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Influence of Supply Planning Practice on the Performance of the Unit of Vaccines and Immunizations in the Ministry Health, Kenya

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Abstract: **The performance of the public health sector in Kenya has been a major concern to the Kenyan people. Good health is a prerequisite for enhanced economic growth and poverty reduction and a precursor to the realization of Kenya Vision 2030's social pillar goal. The country is confronting numerous gaps in health outcomes like high infant mortality rate caused by neonatal problems. Therefore, the purpose of this study was to determine the influence of supply planning practice on the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya. The study adopted mixed research design using both quantitative and qualitative approaches. The target population of the study was 244 from the Unit of Vaccine and Immunizations (UVIS) headquarter, KEMSA depot and warehouse staff, Nairobi, Mombasa, Kisumu,and Busia counties. The study used random sampling to pick a sample size of 74 respondents. Data was collected using questionnaire. Descriptive statistics was used aided by Statistical Packages for Social Sciences version 24 to compute percentages of respondents' answers. Inferential statistics multiple regression and correlation analysis was applied to examine the relationship between the research variables. The study established that there is strong positive correlation between supply planning and the performance of the unit of vaccines and immunizations. Therefore, supply planning practices such as optimum inventory procurement, determination of health requirements of health facilities at every node, aggregate determination requirements and joint coordination with suppliers if adopted by the unit of vaccines and immunizations will increase the performance positively.**

Keywords: **Unit of Vaccines, Immunizations (UVIS) headquarter, KEMSA depot.**

1. INTRODUCTION

Health care has become a critical issue in the world, along with the increased concerns for medical errors, patient safety, and spiraling up medical costs, many researchers have stressed the importance of effective SCM in the healthcare industry (Chan, Chan, Lau, & Ip, 2008; Kumar, Ozdamar, & Zhang, 2008; Mustaffa & Potter, 2009). Healthcare services involve comprehensive and complex systems that treat and prevent diseases, including medical consumables, laundry and cleaning, medical exercise equipment, home-care products, information systems, wheelchairs, vehicle fleet management, and general materials (Gattorna, 1998).

The Global Immunization Vision and Strategy was launched on 25th May 2005 at the World Health Assembly held in Geneva, Switzerland. Governments (including the Government of Kenya), committed themselves to this strategy designed by WHO and UNICEF to fight vaccine preventable diseases which kill more than two million people every year, two-

thirds of whom are young children (Kenya Demographic and Health Survey, 2009). This immunization strategy that is a framework for planning and implementing national programs during 2006-2015 period aims to immunize more people, from infants to seniors, with a greater range of vaccines (Effective Vaccine Management Assessments, 2013). The main goal is, by 2015 or earlier to reduce illness and death due to vaccine-preventable diseases by at least two thirds compared to levels experienced in 2000. The Global Immunization Vision and Strategy has four main aims: to immunize more people against more Diseases, to introduce a range of newly available vaccines and technologies, to integrate other critical health interventions with immunization and to ensure vaccination programs and activities are managed within the context of global interdependence (Kenya Demographic and Health Survey, 2009).

In Kenya vaccination and immunization is done by the ministry of health through the Unit of Vaccines & Immunization Services (UVIS). It became effective from 1st July 2007, and represents the Ministry of Health's new direction in the coordination of immunization services for the general public. The Unit of Vaccines & Immunizations Services (UVIS) has grown from the original Kenya Expanded Program on Immunization (KEPI) but has extended scope to consolidate all vaccination services previously coordinated by other divisions within the Ministry of Health. The mandate of UVIS is to coordinate vaccination services for all vaccine preventable diseases through the provision of guidelines and selected priority vaccines and related biological (sera, immunoglobulin). Also UVIS is to advice on immunization schedules for all age cohorts in line with the Kenya Essential Package for Health (NHSSP-II 2005-2010). Vaccines are very sensitive biological products; they lose their potency if they are subjected to temperatures beyond the recommended ranges. Proper forecasting, procurement, handling, storage and distribution of vaccines are vital in order to provide effective vaccines to protect children from vaccine preventable diseases. To reap the maximum benefits from vaccines, a strong and efficient vaccine supply chain must be in place.

