

## DISTRIBUTION CHALLENGES OF HEALTH COMMODITIES

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### ABSTRACT

Distance to service in Ghana remains a binding constraint for contraceptive health commodities use among rural and urban populace. The distances to goods and services in rural areas is still high, while in urban areas where demand for smaller families is greater, distance is a binding constraint even though average distances are smaller. Expanding access to a choice of affordable and appropriate health commodities such as contraceptive is critical to achieving the goal of reproductive health for all health commodities contraceptive that are considered to be overlooked or underutilized. The objective of this paper is to assess the efficiency of the existing distribution networks and recommend an alternative supply chain distribution network through Geographical Equi-Distance supply chain distribution network. A case study approach was used where purposive sampling was employed to select a major player in distribution of health commodities in Ghana. It was found that Geo-Equi Distance supply chain distribution network for health commodities can improve efficient distribution of health commodities in developing countries. The benefits of efficient supply chain distribution network include improved commodity availability, reduced lead time and improved healthcare delivery.

**Keywords:** Health Commodity, Supply Chain Distribution Network, Geographical Equi-Distance

### 1. Introduction

In recent years we have been highly successful in developing awareness among our people of the need to plan their families. As a result, the demand for family planning services has been steadily increasing. A critical feature of family planning services is the ability to provide high quality contraceptives to its clientele. Without contraceptive security family planning services cannot be effective. Reliable and affordable supplies of commodities are critical for the success of the health sector.

An effective commodity management system must be in place to ensure their accessibility and effective use, both at the service delivery level and in referral services (WHO, 2009). Supply chain distribution network plays a crucial role for companies in all industries striving to deliver outstanding supply chain performance. Distribution refers to the steps taken to move and store a product from the supplier stage to a customer stage in the supply chain. Distribution is a key driver of the overall profitability of a firm because it directly impacts both the supply chain cost and the customer experience. Good distribution can be used to achieve a variety of supply chain objectives ranging from low cost to high responsiveness. As a result, companies in the same industry often select very different distribution networks. (Sunil Chopra, 2013).

In recent years, a number of internal and external assessments have evaluated Ghana's health sector supply chain, including a strategic review supported by USAID in May 2011. While each of these assessments found notable strengths, they also indicated that there is room for improvement in a number of areas. Supply chain weaknesses, especially at the level of the distribution, have engendered deficient in response to customer's demand. Some of the contributors to this decline have included broader health sector changes, including unintended consequences from decentralization within the health sector, local efforts to increase the involvement of the private pharmaceutical sector, and persistent underfunding due to internal system payment problems.

A review of the Supply Chain Management System of Ghana Health Service (GHS) has revealed supply chain weaknesses in the health commodities which has hampered high availability of commodities and uninterrupted service delivery. (Denkyira, 2015). Distance to service in Ghana remains a binding constraint for contraceptive health commodities use among rural and urban populace. The distances to goods and services in rural areas is still high, while in urban areas where demand for smaller families is greater, distance is a binding constraint even though average distances are smaller. (elibrary.worldbank.org). Expanding access to a choice of affordable and appropriate health commodities such as contraceptive is critical to achieving the goal of reproductive health for all health commodities contraceptive that are considered to be overlooked or underutilized. (UNFPA, 2012). It is recognized that the availability of commodities for related services is critical to the success of comprehensive health programs.

In 2012, problems exist with commodity quality, pricing, and availability. In large part due to the high cost of drugs and medical supplies, the financial sustainability of the National Health Insurance Authority is also an increasing threat. (Ministry of health, republic of Ghana health commodity supply chain master plan, September 2012)

The specific objective is to examine the supply chain distribution network and recommend an alternative supply chain distribution network through a customized Geographical Information System (GIS) data for outbound intermediaries will be used.

## 2. Literature Review

In supply chain, distribution refers to the steps taken to move and store a product from the Supplier stage to a customer stage in the supply chain. (Chopra and Meindl, 2013). A distribution network is the system a company uses to get products from the manufacturer to the retailer. A fast and reliable distribution network is essential to a successful business because customers must be able to get products and services when they want them. The variety in contemporary distribution network systems are large and reflects complex customer demands and deficiencies in the distribution network. Challenges in distribution network lead to constraints for intermediaries and beneficiaries trying to establish consistent roles for themselves. Several approaches and models have been used to improve distribution of health commodities. Some examples are outlined below.

