

**THE QUALITY OF PHYSICAL DISTRIBUTION SERVICE AT
THE ETHIOPIAN PHARMACEUTICAL SUPPLY SERVICE
USING A MIXED-METHODS APPROACH: A CASE OF DIRE
DAWA BRANCH**



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This is to certify that the thesis prepared by Saron Alemayehu, entitled: The quality of physical distribution service at the Ethiopian pharmaceutical supply service using a mixed method approach: a case of Dire Dawa Branch and submitted in partial fulfillment of the requirements for the Degree of Master of Science in Health Supply Chain Management complies with the regulations of the University and meets the accepted standards concerning originality and quality.

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The quality of physical distribution service at the Ethiopian pharmaceutical supply service using
a mixed method approach: a case of Dire Dawa Branch

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Abstract

Background - Customer satisfaction is one of an agile supply chain's most commonly utilized key performance metrics. In low- and middle-income nations, inefficient distribution practices directly drive-up costs, resulting in medicine stock-outs. Studying distribution service quality in Ethiopia's health sector is vital for improving health-care services and implementing national health-care quality strategies.

Method - The study was conducted at Ethiopian pharmaceutical supply service (EPSS) Dire Dawa Branch and 56 health facilities in East Hararghe, West Hararghe, Harari region, Somali, and Dire Dawa from Dec 1, 2023 - Jan 30, 2024. An institution-based cross-sectional study with a concurrent mixed method approach was conducted to assess health facilities' satisfaction with the physical distribution service of EPSS using the physical distribution service quality model (PDSQ), which compares customers' expectations with the perception to generate a gap score and measure service quality. The study also identified service challenges in the EPSS Dire Dawa branch using key informant interviews. A stratified random sampling proportionate to size technique was applied to select hospitals and health centers from the four regions under the catchment of EPSS Dire Dawa Branch, and purposive sampling was used to select key informants.

Result- The study revealed that expectation measurement ranges from 4.34 - 4.79 for program commodities and 4.38 - 4.82 for RDF commodities, indicating high expectations in both cases. The mean perception value for all four dimensions (Availability, Timeliness, product quality and responsiveness) ranges from 2.49 - 3.85. The gap score for all four dimensions is negative in both health commodity types, ranging from -0.69 to -2.34, which indicates the physical distribution service quality is perceived as low. The mean Gap score for availability was -2.03 and -2.11 in both program and RDF commodities respectively. Regarding the indirect measure of customer satisfaction, the gap score for all four dimensions is negative. It should be noted that the physical distribution service public health facilities receive from EPSS is less satisfactory. The direct measurement of customer satisfaction shows that health facilities have a good level of satisfaction with the condition of health commodities delivered, average satisfaction with timeliness of delivery, and responsiveness. The lowest satisfaction level was attained with the availability of products. The study also indicated that there was a significant difference in

customer satisfaction between RDF and the program distribution system regarding the availability of health commodities ($\chi^2 = 13.08$, $df=4$) and (P value = 0.004). Regarding challenges of the physical distribution service transportation challenges with the RDF distribution system, poor availability of pharmaceuticals, prolonged order cycle time, lack of supervision, and budget shortage are the main challenges faced by health facilities. Key informants from EPSS Dire Dawa branch indicated poor data quality, delay in replenishment from central EPSS, and lack of vehicle as challenges of the distribution service it provides.

Conclusion- Logistics customer service quality measurement is essential to meet customer requirements. The study found that the physical distribution service of EPSS, Dire Dawa branch, sub-optimal regarding all the physical distribution quality model dimensions, availability of health commodities, timeliness, product quality, and responsiveness.

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I.

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Abbreviations and Acronyms

APICS - American Production and Inventory Control Society

CHWs - Community health workers

CMS - Central Medical Store

EPSS - Ethiopian Pharmaceutical Supply Service

ES - Expected service

HF - Health facilities

LIAT- Logistics Indicator Assessment Tool

LMICs - Low- and middle-income countries

LMIS- Logistics management information system

LSQ- Logistics service quality

OECD- Organization for Economic Co-operation and Development

PDM - Physical distribution management

PDS- Physical distribution service

PDSQ- Physical distribution service

PDSQ- Physical distribution service quality

PS - Perceived service

SDP - Service delivery point

SQ - Service quality

SWOT- Strength, weakness, opportunity, and threat

UHC- Universal health coverage

USAID- United States Agency for International Development

1.INTRODUCTION

1.1 Background

Logistics management is the branch of supply chain management that organizes, executes, and governs the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption. Distribution is a logistics function that involves delivering and storing goods from the supplier stage to the customer stage of the supply chain. Physical distribution, also known as distribution, is the materials management sub-function most directly associated with finished items (Chopra and Meindl, 2020; Magad and Amos, 1989; Embrey and Martha, 2014).

The primary goal of distribution management, as a basic activity of health logistics, is to deliver an adequate and consistent supply of pharmaceuticals and supplies to facilities where they are required while also ensuring that resources are used efficiently. The pharmaceutical distribution cycle begins with the manufacturer or supplier dispatching medications and finishes with the procurement unit receiving drug consumption data. A health logistics system's goal is much broader than simply guaranteeing that a product reaches at its destination. The major purpose is to ensure that the health service delivery point (SDP)—the location where the patient accesses health services—is never without the items required for these services, thereby ensuring commodity security for every client (USAID, 2011; Embrey and Martha, 2014; Allain et al., 2010).

The public health sector's distribution networks can take numerous forms, one of which is a hierarchical network of warehouses at the central, regional, and/or district levels connected by transportation links. Allocating inventories and transporting items between facilities are essential components of this distribution system. The majority of governments in low-income countries, particularly in Sub-Saharan Africa, have adopted a distribution model in which the government purchases medications and distributes them to health clinics via a publicly operated Central Medical Store (CMS) and a government-owned transportation fleet. Health service delivery stations include health clinics, hospitals, and health posts. These facilities, which can be found in both urban and rural locations, act as customers for supply chains. Their requirements differ significantly (Yadav, 2015; Allain et al, 2010).

Studying service quality and customer satisfaction in the pharmaceutical and health sectors is crucial for improving health-care services, enhancing patient outcomes, ensuring access to quality medicines, preventing substandard products, and achieving business success. Parasuraman, Zeithaml, and Berry (1985) stated that service quality is a measure of how well the service level delivered matches customer expectations. Customer satisfaction is one of the most commonly utilized key performance metrics in an agile supply chain. Retailers' satisfaction and physical distribution service of distributor are closely related concepts, as the quality of the physical distribution service can affect the retailer's perception and evaluation of the distributor's performance. Therefore, improving service quality is the best way to achieve client satisfaction. In addition to making the best use of limited resources, responding quickly to changing customer needs is vital to enhancing service quality and ensuring customer happiness. Customers will be most delighted when they receive items from the agency on a continuous and predictable basis, as well as when they receive optimal products and amounts (Chen, Hsu, and Lee, 2019; Lu, 2011; Xing et al. 2010; Parasuraman, Zeithaml, and Berry 1985).

The importance of customer satisfaction is well established, but the satisfaction of health facilities with the distribution service of the Ethiopian Pharmaceutical Supply Service (EPSS) Dire Dawa Branch has not been evaluated. Therefore, this study aims to measure the satisfaction level of health facilities supplied by the EPSS, Dire Dawa branch and identify the challenges faced by the service.

1.2 Statement of the problem

Service quality in the context of pharmaceutical physical distribution refers to the extent to which the services provided by logistics companies meet the needs and expectations of customers in the pharmaceutical industry.

Access to medicines is a necessary component of fully realizing one's right to health. Medical care, as well as disease prevention, treatment, and control, rely heavily on the timely and appropriate availability of quality drugs. Despite advances, many people continue to lack access to crucial medicines. This is due to the barriers that prevent poor countries from getting high-quality, low-cost, and timely medicines. Lack of access to pharmaceuticals perpetuates a cycle of suffering and misery, from mothers dying during childbirth through deaths from diseases that may be easily and reasonably treated (Chan, 2017; UN, n.d.).

The importance of the health supply chain in achieving universal health coverage (UHC) has been demonstrated. Physical distribution management (PDM) is increasingly acknowledged as an important aspect of comprehensive supply chain management. In low- and middle-income nations, inefficient distribution practices directly drive-up costs and result in medicine stock-outs (Mistary, 2020; WHO, OECD, and The World Bank, 2019; Buckley, 2013).

An investigation of medical supply chains in Sub-Saharan Africa revealed that the execution of supplies to health centers that run according to plan is scaled at a 70% difficulty rate. The hurdles of maintaining on-time distribution include delivery scheduling constraints, external factors, vehicle fleet availability, and financial planning. A systematic literature review focusing on low- and middle-income countries (LMICs) among community health workers (CHWs) found that distribution constraints were the most frequently mentioned reasons for stock-outs, which impacted patients by requiring out-of-pocket spending to purchase unavailable medicines, leading to poor adherence to medication regimens, discontent, and low service utilization (Olaniran et al., 2022).

Despite increased service accessibility, uneven distribution of health resources and a lack of essential health commodities and equipment at service delivery points remain major challenges contributing to high rates of neonatal mortality, according to the Ethiopian health sector transformation plan report. Without products and non-drug consumable materials, health facilities are unable to serve their patients and clients; as a result, countries are unable to attain adequate health outcomes for their populations. According to a systematic review of vital medication availability in Ethiopia, Ethiopia's average national availability of vital pharmaceuticals is currently below WHO guidelines, with a longer stock-out period (Tewuhibo, Asmamaw, and Ayenew, 2021; Minister of Health of Ethiopia, 2021).

According to the service's strengths, weaknesses, opportunities, and threats (SWOT) analysis, "poor distribution planning and fleet management" is one of the service's shortcomings (EPSS, 2019).

The distribution service in the health care system plays a crucial role. However, health facilities often face challenges with their pharmaceutical suppliers' physical distribution services. Some concerns raised by facilities include product availability, responsiveness, and communication with EPSS. Until 2019, the EPSS lacked a proper customer satisfaction and feedback tracking

mechanism to assess customer happiness with the organization's products, services, and capabilities. A study on pharmaceutical logistics service performance found that customers are most satisfied when they receive items from the agency consistently and dependably, along with optimal products and quantities. These issues emphasize the need for improvements in the physical distribution process to ensure health facilities' satisfaction with their pharmaceutical suppliers' services (USAID 2023; Gizaw, Bogale, and Gudeta, 2021).

The consequences of poor physical distribution service and poor customer satisfaction in the health sector can be far-reaching. In terms of physical distribution, it can lead to inefficient supply chains, delays in delivering medical supplies, and increased costs. These issues can negatively impact patient care, as timely access to medical supplies is crucial for effective treatment (Johnston,1991).

Based on the provided text, the study aims to evaluate the satisfaction of health facilities with the physical distribution service offered by the EPSS, Dire Dawa branch. It also intends to identify obstacles faced by health facilities in meeting their customers' expectations. The study is motivated by the numerous issues and challenges faced by the distribution service of EPSS, which impact access to medicine throughout the country. Previous studies have focused on customer satisfaction in other parts of the country, providing a general view of the logistics service but failing to address physical distribution, which is directly related to customers. This study aims to fill this knowledge gap and provide an in-depth understanding of service quality and health facilities' satisfaction with the distribution service which ultimately guide the area of intervention to enhance service quality and health facilities' satisfaction.

1.3. Significance of the Study

This study's findings will provide insight to stakeholders at all levels of the health sector and donors on the state of physical distribution service quality and health facilities' satisfaction with their primary supplier, EPSS's distribution service. It will also help to understand how well the organization is functioning according to customers' perceptions and how to improve service delivery performance and relationships with them.

Furthermore, improving customer satisfaction is one of the quality objectives of the Ethiopian pharmaceutical supply service's Dire Dawa branch for the fiscal year 2015 E.C. As a result, this

study will assist in determining the degree of satisfaction of its customers with the distribution sector of the supply chain and identifying the service difficulties that are impeding its capacity to meet the expectations of health institutions.

1.4 Scope of the study

The study is restricted to only EPSS Dire Dawa Branch, public/private hospitals, and health centers and woredas found in the Harari region, Oromia (East and West Harerghe zone), Dire Dawa city administration, and Somali region (Sitti zone). Each health facility was asked questions about the service quality and satisfaction level. Moreover EPSS Dire Dawa branch and regional /zonal health bureau supply chain officers were interviewed on the challenges of distribution service. The dimensions of physical distribution service quality were limited to availability, timeliness, product quality and responsiveness.

1.5 Research questions

The research addressed the following basic questions:

1. What is the physical distribution service quality of the program and revolving drug fund (RDF) products at EPSS, Dire Dawa branch?
2. How satisfied are health facilities with the physical distribution service of the Ethiopian pharmaceutical supply service, Dire Dawa branch, in terms of *availability, timeliness, quality of delivery, and responsiveness*?
3. Is there a difference in physical distribution service quality and customer satisfaction levels between the program and RDF products?
4. What are the challenges of physical distribution service at the Ethiopian pharmaceutical supply service, Dire Dawa branch?

2. LITERATURE REVIEW

2.1 Overview of physical distribution

The concept of physical distribution evolved in the 1960s and 1970s, when it became evident that distribution was a valid administrative function. This involved recognizing that a number of interconnected physical operations, including as transport, storage, material handling, and packing, might be integrated together and managed more efficiently. The 1970s were a pivotal decade in the evolution of the distribution concept. Several firms recognized the significance of incorporating distribution into an organization's functional management structure, which was a significant shift (Croucher, 2021).

According to the APICS Dictionary, physical distribution is “the activities associated with the movement of material, usually finished goods or service parts, from the manufacturer to the customer. These activities encompass the functions of transportation, warehousing, inventory control, material handling, order administration, site and location analysis, industrial packaging, data processing, and the communications network necessary for effective management. It includes all activities related to the physical movement of goods from raw material sourcing to the final distribution of finished goods. ” (Blackstone, 2013).

Physical distribution involves delivering the right product to the right customer at the right time, in the right condition, and for the right price. The flow of material or product, interrupted at various points by periods when the material or product is stationary, may be considered key aspects of a physical distribution structure. Stationary periods are commonly utilized for storage or to accommodate product modifications such as manufacture, assembly, packing, and break-bulk. This flow often incorporates some form of product transportation, as physical distribution is in charge of both inbound and outgoing transportation (Croucher, 2021; Magad and Amos, 1989).

There are two methods for moving supplies between the warehouse and the receiving facility: collection and delivery. In the case of a collection system, the receiving facility is in charge of retrieving items from the warehouse. The warehouse in a delivery system is responsible for delivering products via in-house conveyance, a private-sector contract, or a combination of both. Another way to look at it is that distribution schemes define which levels of the system order

medicines and which, if any, passively receive medicines delivered from higher levels. The two basic alternatives are the pull system, in which each level of the system determines what types and quantities of medicines are required and places orders with the supply source, and the push system, in which supply sources at some level of the system determine what types and quantities of medicines will be delivered to lower levels (Embrey and Martha A, 2014).