Vaccines promote health**:** unlike many other health interventions, they help healthy people stay healthy, removing a major obstacle to human development; have an expansive reach: they protect individuals, communities, and entire populations; have rapid impact: the impact of most vaccines on communities and populations is almost immediate. For example, between 2000 and 2008, vaccination reduced global deaths; save lives and costs: recently, a panel of distinguished economists put expanded immunization coverage for children in fourth place on a list of 30 cost-effective. The impact of vaccination on the health of the world's peoples is hard to exaggerate. With the exception of safe water, nothing else, not even antibiotics has had such a major effect on the reduction of mortality (deaths) and morbidity (illness and disability) and on population growth (Plotkin, Orenstein & Offit 2008).

The goal of Kenya's Vision 2030 for the health sector is to provide equitable and affordable health care at the highest affordable standards to her citizens. Good health is a prerequisite for enhanced economic growth and poverty reduction and a precursor to the realization of Kenya Vision 2030's social pillar goal (Government of Kenya, 2007). The Constitution of Kenya 2010 under the Bill of Rights provides for access to equitable health care as a right to every Kenyan. Despite the relative good performance in health indicators, there are numerous gaps in health outcomes. In fact, the country is not likely to achieve some of the Millennium Development Goals by 2015. At 488 per 100,000 live births, Kenya's maternal mortality ratio is high, mainly due to a number of factors that include low levels of delivery at 43 percent through health institutions. Moreover, despite increasing use of contraceptives, the total fertility rate has been stagnating at around five births per woman for the last 10 years (Kenya Demographic and Health Survey 2009). According to Kenya Demographic and Health Survey (2009), child mortality remains high in Kenya. The less than 5 years mortality rate is estimated at 74 per 1000 live births, while infant mortality is 52 per 1000 live births. The main causes of death amongst children are neonatal problems at 26 percent, diarrhea at 20 percent, pneumonia at 16 percent and malaria at 11 percent.

To address the continued high morbidity and mortality in children under the age of five years, the Government of Kenya has adopted the Integrated Management of Childhood Ilnesses strategy that encourages an integrated approach towards providing prevention and management of the five major childhood illnesses both at the health facilities and at home. This is in addition to immunization that has contributed to the significant reduction in the prevalence of common childhood diseases. The Expanded Program on Immunization (EPI) program plans to achieve over 90 percent coverage nationally and at least 80% in all districts / sub-counties by 2015. The cost of vaccine alone for a fully immunized child (FIC) currently stands at $18. This will increase to $25 with the introduction of the Rotavirus vaccine and Inactivated polio Vaccine (IPV) in 2014 (Effective Vaccine Management Assessment, 2013).

Problem statement:

The performance of the public health sector in Kenya has been a major concern to the Kenyan people. Good health is a prerequisite for enhanced economic growth and poverty reduction and a precursor to the realization of Kenya Vision 2030's social pillar goal (Government of Kenya, 2007). The country is confronting numerous gaps in health outcomes. In fact, the country is not likely to achieve some of the Millennium Development Goals by 2015. At 488 per 100,000 live births, Kenya's maternal mortality ratio is high, mainly due to a number of factors that include low levels of delivery at 43 per cent through health institutions (Kenya Government Publisher, 2015). According to Kenya Demographic and Health Survey (KDHS, 2009), child mortality remains high in Kenya. The less than 5 years mortality rate is estimated at 74 per 1000 live births, while infant mortality is 52 per 1000 live births. The main causes of death amongst children are neonatal problems at 26 per cent, diarrhea at 20 per cent, pneumonia at 16 per cent and malaria at 11 per cent.

Effective Vaccine Management Assessments (EVMA 2013); Vaccine Management Guidelines (2003) and Performance Monitoring Handbook (2013) pointed out that some of the key areas that limit the performance score of the Unit of Vaccines and Immunization and required to be improved is the clearing of vaccines through the customs which takes between 3 to 10 days long and can put the vaccine at risk. During vaccine ordering and supply, staffs do not implement minimum, reorder and maximum stock levels, as a result, several incidents of over stocking and stock-outs have occurred. There are no distribution plans for distribution of vaccine from one level to another. Therefore, it is important to look into the supply planning practice that can improve healthcare organizational performance (Sukati, Hamid, Baharun & Huam, 2011).

Objective of the study:

The general objective of this study was to determine the influence of supply planning practice on the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya.

Hypothesis:

H_1There is a positive significant influence of supply planning practice on the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya**.**

2. LITERATURE REVIEW

Supply Chain Management Theory:

The literature on supply chain management tends to move rather imperceptibly between description, prescription and trend identification. Key trends in supply chain management is "cooperation" rather than competition, a shift from the "antagonistic" model to a collaborative model (Matthyssens & Van den Bulte, 1994; Carr, 1999), the increasing use of supplier-evaluation tools (Carr, 1999) and a trend towards supplier management. Some authors suggest an irresistible trend while others note the relatively limited take up to date (Skjoett-Larsen, 1999; Kemppainen & Vepsalainen, 2003).

