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ABSTRACT

The main objective of this study was to find out the effect of health supply chain in facilitating Universal Health Coverage in Kenya. Specifically, the study identified the effect of Inventory Optimization, Supply Chain Data Analytics, Supply Chain Integration and the influence of Strategic Purchasing on the achievement of Universal Health Coverage (UHC) in Kenya. The research design employed in this study was descriptive. This study relied heavily on secondary data as is the case with most desktop research study. The study reviewed journal articles, unpublished papers and conference papers on Supply Chain Management and Universal Health Coverage. The paper employed a desktop approach to provide answers to the research objectives. Specifically, the paper used a descriptive approach to gather information from peer reviewed publications such as, journal articles, organizations reports and books. The study found that the attainment of UHC in Kenya had remained elusive due to many challenges, which included unequal access to different healthcare services due to poor distribution and use of resources, shortfall in the number of medical personnel, skewed distribution of healthcare workforce, inability of the country's health system to deal effectively with epidemics, corruption in the health sector, the growing burden of chronic diseases, epidemiological as well as a demographic transition with a steep increase among non-communicable diseases (NCDs), health leadership and governance issues, the need to strengthen health purchasing activities, among other myriads of issues. The study recommended that policy makers must purpose to implement strategies to deliver UHC. They must also undertake health financing reforms to mobilize more financing for health and ensure that available funds for health are used optimally and equitably. The state should reorient its health financing strategy away from a focus on contributory, voluntary health insurance, and instead recognize that increased healthcare funding is critical.

Key Words: *Inventory Optimization, Supply Chain, Supply Chain Integration, Strategic Purchasing*

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BACKGROUND OF THE STUDY

The international community has come to recognize the critical importance of strengthening public health systems as a whole to the achievement of major global health goals. Ranging from the overarching health objectives of the Millennium Development Goals to the more focused objectives of the many specific global health programs (Kihara& Ngugi,2021). In 2015, Member States of the United Nations adopted the 2030 Agenda for Sustainable Development and its accompanying Sustainable Development Goals (SDGs), with the third goal of the agenda focusing on health – good health and well-being – thereby identifying the attainment of Universal Health Coverage (UHC) as its core target, (WHO,2022). UHC programs by design, offer all essential and quality health services, namely, health promotion, preventive health, medical treatment, rehabilitation, palliative care, and hospice care (Ranabhat, Acharya, Adhikari & Kim, 2023). Access to good healthcare is a fundamental human right and a responsibility of every government, as the provision of Universal Health Coverage is essential to unlocking quality, accessible, affordable healthcare for all without suffering financial hardship, (Al-Mansur, Oluwatomisin, Olatunji, Adekunle & Oluwatobi,2023). According to Gita, Govender & Salma (2019), considering all elements of a health system and its functioning, it is necessary to advance the following agenda towards UHC: governance; health service delivery; health information systems; human resources; and financing of medical services as well as medical technologies. A good healthcare system is an indispensable part of the happiness of residents in a Country. Nowadays, the existing health systems all over the world are different due to the different combinations of components (Chen et al.,2023). According to Oxfam (2013), Universal Health Coverage is about the right to health. Everyone – rich or poor – should get the Health Coverage they need without suffering financial hardship. Unfortunately, some donors and developing Country Governments are promoting health insurance schemes that exclude the majority of people and one that may also reinforce inequality – by prioritizing people who are formally employed and excluding the poorest and marginalized, who cannot afford to pay premiums, especially women.

