ) indicate that 58.2% of the variance in distribution performance is explained by the combination of IMP, WMP, and TMP. This suggests a robust model but also highlights that 41.8% of the variance is due to other factors not covered in this study. This analysis confirms the strong positive relationship between these variables and distribution performance, highlighting their critical roles in improving distribution efficiency

Integrating SCM Theory with relevant frameworks like JIT, TOC, TQM, and Logistics Performance provides a holistic understanding of how inventory, warehouse, and transportation management practices affect distribution performance. By aligning EPSS operations with these frameworks, inefficiencies can be reduced, on time delivery, cost-effective distribution and improved overall performance.

## CHAPTER FIVE

### 5. SUMMARY, CONCLUSION, AND RECOMMENDATION

This chapter provides a summary of the key data findings, the conclusions derived from these findings, and offers recommendations for both the EPSS and the readers. Finally, it also identifies areas for future research.

#### 5.1. Summary of the Findings

As outlined in chapter one, the objective of this study was to identify the factors affecting distribution performance on pharmaceutical products at the EPSS (headquarter).

The findings of this study indicated that inventory management practices (IMP) had the most substantial influence on the distribution performance of pharmaceutical products at the Ethiopian Pharmaceuticals Supply Service (EPSS) headquarters. With a mean score of 2.505 and a correlation coefficient of  $r = 0.689$  ( $p < 0.01$ ). Warehouse management practices (WMP) also played a significant role, yielding a mean score of 2.652 and a correlation of  $r = 0.577$  ( $p < 0.01$ ). Transportation management practices (TMP) were perceived to have a high influence, with a mean score of 2.588 and a correlation of  $r = 0.612$  ( $p < 0.01$ ). The regression analysis revealed a strong relationship ( $R = 0.763$ ) among the variables, with an  $R^2$  value of 0.582, showing that approximately 58.2% of the variance in distribution performance can be explained by these factors. The standardized beta coefficients indicated that IMP had the highest effect (0.433), followed by TMP (0.294), and WMP (0.181), reinforcing the critical need for focused enhancements in these areas to improve distribution performance at EPSS (headquarter).

## 5.2. Conclusions of the Study

The study found that Inventory Management Practices (IMP), Warehouse Management Practices (WMP), and Transportation Management Practices (TMP) all significantly and positively affect the distribution performance of the Ethiopian Pharmaceuticals Supply Service (EPSS).

Inventory Management Practices had the highest influence on distribution performance, with a mean score of 2.505 and a standard deviation of 0.480, reflecting minimal variability in the respondent perceptions. Key issues identified include inaccurate demand forecasting, poor real-time inventory visibility, low-quality RRF data, frequent emergency requests, slow order processing, inappropriate resupply intervals, and failure to adhere to schedules. IMP's strong effect is further supported by the highest standardized beta coefficient (0.433) and the strongest correlation coefficient of 0.689, emphasizing its critical role in driving distribution performance.

Transportation Management Practices has the second highest influence on distribution performance, with a mean score of 2.588 and a standard deviation of 0.473, reflecting relatively consistent respondent perceptions. While advanced vehicle technology is seen positively, challenges including the lack of standardized scheduling and routing tools, poor communication between fleet and distribution teams, aging vehicles, difficulty in obtaining spare parts, inadequate maintenance programs, inefficient loading practices, and inadequate driver training are prevalent. Inferential analysis supports TMP's significant role, with a correlation coefficient of 0.612 and a standardized beta coefficient of 0.294, highlighting its substantial, though secondary, effect on distribution performance.

Warehouse Management Practices showed a moderate influence on distribution performance, with a mean score of 2.652 and a standard deviation of 0.494, reflecting somewhat consistent responses. Positive aspects include qualified personnel, while challenges such as lack of staff commitment, poor warehouse design, ineffective collaboration, malfunctioning equipment, inefficient dispatch processes, and problematic locations negatively impact performance. Inferential analysis indicates a correlation coefficient of 0.577 and a standardized beta coefficient of 0.181, demonstrating a notable but the least strong effect on distribution performance.