Storey, Emberson, Godsell and Harrison (2006) viewed supply chain management as the holistic concept of "seamless, end to end". Supply chain management is distinct from a series of units or functions engaging in sub-optimal behaviour. However, it implies some considerable effort to reach through the supply chain: upstream beyond the first tier suppliers, and downstream beyond a focal firm's customers the so-called "arcs of integration" (Frohlich & Westbrook, 2001). Alternatively, it would require an unusual degree of co-ordination between tiers.

Holistically SCM in the Unit of vaccines and Immunizations is required internally-focused through integration, particularly within globally dispersed supply chains. Such efforts are both required to simplify control, whilst reducing costs and cycle times within internal logistics activities. For example, The Unit of Vaccines and Immunizations import medicines across the continent through airfreight from various manufacturing operations around the globe. They employ the services of third party logistics providers to clear and forward the goods, and Kemsa depots to store vaccines for regional use.Therefore The Unit of Vaccines and Immunizations should attempt to improve internal functional co-ordination ranged from the appointment of senior managers with designated responsibilities to the nomination of operational individuals with specific accountability for selected boundary-spanning activities. Between these extremes, the institution of formal cross-functional teams will improve pipeline integration.

Supply planning Practice:

Supply Planning is performed to ensure sufficient material is available to be sent to the right place to fulfill future demand. Supply planning process secures supplies to meet future projected demand by balancing between demand & supplies. Supply planning involves co-coordinating with suppliers to get supply commit, place purchase orders as per the supply plan and then reviewing supplies (Sukati, Hamid, Baharun & Huam, 2011). In case of supply disruption, inform all stake holders and initiate inventory allocation / movement to manage risk. Objective of Supply Planning process is to procure optimum inventory as per the forecasted demand. It is done by determining requirement at every node and then rolling up to arrive at aggregated requirement at country level. Then coordinate with suppliers to procure net aggregated inventory requirement.

In many companies, sales forecasting is an integral part of a critical process for matching global demand and supply that is sometimes referred to as sales and operations planning or S&OP (Mentzer & Moon, 2004). An enterprise can be thought of as consisting of two primary functions: a demand function and a supply function. Demand is the responsibility of sales and marketing. In many companies, the sales organization is responsible for generating and maintaining demand from large end-use customers, or from wholesale or retail channel partners. Marketing is usually responsible for generating and maintaining demand from end consumers. Supply is the responsibility of a number of functions, including manufacturing, procurement, logistics or distribution, human resources, and finance. It is also the responsibility of a variety of suppliers, who must provide raw materials, component parts, and packaging (Taylor & Fearne, 2009). The S&OP process provides a "junction box" where information can flow between the demand side and the supply side of an enterprise.

In health centers supply chains, poor replenishment performance leads to product availability problems in stores, or, on the other hand, oversupply of products. This shows particularly in managing exceptional demand situations, such as promotional campaigns, seasonal demand and product introductions, where demand is less predictable (Taylor & Fearne, 2009). These problems have a direct financial impact on the whole supply chain in the form of lost sales and profit (Corsten & Gruen, 2003; Ehrenthal & Stölzle, 2013), or, in cases of oversupply, the products being discarded because the expiry dates have passed or the season is over (Taylor & Fearne, 2009). As a solution to the problem, collaborative health centers replenishment practices have been presented, such as vendor-managed inventory (VMI) and collaborative planning, forecasting and replenishment (CPFR), which are based on the efficient sharing of sales and inventory information (Cachon & Fisher, 2000).

Therefore, in addition to purely technical information sharing, companies need to invest in collaboration with supply chain partners. Collaboration is a partnership where companies are committed to planning and executing operations together, aiming for the best possible solution for both parties (Simatupang & Sridharan, 2005). VMI and CPFR have been developed to create close collaboration and enable information to be shared between supply chain partners (Barratt, 2003). The benefits resulting from the supplier's responsibility for replenishing the customer's inventory, such as secured inventory availability on the customer's premises, are encouraging companies to invest in VMI (Sari, 2008; Claassen et al., 2008). However, problems in implementation have been reported, and especially manufacturers have found it hard to realize the expected benefits (Småros et al., 2003). VMI is suitable for products for which there is stable demand, but it faces difficulties in capturing demand uncertainties related to, for example, promotional activities (Barratt, 2003).