Universal Health Coverage (UHC)

Universal Health Coverage (UHC**)** refers to a government system or program that guarantees that the public have access to all types of available health services. The UHC system should provide such services when and as required without causing financial challenges to the individual receiving such services (Ranabhat, Acharya, Adhikari & Kim, 2023). Universal Health Coverage is a system that allows all members in a society to access essential health services without direct financial barriers (Mounde,2022). This definition embodies three related objectives: that equity in access to health services based on need rather than ability to pay; that the quality of health services is good enough to improve overall health; and that there are financial risk protection mechanisms to ensure that persons are not impoverished for seeking healthcare (World Health Organization, 2013). According to Friebel, *et al*, (2018), the concept of UHC is now considered to go beyond the three dimensions of population, services and costs, with an increasing focus being placed on ensuring a level of quality that helps to improve the health of the service seeker. Voorhoeve, (2022), adds that, achieving Universal Health Coverage and thereby making high quality, essential healthcare accessible and affordable to everyone must be a key priority for the World Health Organization (WHO) and governments across the globe. Ly, Bassoum & Faye, (2022) reiterates that, a Universal Health Coverage must provide the possibility for all individuals to have access to quality healthcare at an affordable cost. However, extreme resource constraints of most developing economies would mean that this cannot be achieved and therefore radical choices must be made by governments. This therefore calls for equitable financing, that is, a sharing of costs within the population that considers the contributory

capacities of everyone. According to Ly et al, (2022), some radical measures would include the establishment of a prepayment system based on tax contributions or compulsory insurance contributions payable by employees, public or private employers and the self-employed.

Figure 1: A Framework of Universal Health Coverage and Equity on Health Coverage in Kenya
Source: Oketch & Lelegwe, (2015)

UHC Progress Globally

Global health and healthcare are characterized by a renewed emphasis on the goal of Universal access throughout the world. While this goal has been achieved to varying extents in the United Kingdom, Canada and many Countries in Europe, even within those Countries where national health systems have long been in place, the pervasive shift in emphasis from health as a social value to health as a commodity within a capitalist market civilization is eroding the commitment to equitable access to healthcare, (Solomon & Gill, 2021). Implementing and expanding health insurance schemes in developing economies associated with very large informal sector populations, poor funding, and inefficient fund collection mechanisms can be very difficult. These factors among many others excluded millions from having access to quality Health Coverage services in affected nations with resultant and persistent poor health indices and development (Olanrewaju, Babatunde, Damilola, Olasupo, Alabi, Bakare & Oluwakorede 2021). According to WHO (2022), Universal Health Coverage represents the umbrella target for SDG 3, with a focus on ensuring that "all people have access to the Health Coverage they need, when and where they need it, without facing financial hardships". Two indicators are used to monitor progress towards UHC: Service Coverage Index (SCI) and Financial Risk Protection. Despite the 2012 United Nations' landmark resolution endorsing UHC, its further prioritization for the attainment of sustainable development by World Health Organization (WHO) and World Bank and the 2015 commitments by WHO member States to implement UHC, Country-led uptake and prioritization has remained slow due to the requisite huge investments to operationalize the system, (NCPD,2019). Very little progress has been made in terms of access, equity, and quality, despite being pronounced as a fundamental human

right by the United Nations Development Program - UNDP (Ranabhat, Acharya, Adhikari & Kim, 2023).

According to Benatar, Stephen & Gill (2021), life expectancy at birth globally has remained at less than 50 in developing countries to over 80 years in wealthy economies. Health and Wealth are the top two factors that contributes to inequalities in the world. At the global level, the top 10% of the world population earn 52% of the total annual income, whereas the bottom 70% combined earn a mere 19%. When extreme poverty affects a large proportion of the population, health is predominantly affected by a lack of access to the basic requirements for life – (clean water, adequate nutrition, effective sanitation, reasonable housing conditions, access to vaccinations, education, and the childhood and adolescent nurturing). In Countries with a large informal sector, UHC through insurance is almost impossible to achieve because the high levels of poverty of the populations (Ly *et al,* 2022). Achieving high-quality UHC is likely to be expensive to government in developing countries because of the design of their UHC Program (Friebel, et al.2018). To sustain progress toward Universal Health Coverage, governments of developing countries must generate resources for expanding coverage, distribute the resources equitably, and use them efficiently to achieve the most benefit in terms of meeting Health Coverage needs, ensuring quality of care, and protecting users from financial hardship due to out-of-pocket payments (Gita, Govender & Salma 2019). Employing Electronic payment in the health sector can help achieve UHC by reducing corruption in the sector as it promotes transparency. There is need for a number of reform actions for a better public procurement system including but not limited to: (i) Strengthening Compliance for enforcement; (ii) the need for an end-to-end E-procurement system for all Procurement Processes; (iii) Need for technological skills among procurement professionals in public sector and need for transparency and accountability in the entire procurement process in Kenya (Panya & Abuya, 2022).