- Informed Push Model (IPM) is a distribution model that adapts principles used in commercial distribution to the public health sector. The IPM addresses common supply chain obstacles of transportation, quantification, data availability, and financial flows. The IPM is based on a commercial sector approach, and uses teams of trained drivers and staff to monitor and restock commodity inventory at health service delivery points within low and middle income countries. Using a small number of trained staff dedicated to supply management, informed push allows for increased visibility into consumption patterns to better inform supply decisions further upstream. Informed push models have proven effective in a number of countries for capturing facility-level data and reducing stock outs

for a range of products. It also allows the limited number of health care providers to focus on clinical care. This model has been successfully used in Senegal, Philippines and Uruguay. In Senegal, the model for contraceptive distribution, known locally as “pousse pousse” or informed push in Senegal, a driver with a truck full of supplies visits each point of sale on a regular schedule, topping up the stock and recording quantities of products sold. The data collected by the driver is used to ensure sufficient stock at the warehouse and at each site, figure out which products and sites are the most popular, and prepare the manufacturers to keep pace with demand.

- Direct Distribution and Information Capture (DDIC) was implemented in Nigeria. In this approach the trucks arrive, carrying predetermined quantities of health commodities, based on the facilities’ past consumption data. By investing in reliable transportation, DDIC ensures that truck drivers and team leaders are available to deliver commodities to health facilities according to an established delivery schedule. A team leader traveling with the truck inspects the facilities’ storage space, counts stock-on-hand for the different health commodities, and enters this inventory data into a specifically-designed inventory management database.
- Delivery Team Topping Up (DTTU) – was implemented in Zimbabwe. DTTU trucks have rolled out to make deliveries to the country’s more than 1,300 public sector health facilities, maintaining high delivery coverage, and low stockout rates. Based on vendor-managed inventory (VMI) principles (a concept used extensively in the commercial sector), DTTU routinely supplies all public sector health facilities with condoms, contraceptives, and other health commodities by sending delivery trucks directly to facilities to “top up” supplies and collect stock data.
- Dedicated Logistics System (DLS) implemented in Mozambique, is an informed push system, instead of following the administrative tiers, has a dedicated field coordinator for the two delivery zones and a vehicle for each zone. Each month, the field coordinator follows a transport loop to each health center to deliver the appropriate quantity of vaccines based on actual consumption during the month before, collects data on vaccine utilization and confirms its quality, checks the refrigerator to ensure it is functioning correctly, and provides supportive supervision to health workers. The data is entered into a new information management system that enables improved data visibility with key information on system performance for decision-makers.

### **3. Supply Chain Distribution Network**

According to Kitaw et al (2011), many organizations are forced to increase their global market share in order to survive and sustain growth. At the same time, organizations must defend their domestic market share from international competitors. The challenge is how to expand the global logistics and distribution networks in order to ship products to customers who demand them in a dynamic and rapidly changing of channels. A strategic positioning of inventories is essential, so that the products are available when the customer wants them. Long-term competitiveness therefore, depends on how well the company meets customer preferences in terms of service, cost, quality, and flexibility by designing the distribution network, which will be more effective and efficient than the competitors. Emerging trends in distribution networks has geared toward responsive supply chain via Geographical Information System (GIS) which easily predicts nearest equi-distance.

According to ESRI (1995), GIS can be used as a tool to map manufacturing, clients, processing units, supplier locations, distribution centers, and routing of vehicles. GIS can be used as

a decision support for effective supply chain management. In the system, the data of the processing units, the customers, the distribution centers, the suppliers, and the topologies of the roads are stored and managed by the geographic information system (GIS).

#### **4. Role of GIS in Supply Chain Management**

Geographic information system can be very useful in supply chain management. Geography matters a lot when the decision to be taken or the problems to be tackled are spatial in nature. GIS is emerging as a very effective tool in the industries that involve logistics and distribution function. The main problem to be tackled in supply chain management is of the routing - to find the shortest path between distributions centers (Regional Warehouses) and to find the alternative path in case of any problem in the shortest route. GIS and spatial analysis can be very effective at solving routing problems because it is able to examine vast numbers of possible solutions from various perspectives with speed and accuracy. The task of supply chain management is a very complex task. The task can be simplified by applying Geographic Information Systems, which automatically reduce the complexity by bringing out subtle geographic patterns and relationships that can form the basis of good decisions. GIS analysis is more than the use of mapping software or the ability to plot points on a map. It is the ability to draw relationships spatially and to identify value in each relationship.