In the context of the pharmaceutical supply chain, physical distribution becomes even more critical. The pharmaceutical supply chain is changing rapidly due to various forces such as health care reform, global trade tensions, cyber attacks, and global pandemics. These forces are transforming the way biopharmaceutical medications are purchased, distributed, and sold throughout the supply chain (Rossetti, Handfield, and Dooley, 2011).

2.2 Ethiopian Health Physical Distribution Service

Ethiopia's health service has been restructured into a three-tier system, with primary, secondary, and tertiary levels of care. The primary level of care includes primary hospitals, health centers, and health posts. General and specialized hospitals are categorized under secondary and tertiary levels, respectively (World Health Organization and Research, 2017).

The public health care facilities in Ethiopia are primarily supplied by the Ethiopian Pharmaceuticals Supply Service (EPSS). EPSS is a governmental pharmaceutical procurement and supply agency established by Proclamation Number 553/2007. Its mission is to supply quality-assured pharmaceuticals to public health facilities at an affordable price in a sustainable manner. It provides a revolving drug fund (RDF) as well as program commodities (those of HIV, TB, malaria, and family planning) (EPSS, 2019).

In EPSS, distribution involves order management and fleet management via direct and indirect delivery methods. Direct delivery sites receive program medications directly from EPSS hubs, while non-direct delivery sites obtain items from EPSS hubs through Woreda Health Offices (WoHOs). EPSS has started providing program goods directly to many health facilities, including all hospitals and "accessible" health centers, since March 2012. As a stopgap measure, the remaining health centers are getting their supplies from their respective Woredas or zonal health offices (EPSS delivers to those). Every two months, hospitals and health centers report and order program medications, which are then provided directly or indirectly by EPSS to these

facilities. Pharmaceuticals, health centers, and hospitals will complete RDFs according to the facilities evaluation period, which might be every two months, quarter, or six months, and collect products from associated EPSS branches (A Shewarega et al., 2015; EPSS, 2015).

2.3 Service Quality

Measuring how well the service level provided meets customer expectations is referred to as service quality (SQ). Customers buy services to meet specific needs, and they have certain standards and expectations for how a company's service delivery meets those demands. As a result, service quality can be described as consumers' assessment of the excellence and superiority of the service received. It refers to a service that meets the expectations and needs of customers. (Khoo, 2020; Prakash, 2019; Roy et al. ,2015).

Lennora Putit, Abd Karim, and Zainuddin (2011) examined the relationship between service quality and customer satisfaction in the B2B pharmaceutical and health care industries. The study found that all five characteristics of service quality—tangibility, reliability, assurance, responsiveness, and empathy—had a significant impact on customer satisfaction. Reliability was determined to have the strongest influence on customer satisfaction. Several management implications were identified, including marketers' consistency in offering services to their corporate clients (Lennora Putit , Abd Karim, and Zainuddin, 2011).

2.3.1 SERVQUAL and Gap Model of Service Quality

The first stages in improving service quality and meeting consumer expectations are to identify gaps and develop remedies. Closing the Gaps may increase customer happiness, loyalty, long-term value, and retention. In 1985, Parasuraman and his colleagues created a model for analyzing service quality that identified five inconsistencies or gaps that could affect expected service, as well as 10 aspects utilized by consumers to build their expectations about a perceived service, which functioned as a foundation stone. Further studies conducted by the same group of researchers in 1988 and 1991 resulted in SERVQUAL, a 22-item questionnaire regarded trustworthy and valid to assess customer insight and perception, which was then improved to operate as a better diagnostic instrument for finding the gaps (Parasuraman, Zeithaml, and Berry, 1988 ; Parasuraman, Zeithaml, and Berry, 1985; Parasuraman, Berry and Zeithaml, 1991). Among the five gaps, four of them are on the marketer side;

GAP 1: Customer expectation-management perceptions gap, **The Knowledge Gap.**

GAP 2: Management perception-service quality specifications gap, **The Policy Gap.**

GAP 3: Service quality specifications-service delivery gap, **The Delivery Gap.**

GAP 4: Service delivery-external communications gap, **The Communications Gap.**

The fifth Gap is on the consumer side;

GAP 5: Expected service-perceived service gap, **The Service Quality Gap.**

The measurement instrument of SERVQUAL, which was developed to measure this gap (GAP 5), gave an advantage to this model in measuring, understanding, and improving the service quality. Based on insights from Parasuraman (1985), perceived service quality is further posited to exist along a continuum ranging from ideal quality to unacceptable quality, with some point along the continuum representing satisfactory quality. The position of a consumer's perception of service quality on the continuum depends on the nature of the discrepancy between the expected service (ES) and perceived service (PS).

- When $ES > PS$, perceived quality is less than satisfactory and will tend toward totally unacceptable quality, with increased discrepancy between ES and PS;
- When $ES = PS$, perceived quality is satisfactory;
- When $ES < PS$, perceived quality is more than satisfactory and will tend toward ideal quality, with an increased discrepancy between ES and PS.

Studies on measuring the SQ of distribution logistics are dominated by the SERVQUAL instrument quality (Parasuraman, Zeithaml, and Berry, 1988) ; Parasuraman, Zeithaml, and Berry, 1985). Parasuraman, Berry and Zeithaml, 1991).

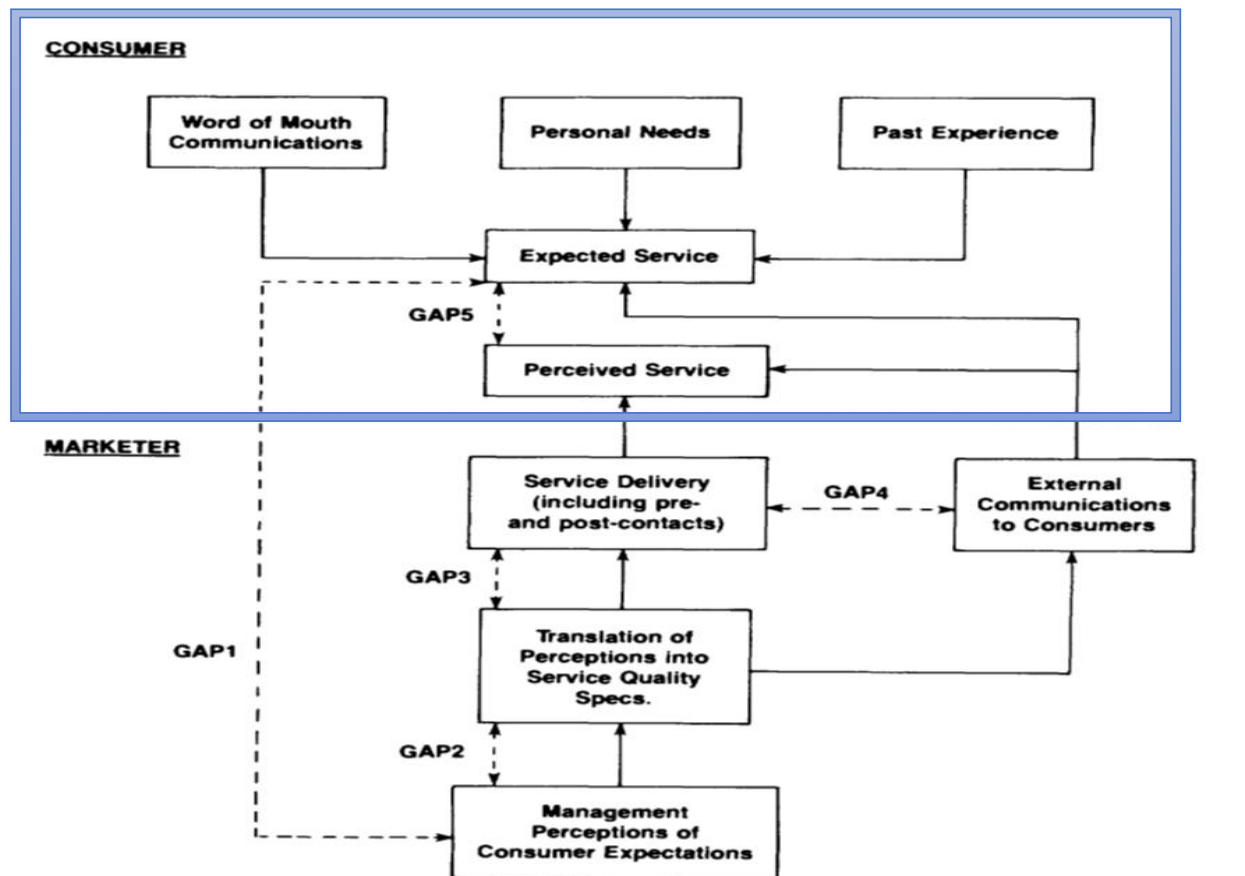


Figure 1. Gap analysis of the service quality model, January 2024

(Parasuraman, Zeithaml, and Berry, 1985)

A study evaluated the quality of service in the pharmaceutical industry for the purposes of improvement using the SERVQUAL method, a tool – a survey conducted among 30 companies from the pharmaceutical industry, customers of the researched operator. A statistical evaluation of results was performed as a part of subsequent statements in the expectations and perception section, along with their comparative analysis intended to determine the size of gaps. Application of the SERVQUAL method to assess the quality of services provided allows identifying any weak quality features and dimensions and provides a basis to set a direction for the improvement activities (Knop, 2019).

2.4 Measuring Physical Distribution Service Quality (PDSQ)

According to Mentzer, Gomes, and Krapfel, Jr. (1989), the major dimensions of physical distribution service (PDS) are availability, timeliness, and quality. These dimensions can be

represented by the following indicators; consistent delivery, lead time, average delivery time, order cycle time reliability, minimum order cycle time for the timeliness dimension; in-stock rate and % orders, units, and lines filled for availability and minimum damage in transit, and order-filling accuracy for the quality dimension (Mentzer, Gomes, and Krapfel, 1989).

Although Parasuraman, Zeithaml, and Berry (1985) developed the popular service quality model (SERVQUAL), Bienstock, Mentzer and Bird (1997) argued that there are difficulties encountered in replicating SERVQUAL's dimensions due to the poor predictive validity demonstrated by SERVQUAL in an industrial business to business context and the overwhelming emphasis on technical or outcome criteria in the physical distribution literature (order cycle times, percentage of orders filled, incidence of items arriving damaged), while the SERVQUAL dimensions are mainly process based criteria. Following that, Bienstock, Mentzer, and Bird (1997) offered an alternative conceptualization of PDSQ dimensions, which are availability, timeliness, and condition, after conducting a series of validity and reliability tests. Furthermore, Parasuraman et al., 1985 stated that customers' quality rating is dependent not only on the product of service but also on the procedures of service delivery. To obtain a more complete explanation of industrial customers' purchasing patterns, Bienstock, Mentzer, and Bird (1997) recommended that PDSQ researchers combine the outcome dimensions (availability, timeliness, and condition) with process dimensions (responsiveness and assurance) (Parasuraman et al., 1985; Bienstock, Mentzer, and Bird, 1997).

(Ramanathan & Karpuzcu, 2011) made an effort to tailor SERVQUAL to distribution service quality, primarily through a literature survey on physical distribution service and personal observations, and proposed seven dimensions for measuring the service quality of a pharmaceutical wholesales in general, and Nevzat Pharmaceutical Wholesaler in particular. Reliability, responsiveness, adaptability, availability, assurance, personnel interaction quality, and tangibles are the seven dimensions (Ramanathan and Karpuzcu, 2010).

This study will primarily employ the PDSQ tool produced by Bienstock, Mentzer, and Bird (1997), as well as the tool developed (Ramanathan and Karpuzcu, 2011) to combine the process dimension (responsiveness).

2.4.1 Availability

One dimension of distribution service quality is stock availability. The proportion of units, order lines, or orders filled is referred to as availability. One of the major indicators of a supply chain's responsiveness is the level of product availability, often known as customer service level. A supply chain can leverage a high level of product availability to boost its responsiveness and attract customers, resulting in increased income. Unavailable products must be back-ordered, resulting in time delays and additional expenses, or the order is canceled by the client. Indicators such as in-stock rate and % orders, units, and lines filled can be used to illustrate the availability dimension. Notably, the availability benefit is supplied anytime the consumer is not compelled to wait an unusually long period of time or to re-place the order. Thus, an order sent to an out-of-stock location that is promptly filled from another site does not result in a reduced availability level from the customer's perspective. From a retail standpoint, availability is offered if the product is on the shelf for purchase when the customer arrives to get it. Stock availability, according to the literature, is an important aspect of customer service. Out-of-stock products can result in lost revenue, backorder fees, delayed cash flow, and lost consumers. This can have a detrimental impact on consumer satisfaction. Research in Kenya estimated that stock outs of essential malaria drugs at public clinics led to an average of \$0.74 in additional costs per patient, as well as productivity losses of \$1.87 per patient due to missed work and school. Another study in Mozambique calculated that stock outs of HIV/AIDS medicines at public facilities resulted in an average of \$4.60 in additional out-of-pocket costs per patient, along with increased risk of HIV disease progression and transmission. The Ethiopian pharmaceutical supply service targets meeting 95% of health facility demand. (Ranjan and Puri, Njagi et al, 2018; Candrihno et al, 2019 2012; Mentzer, Gomes, and Krapfel, 1989; Chopra and Meindl, 2020; EPSS, 2018).

2.4.2 Timeliness

According to a comprehensive literature review by Mentzer et al. (1989), timeliness is one of the three major dimensions of physical distribution service (PDS). Timeliness is the order cycle time performance of the entire distribution system linking buyers and sellers. For the buyer, it is the time elapsed between placing and receiving an order. Timeliness encompasses the duration of one order cycle for a single customer as well as the central tendency and variability across multiple order cycles for one or more customers. It can be measured with consistent delivery,

lead time, average delivery time, order cycle time reliability, and minimum order cycle time. Satisfaction should be driven by the timeliness of orders received and how discrepancies are handled. These expectations may affect customer satisfaction in the logistics service delivery process. Timeliness is an important factor in customer satisfaction. Timely delivery of products and services can enhance customer satisfaction and loyalty. Studies also confirmed the impact of lead time on customer satisfaction. (Darko et al., 2018; Villarreal and Salido, 2011; Gizaw, Bogale, and Gudeta. (2021; Mentzer, Flint, & Hult, 2001).

2.4.3 Product Quality/condition

The quality of physical distribution service is determined by the frequency of in-transit damage, wrong shipment of commodities, and erroneous shipment quantity. The percentage of how effectively shipments match customer expectations is known as quality of service. Quality is the most diverse of the constructs, yet it continues to be a distinct area of customer value, firmly inside the PDS domain. It should be highlighted that shipment to the incorrect site has a greater impact on timeliness than quality because the items can probably be diverted to the correct destination, albeit late. Quality can be measured using indicators such as minimum damage in transit and order-filling accuracy (Ross, 2004; Mentzer, Gomes, and Krapfel, 1989).