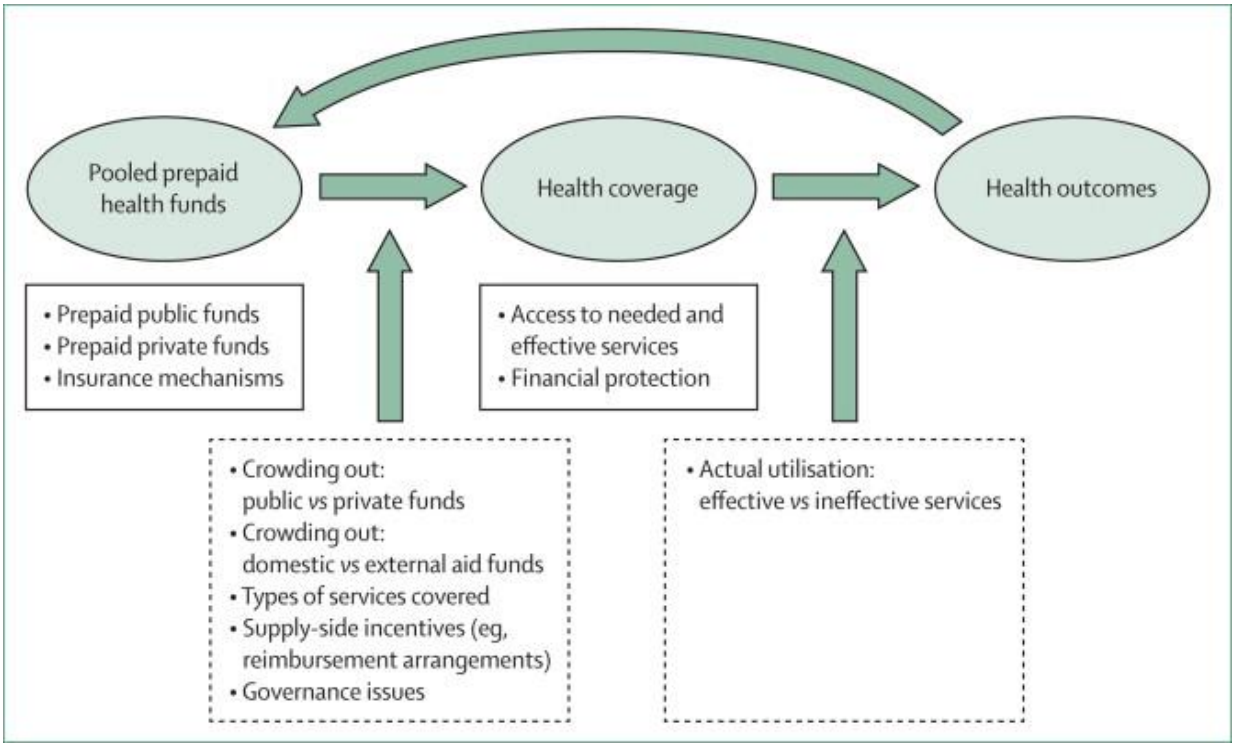

Figure 2: Does progress towards Universal Health Coverage improve population health?
Source: Moreno-Serra & Smith, (2012)