#### **5. Supply Chain Distribution Network and GIS**

The logistics network consists of suppliers, warehouses, distribution centers, retail outlets, as well as raw materials, work-in-process inventory, and finished goods that flow between the different facilities which are part of the network.

Clearly the role of geographical information in logistics network management is all too evident. An often-cited statistic in scientific literature is that most of business data has a geographical element, and hence geographical information systems (GIS) are playing an increasingly important role in any area of business. (Sarkar A, 2007)

The interactions among a firm's distribution strategy, market share, and distribution costs are an important consideration in the design of supply chain networks. However, these interactions are largely ignored by existing distribution system design methodologies, which assume demand is constant regardless of the firm's distribution strategy.

#### **6. Center of Gravity Method**

The Center of Gravity Method is an approach that seeks to compute geographic coordinates for a potential single new facility that will minimize costs. It's an approach where the main inputs that it considers are the following: Markets and Volume of goods shipped.

#### **7. Organization of Study**

DKT International (DKT) is a charitable non-profit organization (NGO) that promotes family planning and HIV prevention through social marketing and operates in Africa, Asia, and Latin America. Much of its revenue comes from its sales of low-cost contraceptives. Since 2013, DKT have sold over 1.2 billion cycles of family health commodities in Ghana. It contributes about 56% of family health commodity distribution in Ghana and also works with health workers and clinics that provide family planning products, information, and services.

Existing Supply Chain Distribution Network in GIS Mapping

- Eastern and Volta region has a regional warehouse (distribution center) based in Koforidua.

- Western and central Region has a regional warehouse (distribution center) based in cape-coast.
  - The three northern regions has a regional warehouse (distribution center) based in tamale
  - Ashanti Region has a regional warehouse (distribution center) based Kumasi.
  - Brong Ahafo region has a regional warehouse (distribution center) based Sunyani
  - Greater Accra region has three warehouse (distribution center) serving Accra West and Accra East and Central Warehouse (Distribution center).
- However, there is a clear indication of deficiencies identified within the supply chain distribution network which can undermine the future demand fulfilment for family health commodities nationwide as per the GIS mapping below.

