ST. MARY'S UNIVERSITY SCHOOL OF GRADUATE STUDIES

THE STUDY OF ETHIOPIA PUBLIC HEALTH SUPPLY CHAIN MANAGEMENT: BEFORE AND AFTER PHARMACEUTICALS FUND AND SUPPLY AGENCY (PFSA)

BY

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May 2015
ADDIS ABABA, ETHIOPIA

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LIST OF ABBREVIATIONS

AIDS	Acquired Immuno Deficiency Syndrome
ART	Antiretroviral Treatment
BC	Bin Card
BPR	Business Process Reengineering
CDC	Center for Disease Control and Prevention
CHAI	Clinton Health Access Initiative
ETB	Ethiopia Birr
FMOH	Federal Ministry of Health
GDP	Gross Domestic Product
GFATM	Global fund to fight AIDS, TB and Malaria
HCMIS	Health Commodity Management Information System
HHRI	Health and Health Related Indicator
HIV	Human Immuno Deficiency Virus
HSDP	Health Sector Development Program
JSI	John Snow Incorporated
LMIS	Logistics Management Information System
NGO	Non-Governmental Organization
PEPFAR	President's Emergency Plan for AIDS Relief
PFSA	Pharmaceuticals Fund and Supply Agency
PHARMID	Pharmaceuticals and Medical Supplies Import and Wholesale Share Company
PLMU	Pharmaceuticals Logistics Management Unit
PSLD	Pharmaceuticals Supply and Logistics Department
PSM	Procurement and Supply Management
RHB	Regional Health Bureau
SCM	Supply Chain Management
SCM	Supply Chain Management
SCMS	Supply Chain Management Systems
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
SOP	Standard Operating Procedure
TPE	Total Pharmaceutical Expenditure
UNFPA	United Nation Population Fund
UNICEF	United Nations Children's Fund
USAID	Agency for International Development
USD	United States of America Dollar
WHO	World Health Organization

ABSRTACT

Background: Supply chain management is core component of health sector for health programs and services. It is a means to ensure products availability for prevention, diagnosis, treatment, care and support. The Ethiopian public health SCM had a major reform in 2007 through the establishment of Pharmaceuticals Fund and Supply Agency, which is a semi-autonomous agency responsible for the forecasting, procurement, storage and distribution pharmaceuticals.

Methods: Exploratory qualitative methods using mixed techniques i.e. survey and case study methods

Objectives: To assess the strength, weakness and challenges of the Ethiopia public health SCM and compare it before and after PFSA

Result: The establishment of PFSA has laid the foundation for strong public health supply chain. Major strengths were establishment of proxy & direct distribution system, improve infrastructure, improved availability of tracer commodities from 59% to 89%. The major weaknesses were lack of supply chain technical capabilities, lack of data visibility, lack of strong coordinating body, unavailability of enterprise wide business information system, lack accountability and clarity of roles and responsibility, and lack of private sector engagement and role. Since, the establishment of PFSA direct delivery (from non to thousands sites), expansion and improvement of warehouse infrastructure from 10 branches of storage capacity of 46,000 M^3 to 17 branches of storage capacity 580,000 M^3, institutionalization of IPLS and automation to over 500 health facilities, increased procurement volume from $45million to $315million and increased distribution volume from $55 million over $562 million (2007/8 vs. 2014) were significant.

Conclusion and Recommendations: There are improvements in the public health SCM over years although there are long ways to resolve the bottlenecks. We recommend the develop national medium and long-term SCMS strategy, improved SCM technical skill sets, accountability and clarity of roles and responsibilities of stakeholders in SCM, restructure and strengthen both PLMU and PFSA, and improve coordination and communications systems

Key words: Supply chain, pharmaceuticals, supply chain management

CHAPTER ONE

1.   INTRODUCTION

1.1.   Background of the Study

Supply chain management (SCM) is becoming more crucial for the survival of a world-class enterprise. Nowadays many organizations become a part of at least one supply chain. They have to perform equally well, in order to achieve better performance. This also requires elimination of interface between many techniques across applications and individual departments (Premaratne, 2005). This is true in public health supply chain because manufactures, importer and distributor (e.g. Pharmaceuticals Fund and Supply Agency) and health facilities are involved in the process of ensuring product availability for the customer. The wide variety of pharmaceuticals needed for diagnosis, prevention and treatment of a certain disease conditions; the needs of these products for the health facility, health professionals and their clients vary from time to time, place to place and program to program. The public health SCM specifically suffers with long list of pharmaceuticals and specific shelf life and storage requirements, involvement of too many players in most key process areas in forecasting and use.

A logistics system provides excellent customer service: by fulfilling the six rights, ensuring that the right goods, in the right quantities, in the right condition, are delivered to the right place, at the right time, for the right cost (The Logistics Handbook, 2006). Each person who works in supply chain management systems (SCMS) must remember that s/he selects, procures, stores, or distributes products to meet customer needs. The logistics system ensures customer service by fulfilling the six rights. Each activity in the logistics cycle, therefore, contributes to providing excellent customer service. The situation where customers and service provider can choose, obtain, and use medicines and other health commodities when and where they need them for prevention, diagnosis, treatment, and care is the one that SCM can provide. The whole supply chain activities in public health are for saving lives and/or improving the health status of the people.

In Ethiopia, a country wide assessment of the pharmaceuticals supply management system was undertaken to document the challenges faced in the procurement, storage and distribution of pharmaceuticals and health commodities. The assessment revealed that long procurement lead times, inadequate storage infrastructure, and unsystematic distribution practices were major constraints to pharmaceuticals supply management system in the country. The main causes of these problems are poor procurement planning, due to the lack of a logistics management information system (LMIS), inadequate staff capacity in the Federal Ministry of Health (FMOH) Pharmaceutical Administration and Supply Service and non-optimal administrative procedures at federal and regional government levels (FMOH, 2005).

To solve these problems in public health facilities, Pharmaceuticals Fund and Supply Agency (PFSA) was established in 2007 by Proclamation No. 553/2007 based on the Pharmaceuticals Logistics Master Plan developed from the national assessment report. It was organized in three technical processes (forecasting and capacity building, procurement, storage and distribution), and three support processes (fund management, management information system, and human resource and general service). PFSA is mandated to avail affordable and quality assured pharmaceuticals in a sustainable manner to all public health facilities and ensure their rational use. Currently, PFSA has 11 functional and six under establishment branches and covers all regions and city administrations of the country. The branches and its activities are working beyond the political regional boundaries. Currently a branch may serve from 1 to 4 regions or city administrations. General Director &two deputy general directors manage who reports to the board. The members of the board are selected from parliamentarian, Prime Minister Office, regions, FMOH and other ministries. Moreover, PFSA reports to FMOH and the parliaments.

As a result, FMOH in its health sector development program (HSDP) IV has set several targets with respect to pharmaceutical supply and services, such as: (i) increasing the availability of quality pharmaceuticals at an affordable price and in a sustainable manner; and (ii) achieving improved rational medicines use and significant reduction of pharmaceuticals wastage. PFSA to achieve the HSDP IV targets it needs to improve its capacity, implement a procurement methods that can sustainably supplies and manage the effectiveness of its suppliers, and increase the number of direct delivery sites and its management efficiency.

1.2. Statement of the Problem

The World Health Organization defines access to quality medicine as a priority for citizens. It needs to be available at all times in adequate amounts, in appropriate dosage and quality and at an affordable price for individuals and communities (WHO). To ensure that people have access to essential and quality medicines, a functioning and sustainable supply chain is necessary, which includes proper forecasting and supply planning, timely procurement, appropriate warehousing and effective transportation systems. In line with this, the FMOH sets up semi-autonomous entities such as a National Level Medical Store, the equivalent in Ethiopian is Pharmaceuticals Fund and Supply Agency (PFSA), which is responsible for the forecasting, procurement, storage and distribution of medicine and medical supplies to health facilities across the country (Federal Negarit Gazeta, 2007). Regardless of this, developing countries where Ethiopia is not an exception have several challenges to ensure an appropriate supply of medicine to health facilities and the customers.

In Ethiopia, there were multiple parallel supply chain systems for different programs, lengthy processes and five layers in the supply chain systems, multiple players in the forecasting and procurement, storage and distributions, and management and decision making in the Ethiopian health supply chain systems. Moreover, there were multiple duplications of efforts at national and regional levels of the health SCMS (FMOH, 2006). As a result the FMOH with partners established PFSA in 2007 to address these challenges and improve the efficiency of the supply chain management system of the public health sector. Government of Ethiopia and partners collaborated to strengthen PFSA since 2007 and PFSA has made improvements in its management capacity, infrastructure and storage and fleet management. Currently, PFSA manages integrated supply chain management system for human immuno deficiency virus, tuberculosis and family planning products and regularly (bimonthly) resupplied over 1100 health facilities (Shewarega, Paul, Welelaw, Sami, and Yared, 2015).

However, there are still complains and questions from different levels of the Ethiopian health system about the efficiency, responsiveness, capacity and management of PFSA. Some even argued that the previous system was better and tried to hinder the integrations of the supply chain for some programs e.g., malaria product management was taken back to the old 5 layers

management system. Recently, FMOH created Pharmaceuticals Logistics Management Unit (PLMU) in the FMOH under the State Minister of operation section to handle some logistics issues and liaison with PFSA.

Hence, this study is to assess and document the Ethiopian public health supply chain before and after PFSA. The study will assess the challenges, progresses and success of the public health supply chain. The result of the study will benefit FMOH, PFSA, regional health bureaus and stakeholders to (1) understand the challenges of the public health supply chain, (2) get information about the progress made so far and see the possible future direction of the public health supply chain, (3) identify areas that need more attentions and collaboration in the public health supply chain management system, and (4) identify core competencies for PFSA, PLMU and regional pharmaceutical management sections in public health SCMS.

1.3. Research Questions

The following were the basic research questions of the study:

1. To what extent did the establishment of PFSA improve the Ethiopian public health supply chain system?
2. What were the key strength and weakness of the Ethiopia public health supply chain management systems?
3. How did the public health SCM pre PFSA and post PFSA look like?

1.4. Objectives of the Study

1.4.1. General Objective

To assess the strength, weakness and challenges of the Ethiopia public health SCM and compare it before and after PFSA

1.4.2. Specific Objectives

1. To determine the relevance of PFSA in improving the Ethiopia public health SCM
2. To assess the strength of Ethiopia public health SCM
3. To assess the weakness and challenges affecting the Ethiopia public health SCM
4. To compare the Ethiopia public health SCM before and after PFSA

1.5. Definition of Terms

Recognizing that there may be multiple interpretations for the terms listed below, they are defined as follow for the purposes of this thesis proposal.

1. **Supply chain** encompasses all activities associated with the flow and transformation of goods (products and services) from initial design stage through the early raw material stage, and on to the end user, (Hines, 2004).
2. **Supply chain management** encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and logistics management, (Council of Supply Chain Management Professionals).
3. **Public health facilities**: these are health facilities owned by the government of Ethiopia and managed under FMOH or regional health bureaus.
4. **Pharmaceuticals:** means any substance or mixture of substances used in the diagnosis, treatment, mitigation or prevention of a disease, and include medical instruments and medical supplies (Proclamation No 553/2007).

1.6. Significance of the Study

The findings will have the follow practical benefits

1. FMOH, Regional Health Bureaus, PFSA and stakeholders will see the Ethiopia public health SCM progresses and strengths documented since the PFSA's establishment.
2. PFSA and its stakeholders will use it to see the spectrum of the public health SCM including the strength, weaknesses and challenges. It will also provide the major SCM concerns to decision makers and stakeholder.
3. PFSA and its stakeholders will use the findings to improve the management of the SCM.

Moreover, the thesis report will be good resources for the general public and scholars by

1. Providing information about the current status of Ethiopian public health SCM from the study point of view

2. Inform the spectrum of pre- PFSA and post- PFSA era in the supply chain areas for further studies.

3. Serving scholars as a resource for future assessments and studies in the area.

As per my knowledge, there is no prior study in this area. Therefore, this study is timely and important. It will provide information on public health SCM and will benefit the FMOH, PFSA, partners, regional health bureaus and health facilities in understanding, strengthening and excelling the public health SCM.

1.7. Scope of the Study

The study was limited to the assessment of public health SCM in relation to PFSA (before and after). It sought data on the strengths, weaknesses and challenges affecting its performance and development. It did collect the major operations not the detail operations of PFSA that could be compared with the pre-establishment era. This was a national level assessment and dealt with the key players i.e. FMOH, Ethiopia Public Health Research Institute, PFSA, HIV/AIDS Prevention and Control Office, Food Medicine and Health Care Administration and Control Authority, partners, donors, regional health bureaus. It did not cover uniformed services, health facilities, private sectors, regional health facilities and regional laboratories. The study was done in Addis Ababa and three regions (Oromia, Addis Ababa, and Amhara). The study was conducted from September 2014 to April 2015.