2.4.4 Responsiveness

The willingness to assist clients and deliver prompt service is referred to as responsiveness. This dimension is concerned with the attitude and promptness with which customers make requests, queries, complaints, and difficulties. It also emphasizes the employees' or staff's timeliness, presence, professional devotion, and so forth. It is based on the amount of time clients wait for support, replies to inquiries, and so on. The responsiveness conditions can be improved by regularly monitoring the service delivery process and staff attitudes toward client requests (Ramya, Kowsalya, and Dharanipriya, 2019).

Table 1 List of dimensions to be investigated

S.n	Service quality dimensions
1	Availability
2	Timeliness

3	Quality
4	Responsiveness

2.5 Customer satisfaction

Two factors influence distribution network building design: the addressability of customer needs and the cost of meeting those needs. Understanding logistics from the client's perspective can help to improve service offerings while also serving as a tool for differentiation and satisfaction. Many factors may influence customer service during this method, ranging from ordering simplicity to stock availability to delivery reliability. Logistics customer service influences customer happiness, loyalty, operational and financial performance (Chopra and Meindl, 2020).

Any supply chain makes an effort to guarantee that cross-company and cross-supply-chain activities are directed toward ensuring end-user customer satisfaction. Supply chains employ channel partners' skills and experience to form a seamless supply system centered on overall customer satisfaction. To cross the customer satisfaction barrier, a provider attempts to meet the basic expectations of consumers. If these basic requirements are not met, the supplier cannot be considered a viable supplier. Once these objectives are fulfilled and the supplier begins to exceed them, it is possible to achieve customer satisfaction and begin to add value to the supply relationship (Croucher, 2021; Ross, 2004).

Customers are satisfied when services have an appealing quality, which is a desirable characteristic whose absence produces dissatisfaction. Even a small number of interconnected quality factors increases customer satisfaction, which can be increased further if the clients do not expect these features. Today, there is a concept known as the "perfect order," which is a statistic that attempts to account for all of the primary aspects that contribute to the fulfillment of an order that satisfies the consumer's needs. The following are the key components of a perfect order: delivered complete to the quantities stated; delivered exactly on the date and time requested by the customer; no delivery issues (damage, shortage, refusal); accurate and complete delivery papers (Croucher, 2021; Chen, Hsu, and Lee, 2019; Parasuraman, Zeithaml, and Berry, 1985).

Oliver (1977; 1980) suggested the Expectancy-Disconfirmation Paradigm (EDP) as the most viable theoretical framework for measuring consumer happiness. According to the paradigm, people acquire goods and services based on their expected performance. The expectation level then becomes a benchmark against which the product is evaluated. That is, once a product or service has been used, the results are compared against expectations. If the conclusion is as expected, confirmation happens. Disconfirmation happens when there is a discrepancy between expectations and results. A customer's satisfaction or dissatisfaction is determined by the positive or negative difference between expectations and perceptions.

Thus, when service performance exceeds the customer's initial expectations, there is a positive disconfirmation between expectations and performance, resulting in satisfaction; when service performance is as expected, there is a confirmation of expectations and perceptions, resulting in satisfaction. When service delivery falls short of what the consumer expected, there is a negative disconfirmation between expectations and perceptions, resulting in dissatisfaction (Yuksel 2008).

(Reimann, F. Lünemann, and Chase, 2008) described the complex relationship between perceived service quality and customer satisfaction as;

(Service Perception – Service Expectation = Perceived Service Quality → Customer Satisfaction)

explaining that although the equation above may overly simplify the very complex relationship, the equation is still a valuable tool and a clear reminder that both factors of perceived service quality and customer satisfaction need to be managed and controlled by the service provider (Reimann, Lünemann, & Chase, 2008).

Customer service can be defined as all of the operations undertaken by a corporation to please the client. Physical distribution service (PDS) is a subset of those operations that give clients time and place utility. Bienstock, Mentzer, and Bird (1997) created a valid scale for measuring industrial customers' perceptions of the physical distribution service quality they receive from their supplier, starting with the physical distribution service quality dimensions availability, timeliness, and condition/quality (Mentzer, Gomes, and Krapfel, 1989; (Bienstock, Mentzer, and Bird, 1997).

Studies that focus on the pharmaceutical sector measure customer satisfaction through different tools. Chen, M.-C., Hsu, C.-L., and Lee, L.-H (2019) used Kano's two-dimensional model and importance-satisfaction model to measure customer satisfaction. Parmata, Rao, S.B., and Rajashekhar (2016) aimed to contribute to the services marketing literature by developing a scale based on Parasuraman's SERVQUAL scale for the measurement of distributor perceived service quality at the distributor–manufacturer interface of the pharmaceutical supply chain (Chen, M.-C., Hsu, C.-L. and Lee, L.-H 2019; Parmata, Rao, S.B., and Rajashekhar 2016).

2.6 Challenges of physical distribution

A systematic analysis that sought to investigate the extent, causes, and implications of critical pharmaceutical stockouts in low and middle-income countries (LMICs) discovered that distribution issues are among the causes of stock-outs. Weak supply chain systems caused suspected theft of medicines at various levels of the chain; insufficient deliveries and delays from central stores; poor communication and coordination between different levels of the supply chain made obtaining information to inform supply chain decisions difficult, especially in distribution and delays were frequently reported in transportation due to security and difficult road conditions, among the identified distribution challenges. Similarly, in Ghana, distance to service remains a significant barrier to the use of contraceptive health commodities among both rural and urban populations. The distances to goods and services in rural areas are still high, while in urban areas where demand for smaller families is greater, distance is a binding constraint even though average distances are smaller (Olaniran et al., 2022; Bray and Awuah, 2019).

According to a recent study upon the challenges of medicines and vaccine supply chains conducted in Nigeria, vaccine supply challenges include insecurity during vaccine transportation, the inability to maintain vaccine integrity in the supply chain, and logistical distance between the manufacturer and Nigeria. Furthermore, issues such as damaged products and packaging, as well as unstructured supplies due to the country's many distribution routes, which are connected with a high degree of pilferage and loss in transit, were mentioned. Moreover, difficulty in maintaining delivery vehicles for the supply of antimalarials and a delay in the distribution of medicines for multi-drug resistant tuberculosis were identified in a study in Nigeria due to transportation challenges such as breakdown of vehicles. Another challenge indicated was the inability to maintain optimum vaccine temperatures in delivery vehicles (Olutuase et al., 2022).

2.7 Distributor Storage with Customer Pickup vs. Last-Mile delivery

In the pick-up strategy, inventory is stored at the manufacturer or distributor warehouse, but clients place their purchases online or over the phone and then come to specified pickup spots to pick up their items. Orders are shipped from the storage facility to the collection locations as needed. Inventory expenses can be maintained low by utilizing either manufacturer or distributor storage to take advantage of aggregation. Because significant aggregation is achievable when delivering orders to a pickup station, transportation costs are lower than any other option using package carriers. This enables the employment of truckload or less-than-truckload carriers to transport orders to the pickup location. However, there is some loss of customer experience with this technique because, unlike the other options outlined, clients must come and pick. (Chopra, 2003).

Last-mile delivery means that the distributor/retailer delivers the product to the customer's home rather than employing a package carrier. Distributor storage with last-mile delivery is a distribution network concept in which a product is sent from the producer to a distributor, who stores the inventory. The customer places an order with the store, who then orders the product from the distributor. The merchandise is subsequently delivered to the customer's location by package carrier or last-mile delivery. This option provides an excellent client experience, especially for large, difficult-to-transport items. The success of last-mile delivery is contingent on consumer acceptance of these services. According to a study published in the *International Journal of Physical Distribution & Logistics Management*, the unattended delivery experience is a multifaceted construct made up of consumers' cognitive, emotional, behavioral, sensorial, physical, and social responses to the service. The results of this study can guide and support managers in assessing and developing delivery services using a consumer-centric approach to enhance customer experience (Chopra, 2003; Olsson, Hellström and Vakulenko, 2022; Olsson, Hellström and Vakulenko, 2022; Boysen, Fedtke and Schwerdfeger, 2020).

Hypothesis 1:(Ho) There is no association between the distribution system and health facilities' satisfaction level.

Hypothesis 2:(Ho) There is no association between direct/indirect delivery system and health facilities' satisfaction level.

2.8. Empirical review

For a logistics company to provide high-quality logistics services, it must properly understand and assess customer needs and expectations in the first place. An assessment of suppliers' logistics service quality (LSQ) performance and its effect on retailers' behavioral intentions suggests that retailers evaluate the process elements of logistics service quality using supplier procedural quality, discrepancy handling procedures, and information quality. Process quality was found to influence customers' perceptions about the transactions' outcome quality (timeliness, availability, and condition). As far as the effects of LSQ dimensions on retailers' repurchase intentions, logistics process quality was found to be the main driver, followed by outcome quality (Giovanis, Tomaras, and Zondiros, 2013; Meidutė-Kavaliauskienė, Aranskis, and Litvinenko, 2014).

Knop (2019) evaluated the quality of services provided by the transport & logistics operator of a company dealing with the organization and service of direct distribution of products by pharmaceutical companies and those from related sectors operating in the hospital or pharmacy market. According to the SERVQUAL analysis, including the five dimensions of tangible, reliability, responsiveness, assurance, and empathy, it was found that the quality dimension that is most significant for the operator's customers is the reliability of the service provider, which exerts some significant impact on the customers' perceived value, satisfaction, and loyalty. Depending on the degree of significance, tangible, assurance, responsiveness, and reliability were found to be significant, with empathy being the last. Another study conducted among pharmaceutical companies in Nigeria found that there was a significant relationship between reliability, assurance, empathy, and customer satisfaction in Lagos State pharmaceutical companies (Knop, 2019; Adejimi, and Olamide, 2020).

Kułyk, Michałowska, and Kotylak (2017) aimed to identify and evaluate determinants influencing consumers' purchasing decisions in the area of logistics customer service. The study demonstrates that the most essential aspect of logistics customer service evaluated in the event of transaction service is the method of shipment and delivery time.

Another study analyzed the impact of logistics on customer service, and there was a pattern of decrease in satisfaction with an increase in the response time, with the widest drop in satisfaction between 24 and 48 hours of response (Querin and Göbi, 2017; Kułyk, Michałowska, and Kotylak, 2017).

An assessment of staff satisfaction with the quality of hospital's logistics services and materials at King Faisal General Hospital showed that (63.8%) of participants thought the availability and quality of logistic services were good, whereas only (36.2%) thought it was neutral, No one got a poor total score of perception when it came to staff satisfaction with logistic unit services. Only 15% of respondents expressed satisfaction with the materials and equipment.

Nearly a third of respondents (36.2%) stated they were pleased with the location. Close to a fifth of respondents (20.7%) believed the services were satisfactory (Mousa et al., 2022).

Chen, Hsu, and Lee (2020) investigated pharmaceutical logistics service quality with refined a Kano's model, and the overall average importance level for pharmaceutical logistics services was 3.946. Among the items listed, the respondents' most important service item is "Goods are delivered on time to customers," followed by "Urgent orders are accepted and processed with timely delivery." Regarding the importance of and satisfaction with professional pharmaceutical logistics, the overall average importance level and satisfaction for the service items were 4.058 and 3.78 respectively. According to the respondents, the most significant service item for medical logistics services is "the order (i.e., item and quantity) delivery rate is accurate," followed by "the rate and extent of damage received are disclosed/low." The satisfaction analysis of the study revealed that question items regarding product quality ("The rate and extent of damage received are disclosed/low and logistics equipment and distribution vehicles meet the temperature requirements of drugs") and timeliness of delivery ("goods are delivered on time to customers and the order (i.e., item and quantity) delivery rate is accurate") were found to be excellent.(Chen, Hsu, and Lee, 2019.

Al-Hawary (2017) studied the supply chain flexibility aspects and their impact on customer satisfaction in the pharmaceutical industry in Jordan, and it was shown that delivery flexibility and distribution flexibility have a positive impact on customer satisfaction and are a key factors that increased customer satisfaction (Hawary et al., 2017).

Gizaw, Bogale, and Gudeta (2021) investigated the effect of pharmaceutical logistics service performance on customer satisfaction at a western cluster of Ethiopian pharmaceutical supply services, and it was found that customers preferred a high degree of performance in transaction logistics components (product availability and timeliness), indicating that the transaction logistics service component predicted customer satisfaction significantly (Gizaw, Bogale and Gudeta, 2021).

Gizaw, Bogale, and Melese (2023) studied healthcare facilities' satisfaction with the western cluster of Ethiopian pharmaceutical supply agency's pharmaceutical logistics services, and only 36% of respondents were satisfied with the transaction logistics services. Similarly, A study in the Ethiopian, southwestern hub of Ethiopian pharmaceuticals supply service found that the majority of the respondents (60%) were satisfied with the pre-transaction performance of the hub however, customers' satisfaction level during transactions was 37%. The analysis of the effect of logistics service attributes on customer satisfaction revealed that ordering procedure, personal contact quality, product availability, timeliness, order accuracy, order discrepancy handling, and complaint handling of pharmaceutical logistics service attributes have a significant positive effect on customer satisfaction (Bogale and Gizaw, 2021; Gizaw, Bogale and Melese, 2021).

Another study conducted in 2018 at Bahirdar Ethiopian Pharmaceutical Supply Service indicated that 64.1% of respondents reported that they were neutral, while 29.7% of respondents were satisfied with the quality of logistics services. In addition, 4.7% of the respondents stated that they were dissatisfied with the service (Tefera and Kebede, 2021).

The studies reviewed above utilize different tools and approaches to assess logistics service quality and customer satisfaction. However, there is a gap in the evaluation of service quality within the specific functions of the supply chain and logistics; therefore, this study will fill that gap by studying service quality and customer satisfaction with regard to the distribution service of the Ethiopian pharmaceutical supply service by adopting a service quality assessment tool developed specifically for physical distribution service. The physical distribution section of logistics is specifically related to service providers and customers; therefore, physical distribution should be the focus of assessment.