The overall distribution performance, with an average mean of 2.663, falls below expectations. Specific inefficiencies were identified in key areas such as on-time delivery, vehicle availability, and distribution costs, with mean values between 1.80 and 2.59, underscoring significant areas in need of improvement. By addressing these challenges comprehensively, EPSS can achieve substantial enhancements in its distribution processes, leading to improved operational efficiency and service delivery.

Moreover, the analysis demonstrated a significant positive and strong relationship between IMP, WMP, and TMP with distribution performance ( $R = 0.763$ ;  $R^2 = 0.582$ ,  $P < 0.01$ ), showing that these factors together explain 58.2% of the variance in distribution performance, leaving 41.8% of the variance attributable to other factors not covered in this study.

In conclusion, inventory management practices have the most significant effect on distribution performance at EPSS (headquarter), followed by transportation and warehouse management practices, respectively. All three factors are statistically significant predictors of performance, emphasizing the need for targeted improvements in these areas to enhance distribution efficiency. Effective enhancements in these practices will not only improve overall service delivery but also contribute to better healthcare outcomes in the country and increased satisfaction among stakeholders and customers.

### **5.3. Recommendations of the study**

The study revealed that inventory management, warehouse management, and transportation management practices have a strong and significant positive effect on distribution performance at EPSS. Therefore, it is recommended that EPSS focus on improving these areas. Specifically:

EPSS should integrate advanced forecasting tools, such as predictive analytics, to improve demand forecasting accuracy. Implementing an advanced inventory management system with real-time tracking capabilities will enhance visibility and help in managing inventory more effectively. Additionally, optimizing order processing workflows and ensuring adherence to resupply schedules can minimize delays and reduce the frequency of emergency requests. These measures will lead to improved distribution performance by ensuring timely deliveries,

minimized cost, and reducing disruptions, ultimately resulting in more efficient and reliable service.

EPSS should provide comprehensive training for warehouse staff to improve their skills and commitment, thereby boosting operational efficiency. Additionally, optimizing warehouse layouts to reduce handling times, enhancing collaboration between warehouse and distribution teams, and investing in or upgrading medical handling equipment will further streamline operations. By addressing scattered warehouse locations and inefficient dispatch processes, EPSS will gain more reliable distribution outcomes, reduced delays and cost, and improved service quality, ultimately supporting better healthcare delivery.

EPSS should revise implement a standardized vehicle scheduling and routing system to optimize delivery routes, reducing delivery times and costs. EPSS should also improve communication between fleet and distribution teams to ensure smoother operations and better coordination. Investing or upgrading to newer vehicles and establishing a robust maintenance program will minimize downtime and repair costs. Additionally, targeted training for drivers on efficient loading practices and vehicle operation will enhance transportation efficiency. By making these improvements, EPSS will gain more reliable deliveries, lower operational costs, and improved overall distribution performance.

EPSS should focus on strategies to enhance on-time delivery by streamlining logistics and reducing delays. Ensuring better vehicle availability through effective fleet management and reducing distribution costs by optimizing routes and processes will contribute to overall performance improvements. By implementing these strategies, EPSS will gain operational efficiency and achieve better service delivery. Regular performance reviews and adjustments to distribution strategies will help EPSS meet and exceed performance expectations, leading to enhanced operational success and service excellence.

EPSS should develop an integrated approach that aligns inventory management, warehouse operations, and transportation processes by using theories. By creating cross-functional teams to foster better coordination and communication between these areas, EPSS will address the root causes of inefficiencies. Resolving these inefficiencies will enhance overall performance and

contribute to improved distribution outcomes. By implementing this approach, EPSS will gain operational excellence and achieve more efficient and effective distribution practices.

### **Limitation of the Study**

It is vital to highlight that this study is limited to the EPSS headquarter distribution system and does not cover the entire pharmaceutical distribution network, including the various hubs and regions throughout Ethiopia. Additionally, the study does not address all factors influencing distribution success at EPSS. The study used a cross-sectional approach, capturing data at a single point in time, which may not fully reflect the dynamic nature of distribution performance. Limitations also include constraints related to reference materials, and the generalizability of the findings to other contexts.