CHAPTER TWO

2.   REVIEW OF RELATED LITERATURES

The reviews include the concepts and functions of supply chains, importance of supply chain, the peculiarities of supply chain in health industry and reviews of related literatures from scholars and study findings.

2.1.   Supply Chain Management: Concepts, key Issues, and Functions

2.1.1.   Supply Chain Management concepts and key issues

Supply chain is a system of suppliers, manufactures, distributors, retailers and customers where material typically flows downstream from suppliers to customers (except for reverse logistics) and information flow in both directions. SCM involves managing a connected series of activities including planning, coordinating and controlling movement of goods from supplier to customer. Therefore there are decisions to be made strategic, tactical and operational. The decision making levels in supply chain are strategic (5 to 10 years), Tactical (3 months to 2 years) and operational (day to day) (Charu & Swatantra, 2004).

The common key issues that face SCM activities are distribution network configuration, inventory control, supply contracts, distribution strategies, supply chain integration and strategic partnering, outsourcing and procurement strategies, information technology and decision support systems, and customer value (Encyclopedia, Charu & Swatantra, 2004). Decisions are made to address these key issues.

2.1.2. Importance of the Supply Chain

Supply chain management (SCM) is becoming more crucial for the survival of a world-class enterprise. Nowadays many organizations become a part of at least one supply chain. They have to perform equally well, in order to achieve better performance (Premaratne, 2005). As a result, organizations increasingly find that they must rely on effective supply chains, or networks, to compete in the global market and networked economy.

The functions of the supply chain are to resolve the major business challenges of the organizations and for developing capabilities to manage value, volume, volatility, velocity, variety, variability, visibility and virtuality of the organizations. Visibility is a core capability for managing the total supply chain from source to customer. Visibility or transparency ensures that parties with in the total supply chain know what the current pipelines look like (Hines, 2004).

Supply chain strategies require a total systems view of the links in the chain that work together efficiently to create customer satisfaction at the end point of delivery to the consumer. As a consequence, costs must be lowered throughout the chain by driving out unnecessary expenses, movements, and handling. The main focus is turned to efficiency and added value, or the end-user's perception of value. Efficiency must be increased, and bottlenecks removed. The measurement of performance focuses on total system efficiency and the equitable monetary reward distribution to those within the supply chain. The supply chain system must be responsive to customer requirements (Hines, 2004).

The purpose of a logistics system is simple: to obtain and move goods, supplies and equipment in a timely fashion to the places where they are needed, at a reasonable cost. Matters are complicated by the fact that equipment and supplies usually cannot go directly from their source to the end user; they frequently must be held as inventory at one or more intermediate points along the way. There are only four reasons for holding inventory: transportation efficiency, safety stocks, storage capacity and anticipation of a program that is growing or changing (USAID | DELIVER PROJECT, 2009). Hence, reducing cost of operations, improving inventory, lead times and customer satisfaction, increasing flexibility and cross-functional communication, and remaining competitive appear to be the most important objectives to implement SCM strategies (Tummala, Cheryl, & Melanie, 2006).

Therefore, the whole purposes of SCM are to reduce cost, speed market, and to provide better customer services so that the organization will be visible, effective and efficient both internally and with its customers (supplier and consumer). In health care industry, the main reasons are cost and risk (Charu & Swatantra, 2004).

2.1.3. Supply Chain Management in Health Care Industry

Health expenditure as a share of Gross Domestic Product (GDP) ranges from less than 5% to 15%. Across the globe there are great variations on the amount countries spend on health. In

high income countries per capita health expenditure is over USD 3000 on average, while in resource poor countries it is only USD 30 per capita. In 2008, there were 64 countries per capita health expenditure was less than USD 100. There is also wide variation in health expenditure with respect to economic development. Some countries spend more than 12% of GDP on health, while others spend less than 3%, on health (Xu, Priyanka, & Alberto, 2011). The proportions for pharmaceuticals are higher. The United State of America healthcare industry is a large enterprise accounting for over 14.1% of the national economic output in 2001(Charu & Swatantra, 2004).

Per capita pharmaceutical expenditures in 2005/2006 ranged from USD 7.61 in low-income countries to USD 431.6 in high-income countries, with considerable variation between income groups in each country. Sixteen percent of the world's population living in high-income countries accounts for over 78% of global expenditures on medicines; Measured Total Pharmaceutical Expenditure (TPE) accounts for 1.41% to 1.63% of GDP by income groups and regions although there is considerable variation between countries ranging from 0.2% to 3.8% of GDP. TPE is closely related with both total health expenditures and with GDP. The proportion spent on medicines is higher in low per capita income countries. On average 24.9 % of total health expenditures spent on medicines, with a wide range from 7.7% to 67.6%. So, the SCM is health care industry is about managing a lot of resources (Ye, Patricia, Dele, & Tessa, 2011).

2.2. Historical Developments of Supply Chain

Six major movements observed in the evolution of supply chain management studies: creation, integration, globalization, specialization phases one and two, and SCM 2.0.

2.2.1. **Creation era:** The term "supply chain management" was first coined by Keith Oliver in 1982. However, the concept of a supply chain in management was of great importance long before, in the early 20th century, especially with the creation of the assembly line. The characteristics of this era of supply chain management include the need for large-scale changes, re-engineering, downsizing driven by cost reduction programs, and widespread attention to Japanese management practices. However, the term became widely adopted after the publication of the seminal book Introduction to Supply Chain Management in 1999 by Robert B. Handfield and Ernest L. Nichols, Jr. (Encyclopedia).

2.2.2. **Integration era:** This era of supply chain management studies was highlighted with the development of electronic data interchange systems in the 1960s, and developed through

the 1990s by the introduction of enterprise resource planning (ERP) systems. This era has continued to develop into the 21st century with the expansion of Internet-based collaborative systems. This era of supply chain evolution is characterized by both increasing value added and cost reductions through integration. A supply chain can be classified as a stage 1, 2 or 3 networks. In a stage 1–type supply chain, systems such as production, storage, distribution, and material control are not linked and are independent of each other. In a stage 2 supply chain, these are integrated under one plan and are ERP enabled. A stage 3 supply chain is one that achieves vertical integration with upstream suppliers and downstream customers (Encyclopedia).

2.2.3. **Globalization era:** The third movement of supply chain management development, the globalization era, can be characterized by the attention given to global systems of supplier relationships and the expansion of supply chains beyond national boundaries and into other continents. Although the use of global sources in organizations' supply chains can be traced back several decades (e.g., in the oil industry), it was not until the late 1980s that a considerable number of organizations started to integrate global sources into their core business. This era is characterized by the globalization of supply chain management in organizations with the goal of increasing their competitive advantage, adding value, and reducing costs through global sourcing (Encyclopedia).

2.2.4. **Specialization era (phase I): outsourced manufacturing and distribution:** In the 1990s, companies began to focus on "core competencies" and specialization. They abandoned vertical integration, sold off non-core operations, and outsourced those functions to other companies. This changed management requirements, by extending the supply chain beyond the company walls and distributing management across specialized supply chain partnerships. The specialization model creates manufacturing and distribution networks composed of several individual supply chains specific to producers, suppliers, and customers that work together to design, manufacture, distribute, market, sell, and service a product. This set of partners may change according to a given market, region, or channel, resulting in a proliferation of trading partner environments, each with its own unique characteristics and demands (Encyclopedia).

2.2.5. **Specialization era (phase II): supply chain management as a service:** Specialization within the supply chain began in the 1980s with the inception of transportation brokerages, warehouse management, and non-asset-based carriers, and has matured beyond transportation and logistics into aspects of supply planning, collaboration,

execution, and performance management. Supply chain specialization enables companies to improve their overall competencies in the same way that outsourced manufacturing and distribution has done; it allows them to focus on their core competencies and assemble networks of specific, best-in-class partners to contribute to the overall value chain itself, thereby increasing overall performance and efficiency. The ability to quickly obtain and deploy this domain-specific supply chain expertise without developing and maintaining an entirely unique and complex competency in house is a leading reason why supply chain specialization is gaining popularity (Encyclopedia).

2.2.6. **Supply chain management 2.0 (SCM 2.0):** Building on globalization and specialization, the term "SCM 2.0" has been coined to describe both changes within supply chains themselves as well as the evolution of processes, methods, and tools to manage them in this new "era". SCM 2.0 replicates this notion in supply chain operations. It is the pathway to SCM results, a combination of processes, methodologies, tools, and delivery options to guide companies to their results quickly as the complexity and speed of the supply chain increase due to global competition; rapid price fluctuations; surging oil prices; short product life cycles; expanded specialization; near-, far-, and off-shoring; and talent scarcity. SCM 2.0 leverages solutions designed to rapidly deliver results with the agility to quickly manage future change for continuous flexibility, value, and success (Encyclopedia).

2.3.   Elements of Supply Chain

The key elements of the supply chain for most organizations are upstream, internal and downstream, however the details vary by industry. These three elements should be interlinked with appropriate information systems. The first elements of supply chain is about the relationship with suppliers specifically supplier relationship management and procurement management that is upstream supply chain. The second element of the supply chain is basically about internal value chain including manufacturing, packing and inventory management. Whereas, the third element is the downstream supply chain which focus how best to reach the customers and distribution centres and hence include distributions, warehousing and transportation management. These basic elements of supply chain are described as activities of public health supply chain as follows.

2.4. Major Activities of the Public Health Supply Chain

Most reference books and handouts explain the different functions of public health supply chain in almost similar manners. In general, the public health SCM involves different activities that must be carefully planned and coordinated to ensure the right commodities of acceptable quality get to the right place at the right time so that customers use for diagnosis, treatment, and care when needed. Therefore, the key activities are:

2.4.1. **Product selection:** selection may start at national level and cascaded to the specific place where the care is going to be provided. It involves establishing a list of commodities at national and facility levels. Therefore, the list should be developed based on the prevailing health care needs and should address the essential health package of the country. Selection is of commodities should be an inclusive and participatory process as develop a consensus list. In Ethiopia, product selection is done at the national level by national advisory board and health programs in collaboration with Food, Medicine and Health Care Regulatory Authority drug and therapeutic committee developed facility based formularies.

2.4.2. **Quantification:** After products are selected, the quantity needed for each product, for a specific time period is needed. This process ensures that product selections are made using standard guidelines and regulatory requirements that consider the cost and timing of procurements. Quantification depends on accurate forecasting and will depend on the appropriate quantification methods. It important to refine and improve forecasting over time and data qualities need to be checked. Quantifications to be effected needs to have a supply plan. Quantification also tells the gaps and available resources for commodity requirements. It can be used for resource advocacy and future planning purposes.

2.4.3. **Procurement:** After the quantity needs and supply plan are known through appropriate forecasting and supply planning, the products need to be procured. This process is to ensure supply plans are met and the available budget is aligned with the

commodity overall cost. The procurement shall base on the supply plan. There should also be appropriate procurement methods in place to ensure continuous availability and improve cost efficiency. In procurement adherence to the procurement regulations and directives is key likewise clients' management and relationship.

2.4.4. **Storage and Inventory management:** Inventory management is as important as like that of managing the money at the bank. After an item is ordered and received, it must be properly stored until the customer needs it. A country's inventory control strategy specifies how much stock to store and where to store it. Enough stock should be available to meet customer needs until a new order is received; but not so much that stocks expire or are wasted or that you exceed storage capacity. Storage has two purposes for products: (1) to ensure the quality or condition, and (2) to make them available for distribution.

2.4.5. *Distribution and fleet Management:* This is the process of transferring products from the source of supply to the place of consumption. It is the art of getting the right amounts of commodities to the right places at the right time. It involves transportation, delivery, and receiving of commodities, proper storage, and inventory control for receipt and disbursement and information systems.

Moreover, there are need to have quality monitoring activity for each activity to perform properly and ensure continuous availability of products to the customers. Also other crosscutting issues are important in SCM including but not limited to finance and budgeting management, human resources management and management information systems.

2.5. Empirical Literature Review

Supply chain management (SCM) is a rapidly evolving area of interest to academics and business management practitioners alike. As a result most of the industries innovations in improving efficiency and reduce cost targeted innovations on key functions including logistics (Charu & Swatantra, 2004). The aspects of marketing, economics, logistics and organizational behavior are all important for developing insights into how and why different SCM arrangements emerge and for understanding the consequences of these arrangements for industry efficiency and competitiveness (Jill & Hobbs, 1996). Like most other industries, SCM in public health is now

slowly evolving. Public health programs consider supply chain starting from the planning and acknowledge the specialization and importance in accomplishing programs.

Public health supply chain in most developing countries are designed and implemented to meet demands of specific program logistics. Some of the examples of vertical or standalone public health supply chains are supply chain systems for tuberculosis, HIV/AIDS, family planning, malaria, vaccines and so on. As a result, the public health supply chain systems are very fragmented and undeveloped. The different health programs have multiple parallel SCM but all basically perform similar functional activities i.e. primarily meeting the supply needs of their clients or customers. However, as the health programs mature and funding from donors decline, there are interests and efforts for integration to takeover. The main anticipation for integrations is SCM knowhow improves and capacity developed. Because of these and recent worldwide notion to improve and integrate public health supply chain, Ethiopia government started moving to make the public health SCM more efficient and integrated.