Healthcare Supply Chain

A healthcare supply chain is characterized by a large supply base and many intermediaries translating to a high number of components (manufacturers, distributors and vendors) all interrelated as the supplies flow through them and into the hospital's internal chain. This complexity in healthcare supply chains is a consequence of several characteristics largely unique to the health sector. First, there is a high degree of heterogeneity in the departments and facilities within a hospital. Clinical departments such as emergency, cardiology, surgery, oncology, and laboratories all have differing materials requirements, many of which are critical for patient safety and public health. Secondly, there is a high level of product variety even for products that are common across multiple chains in the system. A healthcare supply chain therefore can be described as a complex system with many components and a high level of interrelatedness between them, (Yousef, 2016).

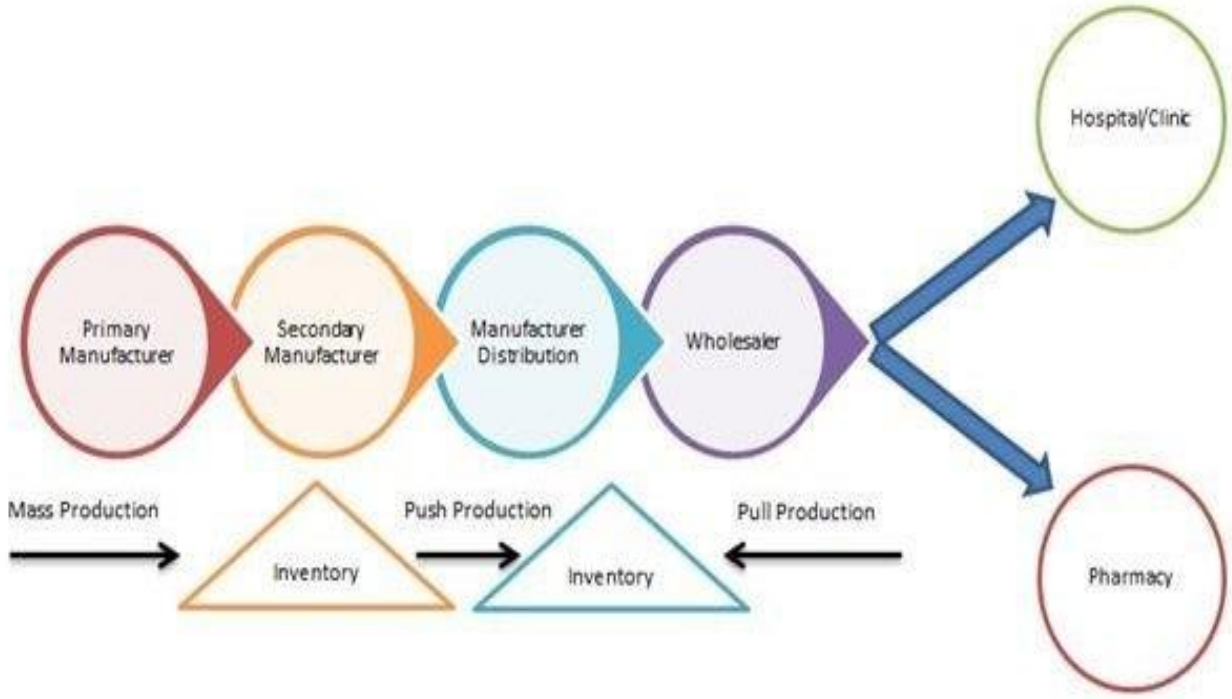

Figure 3: Does Human Capital Improve Health Coverage Agility through Health Coverage Supply Chain Performance? Moderating Role of Technical Orientation

Source: Rungsrisawat & Jermsittiparsert, (2019)