### **Suggestion for future research**

This study did not examine all factors influencing distribution performance at EPSS, headquarter. Future research should consider additional factors, such as geographical challenges, poor infrastructure, information technology, political influences, and legal mandates affecting the organization. These factors may play a critical role in distribution performance but were not covered in this study. The list is illustrative rather than exhaustive. Moreover, this study focused solely on EPSS's distribution practices at the head office in Addis Ababa. Future research should expand to include all EPSS hubs, health facilities, and private pharmaceutical distributors both within and outside of Addis Ababa. This broader scope will allow for better generalization of results and a more comprehensive understanding of distribution performance across the entire country.

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## ANNEX.

### 1. Research Instrument/ Questionnaire

**ADDIS ABABA UNIVERSITY, COLLEGE OF BUSINESS AND ECONOMICS  
SCHOOL OF COMMERCE DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN  
MANAGEMENT**

**Dear Sir/Madam,**

My name is Bereket Dansa. I am student in the graduate school of Addis Ababa University, College of Business and Economics, School of Commerce. I am currently conducting an academic research on the factors affecting distribution performance for the pharmaceutical products: the case of Ethiopian Pharmaceutical Supply Service to fulfill the partial requirement for the Master of Logistics and Supply Chain Management (MA). I want to express my sincere gratitude to your organization and you for your cooperation and enthusiasm in taking part in this important study. Your participation is voluntary and you can withdraw at any time without penalty. Throughout the survey your privacy will be protected and your participation will remain confidential. I do not wish to analyse data individually and all the data will be transferred to a computer programme to analyse the entire group. This means that you are assured of anonymity.

If you agree to participate, please complete the survey that follows this cover letter. It would take about 15 - 20 minutes of your time at the most.

- No need of writing your name
- Indicate your answer with a checkmark (✓) on the appropriate block/cell for both multiple choice and Likert scale questions.
- If you have any concerns, please contact me through +251-921-00-2371 or bereketdansa@gmail.com.

Thank you in advance for your cooperation!

**Part I: General Information and Demographic background of respondents**

Please mark ✓ for your appropriate choice.

1. Gender: Male  Female

2. Age

Less than 25 years

37-47 years

26-36 years

Above 48 years

3. Educational qualification

Diploma

Masters

Degree

PhD

Specify others -----

4. How long have you been working in the organization?

Below 3 years

7-10 years

3-6 years

Above 10 years

5. In which directorate are you working currently?

Warehouse and Inventory Management

Distribution And fleet Management

6. What is your job position?

Officer

Advisor

Team leader

Director

If other, please specify-----

**PART II: Performance Factors**

Please use tick mark (√) to what extent you agree on the following statements under each category using Five-point Likert scale from 1 to 5 as given below:  
**Where; 1 = Strongly Disagree(SD), 2 = Disagree(D), 3 = Neutral(N), 4 = Agree(A), 5 = Strongly Agree (SA).**

<i>Statements</i>		<i>Score</i>				
<b><i>Inventory management practices</i></b>		<i>1(SD)</i> )	<i>2(D)</i>	<i>3(N)</i> )	<i>4(A)</i> )	<i>5(SA)</i> )
<b>1</b>	EPSS applies accurate demand forecasting to meet customer demand.					
<b>2</b>	EPSS allows for real-time visibility of inventory throughout the supply chain.					
<b>3</b>	Hub-sent report and requisition form (RRF) data is of excellent quality.					
<b>4</b>	Hubs or customers did not frequently send emergency requests.					
<b>5</b>	Current order processing in EPSS requires less time to complete.					
<b>6</b>	Resupply intervals is appropriate.					
<b>7</b>	The inventory management teams consistently adhere to the predetermined schedules set by the distribution teams.					
<b>8</b>	EPSS always deliver exactly needed products to hubs or customers.					
<b><i>Warehouse management practices</i></b>		<i>1(SD)</i> )	<i>2(D)</i>	<i>3(N)</i> )	<i>4(A)</i> )	<i>5(SA)</i> )
<b>1</b>	Warehouses have enough qualified people to efficiently handle pharmaceutical delivery.					
<b>2</b>	Warehouse workforces are committed to work to effectively manage distribution activities.					
<b>3</b>	In EPSS warehouses, there is a well-designed warehouse layout.					
<b>4</b>	There is effective collaboration between the warehouse and distribution teams to increase shipping efficiency.					