However, unlike other sectors such as discrete parts in manufacturing and fast-moving consumer goods where there has been a long history and experience with management of inventory, the healthcare sector is behind other industry sectors in implementing effective supply chain management (SCM) practices (McKone et al., 2005; Baltacioglu et al., 2007). The main reason for the sector's difficulties in implementing effective SCM practices is that the healthcare supply chains are much more complex compared to supply chains in other industries (Vikram, Prakash, & Amrik, 2012). However, several factors contribute to this complexity. The first is that physicians are the key decision-makers regarding the procurement of prescription medicines, but they generally have a limited understanding of operations management and SCM techniques and practices (Vikram et al, 2012). There are also new health programs and new medicines continually adding to the SCM, demanding specific conditions like storage and shelf life that challenges the supply chain and inventory management. One good example in Ethiopia is the launching of free ARV treatment in 2003, which was characterized with a large infusion of commodities that require high logistics capacity (FMOH, 2004). Like that of other health program and industries, the success of expanded HIV/AIDS program is dependent on ability to reliably and consistently supply of the essential commodities.

Second, strong institutional and regulatory pressures, such as the number of mainstay or tracer drugs that are ending their patent protection tenure, thereby fuelling the growing competition

from generic drugs, influence the pharmaceutical industry. The regulatory regime of the pharmaceutical industry causes problems in determining accurate sales forecasts. This is essentially because it is difficult to gauge the magnitude of the competition from generics entering the marketplace (Vikram et al, 2012). The Ethiopia case is that Food, Medicine and Health Care Regulatory Authority adapts and follows stringent registration and market authorization procedures. Food and health products need to undergo registration and licensing with detail product descriptions, manufacturer information Andover, there are regular import permit approval and licensing requirements.

Third, pharmaceutical products are characterized by long developmental cycles that are distinctly different from medical devices. These long lead times have a significant impact on capacity planning and supply chain strategies, particularly inventory management. The final challenge with inventory management within the healthcare supply chains is that hospitals are operationally different from the other businesses because it is extremely difficult for them to predict their patient mix and ultimately their supply consumption (Vikram et al, 2012). This is specifically the case in emergency interventions, as it is difficult to ascertain the "type" of patient that will come to the hospital.

Forth, there are regular updates and changes of standard treatment protocols and guidelines that significantly affect the capacity of forecasting and quantify the products needed for each health programs. Moreover, as the level of customer care increases, the possibility of changing regimens, and addition or deletion of products will increases that have an influence on the supply chain management. These all brings challenges for public health supply chain in ensuring the product needs of customers to be effective and efficient.

All these have major ramifications, particularly for pharmacy departments in hospitals that carry high levels of safety stock to hedge against uncertainties such as daily demand fluctuations and supply bottlenecks. The net result is that hospital pharmacies have to maintain excess stock to insulate them against emergencies and an unpredictable demand ((Vikram et al, 2012). These factors lead to recurrent problems such as stock-outs and drug expiry within pharmacy departments in hospitals, health centers and health posts. The estimated expiry of pharmaceuticals in Ethiopia is 8.2% (FMOH & WHO, 2003). Supply chain in most industries is key factor for their efficiency and considered as core competency whereas in public health is to save lives and ensure the proper care to customer. As a result, in public health SCM, getting a

child vaccinated, a mother an appropriate medicine and controlling any epidemic outbreak are all very critical while ensuring the proper management and use of medicines. That makes supply chain in public health program more difficult while it requires the bulk of the health resources. However, this does not necessarily mean that public health supply chains are only designed to be effectiveness; there are also huge chance for cost savings and efficiency too. In Ethiopia, PFSA attempts to cover the need of hospitals and health centers that have several problems in SCM include documentation, SCM knowledge, management capacity, and human resource and SCM tools, which of course affect the national and sub national SCM systems.

Many countries have several logistics systems for selecting, procuring, and distributing health supplies to customers where Ethiopia is one. Often, programs such as HIV/AIDS, family planning, maternal and child health, malaria control, tuberculosis control, and nutrition, all manage and distribute supplies for their programs which is called vertical programs, they have historically been managed by separate management units, often from the central level.

Many countries, however, have been moving away from several vertical logistics systems toward one integrated system that distributes supplies for all programs. For example, a system that manages contraceptives for the family planning program might also manage oral rehydration salts (ORS), vitamin A, and other products for the maternal and child health program. This was one of the reasons for establishment of PFSA in Ethiopia. Although, vertical and integrated systems each have advantages and disadvantages there are valid technical reasons, often reflecting changes in the environment, make integrating a logistics system more advantageous or feasible. Some of the advantages include improved transportation infrastructure, improved data management, improved communications system coverage, new customer service requirements and increased storage and transportation efficiency (USAID | DELIVER PROJECT, 2009).

Therefore, adopting SCM initiatives primarily requires that companies take a long-term view and have an extensive focus, on all the channels that are employed in the total transformation process from the earth to the end-user to create a productive and reliable supply chain network system. Specially a public health supply chain needs to consider the various administrative levels and wide variety of health programs that requires specific storage conditions, shelf life, regulated levels of usage, and seasonal and campaign effects and bulkiness of the products and storage capacity at all levels. Proper execution of SCM requires commitment and champion from senior management too.

In old days and currently even in some organizations, internal supply chain and inventory management were over emphasized. However, organizations and partners have to re-think how their SCM linked to others within and outside the organization, locally and internationally, and upwards and downwards supply chain. Hence by evaluating and mapping a specific supply chain, a company is able to find and reduce system redundancies while improving reliability and flexibility of a system. SCM needs to begin by investigating each function a department handles and breaking it down if necessary.

Despite the challenges that are created developing an effective and efficient supply chain become a core competency or even a distinctive competency. A core competency is any function, which a firm does well at performing. On the other hand, a distinctive competency is a function that is performed well and is unique. Literature has shown that the basis of competition in many industries in the future will revolve around supply chain development (Das & Narasimhan, 2000). Supply chain analysis advocates reducing non-core processes (waste) and streamlining the supplier and logistics network. Thus the supply chain network includes upstream, downstream and lateral suppliers producing goods, services or other value adding activities. The information and communication technologies provide a backbone support to distribute and share information real-time for effective decision making by supply chain partners.

CHAPTER THREE

3.   RESEARCH DESIGN AND METHODOLOGY

The following research design and methods were used to address the objectives of the study

3.1.   Research Design

Exploratory qualitative method research design was used. Exploratory research methods are important for the provision of insights into the situations of the research subject. There were controversial ideas whether the establishment of PFSA improved or not. Hence, the appropriate research design was exploratory qualitative methods as the researcher wanted to find out what was happening in the Ethiopia public health SCM now and 6 years before. As a result, mixed techniques of qualitative research design i.e. survey and case study methods were used. The survey research method was used to collect data from different organizations of different management levels using unstructured interviews. Whereas, the case study method was deployed to study PFSA as a unit (organization) to analyze the status and progresses since its establishment.

3.2.   Population and Sampling Techniques

The study population included purposefully selected program officers, officials in Federal Ministry of Health, Ethiopian Public Health Research Institutes, Pharmaceuticals Fund and Supply Agency, HIV/AIDS Prevention and Control Offices, Food Medicine, Health Care Administration, and Control Authority, Regional Health Bureaus, donors, NGOs. The interviewees were 25 key informants from the different offices included the following.

1. FMOH: experts at PLMU, and medical services directorate
2. PFSA: Experts at Forecasting and Capacity Building Directorate, Storage and Distribution Directorate, Procurement Directorate , Human Resource, branches (Bahir Dar and Hawassa)
3. RHB: pharmacy team representatives at Addis Ababa RHB, Oromia, and Amhara RHB

4. Ethiopian Public Health Research Institutes, expert at regional laboratories capacity building directorate,

5. Donors: experts from UNICEF, UNFPA and USAID

6. NGOs: experts from SCMS, DELIVER, and SIAPS

Key performance indicators to be included in the study were determined prior to data collection in line with the major findings of the baseline assessment of FMOH (in 2006) that substantiate the establishment of PFSA. The technical areas considered were procurement and distribution values, storage and warehousing infrastructures, distribution and fleet capacity and human resources development. The procurement values for different donors were also predetermined and collected to analyze the procurement capacities in wider program commodities area. Additional, key informants were included who had an extensive experience in the country public health supply chain management systems.

3.3. Types of Data and Instruments of Data collection

Three data collection procedures were used which were in-depth interviews, data collection forms and desktop reviews. For the primary data sources, the data collection procedures were in-depth interviews and data collection forms. In addition, the secondary data were collected through desktop reviews of related documents.

For the in-depth interview, the data collection instruments were interview-guiding questions. The guiding questions for key informants at PFSA were mostly related to their technical areas (Appendices-1) while all other key informants guiding questions were similar (Appendices -2). For the study of supply chain performance and related technical areas, pre-prepared data collection forms were used. The prepared data collection forms were distributed to the different relevant organizations in advance (Appendices -3). However, subjected to the availability of data sources at the selected organization, the data collection forms were customized accordingly. Most of the data collections forms were filled and reported based on the organization data base. The investigator organized the data collection forms.

For the desktop reviews, similar data collection forms were used to collect the available data and contents. The investigator did reconcile the data quality and validity of the data collected through the data collection forms with other official reports and different presentations to substantiate the different sources of information. Moreover, the desktop reviews used to examine the before and after supply chain performances in line with the scope of PFSA establishment.

3.4. Procedure of Data Collection

The data of the study were collected from 20 Dec 2014 to 1 May 2015. Primary data were collected from in-depth interviews and data collection forms while the secondary data were collected from official reports or assessment findings using similar data collection forms. The key informants or interviewees were selected purposively from all relevant government agencies and other organizations that work with PFSA. All the 25 key informants who participants in the study were knowledgeable on the past and/or current Ethiopian public health SCM, and PFSA's roles and major performance. The interview guides questions were used to conduct the in-depth interview data collection. The average interview time was about 1.30 hour. The investigator conducted the interview and hand written notes were taken.

Regarding data related to procurement by organizations in values over the years, the investigator communicated in advance to all organizations namely PFSA, National Bank of Ethiopia, FMHACA, UNICEF, SCMS, and UNFPA to collect annual estimated procurements values. Similarly for others supply chain performance indicators, pre-prepared data collection tools were communicated in advance. Most of the data collections forms were filled and reported. The investigator collected the data from these organizations either in printed or soft copies.

3.5. Methods of Data Analysis

The data were analyzed using the thematic analyses methods. The data collected through in-depth interviews and desktop reviews were examined and organized in themes. Thematic analyses were used to organize the patterns across data sets to associate to the specific research question. The findings were organized to the specific objectives themes. The analyses were done by summarizing the thoughts, narrative, transcripts of interviews, and direct quotations of interviewees. Moreover, the data collected using the data collections forms were used to substantiate the narratives. The quantitative data were analyzed using Microsoft excel and the data were presented in appropriate manner in tabular, graphs and/or narrative formats.

CHAPTER FOUR

4.   RESULTS AND DISCUSSION

The results were presented based on the specific objectives. The discussion part described and compared the different studies on the key result areas of the supply chain.

4.1.   Result

The findings of the study are organized by the themes of the research objectives. The main themes of research objectives are the relevance of PFSA to improve public SCM, strengthen of SCM, weakness and challenges of SCM, and improvements of SCM after PFSA.

4.1.1. The Relevance of PFSA in Improving the Public Health SCM

The establishment of PFSA has laid the foundation for strong public health supply chain. The creation of PFSA as a lead agency was a strong stride of the government commitment in excelling the public health supply chain by consolidating the multiple operations at different levels of the health sector. Hence, the relevance of its existence was huge. The rationale given were its contribution to the expansion of health facilities, the development of national systems, the potential to reduce cost and wastages, its commitment to respond clients need, and its stewardship to reach to more facilities through expansion. However, there are still more to do in aligning the roles and responsibilities of PFSA, RHB, FMOH and health facilities. Its accountability and responsibility in meeting the needs of its clients, health programs and health facilities need to be more developed and refined.

To better analyze the relevance of PFSA we adopted both 'Pathway to Supply Chain Sustainability' and the 'Reproductive Health Commodity Security Framework'. The pathway to supply chain sustainability includes scalability, institutionalization and integrated supply chain (JSI, 2012) whereas; the reproductive health commodity security framework has six elements including clients, coordination, capacity, capital, commitment and context (Rao, Raja. 2008). These were selected to see the relevance of PFSA as both encompass elements that suit supply chain major areas.