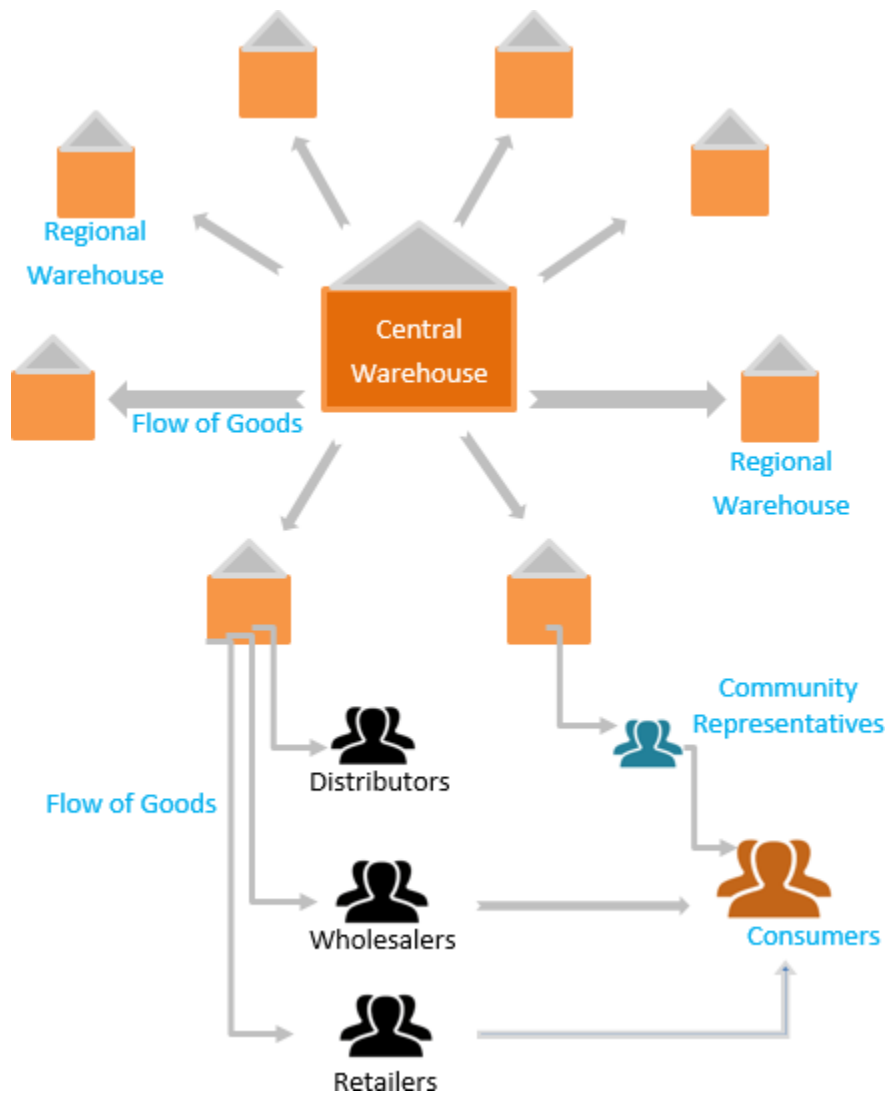


Figure 1. Commodity Flow Diagram

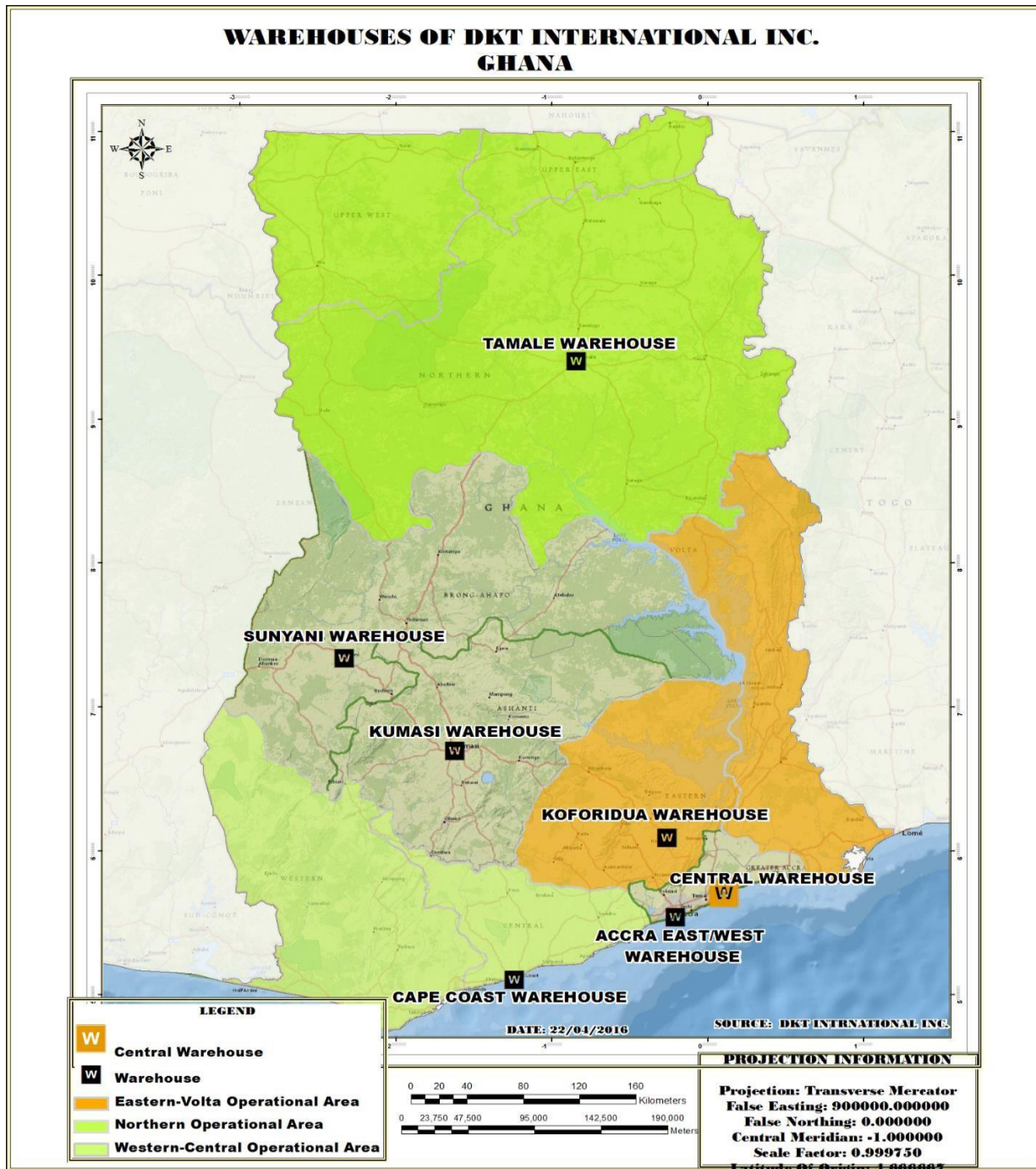
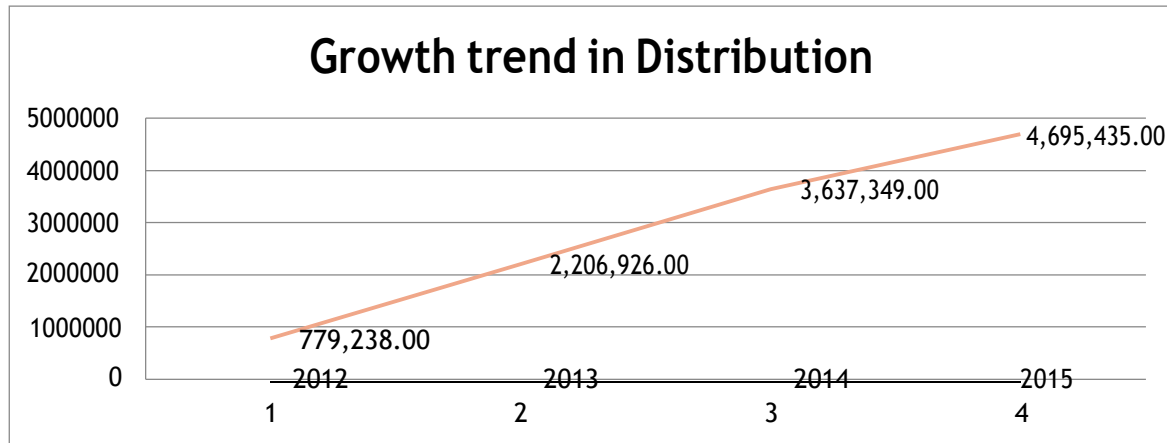