5	The medical handling equipment at EPSS warehouses is well functional.					
6	The current dispatch process is efficient.					
7	The geographically dispersed location of EPSS warehouses has delayed product timely delivery.					
<b>Transportation management practice</b>		1(SD )	2(D)	3(N )	4(A )	5(SA )
1	EPSS has a standardized tool for vehicle scheduling and route planning.					
2	There is effective communication between EPSS fleet and distribution teams to increase overall distribution efficiency.					
3	All vehicles in EPSS are integrated with advanced technology, like GPS.					
4	The bulk of EPSS's delivery vehicles are less than 5 years old.					
5	Spare parts for vehicles are readily available on the market.					
6	There is efficiency in loading the trucks to their optimum capacity due to accurate volumetric measurements.					
7	The vehicle maintenance program of EPSS ensures the availability of the delivery vehicles.					
8	Drivers are well-trained enough to successfully distribute pharmaceutical supplies.					

**Part III. Distribution Indicators**

This section of the questionnaire is designed to gather information on your level of agreement with the statement on the Distribution Performance indicators of pharmaceutical products: The Case of EPSS.

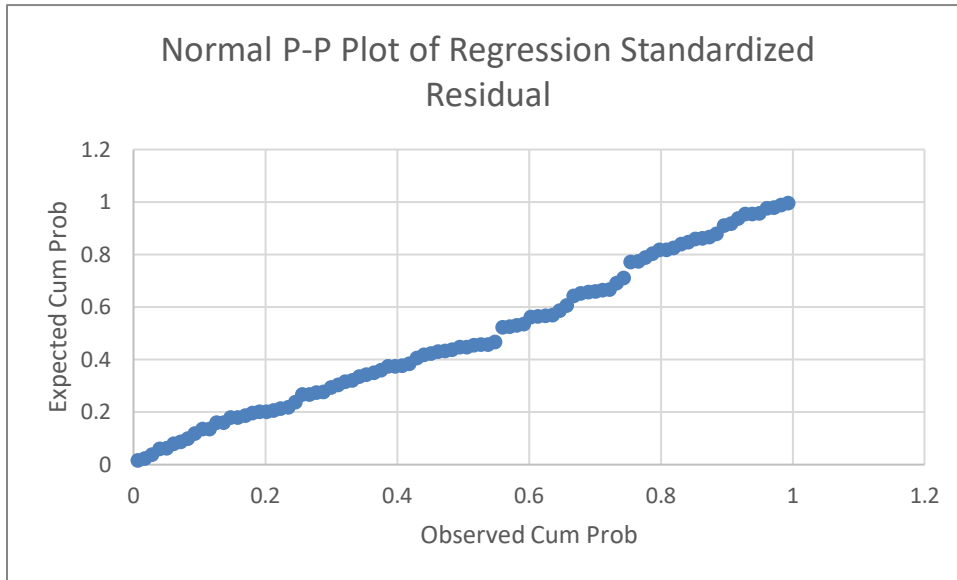
Please indicate ✓ to what extent you agree on the following statements under each category using **Five-point Likert scale** as given below.

		1(SD )	2(D)	3(N )	4(A )	5(SA )
<b>On time delivery indicator</b>						
<b>1</b>	Shipments from EPSS are delivered to the intended hubs/facilities on the scheduled date.					
<b>Average delivery time indicator</b>		1(SD	2(D)	3(N	4(A	5(SA
<b>1</b>	The average time between dispatching and receipt is within the agreed-upon service level agreements.					
<b>Vehicle availability indicator</b>		1(SD	2(D)	3(N	4(A	5(SA
<b>1</b>	A vehicle is ready as soon as it requested for distribution purpose.					
<b>Distribution cost indicator</b>		1(SD	2(D)	3(N	4(A	5(SA
<b>1</b>	The distribution costs for pharmaceutical deliveries are reasonable.					
<b>Proof of delivery (POD) indicator</b>		1(SD	2(D)	3(N	4(A	5(SA
<b>1</b>	Hubs/healthcare facilities consistently provide proof of delivery (POD) documentation for all pharmaceutical deliveries.					