Hence, the PFSA relevance per the six key areas embedded with the 3-sustainability path ways were described as follows:

1. **Client**: the ultimate goal of the supply chain is meeting the demands of the clients who are the ultimate beneficiary of the system. PFSA's ultimate beneficiaries are health facilities and health programs. Health facilities are increasing all over the country and there are quite wide ranges of health programs with special supply chain needs. Hence, PFSA needs to communicate, update health facilities, and program managers on any pertinent SCM issues and policy changes.

Respondents were asked to indicate the relevance of PFSA in improving the public sector supply chain management and all agreed on the relevance of PFSA for the public health SCM and their answers were yes! However, on the client relationship and management side of the question their responses were mixed, some said yes while others said no. The reasons for those who said yes were, PFSA was able to support the expansions of health facilities, supported the distribution of very important health program supplies during campaign like bed nets and vaccines, provide credit to health facilities and established hub based team. While those who said no, PFSA did not yet well organize itself to meet its clients' needs although improving over time. The reasons given were: PFSA didn't communicate its clients clearly; PFSA's policy on stock out, mark up, fee for services and lead time weren't known; PFSA didn't respond all the clients' needs nor provide alternative policy; PFSA still didn't look responsible for any failure to supply of essential pharmaceuticals, no accountability system for not promptly responding to clients; PFSA did not regularly meet with its clients, less representation in different meetings and looked external.

Generally, the communication between PFSA and its clients was found weak and there were weak forums developed to evaluate that both at national and branch levels. PFSA branches were considered much better as compared to the central in communicating clients. However, there were recent communication improvements in the organization in general.

Most respondents suggested that *PFSA need to meet regularly with health facilities, regions, and health programs. Establishing hub based team isn't enough, there needs to be a mechanism to review the supply chain and develop agreed action items at all levels.*

2. *Capacity:* PFSA and its partners are working to increase the organizational capacity to be more responsive to the supply chain needs and institutionalize sustainable improvements to the overall commodity security.

Respondents were asked to indicate the capacity of PFSA in ensuring the commodity security and all acknowledged that PFSA's capacity was improving over time. The major areas identified by majorities were the improvement in warehouse and warehouse handling materials, and increase number of vehicles, and branch expansions. However, there were issues raised regarding clarity of its strategic objectives, lacks of competency, and multiple roles and responsibilities that made PFSA weak and invisible. In summary, PFSA capacity improved overtime but it lacked specializations, quality and focus.

3. *Coordination:* SCM requires engagement of a broad range of stakeholders, including governments, donors, private sector, and civil society organizations. PFSA as a lead supply chain agency of FMOH, it should coordinate within and between the functions and systems to improve the policy, legal, and social environment in which it operates.

Respondents were asked to indicate the coordination of PFSA with its stakeholders to ensure commodity security and sustainable SCM and there were mixed responses. Few said PFSA established coordination forums like PFSA partner forum, procurement and supply management regular meeting; hub based team meetings and selected partners' biweekly meetings, so it is in the right track. While the majority said, PFSA as a lead supply chain agency, it didn't meet regularly with health facilities and regions, and health programs at FMOH to identify gaps, and implement solutions. They their reasons were substantiate because the creation of Pharmaceutical Logistics Management Unit (PLMU) at FMOH and strengthening the pharmacy sections at regions. In conclusion, there are steps to coordinate but needs more improvement and regularities.

Respondent suggested that *SCM is a multi-partners function, not only PFSA. The misunderstanding PFSA can do everything created a weak link between FMOH and PFSA.*

4. **Capital**: Investments from all sources (government, donors, private sectors and users) are required to establish and institutionalize a sustainable and strong supply chain system. Supply chain is a core competency and hence, PFSA as a lead public health supply chain

should be efficient, competitive and effective one. In the agency establishment proclamation, the funds for the agency are from PHARMID, government and revenue it generates. There are markups from zero to 30% on goods procured and sold and 5% of value of goods for distribution and storage service fees.

Respondents were asked to indicate the capital of PFSA and whole market approach in ensuring commodity security and majority agreed that PFSA stretched unnecessarily to cover the public health facilities need. There should be contributions from all players in the sector including private, donors and government. The role of the private sector was found unclear in the public SCM. Looking for documents, the strategic direction for public SCM and/or PFSA was not found. However, the overall asset increases over the years.

5. **Commitment**: creating a sustainable supply chain system and assured access to essential medicines happens when there is government commitment.

Respondents were asked to indicate the commitment of the government in general and PFSA in particular to improve the public SCM and commodity security and all acknowledged the government and partners' commitment. The establishment of PFSA was a big milestone and laid down the foundation of public health supply chain although there are long ways to go. The government is committed and stretched whatever it costs to implement its plans. The commitment in improving the SCM at FMOH, RHB and PFSA levels were found high.

6. **Context**: Context is important feature for SCM. The context from country perspectives ranging from geography, political, social, and cultural angles all important factors.

Respondents were asked to indicate the context and environment for public health SCM in the last six years and all agreed that it was challenging. The establishment of PFSA was followed by three big national happenings. These were 1) massive health facilities expansion, health facility increased from 12,123 in 2007/8 to 19,788 in 2013/14, which is like 63% increment, (HHRI of FMOH, 2007/8 to 2013/14), as PFSA's primary clients are public health facilities equipping these new facilities with medicines, medical supplies, medical equipment and laboratory equipment were challenging; 2) PFSA was working in era of moving from vertical systems in to integrated supply chain; 3) PFSA was working when the role of private sector engagement in resupply was lacking clarity of role and responsibility. While private sector in the health supply

chain is still underdeveloped, however, the role of private sector in most other countries is crucial for sustainable supply chain system.

Moreover, the context where PFSA works was adhoc and quick win approaches. As a result, it lacks clear long term perspectives on the key supply chain activities. Most of the key supply chain functions are not properly defined by policy. Some of the processes that aren't yet clearly defined were PFSA's scope and commitment, policy of near expiry and wastage, role and responsibilities of the different agencies and PFSA, fees for services structure for revolving drugs funds and program logistics, profit mark up, full supply and no full supply list of commodities, stock out policy and accountability, and the role of the private sector in the supply chain mitigation are just few.

4.1.2. The Strengths of the Public Health SCM in Ethiopia

The Ethiopian public health supply chain documented major strengths especially in the last six years. The major strengths identified by the majority of the respondents when they were asked to describe the major strengths of the public health SCM in Ethiopia and the majority of respondents indicated the following five big strengths. These were 1) establishment of proxy and direct delivery distribution systems; 2) expansion and improvement of warehouse infrastructure; 3) improved availability of tracer commodities; 4) creation of SCM tools and increased availability and utilization; and 5) availability of donors support and government continued commitment. The details that the majority of respondents addressed were as follows.

First, establishment of proxy and direct delivery distribution system where health facilities were resupplied from nearby branches without regional boundaries. The distribution system was designed in a route and road access bases from branches to the proxy sites of any region to be effectiveness and reduced costs associated with distribution. However, there were concerns of efficiency in the fleet management and the number of direct delivery sites.

Second, expansion and improvement of warehouse infrastructure at national and branch levels where proper storage could be practiced. These warehouses were equipped with modern warehouse handling equipment. There were also increment of PFSA's branches that improve geographic access to health facilities and regions.

Third, improved availability of tracer commodities that is the final output of the SCM. Respondents provided mixed response on product availabilities although the majority agreed that product availability improved overtime. Product availability may not necessarily attributes to the improved PFSA systems or supply chain activities as such as there are multiple factors that affect product available. However, tracer commodity availability for selected public health programs reported high which is the ultimate output of SCM both from the majority of the key informants and desktop reviews. Some of the programs with high commodity availabilities are family planning, HIV/AIDS, tuberculosis, and malaria. To substantiate the key informants' ideas, we reviewed desk top reports. As a result, we found out that the health facilities stock out of injectable contraceptives (Depo-Provera) and Implant 68mg implant (Implanon) or levonorgestrel 75mg implant (Jadelle) on the day of visit was 24.6% and 40.9 % in 2006 (LIAT, 2006) but significantly decreased in 2014 to 3% and 8% respectively (PFSA, 2014). Generally, the availability of products in health facilities (hospitals, health centers and health post) for 27 selected commodities in 2014 was 89% which is very high compared to prior studies and assessments (PFSA, 2014).

Fourth, the creation of SCM tools and increased availability and utilization at public health facilities. Respondents agreed that **g**overnment and its partners embarked on SCM tools and ensure their availabilities that contribute in improving availability of medicines and reduce wastages. The basic supply chain tools (recording and reporting tools) were standardized and harmonized not like the old days specific to one-program areas. The new tools work for wide range of program logistics and in integrated fashions, which was a success. Now, the tools for managing TB, Malaria, contraceptives, ARV, supplies and other commodities are the same. This is big paradigm shift from the vertical programs to the integrated logistics management approach.

Moreover, reviewing desktop documents showed that there are improved availabilities of these tools. The availabilities of bin cards and/or stock cards, the fundamental logistics records that captures essential inventory data, was 61.5% in 2005 baseline survey but it was increased to 80% in 2014 IPLS assessment. The desktop reviews were in line with the key informants ideas.

Fifth, availability of donors support and continued government commitment to the SCM were key strength. All respondents agreed that there were relatively better donor support opportunities to Ethiopian government in supply chain areas in relative terms. There were technical and financial support in different supply chain technical areas and commodities. The major donors in

Ethiopia supply chain were Global fund to fight AIDS, TB and Malaria (GFATM), President's Emergency Plan for AIDS Relief (PEPFAR), President's Malaria Initiative (PMI), United States Agency for International Development (USAID), and United Nation Children's Fund (UNICEF), United Nation Population Fund (UNFPA),World Bank, Bill and Melinda Gates Foundation (BMGF), and Clinton Health Access Initiatives (CHAI). FMOH, RHB, PFSA, and other agencies are committed to institutionalize a sustainable public health SCM.

4.1.3. The Weaknesses and Challenges of Public Health SCM in Ethiopia

The major bottlenecks and weaknesses identified by the majority of the respondents when they were asked to describe the major weaknesses and challenges of the public health SCM in Ethiopia and the majority of respondents indicated the following seven big weaknesses. These were 1) lack of strong coordinating body at FMOH, 2) lack of supply chain technical capability, 3) lack of data visibility, 4) lack of clarity of roles and responsibility between PFSA, other agencies, and RHBs; 5) unavailability of enterprise wide business information system, 6) lack of skilled and motivated staff, 7)lack of private sector engagement and role. The details described by the majority of respondents were the following.

1. **Lack of strong coordinating body at FMOH level**: The pharmacy department of FMOH was demolished during the business process reengineering (BPR) in 2009/10. The federal level decisions were reflected in almost all regions that left pharmacy as noncore process except Amhara region. As a result, the envisioned PFSA role and responsibility were expanded as a result, pharmacy services and coordination were given to PFSA in addition to revolving drug fund management, forecasting, procurement, storage and distribution. However, recently in 2006, FMOH decided to create a new unit PLMU although the scope and capacity of PLMU is limited.

2. **Lack of Supply Chain Technical Capabilities**: PFSA still lacks key technical capacity and skills sets. The identified technical deficiencies were warehouse management, distribution and fleet management, and procurement and clients' management. Although PFSA and partners spent millions of dollars in these technical areas, PFSA did not yet make significant improvements. All key informants agreed that these could have been the areas of specialization for PFSA. Key informants suggested that it is the time for PFSA to conduct reform so as to be efficient service provider. The details of the key technical areas are presented as follows.

Poor procurement and client management: PFSA has a cumbersome tender process, long lead-times, no system to get replacement for unused and expiry product from manufacturers, and no official procurement list until the data collection. There were neither standardizations of equipment nor national specification of equipment list by levels for Medical and laboratory equipment procurement. However, all government health facilities expect to get their supplies from PFSA or otherwise get a waiver to buy outside in case of stock outs per proclamation No. 953/2007. The major weaknesses that majority of respondents agreed were 1) framework contract procurement methods were not used because of the ceiling policy of the proclamation number 649/2009 and Federal Public Procurement Directive, 2010; 2) unavailability of post supply evaluation system which were not find during the data collection; 3) lack clear procedure and policy, and clarity of roles in the medical and laboratory equipment procurement; and 4) poor procurement and supply management except for HIV/AIDS program commodities.

Warehouse management: Although the warehouses increased both in numbers and sizes, the management of these warehouses were found poor. The reasons given were quality of the warehouse floor, poor design of warehouses (one or two dispatch and receiving windows, no mesh or partition), and unavailability of warehouse management SOP. These might increase wastage and expiry of commodities just at PFSA warehouses. The agency financial report of 2009/10 should that there were 79,899 USD expiries and the same Birr value was reported in 2010/11. This figured decreased in 2011/12 to 12,643 USD.