Global Perspective

With the rapid economic growth, China has made great efforts to achieve UHC. China's gross domestic product has grown substantially at an average annual rate of 9.5% over the past 40 years, and has lifted more than 850million people out of poverty. China has devoted increased public funding to health, the largest increase among BRICS Countries (Tao, Zeng & Dang, 2020). There are 36,570 hospitals and 977,790 primary-level clinics. Hospitals in China are organized according to a three-tier system that recognizes a hospital's ability to provide medical care, provide medical education, and conduct medical research. Based on this, hospitals are designated as primary, secondary, or tertiary institutions. There are 3,275 tertiary hospitals, which are usually affiliated hospitals of Universities or large medical centers in provinces or big cities. There are 10,848 secondary hospitals, which are medium-sized hospitals, in the districts and counties. There are 12,649 primary hospitals and 9,798 unclassified hospitals, which are usually private hospitals. Except for the different-level hospitals above, there are also 36,160 community

health service centers in urban areas and 34,943 township health centers in rural areas, (Chen & Liu, 2023). China has almost achieved all of the Millennium Development Goals (MDG), making a major contribution to the achievement of the MDGs globally, and is now moving towards SDGs to achieve UHC by 2030, (Tao, Zeng & Dang, 2020). China's Equalization of Basic Public Health Services (EBPHS) policy has set out financing and governance measures designed to ensure access to health services for all its citizens. EBPHS is one of five priority areas for action in the comprehensive health system reform launched in 2009 in China, with a target date of 2020 to achieve Universal Health Coverage, (Beibei et al,2019). According to Chen & Liu, (2023), China's healthcare system has made great achievements in the management of medical services and public health challenges for the Chinese people. However, the issue of an aging population in Chinese society is becoming more and more salient. The gap between demand and supply of healthcare is expanding, (Chen & Liu, 2023).

Health Coverage in the United Kingdom is a devolved matter, with England, Northern Ireland, Scotland and Wales each having their own systems of publicly funded healthcare, funded by and accountable to separate governments and parliaments, (Kihara & Ngugi, 2021; Yi-Hui, 2015). To ensure high-quality Universal Health Coverage the National Health Service, a state-funded Universal Health Coverage system, has a sizeable private sector engagement component, and is increasingly opening services up to competition to improve efficiency, (Friebel et al, 2018). The NHS, which sits at the core of the UK health system, is neither a leader nor a laggard when compared to the health systems. The UK health system performs relatively well on some measures of efficiency, such as the rate at which cheaper generic medicines are prescribed, (Anandaciva, 2023). People in the UK receive relatively good protection from the potentially catastrophic costs of ill health. But financial protection is weaker for some services such as dental care, and there is growing concern that people in the UK with lower disposable incomes may be forced to choose between funding their own care or enduring longer waits for treatment (Mounde, 2021). In the USA, Universal healthcare, offer several noteworthy advantages compared to exclusive systems with inequitable access to quality care including: (i) addressing the growing chronic disease crisis; (ii) mitigating the economic costs associated with said crisis; (iii) reducing the vast health disparities that exist between differing SES segments of the population; and (iv) increasing opportunities for preventive health initiatives (Gabriel, Kerr, Moore & Stoner, 2020). Majority of Health Coverage in United States is sponsored by employers, unlike most of European counterparts. Normally, an employer selects and contracts with a third party to administer health benefits program financed either by the employer or self-funding (self-insurance). Traditionally, Health Coverage programs gave employees and their dependents to the freedom to choose and utilize the amenities of any Health Coverage service provider, (Mitra, 2018). To attain near-Universal Coverage, a policy would need to provide premium subsidies for low - and moderate - income people and include a mandatory component that would not allow people to forgo coverage. Subsidizing premiums for low- and moderate-income people would be essential because paying the full cost of comprehensive major medical coverage out of pocket would typically be prohibitive (CBO,2020). Perhaps the most striking advantage of a Universal healthcare system in the U.S. is the potential to address the epidemic level of non-communicable chronic diseases such as cardiovascular diseases, type II diabetes, and obesity, all of which strain the national economy. The economic strain associated with an unhealthy population is particularly evident among low SES individuals. Having a low SES is associated with many unfavorable health determinants, including decreased access to, and quality of health insurance which impact health outcomes and life expectancies, (Gabriel Kerr Moore & Stoner, 2020).