2.9 Conceptual framework

A conceptual framework is a synthesis of interrelated components and variables that help solve a real-world problem. According to the figure, customer satisfaction is the dependent variable, while the physical distribution services dimensions (Product Availability, Timeliness, quality/condition, and responsiveness) are the independent variables

Independent variable

Dependent variable

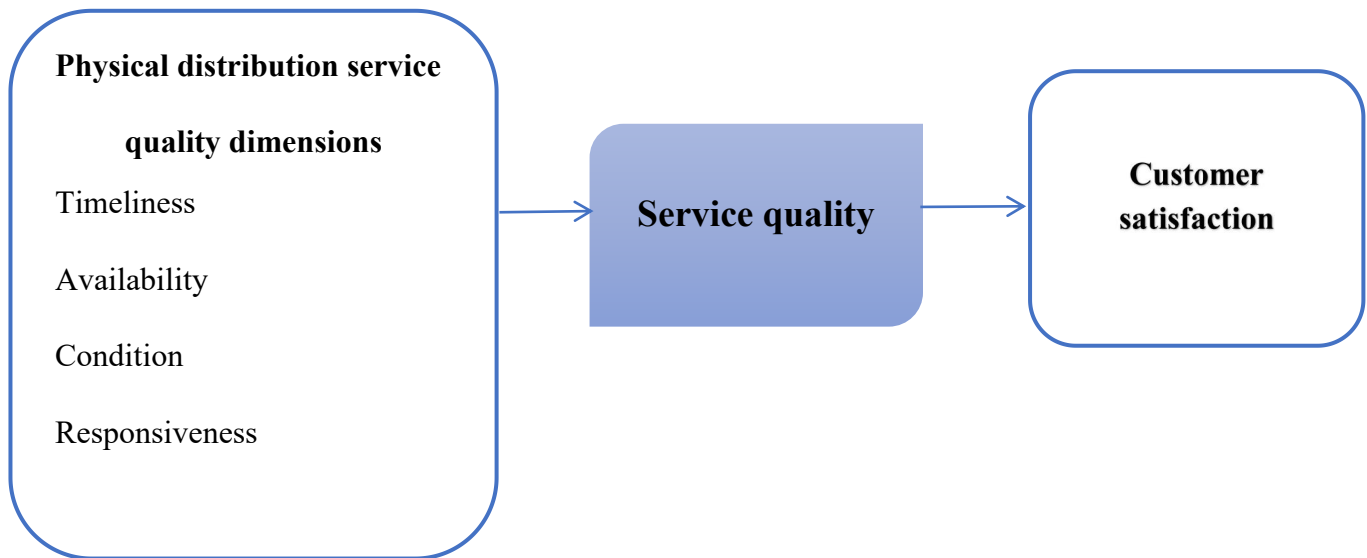


Figure 2. Conceptual framework of the study, January, 2024

3. RESEARCH OBJECTIVE

3.1 General objective of the study

- ✧ The general objective of the study is to assess the service quality of the physical distribution service, health facilities' satisfaction with the Ethiopian pharmaceutical supply service, Dire Dawa branch, and identify its challenges; in 2024.

3.2 Specific Objectives of the Study

Particularly, the specific objectives of the study are:

- ✧ To determine the service quality level of the physical distribution service of the Ethiopian pharmaceutical distribution service, Dire Dawa branch.
- ✧ To assess health facilities' satisfaction with the physical distribution service of the Ethiopian pharmaceutical distribution service, Dire Dawa branch.
- ✧ To identify challenges of the physical distribution service of the Ethiopian pharmaceutical distribution service, Dire Dawa branch.

4. METHODS

4.1. Study Area

The study was conducted at one of the eastern clusters of the Ethiopian pharmaceutical supply service, EPSS Dire Dawa branch, and selected health facilities that are under the catchment area of the specified branch. The Dire Dawa EPSS branch provides services to more than 6 million people in four regions, four respective zones, and 52 Woredas. The branch supplies 286 health facilities, and there are 76 ART locations altogether. In addition to governmental facilities, the hub also services five private health facilities. The branch has a total of 135 employees, 94 male and 41 female. The study was conducted in Dire Dawa, Ethiopia, at the respective EPSS branch and selected health facilities in East Hararghe, West Hararghe, the Harari region, Somali, and Dire Dawa (MOH.gov.et, epss.gov.et). There are 224, 24, 23 and 13 health facilities in Oromia, Dire Dawa, Somali and the Harari region that are supplied by the EPSS, Dire Dawa branch.

4.2. Study period

The study was conducted from Dec 1, 2023- Jan 30, 2024.

4.3. Study design

An institution-based cross-sectional study with a concurrent mixed method approach was conducted to assess health facilities' satisfaction with physical distribution service quality and identify challenges in the EPSS Dire Dawa branch. Mixed-method approach was used to gain a more complete picture than a standalone quantitative or qualitative study, as it integrates benefits of both methods. It also helps put the findings in context and add richer detail to the conclusions.

4.4. Source and Study Participant

All public health facilities supplied by the EPSS Dire Dawa Branch were source population. The study participants were sampled public health facilities, EPSS Dire Dawa Branch, and selected health professionals who have a role in the facility's pharmaceutical logistics in both institutions. Furthermore, key informants were included from health facilities, EPSS, and each region's zonal or regional health bureaus based on their role in the distribution of pharmaceuticals.

4.5. Sampling Determination and Sampling Technique

4.5.1. Sampling

It was inquired how many medical facilities the EPSS Dire Dawa branch supplied, and 284 health facilities including two regional laboratory are on the branch's catchment area. The Logistics Indicator Assessment Tool (LIAT), which was prepared by the USAID Deliver Project, is used to determine the sample size of the health facilities. In assessing logistics systems, it has been recommended that a sample size of 15% of all existing facilities and institutions involved in or affected by the logistics system used (USAID, 2008; Tetteh, E.K. 2021).

Hence, 15% plus 5% non-response is considered, making a sample size of 56 health facilities.

In regard to the qualitative data, 22 key informants from facility, regional health bureau, zonal health office, Woreda health office and EPSS were involved

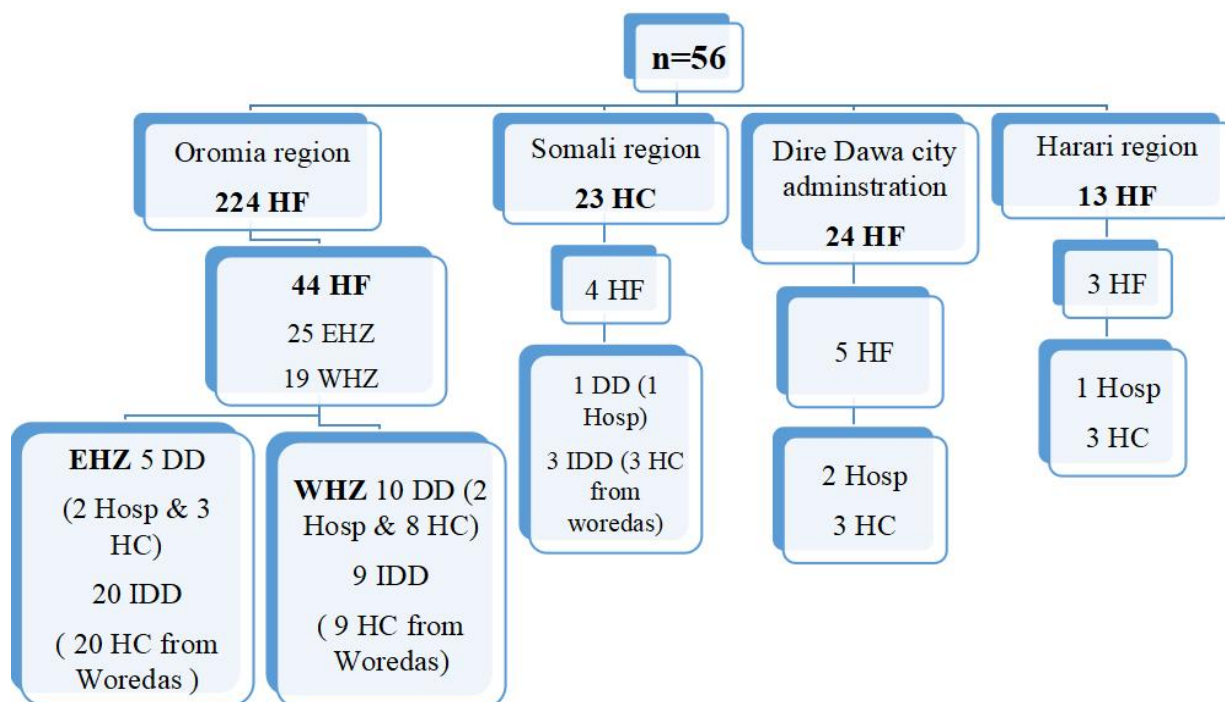
11 tracer drugs from Federal Ministry of Health Health Information System monitoring and Evaluation list for both RDF and Program drug category were used to conduct documentation review (MEASURE Evaluation, 2023).

4.5.2 Sampling technique and procedure

According to the information gathered from EPSS, Dire Dawa branch, there are 30 hospitals and 254 health centers. Therefore, a stratified random sampling technique proportionate to size was applied to select hospitals and health centers from the four regions of the service supply. In a stratified sample, researchers divide a population into homogeneous sub-populations called strata based on specific characteristics (e.g., race, gender identity, location, etc.). This ensures that every characteristic is properly represented in the sample. The study population was categorized under four strata, namely, Oromia region, Harari region, Dire Dawa city administration, and Somali region, and the number of facilities that were selected from each region. The Oromia region and Somali region incorporate both direct and indirect delivery depending on their location, so a proportionate number of facilities was included in both categories. The number of hospitals and health centers to include were calculated using a similar approach. Finally, from these four regions, health centers and hospitals were selected by using simple random sampling.

Moreover, health professionals' responsible for logistics management at the selected health facilities were chosen as the study respondent. For qualitative data, purposively selected experts

from health facilities, the regional health bureau /zonal health office, and the EPSS side were interviewed about the challenges of physical distribution service in the study area.



*HF- Health facility HC- Health center Hosp- Hospital, DD- Direct delivery,
IDD- indirect delivery EHZ- East Harerghe zone WHZ- west Harerghe zone

Figure 4. Sampling procedure of the study, January 2024

4.6 Study variables

The study's dependent variable is customer satisfaction. A customer is defined in this study as a public organization that purchases or receives pharmaceuticals from EPSS (i.e., a health facility – both a health center and a hospital). The study considered product availability, timeliness, delivered product condition/ product quality, and responsiveness as independent variables.

4.7 Inclusion and exclusion criteria

4.7.1. Inclusion criteria

Public health facilities that have been operational and been supplied by the branch for at least one year were included in the study

Health-care workers involved in logistics management for more than one year were also included in the study.

4.7.2. Exclusion criteria

Public health facilities that were not operational during data collection were not included in the study.

4.8 Data collection method and instruments

Quantitative data for the study was collected using a pre-tested, structured, self-administered questionnaire. The tool was adapted and modified from the physical distribution service Questionnaire developed by Bienstock, Mentzer, and Bird (1997) using a Likert scale with five response categories from 1, strongly disagree, to 5, strongly agree. The data was collected from the pharmacy head, store manager of the health facility, or any other health professional who has a role in the health logistics management of the facility. In addition, as a supplement to the questionnaire, a documentation review was conducted to measure the dimensions of PDSQ using a checklist containing respective indicators. The quantitative data collection at health facilities was conducted by trained data collectors with close supervision by the principal investigator. For the qualitative part of the study, a semi-structured face-to-face key informant interview guide was used to collect data on the challenges of the physical distribution service. The key informant interview was conducted by the principal investigator.

For the qualitative study, the semi-structured interview guide was prepared in English translated to Amharic and finally back-translated into the English language to maintain consistency and standardization of the instruments. The principal investigator conducted a key informant interview, which lasted from 20 - 30 minutes. The interview was done in Amharic, and all interviews were audio-recorded after consent is secured and transcribed verbatim manner.

4.9 Data Quality Assurance

To generate good quality data, the self-administered and interview questionnaires were pre-tested on selected non-study public health facilities before conducting the study, and modifications were made to the data collection tools. The provision of training and orientation for data collectors was another method of maintaining data quality. Regular supervision was provided by the principal investigator during data collection to ensure that all necessary data are collected

properly. The collected data was checked for completeness, accuracy, and consistency by the principal investigator. The validity of the instrument was measured through face validity. Reliability was ensured by measuring internal consistency through the Cronbach's alpha test.

4.10 Data processing, analysis, and presentation

After the data collection process, data processing was conducted to ensure the data is checked and cleaned before the analysis process. The data was carefully entered into SPSS version 26 and cleaned for analysis. Descriptive statistics and Chi-square tests of independence were conducted to analyze the collected data from customers through questionnaires. The descriptive statistics were used to summarize the variables, and Chi-square tests of independence were used to determine if the pickup/delivery distribution system is related to satisfaction level. Data presentations and interpretations were made using tables and graphs to display the collected data in a concise and meaningful way. Microsoft Excel was used to analyze and measure the indicators of the PDSQ from the documentation review. Manual thematic analysis was used to analyze the qualitative data.

4.11 Ethical consideration

The Ethics Review Committee (ERC) of the School of Pharmacy at Addis Ababa University was first approached for ethical approval. Regional health offices and the EPSS Dire Dawa Branch received a letter from the Department of Pharmaceutics and Social Pharmacy requesting approval to conduct the research. Following that, letters were written and sent to each chosen health care facility by the regional health bureaus. After receiving permission from the health-care facilities, the research was finally conducted. The aim and goal of the study were explained to the respondents, along with the option to decline participation. The study participants were then asked verbally for their informed permission. By making sure the data is captured and analyzed, and protecting the respondents' identities, the confidentiality of the facilities and respondents were also be preserved.

4.12 Dissemination Plan

The findings of the study will be submitted to the Addis Ababa University School of Pharmacy, the Harari and Dire Dawa regional health bureau, the Oromia and Somali targeted zones, and

other concerned bodies. Attempts will be made to publish the result and reach the scientific world.

4.13 Operational definition

Availability is measured through subjective rating of the expectation and perception in regard to availability of item, its consistency, adaptability in-case of demand change.

Indicators for documentation review : Order fill rate, line fill rate and stock out rate.

Timeliness is measured through subjective rating of the expectation and perception in regard to order processing and cycle time performance of the entire distribution system linking buyers and sellers.

Indicators for documentation review: Average delivery time and on time delivery.

The quality is measured through subjective rating of the expectation and perception in regard to the incidence of in-transit damage, shipment of incorrect items, and incorrect shipment quantity.

Responsiveness is willingness to help customers and provide prompt service.

Customer satisfaction is a function of perceived performance and expectations.

Expected quality refers to the level of quality that a customer expects from a product or service before experiencing it.

Perceived quality is the degree to which a product fulfills its function, given the needs of the consumer.”

5. RESULT

5.1 Demographic characteristics

5.1.1 Personal profile of participant

According to the personal profile data, the majority of respondents (89.3%) are male, whereas 10.7% are female. While the majority of respondents are aged between 24 and 29, 23% are aged between 30 and 35. In terms of profession, slightly more than half of the participants are druggists with a college diploma, while the remainders are pharmacists with a bachelor's degree. 69.6% of professionals have 1-5 years of work experience, and just 7.1% have more than 10 years of experience.

Table 2. Demographic characteristics of participants, EPSS, Dire Dawa, January 2024

Characteristics	Description	Percentage (%)
Gender	Male	89.3
	Female	10.7
	Total	100.0
Age	24-29	76.8
	30-35	23.2
	Total	100
Profession	Pharmacist	39.3
	Druggist	58.9
	Health officer	1.8
	Total	100.0
Level of education	Collage diploma	58.9
	Bachelor's degree	41.1
	Total	100.0
Experience	1-5	69.6
	6-10	23.2
	Above 10 years	7.1
	Total	69.6

5.1.2 Profile of Health facilities

Among the 56 facilities involved, majority (87.5 %) of the facilities are health centers, while the rest are primary (3.6%), general (5.4 %) and specialized hospitals (3.6%).