Distribution and fleet Management: Although PFSA had more vehicles than before; it still faced shortages and regularly uses rented vehicles. The shortages of vehicles were not demonstrated whether it was because of lack of proper management and maintenance or because of real shortage of vehicles. Regardless, during the data collection, we observed that central PFSA rents on average from 6-10 big size tracks per week for delivery to hubs and for Addis Ababa branches direct delivery. Most of custom clearances are done through outsourcing and were not considered as rent. Moreover, we learnt that the time it takes for PFSA to load big vehicles was estimated as 3-4 days on average and the vehicle averages around time for other delivery are about 10 days. The loading time was un-reasonably high because of the multiple rented warehouses and distance between these warehouses, poor dispatch and package, and poor layout of the warehouse (number

of doors/windows). In addition, the old vehicles spent another weeks for maintenance and preparation to the next delivery. Branches didn't rent vehicle for the regular deliveries to health facilities, they used their own vehicle.

3. **Lack of data visibility**: The data visibility concerns at PFSA are due to poor coordination, lack of accountability, and lack of data management and dissemination skills. As a result stock on hand, procurement and pipeline information, and stock out notifications were not organized and shared to both FMOH and stakeholders on regularly bases. The data visibility concerns at health facility were mostly lack of accountability, poor adherence to schedule, and lack of completeness and quality of reports. These significantly affect PFSA's operations and put RHB and stakeholders as outlier on logistics related data.

4. **Lack of clarity of roles and responsibility between PFSA, other agencies and RHBs:** key respondents explained that there are unclarity of roles and responsibilities on pharmacy services, SCM capacity building, site level support and management of full and non-full supply commodities. During the data collections, there were no strategies how to management supply chain at woreda and zone levels for non-direct delivery sites. There were no list of commodities that PFSA committed for. During the data collection, there were no officially shared short term, medium term and long-term targets and milestones with regular performance monitoring and evaluation schemes for the SCM. Moreover, during the data collection, there were long list of commodities that were imported by Ethiopian Public Health Institutes that raised concerns of procurement of specialized items for the health services. Key informants believed that PFSA should be accountable and responsive for any services it provides to any health facilities. Some of them also reported that there should be a claim system for the value of money lost because of the PFSA system.

Moreover, we conducted desktop review on the availability of pricing policy and fee structures of its services as indicated in the proclamation. We could not find one. However, we learnt from key informants that the mark up range from zero, the most subsidized public health important program to about 30%. The distribution and storage fee is also set as 5% of the value of the invoice. We also learnt that there is a draft pricing policy document at central levels. Currently, branches do not have any role on the price seating they just implement as per the direction from center. We also learnt that there is

no clear demarcation of role and responsibilities between branches and centers. The different directors at central levels also have some role conflicts and overlap that resulted lack of accountabilities.

5. **Unavailability of Enterprise wide business information system**: during the data collection, PFSA was not having a tool that summarizes stock data, procurement data, and consumptions data. PFSA has automated tools for warehouse management, not for procurement planning and monitoring, consumptions of hubs and health facilities. These brought difficulty of managing and aggregating the available data. Moreover, there were no strategy on the required management information systems and policy. However, there were proposal for enterprise resource planning development.

6. **Lack of skilled and motivate human resource:** Most of key respondents agreed that PFSA lacks skilled and motivated staff. Even the available staffs did not have clear job descriptions and career development systems. Regardless, PFSA for its current and near future operations it required procurement specialist, distribution specialist, supply chain information management specialist, warehouse management specialist, quality assurance and quality control specialist, biomedical engineers, cold chain experts, performance improvement advisors, regulatory affairs professionals, laboratory technologists, and etc. However, during the data collection, we learnt that PFSA planned to establish center of excellence to train its staff on some its operations. Reviewing documents and from key informants, we learnt that PFSA sponsored over 30 staff in master of public health. Forty-five staffs were under training on master in business management, supply chain, financial management all of which are important for PFSA operations.

The proportion of pharmacy professionals from diploma to master in PFSA were 17%. As PFSA did not yet transfer itself to modernized logistics organization, it may not be as such high. The reasons that we said not too high were all of its systems were not simplified for a general supply chain professionals to takeover and contribute to the pharmaceuticals supply chain.

There was no human resource information system during the data collection. However, looking the available documents, the total number of employees for the agency were 1650, 1488, 1223, 1041, 1026, 814, 656, 635, during the data collection (April 2015), 2014, 2013, 2012, 2011, 2009, 2008 and 2007 respectively. There were increments over the years. During the data collection, the human resource data disaggregated by profession and education levels were

available for recent year only. Thirty five percent (578/1650) of the staff were diploma (232) and above (344) by training and 29% (167/578) of diploma (84) and above (83) were females. The proportion of pharmacy professionals were 17% (285/1650) and around 16% (45/285) were female. The proportions of female in the total staff were 25% (405/1650). Moreover, the attrition rate was not well organized by years. However, in 2013 and 2014 reporting period, 66 and 139 employees respectively left PFSA showing 5.4% and 9.3% attrition rate.

7. **Lack of private sector engagement and role**: most of the respondents agreed that the role of the private sector in the public health SC was not clear. The reasons given were PFSA strategies were not clear for private sector to engage at any scale. PFSA imports whatever the markets need at any time for both the public and private sector and there was no partnership with private importers. Some of the key informants provided specific examples where private importers used to import pharmaceuticals and PFSA accidently imported that brought some wastage and unpredictability for future business feasibility.

4.1.4. Improvement of SCM after PFSA as Compared to the Pre-PFSA Era

From the 2006 national situational assessment, the Ethiopia public health supply chain were suffering on duplication of effort at national and regional levels, too much decentralization that resulted inefficiencies, too long in country pipelines (5 tier systems) resulted in high wastage rate, many parallel & vertical SCM, poor storage facilities that compromised quality, and poor region based distribution network. The main reasons for establishment of PFSA were to address these major challenges and build sustainable SCM. In the last over 6 years, these challenges were fairly addressed by PFSA. However, there were areas of improvement and technical specializations to sustain the success.

Respondents were asked to indicate the improvements in the public health SCM in Ethiopia and intensive desktop review were also used to documents the new developments after the establishment of PFSA as compared to the baseline. All respondents agreed that PFSA establishment brought substantial developments in the public health SCM. The major ones that were identified were improved warehouse infrastructure, institutionalization of direct delivery to health facilities, redesign and integrate the supply chain system, initiation of insurance coverage for in country distributions, expansion of PFSA branches, and increment of the number of

distribution vehicles. Moreover, we conducted desktop reviews of government and partners reports, and assessment findings to compare the improvements of the supply chain after PFSA.

To qualify these improvements, the key indicators selected were procurement and distribution values by years, integration of the vertical logistics systems i.e. IPLS, warehouse improvement and expansions, increment of automation of the warehouse management systems, direct delivery sites by years, vehicle availability over the years and fund management value over the years. Using selected indicators, we presented the improvements that helped to compare the PFSA and pre-PFSA eras to see the general perspectives over the years as an iceberg for readers, policy makers and researchers as follows:

4.1.4.1.   **Warehouse Infrastructure Improvement and Expansion of Branches**

Currently, PFSA increased its accessibility to health facilities as compared to PHARMID and Pharmaceuticals Supply and Logistics Department (PSLD) of FMOH. PHARMID used to have ten branches of which two were in Addis Ababa and the other two (Adama and Nekemet) were established in the last era of PHARMID with rented warehouses. Whereas, PFSA currently has 17 modern warehouses with the average capacity of 3,000 square meters each. The construction of these warehouses increased the storage capacity of PFSA from 46,000 M^3 in 2009 to 580,000 M^3 in 2014 (IPLS 2014, and PFSA presentation, 2013). Moreover, there were 17 new cold rooms.

Table 1: PFSA warehouse expansion and functional status.

SN	Current PFSA branches and type	Current status	Availability of owned warehouse	
	Primary		Before PFSA	After PFSA
1	AA	Functional	Available	Available
2	Adama	Functional	No	Available
3	Bahir Dar	Functional	Available	Available
4	Dessie	Functional	Available	Available
5	Dire Dawa	Functional	Available	Available
6	Hawassa	Functional	Available	Available
7	Jimma	Functional	Available	Available
8	Mekele	Functional	Available	Available
9	Nekemte	Functional	No	Available
10	Arba Minch	Not functional	No	Available
	Secondary			
11	Gondar	Functional	No	Available
12	Negele Borenna	Functional	No	Available
13	Semera	Not fully functional	No	Available

SN	Current PFSA branches and type	Current status	Availability of owned warehouse	
14	Shire	Not fully functional	No	Available
15	Gambella	Not fully functional	No	Available
16	Assossa	New- Not functional	No	Available
17	Kebri Dar	New- Not functional	No	Available

Data Source, PFSA. Data collected in April 2015.

Figure 1: Picture of New vs. Old PFSA Warehouses.

4.1.4.2. **Implementation of Integrated Pharmaceuticals Logistics System (IPLS)**

Before PFSA, there were multiple vertical logistics systems for different programs like family health, tuberculosis and leprosy, HIV/AIDS, and malaria programs. However, PFSA with partners developed and began implementation of IPLS since 2009. With the introduction of IPLS, PFSA worked to establish an integrated health commodity supply chain that would include all health program commodities and that would connect all levels with accurate and timely data for decision making.

IPLS is the term applied to the single pharmaceuticals reporting and distribution system from PFSA to health facility. The establishment of IPLS reduced the five tier distribution system to three tier systems, which was a big achievement that would reduce wastage and miss-management resulted because of the long tier system. The IPLS integrates the management of

essential pharmaceuticals that were used to be managed vertically like HIV/AIDS, Malaria, TB and Leprosy, EPI, MCH and other essential medicines. Currently more than 2500 health facilities implement IPLS and more than 500 of them were automated (IPLS, 2014). PFSA to reach to this level of implementation and reduce the long in-country pipeline from 5-3 tiers, it embarked on training over the years.

4.1.4.3. **Institutionalization of Direct Delivery System**

PFSA started direct delivery in August 2011. The direct deliver was started for HIV/AIDS program commodities to ART health facilities i.e. all hospitals and accessible health centers. Unlike its predecessor PHARMID, PFSA was able to deliver program logistics to all woreda health offices and to over thousands of health facilities. The direct delivery in line with the implementation of IPLS, institutionalize the three tier distribution levels i.e. PFSA center →PFSA HUB →Health facilities. Currently PFSA does direct delivery to over 1,065 ART sites bimonthly. There are adhoc deliveries to other PMTCT only sites. These sites also have the potential to receive their revolving drug fund medicines if they made orders in line with their programs.

The direct delivery from 2012 to 2014 showed small percentage increase. There was also variability per branch from 20% to 76% of their sites covered in direct delivery. The percentage increase was small because there were more numbers of health facilities added to each branch to the denominator. The denominator was the total public health facilities under that specific branch. There are other direct deliveries but it was difficult to get a comprehensive data to consider as direct delivery. The ART or high volume sites were all served through bimonthly direct delivery from their nearby branches.

Table 2: PFSA Direct Delivery by Branches.

PFSA Direct Delivery Sites by Years and Branches: Data Source SCMS										
Hub	**2014**			2013			2012			2011
	Total sites	Direct Delivery	Percent	Total sites	Direct Delivery	Percent	Total sites	Direct Delivery	Percent	
Addis Ababa	473	190	40%	467	177	38%	467	161	34%	
Adama	310	85	27%	286	82	29%	286	65	23%	
Bahir Dar	349	92	26%	346	93	27%	346	75	22%	
Dessie	324	98	30%	298	78	26%	298	77	26%	
Dire Dawa	359	80	22%	350	82	23%	350	69	20%	
Gondar	145	38	26%	147	40	27%	147	33	22%	
Hawassa	652	155	24%	537	152	28%	537	146	27%	
Jimma	321	89	28%	296	80	27%	296	71	24%	
Mekelle	251	120	48%	251	96	38%	251	96	38%	
Negele Borena	34	26	76%	34	26	76%	34	26	76%	
Nekemte	291	92	32%	276	83	30%	276	62	22%	
Total	**3509**	**1,065**	30%	3288	989	30%	3288	881	27%	

Data source SCMS. Data collected April 2015.

4.1.4.4.   **Improved Distribution Capacity and Establishment of Insurance Coverage**

The distribution capacity of PFSA was improved over the years. Products procured by PFSA and other donors are distributed majorly through the PFSA distribution systems either directly to the sites, woreda, zone or region depending on the program needs and capacity of the PFSA branches. As a result, the value of distribution increased from around $55 million (June 2008) to over $562 million (June 2014). The value of distribution increased as compared to procurement. During the data collection, it was not cleared if the mark up were included in the report or only the cost of the commodities. Moreover, PFSA buys insurance per shipment invoice value. This is improvement from the previous distribution system where no insurance coverage for the in country distribution related risks. The PFSA deliveries either to health facilities or to woreda / zones were insured.

Figure 2: Distributions   by PFSA from 2007/8 to 2013/14.