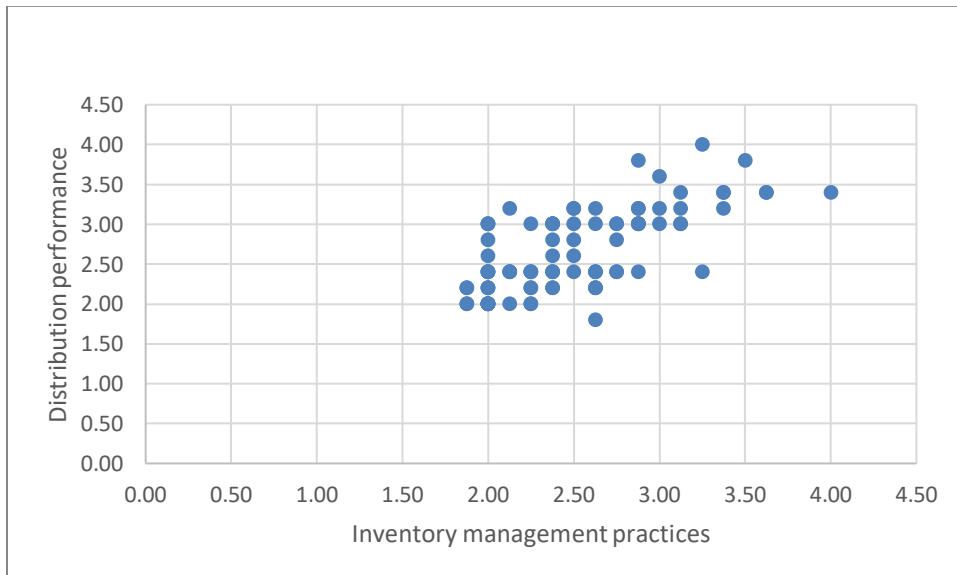
**Thank You for Taking Your Precious Time to Complete This Questionnaire!**

## 2. Figures

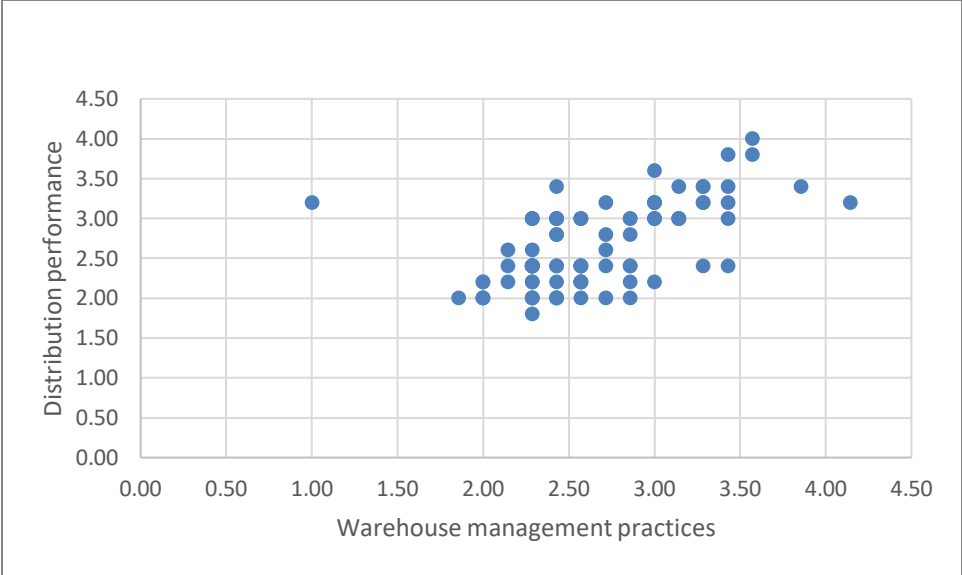
### Normality test



### Linearity Test for IMP and DP



**Linearity Test for WMP and DP**



**Linearity Test for TMP and DP**