Table 3. Characteristics of selected health facilities, Dire Dawa EPSS, January 2024

Characteristics	Description	Percentage (%)
Health facilities level	General hospital	5.4
	Primary hospital	3.6
	Specialized/referral hospital	3.6
	Health center	87.5
	Total	100.0
Distribution system	Direct delivery	42.9
	Indirect delivery	57.1
	Total	100

5.1.3 Reliability Test

Reliability refers to the ability of measuring instruments to produce consistent results when used at different times. Internal consistency is linked to the reliability of the expressions contained in the measuring device. The measuring instrument assesses the consistency of the things within it and asks how effectively it measures a specific behavior or trait. The internal consistency of the measuring instrument is determined by the correlation of each of its constituent items. Among the existing methods used to determine reliability based on internal consistency, the most preferred and widely used method is to determine internal consistency according to Cronbach's alpha value (Sürücü and Maslakci, 2020).

The internal consistency of the modified SERVQUAL items to fit the physical distribution service quality assessment was tested by computing the total reliability scale. The dimensions timeliness, availability, and responsiveness showed coefficients higher than 0.7 on both the expectation and perception sections, meaning these dimensions, comprising various items, show a the items measure the same concept and are closely related together.

Table 4. Reliability test of the service quality assessment tool used, Dire Dawa EPSS, January 2024.

Dimensions	Cronbach's Alpha	Number of Items
<i>Expectation of Services</i>		
Timeliness	0.836	6
Availability	0.705	5
Product quality	0.784	4
Responsiveness	0.832	2
<i>Perception of Services</i>		
Timeliness	0.837	6
Availability	0.807	5
Product quality	0.553	4
Responsiveness	0.918	2

5.2 The overall service quality as perceived by public Health Facilities supplied by EPSS, Dire Dawa Branch

The four quality dimensions of physical distribution service quality were calculated as the mean values of the variables that composed each one of them. This was done for both expectations and perceptions, and thus eight new variables (four pairs of perceptions-expectations for each service quality dimension) were created for both the program and the RDF health commodity distribution service. Afterwards, the gap analysis between perceptions and expectations was calculated for these variables by subtracting expectations from perceptions [P-E].

5.2.1 Expectation and Perception

As shown in the table below, both expectations and perceptions of health facilities towards the distribution service quality for both health commodity types which follow different distribution systems were measured through four dimensions of service quality using the 5-point Likert scale. The higher numbers indicate a higher level of expectation or perception, while the low numbers indicate low measurement. In general, in both cases, consumer expectations exceeded the

perceived level of service shown by the perception scores, which resulted in a negative gap score (Perception – Expectation).

The expectation ranges from 4.34 - 4.79 for program commodities and 4.38 - 4.82 for RDF commodities indicating high expectation in both cases. The items with highest expectation are listed below with value (Program, RDF) the time between placing and receiving an order should be short, T1 (4.66, 4.71), delivery should be rapid, T2 (4.7, 4.68), products ordered should be available in inventory, A4 (4.66, 4.64), products should consistently be available in inventory, A5 (4.68, 4.68), All orders should be delivered undamaged, C1 (4.79, 4.82), All orders should be accurate, C2 (4.68, 4.71), All products should be delivered undamaged, C3 (4.75, 4.78), Orders should be packaged conveniently, C4 (4.7, 4.71). The expectation mean value for the four dimensions ranges from 4.5 - 4.7 with the highest mean expectation for dimension condition of delivery (quality of products delivered or product quality).

The perception of facilities ranged from 2.32 - 4.02. The item rate was lowest for availability; items orders are available in inventory when ordered, A1 (2.2, 2.5) and products are consistently available in inventory, A5, (2.3, 2.32). The items rated highest for actual service perceived was, All products are delivered undamaged, C3, (4, 4.02) for both Program and RDF health commodities. However, item C1, All orders are delivered undamaged was higher only for RDF, (4.02).

The mean perception value for all four dimensions ranges from 2.49 - 3.85.

Among the four dimensions, the condition of the delivered product/ product quality scored the highest expectation and perception value of (4.73, 4.75) (3.80, 3.85) respectively for program and RDF products. The lowest mean perception value (2.49, 2.5) was attained for the availability of both program and RDF products.

5.2.2 Gap analysis

The gap scores are the differences between the perception and expectation scores, and they are used to measure service quality and, as a result, customer satisfaction. The more perceptions align with expectations, the higher the perceived degree of quality.

In general, as the table below shows, the gap score for all four dimensions is negative in both health commodity types ranging from (-0.69 to -2.34) which indicates the physical distribution service quality is perceived as low.

Table 5. SERVQUAL score and its interpretation, Dire Dawa EPSS, January 2024.

Servqual score: Service perceptions - Service expectations	
Servqual score = 0	Quality service
Servqual score > 1	Excellent or extraordinary level of quality
Servqual score < 1	Shortfall or lack of quality (deficient quality)

Source: From Zeithaml et al. (1993)

Timeliness

The mean gap score of timeliness was found to be -1.78 and - 1.73 for program and RDF health commodities ,respectively . Item T1, The time between placing and receiving an order should be /is short has the highest gap score, indicating the order cycle time is longer than customer's expectation. Similarly, order cycle time consistency, delivery time and warehouse order processing time and its consistency were lower than customer's expectations, indicating there is a need for improvement.

Availability

The mean Gap score was -2.03 and -2.11 in both program and RDF commodities, which is the highest mean gap score among all four dimensions. This clearly indicates a high variation between expectation and perception, showing low service quality. The item product should be /is available when ordered, and consistent availability scored the highest gap, showing there is a huge availability variation from health facilities expectations, which calls for solution. Similarly, there is a high gap in meeting the requirements of health facilities in-case of a possible demand increment.

Condition/Product quality

The average gap score for condition is -0.93 and -0.905 for program and RDF health commodities. Item Order delivery without damage and item wise order accuracy has the highest gap. Over all, this dimension have a lower gaps score compared to the other dimensions.

Responsiveness

The average gap score for condition is -1.1 and -1.2 for program and RDF health commodities, showing there is a gap in distributors responses to customer inquiries and complaints.

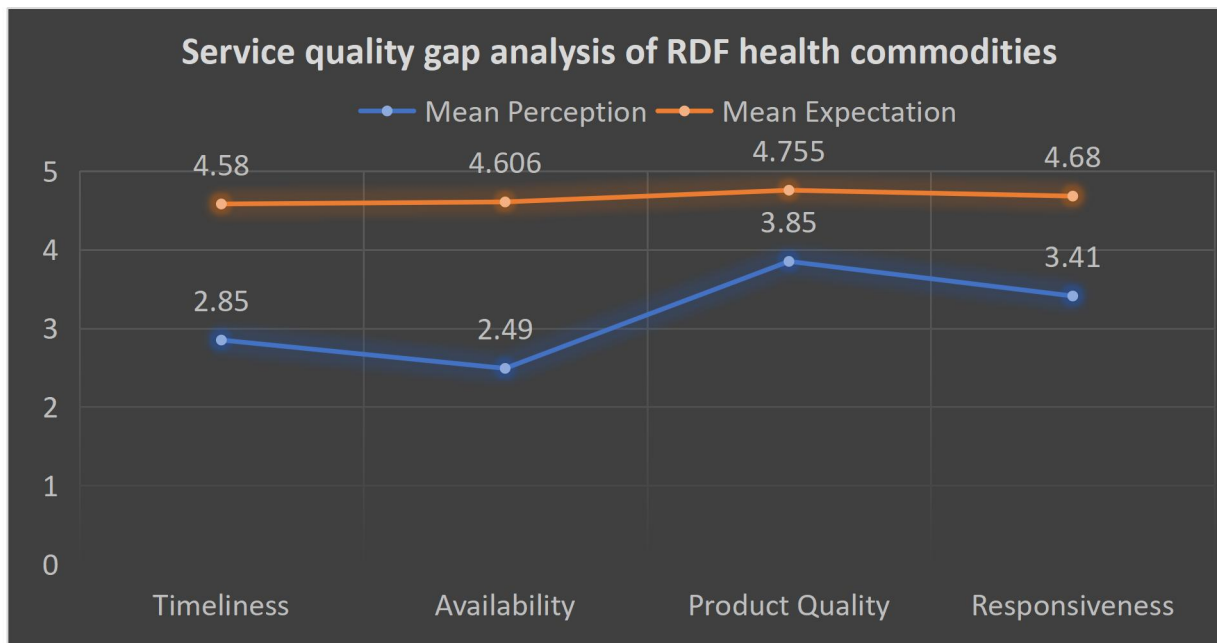


Figure 5. Service quality gap analysis of RDF health commodities, EPSS Dire Dawa, January 2024.

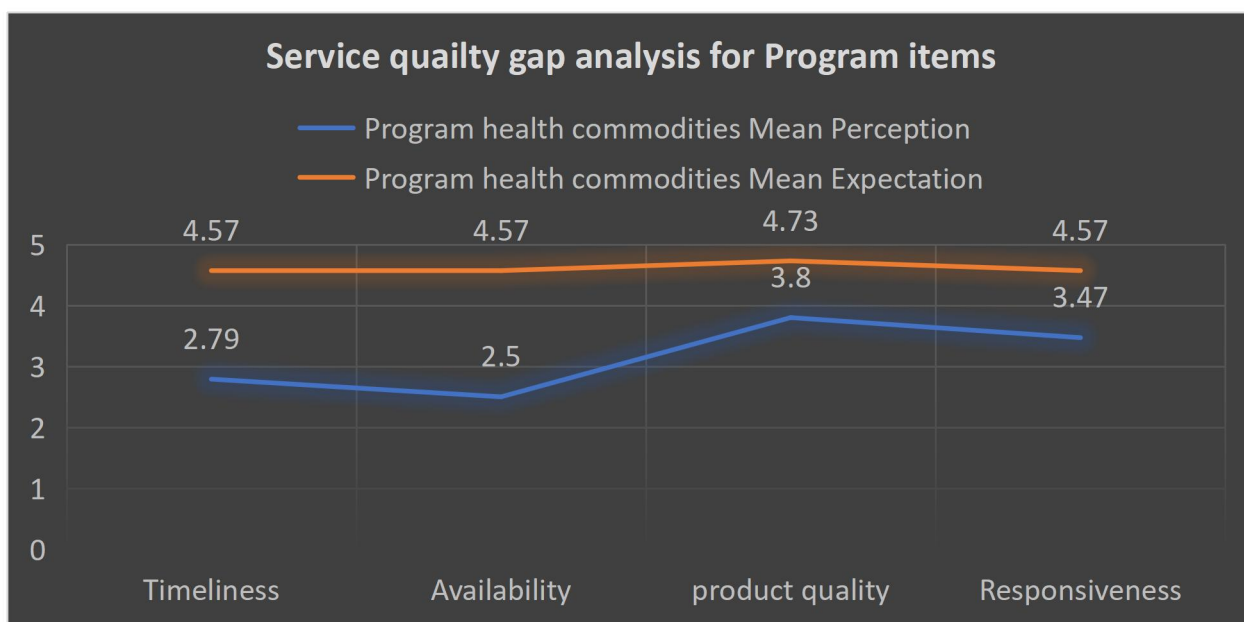


Figure 6. Service quality gap analysis for Program items, Dire Dawa EPSS, January 2024.

Table 6. Gap analysis of service quality dimensions for RDF and program health commodities, EPSS Dire Dawa branch, January 2024.

Service quality dimension	Program health commodities				RDF health commodities		
		Performance (P)	Expectation (E)	Gap	Performance (P)	Expectation (E)	Gap
		Mean	Mean	Score (P-E)	Mean	Mean	Score (P-E)
Timeliness	T1	2.64	4.66	-2.02	2.82	4.71	-1.89
	T2	2.79	4.7	-1.91	2.93	4.68	-1.75
	T3	2.86	4.57	-1.71	2.68	4.54	-1.86
	T4	2.89	4.5	-1.61	2.8	4.48	-1.68
	T5	2.71	4.48	-1.77	2.98	4.57	-1.59
	T6	2.88	4.54	-1.66	2.91	4.54	-1.63
	Mean	2.795	4.575	-1.78	2.85	4.587	-1.73
Availability	A1	2.52	4.63	-2.11	2.27	4.7	-2.43
	A2	2.66	4.34	-1.68	2.61	4.38	-1.77
	A3	2.59	4.57	-1.98	2.61	4.63	-2.02
	A4	2.64	4.66	-2.02	2.66	4.64	-1.98
	A5	2.32	4.68	-2.36	2.3	4.68	-2.38
	Mean	2.5	4.576	-2.03	2.49	4.606	-2.116
Condition/produ	C1	3.91	4.79	-0.88	4.02	4.82	-0.8

ct quality	C2	3.46	4.68	-1.2	3.66	4.71	-1.05
	C3	4	4.75	-0.75	4.02	4.78	-0.76
	C4	3.84	4.7	-0.86	3.7	4.71	-1.01
	Mean	3.80	4.73	-0.93	3.85	4.755	-0.905
Responsiveness	R1	3.46	4.64	-1.18	3.39	4.73	-1.34
	R2	3.48	4.5	-1.02	3.43	4.63	-1.2
	Mean	3.47	4.57	-1.1	3.41	4.68	-1.27

Table 7. Table Gap analysis for service quality dimensions for RDF and program health commodities, EPSS Dire Dawa branch, January 2024.

Service quality dimension	Program health commodities			RDF health commodities		
	Mean Perception	Mean Expectation	Gap score	Mean Expectation	Mean perception	Gap score
Timeliness	2.79	4.57	-1.78	2.85	4.58	-1.73
Availability	2.5	4.57	-2.03	2.49	4.606	-2.11
Condition/product quality	3.80	4.73	-0.93	3.85	4.755	-0.90
Responsiveness	3.47	4.57	-1.1	3.41	4.68	-1.27

5.3 Customer satisfaction

1. Indirect measure of customer satisfaction

According to the **Expectancy-Dis-confirmation Paradigm (EDP)** outcomes are compared against expectations, and if the outcome matches the expectation, confirmation occurs. Disconfirmation occurs when there is a difference between expectations and outcomes. A customer is either satisfied or dissatisfied as a result of a positive or negative difference between expectations and perceptions.

According to Rodrigues et al. (2011), if SERVQUAL level is between 2 and 4 customer satisfaction is; high, if it's between -2 to 2 is medium; and if it's less than -2, it's considered low.