Figure 2. Geographical View of nationwide Warehouse and distribution Centers

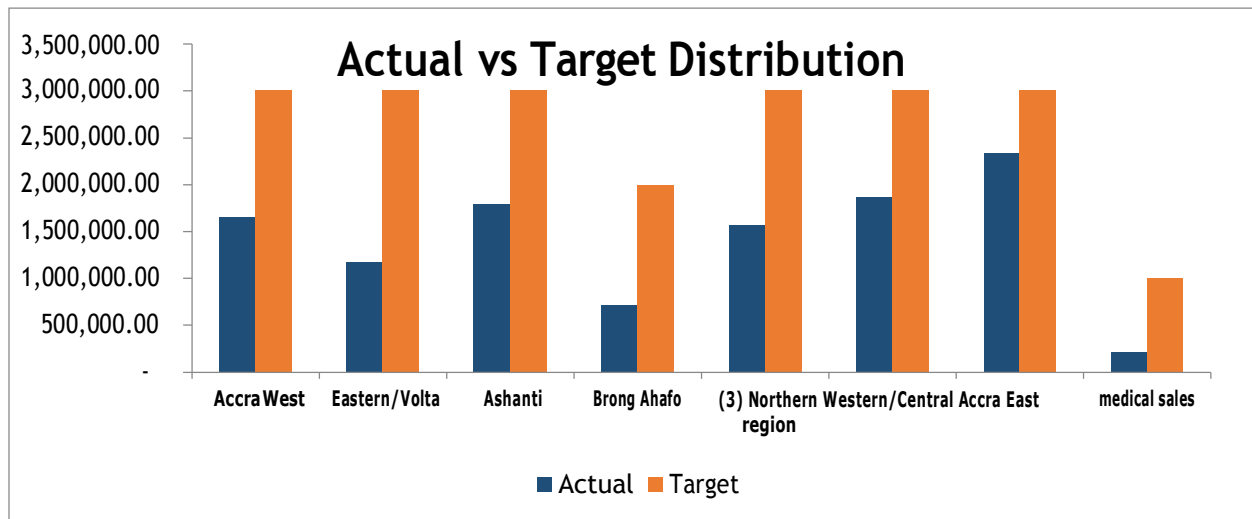
## 8. Data Analysis

In general, 90% of the responses was gotten from the field. 53.9% of targeted health commodities were achieved from 2012 to 2015 distribution data observed as per the data extracted from DKT SAP for the period over review.