The replenishment challenges have been associated with the specific features of the health care: high product variety and fierce price competition, which causes volatile sales. The volatility in demand is not only affected by promotional campaigns, but also seasons, the weather and more flexible opening hours of health care centers . Furthermore, health centers may not be willing to share on-hand inventory levels, and, second, the shared data may be inaccurate. Supply chain planning in these circumstances is challenging, because accurate and reliable forecasts are needed to be able to create a responsive supply chain

Research Methodology:

The study adopted mixed research design using both quantitative and qualitative approaches. The target population of the study was 244 from the UVIS headquarter, KEMSA depot and warehouse staff, Nairobi, Mombasa, Kisumu and Busia counties. The study used random sampling to pick a sample size of 74 respondents. Data was collected using questionnaire. Descriptive statistics was used aided by Statistical Packages for Social Sciences version 24 to compute percentages of respondents' answers. Inferential statistics multiple regression and correlation analysis was applied to examine the relationship between the research variables.

3. RESEARCH FINDINGS AND DISCUSSION

Response Rate:

The study targeted a sample of 74 responded, who were official staff in the headquarter of UVIS, Central Vaccines Store, Kepi County nurses, Kepi County Logisticians, Sub-county EPI Coordinators, KEMSA depot staff and KEMSA Central Warehouse staff. A total of 66 self-administered questionnaires were filled out of the expected 74 yielding a response rate of 89%. This good response rate was attributed to the data collection procedure, where the researcher personally administered questionnaires and waited for the respondents to fill, and picked the filled questionnaires.

Reliability and factor analysis for Supply planning practise:

Table below shows the Cronbach's alpha values of supply planning practice and factor loading of the five supply planning practice statements. The higher the absolute value of the loading, the more the factor contributes to the variable. Table below illustrates that the Cronbach's alpha value of supply planning practice before and after removal of item with a factor loading value of less than 0.5. The study, therefore, considered all the five supply planning practice statements. Scale refinement was assessed using item to total correlations analysis, with indictors with an item to total correlation threshold of 0.3 and higher being maintained for further analysis (Hair et al., 2006).

Table.1: Reliability and factor analysis for Supply planning practise

Statements on Supply planning practise	KMO	Factor loadings	Overall Cronbach's Alpha	Item to total correlation
we procure optimum inventory requirements	0.686	.931	0.708	.421
we determine requirement at every node e.g. dispensaries, health centres etc.		.800		.574
we arrive at country level requirements by aggregating requirements from lower levels		.839		.402
we coordinate with suppliers to procure net aggregated inventory		.861		.464
we depend on demand forecast and historical consumption data to arrive at supply requirements		.843		.533

Analysis of Supply planning practise:

The study sought to establish the influence of supply planning practice on the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya. This objective was measured using opinion statements given with regard to supply planning practices and Unit of Vaccines and Immunizations capabilities.

Supply planning practices opinion statements:

Respondents were asked to indicate the extent to which they agreed with supply planning practices opinion statements that are executed in the Unit of Vaccines and Immunizations. This was on a scale of not at all, small extent, moderate, large extent and very large extent. A result of the analysis is presented in table below. The study determined that majority of the respondents (39%) indicated large extent that they procure optimum inventory requirements, 27% of respondents indicated moderate that they procure optimum inventory requirements, 16% of respondents indicated small extent that they procure optimum inventory requirements, 14% of respondents indicated very large extent that they procure optimum inventory requirements, and 5% of respondents indicated not at all that they procure optimum inventory requirements.

On determination of health requirements, majority of respondents (36%) both indicated very large and large extent that they determine requirements of dispensaries or health centres at every node, 14% of the respondents indicated moderate extent that they determine requirements of dispensaries or health centres at every node, 13% of the respondents indicated small extent that they determine requirements of dispensaries or health centres at every node and 2% of the respondents indicated not at all that they determine requirements of dispensaries or health centres at every node. This finding agrees with the study of Performance Monitoring Handbook (2013) that objective of supply planning process is to procure optimum inventory as per the forecasted demand. It is done by determining requirement at every node and then rolling up to arrive at aggregated requirement at country level.