As an indirect measure of customer satisfaction, depending on the SERVQUAL gap score, this study found that the satisfaction level related with availability have a gap score of less than -2.00 which reveals health facilities have low satisfaction in availability of products. 48% and 53% of participants have low satisfaction regarding the availability of program and RDF items, respectively. The other dimensions has a gap score of greater the -2 which indicates the satisfaction level for timeliness, condition of delivery, and responsiveness is medium level satisfaction. The Timeliness dimension has low satisfaction among the 42.9 % of participants for RDF products, and none of the participants has low satisfaction level regarding the timeliness of the program drugs distribution system. However, in general, as long as the gap score for all four dimensions is negative, it should be noticed that the physical distribution service public health facilities receive from EPSS is less satisfactory. Among participants, 86 % has a medium level satisfaction, whereas, the rest, 14% have low satisfaction level regarding the physical distribution service.

Table 8. Satisfaction frequency for RDF and program health commodities, EPSS Dire Dawa branch, January 2024

PDSQ dimensions	Low satisfaction %		Medium satisfaction %		Excellent satisfaction %	
	Program	RDF	Program	RDF	Program	RDF

Availability	48.2	53.6	51.8	46.4	0	0
Timeliness	0	42.9	100	57.1	0	0
Product quality	5.4	7.1	94.6	92.9	0	0
Responsiveness	0	21.4	100	78.6	0	0

Service quality satisfaction level	SERVQUAL
Low	≤ -2
Medium	$-2 < \leq 2$
High	$> 2 < \leq 4$

Table 9. Service quality satisfaction level interpretation

2. Direct measure of customer satisfaction

In addition to the indirect measurement of customer satisfaction through SERVQUAL gap analysis. The direct measurement of customer satisfaction level for each dimension was done using four direct questions, and level of satisfaction was determined using Bests' (1977) criteria of customer satisfaction, which is described in Table 13. As shown in the table below, about 26 % of participants perceived the availability of products to be poor, and another 26% described it as fair. In regard to timeliness, almost half of the participants described having a very good satisfaction level. Close to one third of participants perceived the service to have a good or very good satisfaction level. As its shown in Table 14, heath facilities have a good level of satisfaction with the condition of health commodity delivery, average satisfaction with he timeliness of delivery, responsiveness. The least satisfaction level was attained with the availability of products as customers have a low satisfaction level with the availability of both program and RDF health commodities. The overall mean satisfaction level was 2.95 and 2.72 for program service and RDF products, respectively, which falls under the average satisfaction level.

Table 10. Satisfaction frequency for RDF and program health commodities, EPSS Dire Dawa branch, January 2024.

PDSQ dimensions		Availability(%)	Timeliness(%)	Product quality(%)	Responsiveness(%)
Satisfaction level	Poor	26.8	19.6	7.1	19.6
	Fair	28.6	19.6	8.9	5.4
	good	28.6	33.9	19.6	30.4
	very good	16.1	17.9	51.8	32.1
	Excellent	0	8.9	12.5	12.5

Table 11. Bests' (1977) Translation level of customer satisfaction

Score No	Score	Mean	Level Of Satisfaction
1	1.00 – 1.80	Mean	Lowest Satisfaction
2	1.81 – 2.61	Mean	Low satisfaction
3	2.62 – 3.41	Mean	Average satisfaction
4	3.42 – 4.21	Mean	Good satisfaction
5	4.22 – 5.00	Mean	Very good satisfaction

Table 12. The overall distribution service satisfaction rate of health facilities at Dire Dawa EPSS, January 2024.

Dimension	Overall satisfaction		Interpretation
Timeliness	Program	2.77	Average satisfaction
	RDF	2.77	Average satisfaction
Availability	Program	2.34	Lowest satisfaction
	RDF	1.71	Lowest satisfaction

Condition	Program	3.54	Good satisfaction
	RDF	3.5	Good satisfaction
Responsiveness	Program	3.13	Average satisfaction
	RDF	2.96	Average satisfaction
Mean satisfaction	Program	2.95	Average satisfaction
	RDF	2.72	

Test of Normality

Many of the statistical procedures including correlation, regression, t tests, and analysis of variance, namely parametric tests, are based on the assumption that the data follows a normal distribution or a Gaussian distribution (after Johann Karl Gauss, 1777–1855); that is, it is assumed that the populations from which the samples are taken are normally distributed . Normality and other assumptions should be taken seriously, for when these assumptions do not hold, it is impossible to draw accurate and reliable conclusions about reality.

Kolmogorov–Smirnov and Shapiro–Wilk tests were applied to assess the normality of their distributions. These tests showed a statistically significant deviation from normality, as P-value have fallen below 0.05. Additionally, their graphical illustration using box plots and Q-Q plot displayed many outliers, thus all the statistical tests that were used were non-parametric.

Table 13. Normality test of variables

After log transformation						
	Kolmogorov-Smirnov ^a			Kolmogorov-Smirnov ^a		
	Statistic	df	Sig.	Statistic	df	Sig.
Timeliness Expectation	.240	56	.000	.233	56	.000
Timeliness performance	.106	56	.180	.116	56	.056
Condition Expectation	.291	56	.000	.227	56	.000

Condition performance	.212	56	.000	.108	56	.158
Availability Expectation	.220	56	.000	.286	56	.000
Availability performance	.130	56	.020	.221	56	.000
Responsiveness Expectation	.309	56	.000	.352	56	.000
Responsiveness performance	.260	56	.000	.195	56	.000

Correlation

Correlation coefficients describe the strength and direction of an association between variables.

Correlation Coefficient can take any value between $-1 \leq r \leq +1$

If $r = 0$ then there is no relationship between the variables If $r > 0$ then there is direct relationship between the variables If $r < 0$ then there is indirect or reverse relationship between the variables (Schober, Boer and Schwarte, 2018;Shafaq and Shuaa, 2020).

In order to check the relationship between customer satisfaction and service quality dimension, spearman correlation was used. As described in Table 16 there is a positive and strong relationship between customer satisfaction and timeliness, condition of delivery and responsiveness with value of $r = 0.776, 0.663, 0.877, 0.819$ respectively. Availability has a moderate relationship with customer satisfaction with $r=0.525$. This indicates that if timeliness, condition of delivery, responsiveness and availability increase; customer satisfaction are affected positively in Ethiopian Pharmaceutical Supply Service, Dire Dawa Branch.

Table 14. Correlation coefficient interpretation

Absolute Magnitude of the Observed Correlation Coefficient	Interpretation
0.00–0.10	Negligible correlation
0.10–0.39	Weak correlation
0.40–0.69	Moderate correlation

0.70–0.89	Strong correlation
0.90–1.00	Very strong correlation

Table 15. Correlation analysis

			Availability	Timeliness	condition	Responsiveness	RDF_satisfaction
Spearman's rho	Availability	Correlation Coefficient	1.000				
		Sig. (2-tailed)	.				
		N	56				
	Timeliness	Correlation Coefficient	.358**	1.000			
		Sig. (2-tailed)	.007	.			
		N	56	56			
	Condition	Correlation Coefficient	.167	.371**	1.000		
		Sig. (2-tailed)	.217	.005	.		
		N	56	56	56		
	Responsiveness	Correlation Coefficient	.312*	.545**	.592**	1.000	
		Sig. (2-tailed)	.019	.000	.000	.	
		N	56	56	56	56	
	RDF_satisfaction	Correlation Coefficient	.525**	.776**	.663**	.877**	1.000
		Sig. (2-tailed)	.000	.000	.000	.000	.
		N	56	56	56	56	56

5.4 Difference in customer satisfaction between RDF and program

Pharmaceuticals distribution system through Chi square test and Paired T test.

1. Chi square test

According to the chi square test conducted, there was a significant difference in customer satisfaction between RDF and the program distribution system regarding the availability of health commodities ($\chi^2 = 13.08, df=4$) and (P value = 0.004). However, customer satisfaction dimensions like timeliness, condition of delivery, and responsiveness didn't show a significant difference between the two distribution systems.

Table 16. Chi square test of independence for difference in customer satisfaction rate between RDF and program item distribution system.

Satisfaction level		Poor	Fair	Good	Very good	Excellent	Chi square	df	P-Value
Timeliness	Prog	15	16	16	9	15	5.025	4	0.2846
	RDF	26	20	10	0	26			
Availability	Prog	16	16	16	9	16	13.08	4	0.00445
	RDF	26	20	10	0	26			
Condition	Prog	4	5	11	29	4	2.107	4	0.715914
	RDF	4	4	11	34	4			
Responsiveness	Prog	11	3	17	18	11	3.534	4	0.361633
	RDF	10	9	15	17	10			

Paired Samples Test

			Paired Differences							
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
						Lower	Upper			
Pair 1	Availability	-	.625	.799	.107	.411	.839	5.853	55	.000
	Availability									
Pair 2	Timeliness	-	.000	.934	.125	-.250	.250	.000	55	1.000
	Timeliness									
Pair 3	condition	-	.036	.631	.084	-.133	.205	.423	55	.674
	condition									
Pair 4	Responsiveness		.161	.496	.066	.028	.294	2.423	55	.019
	- responsiveness									

2. Paired T test

The difference in customer satisfaction was also tested using the paired t-test to identify which of the four dimensions are responsible for the difference between the RDF and program distribution system. Therefore as the table above shows, availability of pharmaceuticals and responsiveness dimensions have a significant difference between the two distribution system whereas timeliness, and condition of delivery didn't show a difference.

5.5 Difference in customer satisfaction between Direct and Indirect supplied health facilities through Chi square test .

The satisfaction level of health facilities with regard to the either direct or indirect delivery system were computed using chi square test and it was found that there is significant difference between direct and indirectly delivered health facilities ($P > 0.05$).

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	2.385 ^a	1	.123		
Continuity Correction ^b	1.480	1	.224		
Likelihood Ratio	2.495	1	.114		
Fisher's Exact Test				.191	.111
Linear-by-Linear Association	2.342	1	.126		
N of Valid Cases	56				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.36.

b. Computed only for a 2x2 table

5.5 Documentation review

A Documentation review was conducted to measure the service quality dimensions through their respective indicators and provide a wider and deeper insight into the matter. Availability and timeliness were measured through five indicators taking a yearlong data of the 2015 fiscal year. However, data was not available to measure the rest of the dimensions.

1. Availability

Availability of 11 tracer pharmaceuticals are measured through three indicators: order fill rate, line fill rate, and stock out rate. A year-long data of 2015 E.C was analyzed to find out about the services' performance in refilling the order of the selected health facilities. The indicators show that Order fill rate is 52.6% and 74% for RDF and program item respectively at the EPSS, Dire Dawa branch. As shown below, the stock out rate is 29% and 9% for RDF and Program products respectively. Program item are found to have better performance than RDF products in all three indicators.

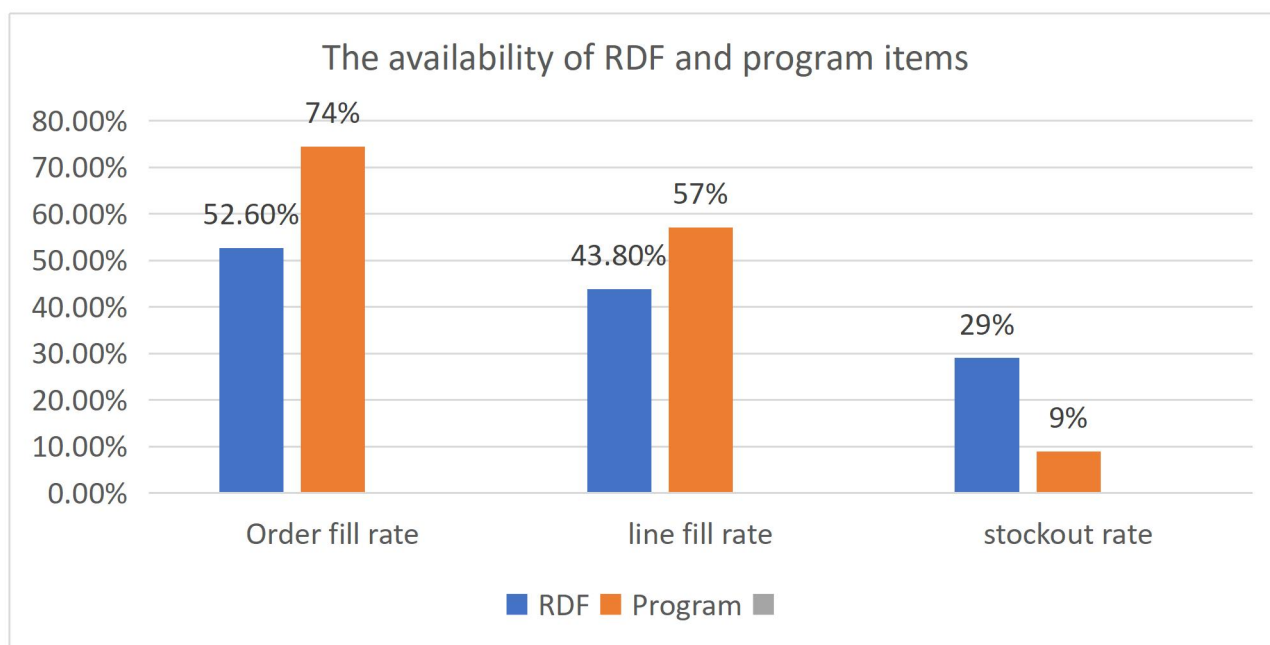


Figure 7. The Availability indicators of health facilities at Dire Dawa EPSS, January 2024.

2. Timeliness

The timeliness of delivery for program items was measured through two indicators that are on time delivery and average delivery time. It was found that the average delivery time is more than a day and half (1 day and 14.52 hr) and on time delivery is 65%.

Table 16. Timeliness performance indicators of Dire Dawa EPSS, January 2024

Indicator	Value
Average delivery time	38.52 hr (1 day and 14.52 hr)
On time delivery	65 %

5.6 Challenges of physical distribution

1. Transportation Challenges

Most facilities noted transportation challenges with the RDF distribution system. Since RDF items are picked up by facilities or Woredas, it is the facilities' responsibility to contract vehicles whenever they purchase medications from EPSS. Participants noted that the cost of delivering products is considerable, which affects the facility's purchasing ability. Another issue brought up

is the sort of vehicle used for transportation. The types of loading vehicles available commercially are quite limited, forcing facilities to use open-back trucks that are not specifically intended to protect and transport medications. It was additionally brought up that several facilities use ambulances to deliver products from the hub to facilities due to transportation vehicle issues. One participant also indicated that seasonal weather conditions have an impact on road conditions, making transportation difficult and eventually influencing pharmaceutical delivery timeliness.

According to one participant,

“ The facility loads all purchased items into a standard vehicle with an open roof. To use the EPSS vehicles for transportation, there is a lengthy bureaucratic process on both the EPSS and facility sides. As a result, the facility is required to use commercially available vehicle types. ”

Another participant mentioned

"For indirectly supplied facilities, sometimes products stay at woreda level for about a week because we wouldn't be able to find transportation vehicles to transport the pharmaceuticals from woreda to facility level."