PFSA Distribution Expansion Trend (USD)
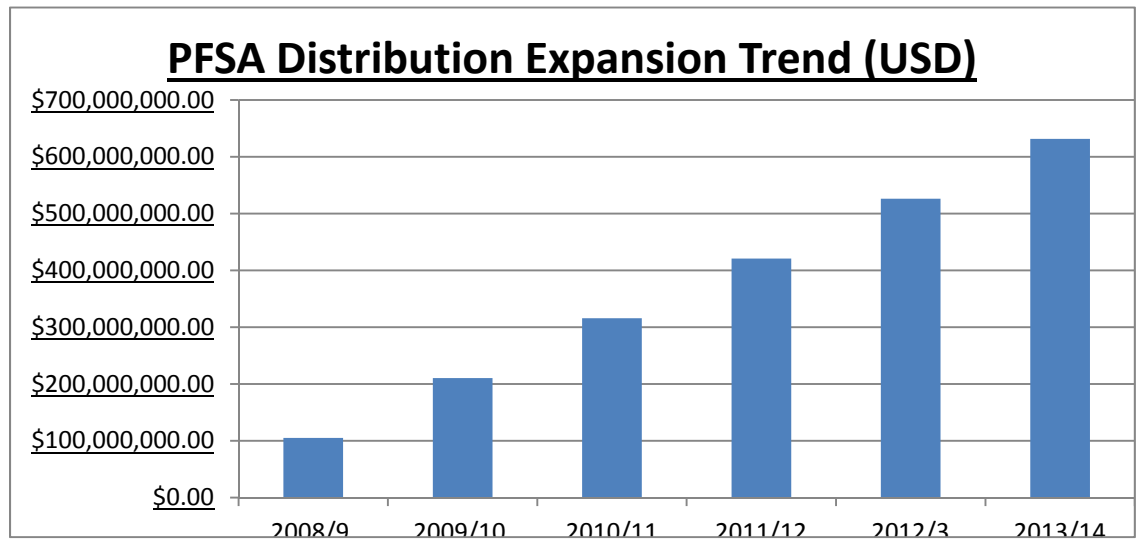
Data Sources PFSA. Data collected in April 2015.

4.1.4.5.   **Increased Number of Vehicles and Forklifts:**

There were increased in vehicles for distribution, supportive supervision and office operations. Forklifts were also procured and used. The distribution was made possible because of the available numbers of vehicles that increases over the years. Most of the vehicles that were transferred from PHARMID and FMOH were nonfunctional indicating that most of these vehicles are made available after PFSA establishment. As most the pharmaceuticals are light in weight, we looked to find out by volume capacity of the vehicles especially for distribution but we could not find during the data collections.   The total functional distribution vehicles were 143, supervision and operation were 72 and forklift of 1600kg capacity were 24 (13 at central and 11 at branches).

Although PFSA had more vehicles than before; it still faced shortages and regularly uses rented vehicles. Regardless, during the data collection, we observed that central PFSA rents on average from 6-10 big size tracks per week for delivery to hubs and for Addis Ababa branches. Most of custom clearances are done through outsourcing. PFSA neither have fleet management system nor estimated vehicles requirements for its operations. However, during the data collection PFSA was planning to conduct fleet management survey.

Table 3: PFSA's distribution vehicle types and status.

	PFSA Vehicle information. Data source PFSA. Data collected in April 2015				
S. No	Type	Loading Capacity (in 100kg)	Location Central	Branches	Current Functionality
1	Euro Trukcer IVECO cargo and Van	150/200	12	0	Functional
2	IVECO Van	100	4	18	Functional
3	Vehicle, ISUZU FSR 33L, Cargo Van	75	8	18	Functional
4	Truck NPR ISUZU	35	5	24	Functional
5	Truck Hyundai Vane	35	8	24	Functional
6	Long Base Toyota	12	2	15	Functional
7	Truck Mistusbushi van	70	1	0	Functional
8	Truck Nissan UD	95/100	3	1	Functional
	Total Functional		**43**	**100**	Functional
	Total non Functional		14		Nonfunctional

Table 4: PFSA's supportive supervision & office operation vehicle.

S.No	Type of Vehicle	Year of manufacture	Loading Capacity	Location Central	Branches	Current Status
1	Prado Toyota		8 persons	6	0	Functional
2	Pick up Ford		4 +	1	1	Functional
3	Pick up Nissan Patrol		8 persons	1	10	Functional
4	Pick up Mitsubishi		2 persons	1	0	Functional
5	Pick up Nissan		4+	1	10	Functional
6	Station Wagon Toyota		8 persons	3	1	Functional
7	Toyota Corrola		4 persons	2	0	Functional
8	Automobile Suzuki		4 persons	6	0	Functional
9	Nissan Corrola		4 persons	1	0	Functional
10	Service Hundai		26 person	1	16	Functional
11	Service bus fiat-IVECO		35-45 seats	1	2	Functional
12	Motor Cycle Suzuki		1 person	2	6	Functional
	Total			**26**	**46**	

The Data source for vehicle information was PFSA. Data collected April 2015.

4.1.4.6.   The Establishment of Automated Inventory Management at Health Facilities

In line with implementation of IPLS, PFSA with its partners institutionalize the automation of the inventory of pharmaceuticals at health facilities, PFSA central and branches. The automation of health facility was started in 2009 at Wukro hospital in Tigray while the hub editions was tested and started implementation at Adama branch since March 2010. The software was developed locally and developed over the years. Currently, all operational branches, 15 cold rooms and over 500 health facilities are automated their warehouse operations. There are dashboard on progress to the relevant officers at different agencies and FMOH. The implementation status of the automation is shown below.

Table 5: Automated sites from 2009/10 to 2013/14.

The Summary of HCMIS sites per Hub per each fiscal year, report of USAID|DELIVER PROJECT

Year	Total number of Automated Sites per year	Total	Remark
2009/10	100	100	Implemented in all regions except Afar, Gambela, Somalia and Benishangual
2010/11	90	190	All, 9 regions and 2 city administrations
2011/12	92	282	All, 9 regions and 2 city administrations
2012/13	107	389	All, 9 regions and 2 city administrations
2013/14	130	519	All, 9 regions and 2 city administrations

Data Source USAID|DELIVER PROJECT. Data collected in April 2015.

4.1.4.7. **Increased Training Opportunities for Supply Chain Development at all levels**

There were relative training opportunities to strengthen the supply chain systems. There were more training opportunities both international and local on different SCM topics. Both government and its stakeholders invest on trainings and development of simplified tools and processes. These training opportunities would motivate staff and improve systems. Both partners and PFSA believed that there were extensive training opportunities. Previously, most of the trainings were specific to the program logistics and generic drug supply management. However, after establishment of PFSA the trainings were more diverse, system building focused, and in an integrated approach. Some of the training types explained were quantification and forecasting, IPLS, IPLS supportive supervisions skills, warehouse management, HCMIS users training, commodity security and monitoring and evaluation trainings. However, during the data collection, we found the following at PFSA.

Table 6: Training organized by PFSA.

No	Type of Training	Number of Participants
1	Integrated Pharmaceutical Logistics System (IPLS)	20,688
2	Medical Equipments, Supplies and Laboratory Reagents	1,239
3	Pharmaceuticals Selection and Quantification	3,000
4	Drug and Therapeutics Committee	1,366
5	Clinical Pharmacy Service	200
6	Electronic Dispensing Tool (EDT)	113
7	Supply management and rational use of medicines for Druggists	140
8	Pharmaceuticals Supply Chain Management M & E (631 + 54)	685
9	Drug supply management training (DSM training)	604
10	Supply Management of TB Pharmaceuticals for PFSA internal staff	64
	Total Trained	**28,099**

Data Source PFSA. Data collected in March 2015.These trainings were organized with the support of PFSA's partners. The data did not capture all trainings but the major ones.

4.1.4.8. Contribution for Health Facility Expansion

PFSA's primary clients are public health facilities including hospitals and health centers with their cluster health posts. These facilities are expected to get their supplies from PFSA for all program pharmaceuticals and other vital and essential pharmaceuticals in sustainable manner. PFSA is also expected to equip new health families with medical and laboratory equipment and provide replacements of when needed. The designed resupply for health commodities are the health posts are resupplied from health centers while health centers, hospitals and private drug outlines are resupplied at PFSA branches.

The health facilities expansions were significant from 1992 to 2014. Specially, there were significant increments of health facilities after 2005/6 for PFSA to provide necessary supplies during establishment or on regular bases, the numbers of health centers were 157, 600 and 3315 in 1992, 2007 and 2014 respectively, which was significant. Moreover, the numbers of health post and health station were 2,087 (in 1992), 5,873 (in 2007) and 16,251 (in 2014) with the same period. There were over 6,000 clients registered at PFSA in 2014 (HCMIS, 2014).

Figure 3: Health facility from 1992/3 to 2013/14.
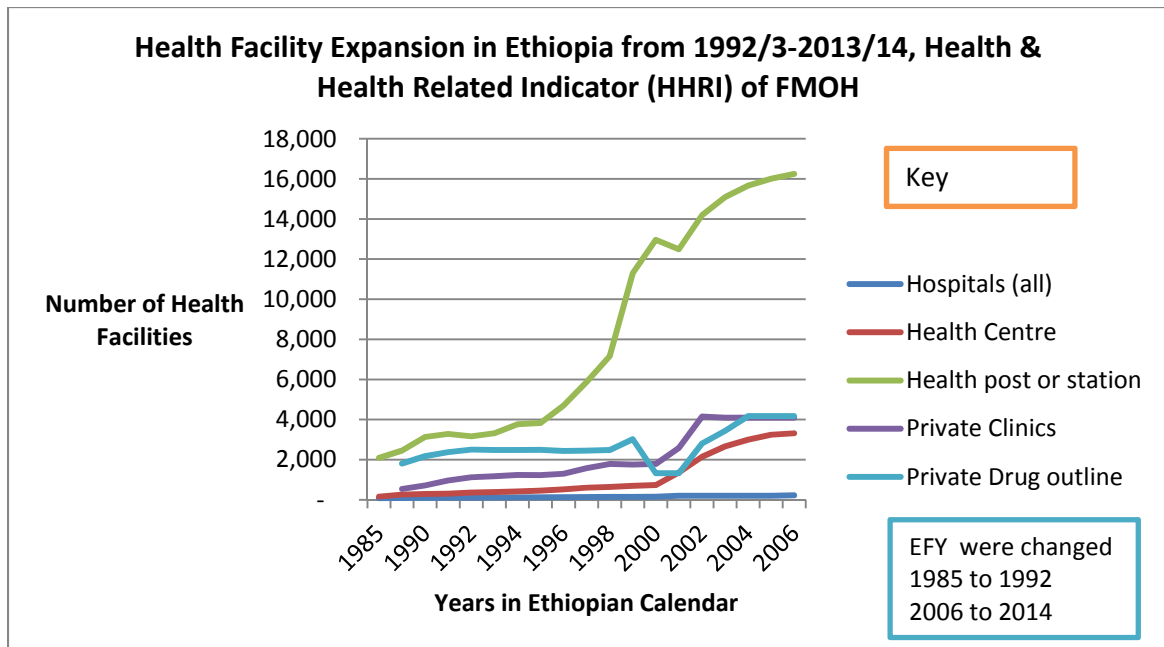
Data source FMOH. Data collected in March 2015.

4.1.4.9. **Increased Pharmaceuticals Procurement Capacity**

The pharmaceuticals importation were one of the major country imported goods both through the government and donors funds. The share of the pharmaceuticals importation was 3rd following petrol and food and live animals from 1979/80 to 2013/14. The pharmaceuticals importation proportion from 2007 to 2014 was about the 4th largest next to petrol, food and fertilizer. However, the aggregated importation of pharmaceuticals from 1979/80 to 2007/8 was 7,071,198,000 Ethiopian Birr while from 2007/8 to 2013/14, the total import were 37,339,535,000 Ethiopian Birr that is 5 times of the previous 16 years. These figure showed only pharmaceuticals imported by both government and private sector not donors and international NGOs.

Figure 4: Pharmaceuticals vs. major goods imported.