With regard to aggregating requirements, majority of respondents (47%) indicated very large extent that they arrive at country level requirements by aggregating requirements from lower levels, 22% of the respondents indicated large extent

that they arrive at country level requirements by aggregating requirements from lower levels, 14% of the respondents indicated moderate that they arrive at country level requirements by aggregating requirements from lower levels, 11% of the respondents indicated small extent and 6% of the respondents indicated not at all that they arrive at country level requirements by aggregating requirements from lower levels.

On coordinate with suppliers to procure net aggregated inventory, majority of the respondents (29%) both indicated very and large extent that they coordinate with suppliers to procure net aggregated inventory, 17% of the respondents indicated not all that they coordinate with suppliers to procure net aggregated inventory, 16% of the respondents indicated small extent that they coordinate with suppliers to procure net aggregated inventory and 10% of the respondents indicated moderate that they coordinate with suppliers to procure net aggregated inventory. This finding concur with the study of Taylor and Fearne (2009) that in health centers supply chains, poor replenishment performance leads to product availability problems in stores, or, on the other hand, oversupply of products. This shows particularly in managing exceptional demand situations, such as promotional campaigns, seasonal demand and product introductions, where demand is less predictable). As a solution to the problem, collaborative health centers replenishment practices have been presented, such as vendor-managed inventory (VMI) and collaborative planning, forecasting and replenishment (CPFR), which are based on the efficient sharing of sales and inventory information (Cachon & Fisher, 2000).

In addition, majority of respondents (50%) indicated very large extent that they depend on demand forecast and historical consumption data to arrive at supply requirements, 34% of the respondents indicated large extent that they depend on demand forecast and historical consumption data to arrive at supply requirements, 11% of the respondents indicated moderate that they depend on demand forecast and historical consumption data to arrive at supply requirements, 3% of the respondents indicated small extent that they depend on demand forecast and historical consumption data to arrive at supply requirements and 2% of the respondents indicated not at all that they depend on demand forecast and historical consumption data to arrive at supply requirements. This finding concurs with the study of Mentzer and Moon (2004) that in many companies, sales forecasting is an integral part of a critical process for matching global demand and historical consumption data to arrive at supply requirements.

Table.2: Analysis of Supply planning practise

Opinion statements	Not at all (%)	Small extent (%)	Moderate (%)	Large extent (%)	Very Large extent (%)	Mean	Std. deviation
we procure optimum inventory requirements	5	16	27	39	14	3.42	1.066
we determine requirement at every node e.g. dispensaries, health centres etc.	2	13	14	36	36	3.92	1.074
we arrive at country level requirements by aggregating requirements from lower levels	6	11	14	22	47	3.92	1.276
we coordinate with suppliers to procure net aggregated inventory	17	16	10	29	29	3.35	1.483
we depend on demand forecast and historical consumption data to arrive at supply requirements	2	3	11	34	50	4.28	.899

Test of hypothesis:

The researcher conducted regression analysis so as to establish the influence of supply planning practice on the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya. The hypothesis to test for this specific objective was:

H_2: There is a positive significant influence of supply planning practice on the performance of the unit of vaccines and immunizations in the Ministry of Health, Kenya**.**

The linear regression model shows R^2= 0.617 which means that 61.7% change of performance of the UVIS in the ministry of health, Kenya can be explained by a unit change of supply chain practice. The result is shown in table below. Out of the results there is an indication that one unit change in supply chain practice translates to 61.7% change in performance of the UVIS in the ministry of health, Kenya therefore, supply chain planning practice has influence on how UVIS perform.

Table.3: Model Summary of supply chain planning practice

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.786[a]	.617	.610	.51882

a. Predictors: (Constant), supply planning practice
b. Dependent Variable: Performance of the unit of vaccines and immunizations

Further test on ANOVA shows that the significance of the F-statistic (22.441) is less than 0.05 since p value, p=0.00, as indicated in table below. This implies that there is a positive significant relationship between supply chain planning practice and performance of the UVIS. This result is in harmony with other studies in the literature that in health centers supply chains, poor replenishment performance leads to product availability problems in stores, or, on the other hand, oversupply of products. This shows particularly in managing exceptional demand situations, such as promotional campaigns, seasonal demand and product introductions, where demand is less predictable (Taylor & Fearne, 2009). As a solution to the problem, collaborative health centers replenishment practices have been presented, such as vendor-managed inventory (VMI) and collaborative planning, forecasting and replenishment (CPFR), which are based on the efficient sharing of sales and inventory information (Cachon & Fisher, 2000).