2. Availability

All facilities highlighted the availability of both RDF and program as one of the issues they face with the EPSS distribution system. However, it has been confirmed that program items are more readily available than RDF medications. It was also claimed that the availability issue seen is both item and quantity-related. Stocked-out products at EPSS are purchased from private suppliers, but the rising cost of pharmaceuticals and inflation make it difficult for facilities to fill the availability gap through private wholesalers, and facility affordability is influencing availability at the facility level. Some participants remarked that there is also an issue with consistency of product availability, claiming that things accessible at EPSS today would not be available in the next round of purchases.

One participant stated that

"When there is service expansion in the facility their demand rises however, the EPSS is not being able to fulfill our escalating demand."

Another participant mentioned

“For indirectly supplied facilities like ours, the RRF is not directly sent to EPSS; instead, we submit it to the respective Woreda that manages the facility, and the woreda recalculates the quantity of items on the RRF facilities submitted, affecting the restocked quantity of pharmaceuticals, which is usually less than what we primarily requested.”

3. Long order cycle time

Some participants expressed that the order processing time at EPSS is extremely long. It was stated that the RRF submitted by facilities must be manually entered into the system in order to process the pick list, and that even after the order is processed, the pick-up and dispatch process takes a long time because the warehouse and dispatch department serve multiple facilities per day, resulting in waiting time. Facilities indicated that it takes two or three days to complete a single purchase, which impacts the timeliness of pharmaceutical supply. This causes the facilities to spend days away from their facility. In circumstances where the facility brings its own ambulance, the vehicle will spend days away from The vehicle will be absent from the service it is meant to deliver for several days.

A participant mentioned

“ Our facility purchases hundreds of items per purchase, so the warehouse and inventory officer is expected to enter and process all of these items into the HCMIS system, so I won't be able to finish the purchasing process that same day, so I have to come back the next day or after that process is completed, and there will be queues at the warehouse and inventory department, as well as the warehouse and dispatch department, which lengthens the order cycle time.”

Another participant stated

“ The order processing time requires us to spend days waiting and leaving late in the day, making the travel risky because the roads are unsafe and at risk of robbery at night.”

4. Lack of supervision and communication between EPSS and facilities.

Some participants cited a lack of supervision from EPSS, as well as a gap in the customer-supplier relationship and communication. A participant noted that the provider should be able to assess the impact of the stock-out on the facility and the community it serves. Another

participant remarked that the line of communication between EPSS and indirectly supplied facilities is relatively narrow, as facilities are linked to EPSS via woredas. As a result, facilities face challenges in maintaining a positive customer-supplier relationship with EPSS.

5. Budget shortage

Most facilities stated that the pharmaceutical budget is insufficient to meet their needs. Because of the availability issue at EPSS, an alternative method of restocking things is to purchase from various private suppliers; nevertheless, the prices of products and the budget approved for pharmaceuticals are not comparable, influencing pharmaceutical availability at facilities.

One participant pointed out;

“The CBHI plan has increased patient flow to our hospital, and clients are served for free. However, compensation for all costs associated with delivering the service occurs every three or four months, impacting the facility's purchasing capability. Therefore, we are compelled to wait for reimbursement to refill medications. Furthermore, the budget, which would have supplied the facility for months if acquired from EPSS, will only last a few weeks because of the significant differential in pharmaceutical costs between EPSS and private wholesalers.”

3. The consequences of the challenges of distribution.

1. Low customer satisfaction

The majority of participants reported that pharmaceutical stockouts are generating disruptions in service delivery, eventually impacting the facility's customer satisfaction. As a result, EPSS supply issues, combined with the unaffordability of medications from private suppliers, contribute to frequent product stockouts and dissatisfied clients.

One participant mentioned

“The CBHI scheme is increasing the patient load served by the facility, and patients have been told they will receive all health care services free of charge when they get information about the insurance system, so clients become enraged and engage in verbal fights with pharmacy professionals when they are informed that some items are out of stock.”

2. Compromised product quality

Transportation difficulties, namely transportation vehicle type, pose a barrier to the condition of products delivered because the vehicles employed are not designed to protect pharmaceuticals from various conditions that may damage product quality. As a result, medications must pass through all physical and weather conditions before arriving at a health facility.

A participant stated;

“ Because we contracted the vehicle, we load each cargo simultaneously, which impacts the quality of the items carried. For example, delicate products such as ampules and vials are occasionally discovered broken or damaged when they arrive at the facility following delivery. ”

3. Recommendation

3.1 Preparing specially designed vehicles.

There are specially constructed vehicles/pharmaceutical delivery trucks that have the essential construction and equipment, including temperature controls and safety measures. One participant suggested that facilities like the EPSS use such vehicles to protect medications during transportation. Another participant claimed that EPSS can provide last-mile delivery for RDF goods through an agreement with facilities that include transportation costs in the overall cost of the medications. Such solutions, including a last-mile delivery distribution system, will address facilities' transportation issues.

3.2 Quantification/demand based supply

Each year, facilities submit their quantification for the upcoming year. EPSS is intended to rely on quantification papers to supply facilities. However, facilities are skeptical that if quantification is used by the service, the supply of drugs would improve despite factors as budget shortage at facility level's purchasing capacity.

One participant mentioned that

“Products may be delivered without the facility's request or need, resulting in waste due to the absence of disease cases in the area. EPSS should distribute products based on demand and morbidity in the area. I recommend that the agency acquire inventory reports from institutions and move such drugs to locations with cases and demand.”

3.3. Alternative supplier

The Ethiopian pharmaceuticals supply service is expected to fulfill the pharmaceutical needs of public health facilities; however, the availability gap at the EPSS, Dire Dawa hub negatively impacts the availability of items at the facility level, necessitating an alternative solution. Some facilities stated that because the budget allocated for pharmaceuticals is insufficient and the regulation prohibits facilities from using the budget allocated to purchase from private suppliers except for a small portion of the budget, they are forced to remain stocked out unless pharmaceuticals are available at EPSS. Furthermore, facilities should have an alternate source that is capable of supplying them in a sustainable manner.

3.4 Direct link between EPSS and facilities

Indirectly supplied facilities recommended that there be contact and a direct link between EPSS and facilities, even though medications are delivered through woredas. Participants also noted that the service could improve its communication with facilities.

3.5 Pre-delivery notification

One participant stated that drugs are delivered without prior notification, which increases delivery time because the products may be delivered late at night or on weekends when personnel responsible for receiving are not available, causing the receiving process to take an unreasonably lengthy period. To make the receiving procedure easier, it was recommended to send a pre-delivery notification.

Key informant interview

Role of regional health bureaus and zonal health bureaus in the distribution process.

The regional and zonal health bureaus are in charge of providing supporting oversight, feedback, capacity building, and establishing a relationship between EPSS and facilities. The bureaus' other tasks include collecting RRFs, tracking consumption, doing fill rate checks, ensuring data quality, and combining submitted reports to transmit EPSS.

Challenges of physical distribution service of EPSS

All key informants agreed on the availability concerns at EPSS, indicating that line and order fill rates are low, particularly with RDF medicines. The problem was with both the quantity and the item. One key informant stated that there are quantification concerns on the facility side, such as low forecast accuracy, which affects the demand-based supply that the EPSS uses. The key informant also mentioned financial constraints, as well as pricing differences between EPSS and private pharmaceutical suppliers, which are causing facilities to seek alternate private providers to address the EPSS availability gap.

One key informant states:

“The inflation rate causes price fluctuations on a regular basis, affecting the number of private suppliers willing to enter into long-term agreements with facilities to supply medications because product prices are expected to change during the agreement time.”

Consequence of the challenges

The roles sustainable availability of pharmaceuticals is the backbone of health care service. The availability issue, together with the budget shortage at the main public facility supplier, EPSS is causing frequent stockouts and frustrating clients leading to a low client satisfaction with the public health care system. The stock outs are also forcing patients to purchase pharmaceuticals from private pharmacies at a higher price. In some areas of the region, the privilege of private pharmacies is not attained, which raises a more serious concern of pharmaceutical accessibility.

One key informant mentioned;

“The number of private pharmacies in the rural area is quite small; hence, the community suffers issues accessing drugs that are stocked out at public facilities due to EPSS incapacity to supply the commodities.”

Recommendation

The local manufacturers have a small contribution to the pharmaceuticals consumption of the country. Because the primary challenge of availability stems from the procurement process, which is heavily reliant on importing drugs and foreign manufacturers, the problem might be addressed by encouraging local producers to produce more. A key informant stated that opening closed locally owned businesses and capacitating their operations would be one way to boost

product availability. Another significant informant advocated attracting foreign investment in the manufacturing sector. One of the health bureau also suggested that collaborating with private importers, distributors, and suppliers, as well as boosting facility purchasing capability, should be considered solutions. It was also suggested that performing pharmaceutical substitutions at the plant level can help to reduce the number of stock outs. The need for improvement in quantification data quality and forecast accuracy on the health facility side was also identified.

2. Key informant - EPSS Distribution management coordinator and Warehouse and inventory coordinator

1. Challenges

The distribution management coordinator indicated that the hub faces obstacles in the distribution process, such as RRF data quality and timeliness from the facility side, as well as delays in replenishment from the central EPSS side. The key informant also indicated that seasonal variations on the road have an impact on vehicle integrity and the process of vehicle maintenance, as well as the availability of spare parts on the market, which influences delivery time.

Another difficulty mentioned is the availability of medications, with the fill rate for RDF programs being less than 50% and better with program medication. The transportation of vaccines is further limited by a lack of cold van capacity, thus the hub uses cold boxes the majority of the time.

The inventory and warehouse management coordinator indicated that one of the hub's issues is the availability of drugs, which is due to the country's foreign currency shortfall. Local manufacturers are currently supplying far less medication than in the past, forcing the central hub to rely on imported drugs. The informant also stated that the country is currently expanding its service offerings, including the construction of community pharmacies and community-based health insurance, which is significantly increasing demand. However, the supply of medicines could not keep up with the rising demand, and it is now falling due to the causes indicated above, resulting in a serious availability issue.

Order processing time is affected by availability since products are frequently stocked out, therefore when products are refilled, facilities are notified and visit the hub at the same time, forcing the hub to host several facilities at the same time, resulting in a prolonged order cycle.

2. Recommendation

The key informants recommended that facilities be supported in order to improve their skill and knowledge, resulting in a higher-quality RRF submission. It was also highlighted that there is a need to improve coordination and communication between the hub's departments, as well as between facilities and the EPSS hub. The storage capacity of facilities should also be increased. The WIM coordinator also emphasized that availability difficulties can be mitigated by supporting and increasing the capacity of local manufacturers, reducing the requirement for imported drugs. The government should address foreign cash difficulties by prioritizing pharmaceuticals more effectively.

The country's security issues also adversely affect pharmaceutical delivery from center to hub, thus the government should work on long-term security measures. Medicine consumption should also be evaluated, as there is an uncontrollable degree of antibiotic use. There should also be a means to trace products that leave EPSS to guarantee they reach the correct recipient.

6. DISCUSSION

6.1 Service quality and customer satisfaction

This study investigated the service quality gap of the Ethiopian pharmaceutical supply service and its customers (health facilities') satisfaction. While earlier studies have explored the health facilities' satisfaction level with the service they have not explicitly addressed the service quality gap.

Customer satisfaction and loyalty, as well as operational and financial performance, are all influenced by logistics customer service. After conducting a series of validity and reliability tests, Bienstock, Mentzer, and Bird (1997) offered a conceptualization of PDSQ dimensions, which are availability, timeliness, and condition. In order to check the relationship between customer satisfaction and service quality dimension this study conducted a spearman correlation test and found that there is a positive and strong relationship between customer satisfaction and timeliness, condition of delivery, and responsiveness, with value of $r = 0.776, 0.663, 0.877$ respectively. Availability has a moderate relationship with customer satisfaction with $r=0.525$. This indicates if timeliness, condition of delivery, responsiveness, and availability increase; customer satisfaction is affected positively in Ethiopian Pharmaceutical Supply Service, Dire Dawa Branch.

As the findings of this study demonstrated health facilities have good level satisfaction with service quality dimension, condition of health commodity delivery/product quality delivered and average satisfaction with timeliness of delivery, a study in Taiwan on service quality and customer satisfaction in pharmaceutical logistics showed that question items regarding product quality ("The rate and extent of damage received are disclosed/low and logistics equipment and distribution vehicles meet the temperature requirements of drugs") and timeliness of delivery ("Goods are delivered on time to customers and the order (i.e., item and quantity) delivery rate is accurate") were found to be Excellent. The variation could be due to differences in the study setting, geographical location and distance from supplier and logistical capacity of the the supplier.

This study finds that the least satisfaction level was attained with the availability of products as customers have a low satisfaction level with the availability of both program and RDF health commodities. However, the satisfaction level of participants with program items is better which

could be due to the international technical and financial support for the program items. Only 26 % of the participants described the availability of pharmaceuticals as good and 8.9 % of participants perceived satisfaction as poor for timeliness and 12.5% perceived product quality delivered and responsiveness as poor for the logistics service quality. however, an assessment of staff satisfaction with the quality of the hospital's logistics services and materials at King Faisal General Hospital showed that (63.8%) of participants thought the availability and quality of logistic services were good, whereas no one got a poor total score of perception when it came to staff satisfaction with logistic unit services. The variation could be due to differences in the study setting, source of pharmaceuticals and suppliers and procurement method, and policy between countries.

The result of this study indicated that among participants, none are highly satisfied, and 86 % of the participant have a medium level satisfaction whereas the rest, 14% have a low satisfaction level regarding the physical distribution service. However, according to a study on health care facilities' satisfaction with the western cluster of Ethiopian pharmaceutical supply agency's pharmaceutical logistics services and only 36% of respondents were satisfied with the transaction logistics services. Similarly, A study in the Ethiopian, southwestern hub of Ethiopian pharmaceutical supply service found that customers' satisfaction level during transactions was 37%. Another study conducted in 2018 at Bahirdar Ethiopian pharmaceutical supply service indicated that 29.7% of respondents found to be satisfied with the quality of logistics services while 4.7% of the respondents stated that they were dissatisfied with the service (Bogale and Gizaw, 2021; Gizaw, Bogale and Melese, 2021; Tefera and Kebede, 2021). This difference in level of satisfaction could be due to the EPSS branch difference (study area variation) and logistics service provided and study population characteristics.

The study assessed the availability of tracer products using different indicators such as line fill rate, order fill rate and stock out rate and it was found that the line fill rate for Program and RDF items is 43% and 57 % respectively, while the stock out rate was 29 % and 9 % which is very far from the target Ethiopian pharmaceutical supply service (EPSS) aims to avail, 95% of health facility demand.

Similarly, timeliness was measured using two indicators, namely average delivery time and on time delivery, it was found that the average delivery time of EPSS, Dire Dawa is 38.52 hrs or 1

day and 14.5 hours which falls below the target of EPSS which is 2 days. However, the on time delivery of health commodities was shown to be 59 % while the target for the indicator is 68%, which indicates that there is an issue with the timely delivery of items. A study on logistics customer service shows that one of the most important element in the sphere of transaction logistics customer service is delivery time. Another study that analyzed the impact of logistics on customer service found that there was a pattern of decrease in satisfaction with an increase in the response time, with the widest drop in satisfaction between 24 and 48 hours of response.