Supply of health commodities experienced a general growth trend from 779,238 cycles of commodities 2012, 2,206,926cycles in 2013, 3,637,349cycles in 2014 and 4,695,435cycles in 2015 however; a supply gap of 46.10% was not attained within the 4yrea target deliverables.



Health commodities like contraceptive has a general prevalence rate of 27% in women aged 15 to 49 by 2015 in Ghana (data.worldbank.org/indicator/SP). It is the percentage of women who are currently using, at least one method of contraception, regardless of the method used. Actual distributed commodities did not meet target deliverables but there was a consistent growth in all territories and yearly basis for the period observed (2012-2015).



## 9. Conclusion

The availability of commodities at the central level is vital to the system working properly. For distribution of health commodities to be efficiently distributed, a robust and responsive approach need to adopted. Coordinating various stakeholders at the central level can be a challenge in terms of harmonizing/integrating commodities of programs for distribution. This can be overcome by working through procurement and supply management coordination mechanisms in

all supported sites where issues related to commodities are discussed.

Geo-Equi Distance supply chain distribution network for health commodities can improve efficient distribution of health commodities in developing countries. The benefits of efficient supply chain distribution network include improved commodity availability, reduced lead time and improved healthcare delivery. Moreover, in a responsive healthcare delivery, Geographical Equi-Distance supply chain distribution network is recommended.

## **10. Recommendations**

To re-establish the role played by the Integrated Inventory and Commodity Management Systems, Enterprise Resource Planning (ERP Systems), traditional Transport road network and Geographical equidistance strategy in supply chain distribution network, the following recommendations have been put forth to help in solving the Distribution challenges in the health commodity.

## **11. Integrated Inventory and Commodity Management System**

For a highly effective supply chain management system, it is essential that an inventory is kept and thoroughly maintained. An inventory means the ready list of items, raw materials and other essentials required for the product or service. This list has to be regularly updated to demarcate available stock and required stock. Inventory management is critical to the function of supply chain management, because without proper inventory and commodity management systems, bullwhip effect is likely to occur and impede health service delivery. Inventory and health commodity exists in the supply chain because of a mismatch between supply and demand. An important role that inventory plays in the supply chain is to increase the amount of demand that can be satisfied by having the health commodities ready and available when the customer wants it.

High levels of inventory and commodities in an apparel supply chain improve responsiveness but also leave the supply chain vulnerable to the need for markdowns, lowering profit margins. Low levels of inventory improve inventory turns but may result in poor service delivery if patient are unable to have access to health commodities when the need arises.

## **12. Enterprise Resource Planning (ERP Systems)**

The world today is dominated by a continuous flow of information. In order to be successful, it is essential that a business stays abreast with all the latest information about the various aspects of its flow cycles. The market trends of supply and demand for health commodities can be best understood if the information is properly and timely disseminated through the many levels of the supply chain cycle.

Information is potentially the biggest driver of performance in the supply chain because it directly affects each of the other drivers. Information presents management with the opportunity to make supply chains more responsive and more efficient. Chopra et al, (2015).

Organization uses information to improve product availability while decreasing inventories. Information are used to track shipments from suppliers, facilitate cross-docking and transportation. ERP platform should be implemented to link all the distribution centers and service facilities to have access to their real time commodity movement. This help in supply chain planning of commodities in other to replenish commodities to user facilities without going through the ordering and approval processes to reduce lead time. Every reduction in lead time in supply chain have a positive impact on service delivery and improve responsive supply chain objective.



### 13. Traditional Transport road network

Traditional Transport road network in Ghana have played significant functions as the main source of linkage between rural inhabitant and urban space. Even though our transportation infrastructure does not receive much attention on upgrade and maintenance, it contributes a lot for transporting health commodities from urban distribution centers to rural health facilities to enhance availability. Traditional Transport road network focus mainly on existing route for transporting both human and goods to it various destination. Traditional Transport road network can be used to achieve cost efficiency in the distribution of health commodities to our various users. It is also noticeable from the study that there is a strong linkage between urban road transportation and rural distribution centers and if it is augmented with a multi modal transport system, it can achieve both cost efficiency and responsive distribution strategy.

### 14. Geographical Equidistance from Regional Warehouses

Without a well-developed transportation system, both efficient and responsive distribution strategy cannot be full exploited. Besides, a good transportation system in our rural and urban setup could provide efficient movement of health commodities from Central Distribution Centers to Regional Distribution Centers, reduce transport cost, and promote service delivery. Based on empirical evidence, Geographical equi-distance of some areas within a certain region can efficiently and responsively served using equi-distance to other Distribution Centers.

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