Regional Perspective

South Africa is a highly unequal country. The most significant contributors of the poverty index are living conditions (47.5%) and health (39.5%). The country has a two-tiered health system, in which the healthcare system consists of the private sector funded by voluntary health insurance (VHI) and the public sector funded by taxes, (Mametja, Semenya, Letshweni, Hattingh and Moloabi, 2022). The concept of National Health Insurance (NHI) in South Africa has widespread support. The strategies for how a successful and effective NHI could be implemented, over what time-frame and what it covers are, however, very controversial issues. What tends to be ignored is that sustainable health improvement in South Africa, and elsewhere, is not determined merely by medical care but more especially by social structures intimately linked to deeply entrenched local and global social, economic and political forces and inequalities (Solomon & Gill, 2021). South Africa embarked on this bold and new direction, piloting National Health Insurance (NHI) in 2011. Two vehicles and strategic interventions selected to reach UHC are Primary Health Coverage (PHC) re-engineering and NHI. The goal of UHC is to ensure that everyone has access to appropriate, efficient and quality health services without the risk of impoverishment or financial catastrophe, (Michel et al,2020). Healthcare in Rwanda was historically of poor quality, but in recent decades has seen great improvement. Rwanda operates a Universal Health Coverage system, and is considered to have one of the highest-quality health systems in Africa, (Kihara & Ngugi, 2021). According to Sainathan and Greenbelt (2019), the success has been achieved through Inventory Management systems which enabled the accuracy of vaccine forecasting and needs estimation depends upon the level of implementation national, district or local service delivery and the time period of estimation used month, year, multi-year. The accuracy of the estimation depended upon the quality of data used, as well as the Programme Manager's knowledge of specific programmatic conditions. Since September 2012, Rwanda was recognized as one of the nine countries in Africa and Asia making significant progress to make Universal healthcare systems possible. The five countries on intermediate - stage reforms are Ghana, Indonesia, Philippines, Rwanda, Vietnam and the four on early-stage reform are India, Kenya, Mali and Nigeria (Nyandekwe, Nzayirambaho, & Kakoma, 2014; Kihara & Ngugi, 2021).