6.2 Challenges

Findings of the study in regard to challenges of the physical distribution service showed that transportation challenges with the RDF distribution system, poor availability of pharmaceuticals, prolonged order cycle time, lack of supervision, and budget shortage are the main challenges faced by health facilities while the EPSS Dire Dawa mentioned poor data quality, delay in replenishment from central EPSS and lack of transportation vehicle capacity as challenge of the distribution service it provides. It's also indicated that seasonal weather conditions have an impact on road conditions, making transportation difficult and eventually influencing pharmaceutical delivery timeliness. It was pointed out that such challenges are contributing to health commodity stock out which leads to poor customer satisfaction and compromised product quality. In compliance with the finding, a systematic analysis that sought to investigate the extent, causes, and implications of critical pharmaceutical stock outs in low and middle-income countries (LMICs) discovered that distribution issues were among the causes of stock-outs, and distribution delays were frequently reported in transportation due to security, and difficult road conditions were among the identified distribution challenges.

The study indicated that most facilities noted transportation challenges with the RDF distribution system as the main challenge. Similarly, according to a recent study on the challenges of medicines and vaccine supply chains conducted in Nigeria, insecurity during vaccine transportation, the inability to maintain the integrity of vaccine in the supply chain, and logistics distance between the manufacturer and Nigeria were all identified as vaccine supply challenges. Furthermore, issues such as damaged products and packaging, as well as unstructured supplies due to the country's many distribution routes, which are connected with a high degree of pilferage and loss in transit, were mentioned.

7. STRENGTHS AND LIMITATIONS OF THE STUDY

7.1. Strength of the Study

The strength of the study is that it measures both service quality and customer satisfaction along with the challenges faced, therefore provides a complete picture of the physical distribution looks like. Moreover, the dimension of physical distribution were also measured with there respective indicators in addition to the subjective measurement from health facilities. Furthermore, the study analyzed the difference of the two distribution system it follows in regard to the health facilities satisfaction level.

7.2 . Limitations of the Study

Health facilities in areas with security issues were not included.

As the documentation review was conducted, indicators of some of timeliness and product quality were not included, as some of the indicators were not recorded and documented by both the facility and the EPSS itself.

8. CONCLUSION AND RECOMMENDATION

8.1 Conclusion

Logistics customer service quality measurement is important to ensure customer requirements are met. The study found that the physical distribution service of EPSS, Dire Dawa branch has less than satisfactory quality in terms of all the physical distribution quality model dimensions, availability of health commodities, timeliness, product quality and responsiveness as the gap between expectation and perceived quality was significant and negative. Standing on the result of the gap analysis the customer satisfaction measurement reveal that health facilities has low satisfactory in terms of availability of health commodities and medium level satisfactory quality in terms of product quality, timeliness and responsiveness. The availability indicators, order fill rate and line fill rate were very far from the service's target. Similarly timeliness indicator on time delivery was far below the target. The challenges of the physical distribution identified were stock outs of pharmaceuticals, poor transportation facilities, financial constraints, weak supervision and communication between facilities and EPSS and poor data quality. The assessment of the quality of physical distribution service provided indicates there are gaps in terms of important technical and process service quality dimensions ultimately resulting poor customer satisfaction.

8.2 Recommendation

To health facilities

- RRF data quality and timeliness should be improved.
- The quality of quantification and forecast accuracy should be improved.
- Facilities should improve the communication with other health facilities and facility practice to facility transfer mechanism to minimize stockout duration.

To WHO, ZHO and regional health bureau

- The health offices/ bureau should provide a stronger support to facilities in terms of building the capacity and skill of professions to improve RRF and quantification quality.
- The offices/bureau should work with the Economy and finance bureau to enhance the budget allocated to health facilities.
- The bureau should work with the CBHI agency to ensure budget reimbursement is timely.
- The bureau should improve the transportation facility capacity of health facilities.

To EPSS, Dire Dawa branch

- The branch should improve the availability of health commodities and work on its consistency.
- The branch should conduct and document indicators like order cycle time and rate of product damage during transport to improve customer quality.
- The branch should develop interoperable LMIS which can like the information system of the service with facilities to reduce the order processing time.

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ANNEXES

Annex 1: Consent and information sheet

My name is Saron Alemayehu. I am here on behalf of Addis Ababa University College of Health Sciences, School of Pharmacy, Department of Pharmaceutics and Social Pharmacy. I am doing this study for the partial fulfillment of the requirements for a Master of Science in Health Supply Chain Management. The objective of this study is to assess the service quality of the physical distribution service, and health facilities' satisfaction with the Ethiopian Pharmaceutical Distribution Service, Dire Dawa Branch and identify its challenges.

Your cooperation and honest participation in filling questionnaires will provide me with valid results and show the real status of health commodities physical distribution service quality and challenge which will help me recommend appropriate interventions to concerned bodies for evidence-based decision-making. Hence, I kindly request you to be honest in your response. Your participation in filling out the questionnaires and every aspect of the study is completely voluntary based. Your name will not be written in this form and all information that you give will be kept confidential. You may skip any question that you may prefer not to answer, but I would appreciate your cooperation. You may also ask me to clarify questions if you don't understand them. Your responses to our questions are identified only by number, never by your name and your facility name.

Thank you

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Annex 2 : Data collection tool

Physical Distribution Service Quality Questionnaire

Section I: General Information and Demographic Background of Respondents.

1. Professional in charge of the facilities' logistics management
a) Pharmacist b) Health officer c) Nurse/midwife d) Druggist e) Other (specify-----)
2. Sex: a) Male b) Female
3. Age (in years)-----
4. Level of Education
 a) College Diploma
 b) Bachelor's degree c) Postgraduate studies
5. How long have you been working in the facility? (In years).....
6. Level of your health facility
 a) General hospital b) Primary hospital c) Specialized hospital d) Referral hospital
 e) Health center f) Others -----

Section II. Physical distribution service-related questions

This questionnaire asks you some questions about the physical distribution service you receive from your suppliers. For this questionnaire, physical distribution service is defined as all the activities that are involved in the physical delivery of products from a supplier to your company. In answering all the questions in this questionnaire, please think about the product you purchase most often.

Level of agreement

1 – Strongly disagree

2 – Disagree

3 – Neither agree or disagree

4 – Agree

5 – Strongly agree

Note: Order - order pertains to the whole order placed

Ordered product - means specified products ordered

Expectations

Circle a number to the right of each feature of physical distribution service, indicating whether you think suppliers, in general, should offer the feature; that is, whether you feel it is reasonable to expect a supplier to offer the feature. (Values range from 1, strongly disagree, to 5, strongly agree).

Program		RDF
Timeliness Item		
T1	The time between placing and receiving an order should be short. 1 2 3 4 5	The time between placing and receiving an order should be short. 1 2 3 4 5
T2	Delivery should be rapid. 1 2 3 4 5	Delivery should be rapid. 1 2 3 4 5
T3	The time between placing and receiving an order should be consistent. 1 2 3 4 5	The time between placing and receiving an order should be consistent. 1 2 3 4 5
T4	The time it takes my supplier to put my order together should be consistent. 1 2 3 4 5	The time it takes my supplier to put my order together should be consistent. 1 2 3 4 5
T5	The time between my supplier receiving and shipping my order should be short. 1 2 3 4 5	The time between my supplier receiving and shipping my order should be short. 1 2 3 4 5
T6	The time it takes my supplier to put my order together should be short. 1 2 3 4 5	The time it takes my supplier to put my order together should be short. 1 2 3 4 5
Availability Items		
A1	Orders should be available in inventory when ordered. 1 2 3 4 5	Orders should be available in inventory when ordered. 1 2 3 4 5
A2	Suppliers should have inventory available near my facility. 1 2 3 4 5	Suppliers should have inventory available near my facility. 1 2 3 4 5
A3	If suppliers are notified of possible increases in upcoming orders, they should maintain extra inventory. 1 2 3 4 5	If suppliers are notified of possible increases in upcoming orders, they should maintain extra inventory. 1 2 3 4 5
A4	Products ordered should be available in inventory. 1 2 3 4 5	Products ordered should be available in inventory. 1 2 3 4 5
A5	Products should consistently be available in inventory. 1 2 3 4 5	Products should consistently be available in inventory. 1 2 3 4 5
Condition		

C1	All orders should be delivered undamaged. 1 2 3 4 5	All orders should be delivered undamaged. 1 2 3 4 5
C2	All orders should be accurate (i.e., items ordered should arrive, not unordered items). 1 2 3 4 5	All orders should be accurate (i.e., items ordered should arrive, not unordered items). 1 2 3 4 5
C3	All products should be delivered undamaged. 1 2 3 4 5	All products should be delivered undamaged. 1 2 3 4 5
C4	Orders should be packaged conveniently. 1 2 3 4 5	Orders should be packaged conveniently. 1 2 3 4 5
Responsiveness		
R1	The distributor should respond immediately to your inquiries. 1 2 3 4 5	The distributor should respond immediately to your inquiries. 1 2 3 4 5
R2	The distributor should respond immediately to your complaints 1 2 3 4 5	The distributor responds immediately to your complaints 1 2 3 4 5
	Program	RDF
Perceived Performance This question concerns the physical distribution service performance of a specific supplier. For this question, please think about your primary, secondary, and third most often used supplier for the product you most often purchase and indicate the extent to which you agree or disagree that the performance you receive from this supplier possesses each feature below. (Values range from 1, strongly disagrees, to 5, strongly agree).		
Timeliness Items		
T1	The time between placing and receiving an order is short. 1 2 3 4 5	The time between placing and receiving an order is short. 1 2 3 4 5
T2	Delivery is rapid. 1 2 3 4 5	Delivery is rapid. 1 2 3 4 5
T3	The time between placing and receiving an order is consistent. 1 2 3 4 5	The time between placing and receiving an order is consistent. 1 2 3 4 5
T4	The time it takes my supplier to put my order together is consistent. 1 2 3 4 5	The time it takes my supplier to put my order together is consistent. 1 2 3 4 5
T5	The time between my supplier receiving and shipping my order is short. 1 2 3 4 5	The time between my supplier receiving and shipping my order is short. 1 2 3 4 5
T6	The time it takes my supplier to put my order together is short.	The time it takes my supplier to put my order together is short

	1	2	3	4	5		1	2	3	4	5
Availability Items											
A1	Orders are available in inventory when ordered. 1 2 3 4 5						Orders are available in inventory when ordered. 1 2 3 4 5				
A2	Suppliers' is inventory available near my facility. 1 2 3 4 5						Suppliers' is inventory available near my facility. 1 2 3 4 5				
A3	If suppliers are notified of possible increases in upcoming orders, they do maintain extra inventory. 1 2 3 4 5						If suppliers are notified of possible increases in upcoming orders, they do maintain extra inventory. 1 2 3 4 5				
A4	Products ordered are available in inventory. 1 2 3 4 5						Products ordered are available in inventory. 1 2 3 4 5				
A5	Products are consistently available in inventory. 1 2 3 4 5						Products are consistently available in inventory. 1 2 3 4 5				
Condition											
C1	All orders are delivered undamaged. 1 2 3 4 5						All orders are delivered undamaged. 1 2 3 4 5				
C2	All orders are accurate (i.e., items ordered should arrive, not unordered items). 1 2 3 4 5						All orders are accurate (i.e., items ordered should arrive, not unordered items). 1 2 3 4 5				
C3	All products are delivered undamaged. 1 2 3 4 5						All products are delivered undamaged. 1 2 3 4 5				
C4	Orders are packaged conveniently. 1 2 3 4 5						Orders should be packaged conveniently. 1 2 3 4 5				
Responsiveness											
R1	The distributor responds immediately to your inquiries. 1 2 3 4 5						The distributor responds immediately to your inquiries. 1 2 3 4 5				
R2	The distributor responds immediately to your complaints 1 2 3 4 5						The distributor responds immediately to your complaints 1 2 3 4 5				

Section III. Direct health facilities' satisfaction measurement

Please rate the following questions based on the scale below

1. Poor	2. Fair	3. Good	4. Very good	5. Excellent
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1. How would you rate the availability of product to meet your demand?

RDF 1 2 3 4 5

Program 1 2 3 4 5

2. How would you rate the timeliness of delivery?

RDF 1 2 3 4 5

Program 1 2 3 4 5

3. How would you rate the quality of delivered or pickup products?

RDF 1 2 3 4 5

Program 1 2 3 4 5

4. How would rate the responsiveness of the service?

RDF 1 2 3 4 5

Program 1 2 3 4 5

Qualitative tool

Key informant interview guide

Section I: General Information and Demographic characteristics of Respondents.

1. Professional in charge of the facilities' logistics management
 - a) Pharmacist b) Health officer c) Nurse/midwife d) Druggist
 - e) Other (specify-----)
2. Sex: a) Male b) Female
3. Age (in years)-----
4. Level of Education
 - a) College Diploma b) bachelor's degree c) Postgraduate
5. How long have you been working in the facility? (in years)-----
6. Level of your health facility
 - a) General hospital b) Primary hospital c) Specialized hospital d) Referral hospital
 - e) Health center f) Others -----

Section II: Interview questions

1. What are the main challenges of the distribution process?
2. How is it affecting the process of distribution service?
3. What is your recommendation for overcoming the challenges?
4. What would you like to add on the distribution of pharmaceuticals to the HFs?

Documentation review checklist

List of indicators to measure PDSQ dimensions

Availability dimension;

1. Order fill rate
2. Line filled rate
3. Stock-out rate

The timeliness dimension;

1. Average delivery time,
2. On-time delivery

Annex 3: Declaration Sheet

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all the resources and materials used for the thesis, have been fully acknowledged.

Name: Saron Alemayehu

Signature: _____

This thesis has been submitted for examination with my approval as university advisor.

Name: Teferi Gedif Fenta (Professor)

Signature: _____

Place and date of submission: School of Pharmacy, Addis Ababa, Ethiopia

May, 2024

Annex 4. List of tracer drugs

Tracer Drugs by Facility	H. Center	1^{ry} Hosp.	Gen. Hosp.	3^{ry} Hosp.
1. Ciprofloxacin 500mg tablet	X	X	X	X
2. RHZE- 150mg+75mg+400mg+275mg-tablet	X	X	X	X
3. TDF/ZDV+3TC+EFV/NVP adult	X	X	X	X
4. Arthmeter + Lumfanthrine 20mg+120mg tab	x	x	x	
5. Magnesium Sulphate injection	X	X	X	X
6. Oxytocin 10units/ml injection	X	X	X	X
7. Hydralazine injection	X	X	X	X
8. Adrenaline (Epinephrine) injection	X	X	X	X
9. Aminiphyllin injection	X	X	X	X
10. Glucose 40%	X	X	X	X
11. Dextrose in normal saline/Ringer lactate	X	X	X	X