Table.4: ANOVA of supply planning practice

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.129	1	10.129	22.441	.000[b]
	Residual	25.728	57	.451		
	Total	35.857	58			

a. Dependent Variable: Performance of the unit of vaccines and immunizations
b. Predictors: (Constant), supply planning practice

Further test on the beta coefficients of the resulting model, the constant $\alpha = 0.152$, if the independent variable of supply chain planning practice is held constant then there will be a positive performance of the UVIS in the ministry of health, Kenya by 0.152. The regression coefficient for supply chain planning practice was positive and significant ($\beta = 0.697$) with a t-value=9.065 (p-value<0.001). As shown in table below.

This implies that for every 1 unit increase in supply chain planning practice, performance of the UVIS in the ministry of health, Kenya is predicted to increase by 0.697 units and therefore H_2 is accepted.

Table.5: Coefficients of supply planning practice

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.152	.073		2.082	.042
	supply chain planning practice	.697	.077	.786	9.065	.000

a. Dependent Variable: Performance of the unit of vaccines and immunizations

The finding of this study agrees with the literature reviewed in this study that supply planning process secures supplies to meet future projected demand by balancing between demand & supplies. Supply planning involves co-coordinating with suppliers to get supply commit, place purchase orders as per the supply plan and then reviewing supplies (Sukati, Hamid, Baharun & Huam, 2011). The objective of Supply Planning process is to procure optimum inventory as per the forecasted demand. It is done by determining requirement at every node and then rolling up to arrive at aggregated requirement at country level. Then coordinate with suppliers to procure net aggregated inventory requirement and if supply chain planning is coordinated well, it will increase the performance of organizations (Performance Monitoring Handbook, 2013)

4. CONCLUSIONS AND RECOMMENDATIONS

Supply planning is performed to ensure sufficient material is available to be sent to the right place to fulfill future demand. Supply planning process secures supplies to meet future projected demand by balancing between demand & supplies. Supply planning involves co-coordinating with suppliers to get supply commit, place purchase orders as per the supply plan and then reviewing supplies. The study established that there are quite number of supply planning practices which are practiced by the unit of vaccines and immunizations in order to improve its performance. Results showed that the unit of vaccines and immunizations procure optimum inventory requirements in order to trade-off between the cost

holding inventory and stock outs. The study determined that the unit of vaccines and immunizations determines the health requirements of dispensaries or health centres at every node. This is done by determining requirement at every node and then rolling up to arrive at aggregated requirement at country level. Also, the unit of vaccines and immunizations aggregates the country' requirements from lower levels. This enabled them to establish the required quantity required by customers. The unit of vaccines and immunizations they coordinate with suppliers to procure net aggregated inventory. Taylor and Fearne (2009), asserts that in health centers supply chains, poor replenishment performance leads to product availability problems in stores, or, on the other hand, oversupply of products. A solution to this problem is via collaboration of health centers replenishment practices such as vendor-managed inventory (VMI) and collaborative planning, forecasting and replenishment (Cachon & Fisher, 2000).

In addition, the study established that there is strong positive correlation ($r=0.717$, $p<0.01$) between supply planning and the performance of the unit of vaccines and immunizations. Therefore, supply planning practices such as optimum inventory procurement, determination of health requirements of dispensaries or health centres at every node, aggregate determination requirements and joint coordination with suppliers if adopted by the unit of vaccines and immunizations increase the performance positively. Further, it was noted that the performance the unit of vaccines and immunizations when measured in terms of quality health care delivery, procedure time for patient undergo for vaccination and immunization, responding promptly to avoid any outbreak of immunized diseases, provision of efficient services to the clients, offering sustainable and safety healthcare to or customers and reduced cost of health care, was positively influenced by supply planning practice.

The linear regression model showed that $R^2= 0.617$ which means that 61.7% change of performance of the UVIS in the ministry of health, Kenya can be explained by a unit change of supply chain practice. On ANOVA test showed that the significance of the F-statistic (22.441) is less than 0.05 since p value, $p=0.00$, as indicated in table 4.32. This implied that there was a positive significant relationship between supply planning practice and performance of the UVIS. Further, test on the beta coefficients of the resulting model, showed that the regression coefficient for supply planning practice was positive and significant.

Thus, the study recommends that UVIS to determine the requirement at every node by aggregating the requirements at country level. This will enable UVIS to establish the required quantity required by customers. Also, the study recommends That UVIS should adopt supply planning practices such as optimum inventory procurement, aggregate determination requirements and joint coordination with suppliers in order to improve the performance of the unit of vaccines and immunizations.

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