The proportion od f Pharmaceuticals imports as compared to the major imported goods aggregated from 1979/80 to 2013/2014. Data source National Bank of Ethiopia (NBE)

Paper & Paper Manfc. 3%
Rubber Prod. 6%
Soap & Polish 2%
Medical & Pharm. Prod 10%
Food & Live Animals 16%
Beverages 1%
Tobacco 0% 0.45%
Fertilizers 10%
Petroleum Crude 48%
Chemicals 4%
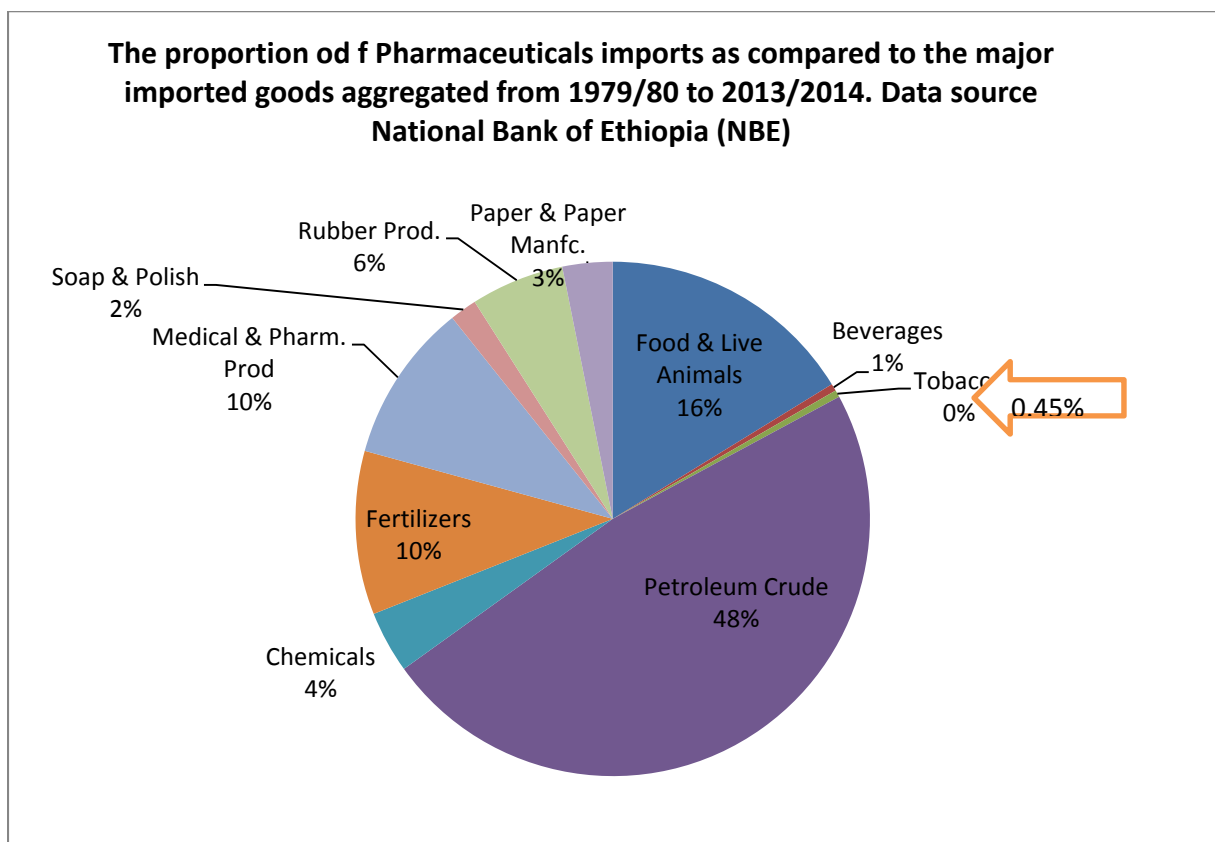
Looking the importation of pharmaceuticals over the years, it showed increment over the years while there were some declines in some years. However, the increment was very much visible

after 2005/6. Looking at the nominal values of these increments, the increment from 2007/8 to 2013/14 was 4.45 fold, which was very significant.

Table 7: pharmaceuticals imported from 1979/80 to 2013/14.

Period	Medical & Pharmeuticals Imports in 1000 of Birr	Period	Medical & Pharmeuticals Imports in 1000 of Birr
1979/80	68,816	1998/99	315,940
1980/81	40,901	1999/00	246,179
1981/82	48,163	2000/01	293,784
1982/83	38,918	2001/02	358,994
1983/84	51,615	2002/03	352,193
1984/85	41,980	2003/04	636,324
1985/86	58,513	2004/05	671,524
1986/87	68,638	2005/06	1,212,655
1987/88	50,280	2006/07	1,410,844
1988/89	58,440	**Total from 1979/80 to 2007/08**	**7,071,198**
1989/90	64,550	2007/08	1,848,363
1990/91	36,305	2008/09	2,771,689
1991/92	48,294	2009/10	3,936,222
1992/93	131,578	2010/11	5,054,381
1993/94	187,200	2011/12	6,488,435
1994/95	193,305	2012/13	7,169,253
1995/96	165,785	2013/14	10,071,193
1996/97	77,317	**Total from 2007/08 to 2013/14**	**37,339,535**
1997/98	142,163	**Data source NBE. Data collected in April 2015.**	

Moreover, looking the procurement of PFSA, it was increased over the years. The procurement in 2013/14 was 5.92 times more than the procurement in 2007/8. However, when the procurement of other partners was analysis from 2012 to 2014, it looked like the proportion was similar about 20% gap filling. This showed that the developing partners procurement was not yet fully handover to PFSA either due to specialization nature of the pharmaceuticals or funding source requirements.

**Figure 5: Values of PFSA and major procurement organizations.**

Year	PFSA, 1000 (USD)	% Increase from base year	SCMS Procurement	% Increase from base year	UNICEF	UNFPA	% Increase from base year
2008	$ 45,565,217	0%	$9,339,375	0%		$13,325,000	0%
2009	$ 48,101,205	6%	$38,538,445	76%		$13,325,000	0%
2010	$ 201,155,575	341%	$25,448,040	63%		$ 5,000,000	-62%
2011	$ 212,543,265	366%	$25,739,531	64%		$ 3,920,000	-71%
2012	$ 280,248,756	515%	$27,982,789	67%	$34,148,977	$13,375,300	0%
2013	$ 305,793,991	571%	$31,041,392	70%	$53,913,566	$11,328,057	-15%
2014	$ 315,094,724	592%	$19,694,614	53%	$53,022,670	$10,685,902	-20%

Procurement information over the years for major procurement means for the public SCM. Data source PFSA, UNICEF, UNFPA, and SCMS. Data collected April 2015.

4.1.4.10.   Increased Amount of Funds Managed by PFSA over the year:

The total asset and capital of PFSA increased significantly. PFSA's capital was increased by 3.56 times in 2011/12 as compared to the amount in 2007/8. Similarly the total asset increased by 22.69 times in the same period.

Figure 6: PFSA Asset increment from 2007/8 to 2011/12.
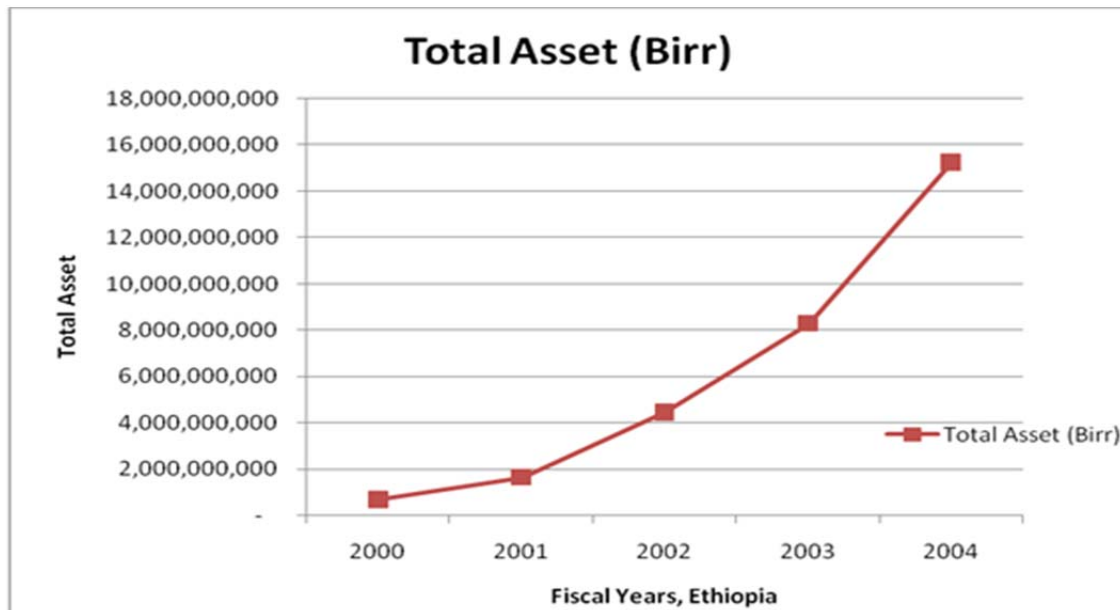
4.2. Discussion

Strong supply chain requires stakeholders' involvements and commitments. The creation of PFSA as a lead agency of supply chain however, was a strong stride of the government commitment in excelling the public health supply chain. The study revealed that the establishment of PFSA has laid the foundation for strong public health supply chain and good indication of government's commitment. As result, the relevance of its existence was huge. However, looking at the policy and strategic context, there was not a well-defined and shared country level supply chain strategy developed by FMOH, PFSA and RHBs. The only document available was the Pharmaceuticals Logistics Master Plan of Ethiopia for 2007 to 2012. The general country context was not favorable for outsourcing pharmaceutical SCM because 1) lack of capacity of the private sectors, 2) unclear strategy of private sector involvement 3) lack of information on PFSA's capacity and 4) lack of clarity of the future PFSA directions and strategies. As a result, PFSA was the only available and best choice for the public supply chain services in Ethiopia.

The Ethiopian public health supply chain documented major strengths in the last years. The establishment of proxy and direct delivery distribution system from none to thousand, expansion and improvement of infrastructure from 10 branches of storage capacity of $46,000M^3$ to 17 branches of storage capacity $580,000M^3$, improved availability of tracer commodities from 59% (18 selected products) to 89% (27 selected products) some of which were same products, creation SCM tools and increased availability and utilization, and availability of donors support and government continued commitment were the major strengths of the public health SCM.

The major bottle necks and weaknesses identified were 1) lack of supply chain technical capabilities (procurement, warehouse, distribution and fleet management); 2) lack of transparency and accountability systems; 3) lack of data visibility; 4) poor human resource deployment and development; 5) lack of good governance and accountability; 6) lack of strong coordinating body at FMOH level; 7) poor procurement and supply management; 8) unavailability of enterprise wide business information system; 9) lack of clarity of roles and responsibility between PFSA, other agencies, and RHBs; and 10) lack of private sector engagement and role. It was found out that PFSA still has major technical deficiencies in

warehouse management, distribution and fleet management, and procurement and clients' management. On the other hand, PFSA was not yet embarking on framework contract procurement methods because of volumes of its procurement and ceiling policy, do not yet emplaced post supply evaluation system. The other major weakness was lack of data visibilities on the key logistics data like stock information, procurement information, and stock out notifications.

There was improved public health SCM after PFSA as compared to the pre-PFSA period. The major bottlenecks identified in the 2006 national situational assessment were duplication of efforts, procurement inefficiencies and decentralization, long in country pipelines (5 tier systems), many parallel & vertical SCM, poor storage facilities, and poor region based distribution network (FMOH, 2006). These bottlenecks were fairly addressed and improved overtime after PFSA. PFSA implemented pulled procurement to gain economy of scale, warehouse improvement programs and expansion of branches, institutionalization of direct health facility delivery system, establishment of proxy distribution networks beyond regional boundaries, and redesigned the SCM from five tiers to three tiers systems. Moreover, PFSA worked to increase the number of distribution vehicles and forklifts, equipping with modern warehouse handling equipment, established of an insurance coverage scheme for in country distributions systems, and contributed in expansion of health facilities for example health centers from 600 (in 2006/7) to 3315 (in 2013/14) while health post and health station from 5,873 (in 2006/7) to 16,251 (in 2013/14).

The aggregated importation of pharmaceuticals to Ethiopia from 1979/80 to 2007/08 was 7,071,198,000 Ethiopian Birr while from 2007/8 to 2013/14, the total import were 37,339,535,000 Birr that was 5 times of the last 16 years in nominal values. Moreover, the increment from 2007/8 to 2013/14 was 4.45 fold, which was very significant. PFSA's capital was increased by 3.56 times in 2011/12 as compared to the amount in 2007/8. Similarly the total asset increased by 22.69 times in the same period.

The availabilities of bin cards and/or stock cards, the fundamental logistics records that capture essential inventory data, vary over the years. The availability recording tools (bin card/stock card) was 61.5% in 2006 (FMOH, 2006). Whereas, the availability of bin card (record tool) at health posts levels was 14% and 40% in 2010 and 2014 respectively. At health center, the availability was 40% (in 2010 both BC & SCR) and 80% (in 2014). Moreover, the availability of

logistics reporting tool of any type was 26% at health post levels and 55% at health center level in 2010 but it was 40% and 80% in 2014 respectively. The availability of bin card and reporting forms were over 90% at hospital levels in 2014 (JSI, 2010, PFSA 2014).