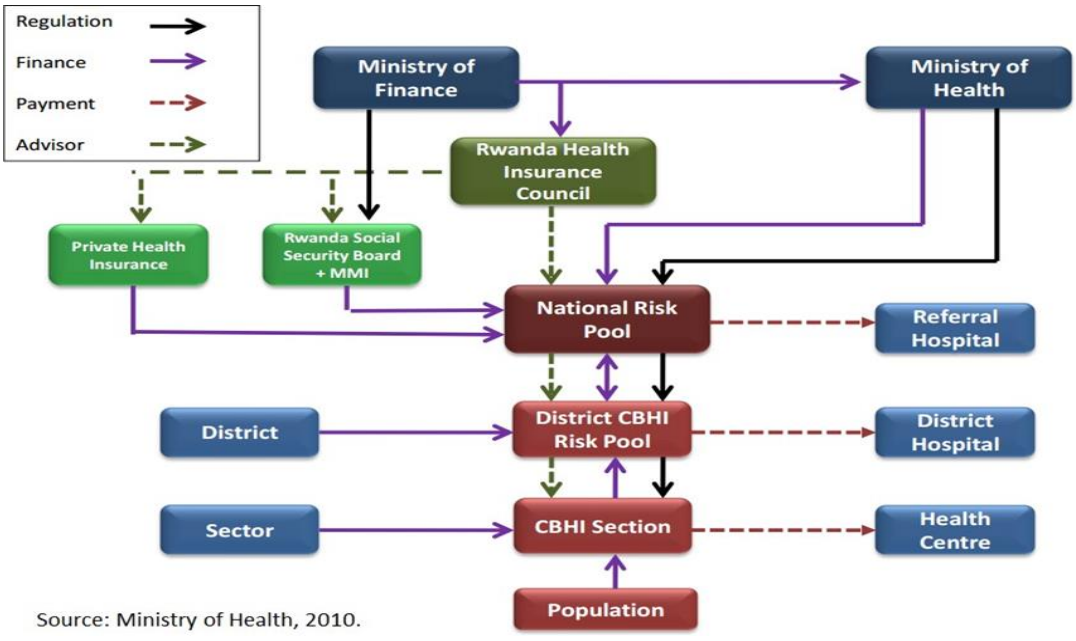

Figure 4: Structure of the CBHI system in Rwanda

Access to healthcare is limited and most Nigerians are unable to pay for health services and health facilities are far from being equally distributed. Of the 23,640 Health Coverage facilities available in the country, only 7,300 representing 31% of the facilities were accredited by the NHIS to provide services to registered enrollees. Currently, 4.5 million people representing 3% of Nigeria's population are covered under the Scheme (Olanrewaju, Babatunde, Damilola, Olasupo, Alabi, Bakare, & Oluwakorede, 2021). Nigeria's health system does not have well-developed preparedness plans for transitioning out of development assistance for immunization and HIV programmes. There are policies and strategies in place to enable Nigeria to transition smoothly from such assistance and make progress towards Universal Health Coverage. However, the implementation of these policies and strategies is hindered by systemic inefficiencies and poor leadership (Uche, Ogbuoji, Wenhui, Minahil, Onwujekwe, & Yamey, 2021). Nigeria is ranked second after India in the global maternal incident rate which is the worst in Africa. Nigeria's maternal mortality is reported to be 545 per 100,000 births, there is at least a case of maternal mortality in every 20 live births, and under-five mortality rates are 132 per 1000 live births. These unacceptable health outcomes are due to the penurious health service delivery system impeding the achievement of Universal Health Coverage (Al-Mansur et al,2023). In an attempt to achieve Universal Health Coverage, Nigeria introduced a number of health insurance schemes. One of them, the Formal Sector Social Health Insurance Programme (FSSHIP), which was launched in 2005 to provide health cover to federal government and formal private sector employees. It operates with two levels of purchasers, the National Health Insurance Scheme (NHIS) and health maintenance organisations - HMOs (Etiaba, Onwujekwe, Honda, 2018). The National Health Insurance Authority (NHIA), formerly the National Health Insurance Scheme (NHIS) is designed to provide affordable care delivery, covering self-employed individuals, rural communities, the poor, and vulnerable groups. Based on a prepayment approach, employees can access the plan whenever they become ill, and the employer and employee make money from it (Ngozi, Olorunfemi & Oduyemi, 2023).

Universal Health Coverage Coverage in Kenya

Kenya's Health Insurance System

The health sector in Kenya is governed at two levels: national and county. The national level has overall stewardship, policy formulation, standards and regulations, capacity building and national referral facilities, while the counties are responsible for policy implementation and service delivery (MoH ,2020). Kenyan health system is defined into six levels of the hierarchy i.e Level 1: community services; Level 2: dispensaries and clinics; Level 3: health centres, maternity and nursing homes; Level 4: sub-county hospitals; and medium-sized private hospitals; Level 5: county referral hospitals; and large private hospitals; and Level 6: national referral hospitals; and large private teaching hospitals (IFC, World Bank, 2019). Healthcare in Kenya is expensive yet 45.2 per cent of the population lives below the poverty line. This means almost half of Kenya's population cannot afford healthcare (NCPD,2019). According to the Kenya Household Health Expenditure and Utilization Survey – KHHEUS (2018), out of pocket expenditure was at 32% and the incidence of catastrophic health expenditure was estimated to be 4.9%, an improvement from 6% recorded in 2013. The main managers of resources moving from pooled health funds and health providers (health service purchasing) are the national government, the county governments, the National Hospital Insurance Fund (NHIF) and private health insurers, (KHHEUS, 2018). Kenya's expectation was that devolving the health system would lead to improvement in efficiency of service delivery, stimulate innovation in the wider sector, improve access to and equity of available services, and promotes accountability and transparency in service delivery. This has not been achieved 10 years into devolution partly because of the