Product availability is the ultimate output of improved SCM. However, product availability will not necessary attribute to the system improvement as there are other critical commodity security activities. There were different assessment on product availability before and after PFSA. All assessment showed different results. The result presented before 2007 and after to see the spectrum and situations. In 2006 national assessment for product availability was conducted. The availability of ARVs on the day of visit were 48.4%, anti-tuberculosis was 76.9%, and overall essential medicines (list of selected 18 medicines) availability at health facility levels were 59%. Availability of the day of survey was 78%, 53%, and 29% at hospitals, health centers and health post respectively (FMOH, 2006). Moreover, product availability for contraceptives were done in 2006. The result showed that stocked out during the day of visit was 24.6% for injectables (Depo-Provera), 40.9% for Implants (Jedelle), 15.5% for pills (Microgynon) and 12.1% for condoms (LIAT, 2006).

In 2010, national assessment in four regions showed that the availability of tracer commodities at the health post and health center levels. The data showed that availability at health post levels were 87 %, 77% and 57% for injectables (Depo-Provera), combined oral contraceptives and male condoms respectively. Whereas at the health center levels the availability was 85%, 90% and 65% for injectables (Depo-Provera), combined oral contraceptives and male condoms respectively. The recent (2015) national assessment for 27 selected products reveled that overall product availability was 89%. Moreover, the availability of Depo-Provera was 98% both at health post and health center; Implant of any type 93% and 89% at health center and health post levels respectively (IPLS, 2015). The availability of essential medicine increased from 59% in 2005 to 89% in 2015 which was very encouraging finding for the public health supply chain.

The storage of medicines is one critical milestone for ensuring quality assured medicines for clients. Health facilities practiced to adherence to first expiry first out (FEFO) was assessed in the baseline and in recent survey. As a result, health posts adhered to FEFO increased from 25% in 2006 to over 42% in 2014. The other comparable indicator was whether medicines/supplies were protected from direct sunlight or not. The 2005 data showed 75% for health post and 57.1% for health center protected medicines from direct sunlight while the 2010 assessment showed 87% of health posts which was in increment. The 2014 assessment showed that 72% of the health post

and 95% of the health centers protect their products from direct sunlight. The result showed increments from the base year but decrease from 2010 for the health posts. The storage spaces sufficient and adequate were assessed as 28.6% and 62.5% in 2005 and 80% and 68% in 2014 at health center and health post level respectively. The result showed improvements in warehouse initializations and management.

The estimated contribution of local manufacture accounts for 15-20% of the Ethiopian pharmaceutical market. PHARMID purchases approximately 35% of its requirements from the local manufacturing industry and imports the remainder. However, PFSA procured about 20% from local manufacturers. The proportion looks lower but the actual numeric value was higher than the time of PHARMID (FMOH, 2006; PFSA 2014).

Some of the future research priorities from our study findings are listed as follows. Effectiveness of the fleet management systems in PFSA, challenges and possible solutions of warehouse management in PFSA, PFSA capacity and needs for automated management information system, procurement laws and its effect on pharmaceuticals procurements, opportunity and challenges for private pharmaceuticals importers and distributors.

CHAPTER FIVE

5.   SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary of the Major Findings

The study revealed that the establishment of PFSA has laid the foundation for strong public health supply chain. As result, the relevance of its existence was huge. However, looking at the policy and strategic context, there was not a well-defined and shared country level supply chain strategy developed by FMOH, PFSA and RHBs. The only document available was the PLMP of Ethiopia for 2007 to 2012.

The Ethiopian public health SCM showed major strengths in the last six years. Major strengths included the establishment of proxy and direct delivery system, expansion PFSA branches and warehouse infrastructures, improved availability of tracer commodities from 59% (for 18 selected products) to 89% (27 selected products) some of which same, creation SCM tools and increased availability and utilization, and availability of donors support and government continued commitment. Where, the major bottle necks and weaknesses were lack of supply chain technical capabilities (procurement, warehouse, distribution and fleet management), lack of data visibility, lack of skilled human resource, lack of strong coordinating body at FMOH level, poor procurement and supply management, unavailability of enterprise wide business information system, lack of clarity of roles and responsibility between PFSA, other agencies, and RHBs, and lack of private sector engagement and roles.

Looking at the key indicators from 2006 baseline assessments, the establishment of PFSA brought significant improvements in areas of warehouse improvement and expansions from 10 branches of storage capacity of 46,000 M^3 to 17 branches of storage capacity 580,000 M^3, establishment of direct delivery (from non to thousands) and to woreda levels, institutionalization of IPLS to majority of the public health facilities and automation to over 500 health facilities, and initiation of insurance coverage for in country distributions, increased procurement volume from $45million to $315million and increased distribution volume from $55 million in 2007/8 to over $562 million in 2014. Hence, positive developments were documented.

5.2. Conclusions

The study found out that the establishment of PFSA has laid the foundation for strong public health supply chain. As a result, improvements on key functions like warehousing; procurement and distribution were documented in public health supply chain management. There were also new establishments like direct site level delivery, automations of inventory management and expansions of branches. However, clarity of roles and responsibility, specializations on supply chain management technical skills, long and medium term SCM strategies, and coordination were lacking. In general, the study concluded that there are improvements in the public health SCM over the years although there are long ways to resolve the bottlenecks. Further researches on the effectiveness of the key supply chain functions are needed.

5.3. Limitations of the Study

The limitations of the study were (1) focus group discussion were not included as data collection methods (2) only few regions were considered in the data collection and key informants from health facilities were not included as planned because of shortage of time for data collections , and (3) local pharmaceutical manufacturers were not included in the study. Moreover, the study can provide insight about the public health SCM to FMOH, PFSA, RHB, donors and researchers but it could not be generalized to the overall public health SCM.

5.4. Recommendations

Based on the findings and conclusions drawn, the researcher recommends the following to different stakeholders.

A. **FMOH and PFSA:** The following recommendations were proposed for FMOH and PFSA
   1. Revise the PLMP and develop clear medium and long-term SCMS strategy, the strategy should clarify the role and responsibility of all stakeholders.
   2. Restructure and strengthen PLMU. PLMU shall be the lead coordinator of the procurement and supply management and pharmacy services at national level
   3. Develop accountable and transparent systems for PFSA services to health programs and health facilities including markups for product category, handling & service fees, rights and obligations of PFSA and health facilities regarding wastage, expiries, logistics reporting and other SCM functions performances.
   4. Redefine the role and responsibility of PFSA. The scope and role of PFSA should be clear to all stakeholders including the private sector.

B. **PFSA:** The following recommendations are proposed to PFSA
   1. Develop and communicate clearly full supply and non-full supply pharmaceuticals to its clients. Develop the list of pharmaceuticals for private sectors sources.
   2. Develop specialized skills on procurement and client management, warehouse management and fleet management to satisfy its clients
   3. Increases the number of direct delivery sites and communicate its strategy to clients at the same time develop clear strategy for non-direct delivery sites.
   4. To restructure its management system to meet clients' needs, improve its effectiveness and efficiency, and provide more autonomy to branches

C. **Donors and NGO:** The following recommendations were given to donors and NGO partners
   1. To continue providing technical assistance to transform PFSA's processes, strategies, working culture and working environment, and to document lesson learnt on key SCM performance areas
   2. To continue support PFSA to bench mark on critical logistics functions like procurement, warehousing, distribution and information management.
   3. To continue provide material and financially support to the public health SCM and PFSA

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APPENDICES: DATA COLLECTION MATERIALS

Dear Respondents,

The following questions are prepared for MBA Thesis work topic. The topic is Assessment public health SCM: before and after PFSA. The general objective is to assess the strength, weakness and challenges of the Ethiopia public health SCM and compare it before and after PFSA. The specific objectives are

1. To determine the relevance of PFSA in improving the Ethiopia public health SCM
2. To assess the strength of Ethiopia public health SCM
3. To assess the weakness and challenges affecting the Ethiopia public health SCM
4. To compare the Ethiopia public health SCM before and after PFSA

The study will have a paramount benefit to Ethiopian public health supply chain and to FMOH, PFSA, RHB and Health facilities. It will give insight on the current progresses and challenges and opportunities on the ground for the SCM. As, this is first study, it has a paramount benefit to stakeholders.

The research team would like to reassure you that this is strictly confidential and won't be shared to **<u>anyone one</u>** about your responses; no personal identifier will also be attached to the questions. It will be only the research team who would be looking the data. Please also make sure that you are not forced to reply any of the questions that you are not comfortable with. You may also refuse responding to any of the questions. However, we encourage you to provide you best of knowledge on the questions so that the study will be useful.

Finally, we would like to appreciate and thank you in advance for your dedication, time and genuine response to the questions.

The research team
Principal investigator: Dessalegn Tesfaye
Advisor: Tiruneh Legesse (Assistant Professor)
Sponsor: Self

Appendix A: In-depth interview guiding questions at PFSA technical units

Procurement management, processes and tools related

    a. Could you please describe the procurement policy and guidelines of PFSA (explore the major procurement methods and differ from the MOFED procurement guidelines)

    b. How do you think the procurement policy respond to the programs and clients' needs? (Timelines, Cost wise, Expiry and Quality of products (meeting FMHACA and/or other stringent regulatory authority)

    c. What are the procurement lead-times of PFSA? (Do clients (RHB, facilities and partners) know the lead-time, adherence to the lead-time, major reasons for not meeting the proposed lead-time?)

    d. Does PFSA have different procurement guidelines for medicines, supplies, reagents and equipment? (What are the main difference, maintenance and installations, years of services, warrantees)

    e. What are the major differences between local and international procurement? (list of products for local procurements, manufactures for regular resupply, procurement product list)

2. Storages capacity and infrastructure

    a. Does PFSA think that the current storage size enough for its operations?

    b. Does PFSA plan to construct or establish new hubs in addition to the 17current hubs (where, when)?

    c. How do you estimate the storage space requirement of the organization?

    d. What do PFSA and its partners need to do to improve the storage capacity of PFSA? (Warehouse handling equipment, Shelves and pallets)

3. Transport and fleet management

    a. Do you think that PFSA have shortage of vehicle? What type and what level

    b. Does PFSA recover its transportation cost? What are the mechanisms? What needs to be done in the future

    c. Do you have a network design to determine, how many trucks? How often should I deliver goods?

    d. Does PFSA have a fleet management unit? What are the problems encountered?

    e. How much is PFSA"s transportation cost? Does PFSA charge all programs? What is the policy? Is it a written document?

4. Logistics management information system

    a. Are you satisfied with the IPLS reporting rate and quality? (Do you have any estimate for reporting rate? What about quality of the report)

    b. What do you think PFSA need to do to improve the IPLS reporting, rate and quality of the report

Appendix B: In-depth Interview guiding questions at FMOH/ RHB /donors/ NGO

1. How do you describe the relevance of PFSA to ensure commodity security (the six C, the pathways)?

2. What are the current strengths of the public health SCM in Ethiopia? (explore from the logistics cycle, technology and other health system strengthening activities)

3. What are the current weakness and challenges of the public health SCM in Ethiopia (explore from the logistics cycle, technology and other health system strengthening activities)

4. How do you compare the SCM before PFSA and after PFSA (explore storage, procurement, distribution and system strengthening perspectives)

5. What are the specific management problems in the Ethiopia SCM? (Structure, Management leadership and involvement)

6. What do you think are the solution to resolve the current problems and sustainable SCM solutions? (organizational structure, human resources , infrastructure, coordination and system development)

Appendix C: Pre-prepared data collection tool at PFSA and other organizations

1. Procurement and distribution value: How much does PFSA/donor/NGO procure and distribute in the fiscal years below?

Year	Program area							
	HIV/AIDS	TB	Malaria	FP	MNCH	RDF	Others	Total
2007								
2008								
2009								
2010								
2011								
2012								
2013								
2014								
Total								

2. Number of Vehicles at PFSA for distribution and supportive supervision

Year	Purpose				
	# of Vehicle for Transporting of Pharmaceuticals/distribution		# of Vehicle for Supportive supervision/Management		
	Functional	Non-Functional	Functional	Non-Functional	Total
2007					
2008					
2009					
2010					
2011					
2012					
2013					
2014					
Total					

3. Human Resource at PFSA level (Human Resource Development and Attritions)

Year	Human Resources								
	Professional				Support Staff				
	Diploma	Degree	Master	Total	Others	Diploma	Degree	Master	Total
2007									
2008									
2009									
2010									
2011									
2012									
2013									
2014									

DECLARATION

I, Dessalegn Tesfaye Mekonen, hereby submit my MBA Thesis for oral defense, entitled Assessment of Ethiopia Public Health Supply Chain: Before and After Pharmaceuticals Fund and Supply Agency (PFSA)and truthfully declare that the above thesis is a product of my original research investigation. I further confirm that it has not been submitted either in part or in full for any Degree.

Signed on this day of _____

_____

Dessalegn Tesfaye

ENDORSEMENT

This thesis has been submitted to St. Mary's University, School of Graduate Studies for examination with my approval as a university advisor.

Tiruneh Legesse   _____

Advisor   Signature

St. Mary's University, Addis Ababa May 2015