corruption in the health sector. Corruption in public procurement has persisted primarily because there are people in power who benefit from it and at the same time, existing governance institutions lack both the will and capacity to stop them from doing so, (Kihara & Ngugi, 2021; Panya & Abuya, 2022). Health insurance is crucial in terms of access to quality Health Coverage. It aids in reducing the costs associated with illness, treatment, and care substantially. According to KDHS Report, 2022, one in four persons in Kenya (26% of females and 27% of males) have some form of health insurance. The National Hospital Insurance Fund is the most common type of health insurance (24% each of females and males). The proportion of persons covered with any health insurance is higher in urban areas (39% among females and 41% among males) than in rural areas (20% among females and 19% among males). Health insurance coverage increases with increasing wealth, from 5% among females and males in the lowest wealth quintile to 56% among females and 60% among males in the highest wealth quintile (KDHS, 2022).

Table 1: The percentage of de jure household members with specific types of health insurance

Table 3 Health insurance coverage

Percentage of de jure household population with specific types of health insurance coverage, and percentage with any health insurance, according to backgrounc characteristics, Kenya DHS 2022

	Females							Males						
Background characteristic	National Hospital Insur-ance Fund	Private/ com-mercial	Com-munity based	Other	None/ don't know	Any health insur-ance	Number of persons	National Hospital Insur-ance Fund	Private/ com-mercial	Com-munity based	Other	None/ don't know	Any health insur-ance	Number of persons
Age														
0–14	18.9	3.0	0.6	0.1	79.1	20.9	14,467	18.8	3.3	0.5	0.0	79.2	20.8	14,514
15–49	26.0	4.4	0.5	0.1	71.3	28.7	18,142	26.2	4.6	0.4	0.0	71.2	28.8	16,878
50+	27.8	4.0	1.2	0.0	69.1	30.9	5,087	33.8	5.6	1.0	0.1	62.9	37.1	4,323
Residence														
Urban	35.3	6.8	0.2	0.0	61.1	38.9	12,695	37.5	7.9	0.2	0.0	58.8	41.2	11,778
Rural	17.5	2.3	0.9	0.1	80.5	19.5	25,025	17.5	2.4	0.7	0.0	80.6	19.4	23,967
Wealth quintile														
Lowest	3.6	0.4	1.0	0.0	95.0	5.0	7,446	3.6	0.3	0.9	0.0	95.3	4.7	7,172
Second	10.7	0.7	0.7	0.1	88.0	12.0	7,616	11.2	0.6	0.5	0.0	87.9	12.1	7,134
Middle	20.0	1.4	0.9	0.1	78.3	21.7	7,334	19.9	1.8	0.6	0.1	78.4	21.6	7,190
Fourth	31.4	4.2	0.5	0.0	66.2	33.8	7,463	33.2	4.3	0.4	0.0	64.0	36.0	7,521
Highest	50.4	11.9	0.1	0.0	43.8	56.2	7,861	54.0	14.5	0.2	0.0	40.1	59.9	6,728
Total	23.5	3.8	0.6	0.1	74.0	26.0	37,720	24.1	4.2	0.5	0.0	73.5	26.5	35,745

Note: The data for this table were collected in the full household questionnaire but not in the short questionnaire. Total includes 27 women and 35 men for whom information on age is missing.

Source: KDHS Report 2022

UHC coverage in Kenya

The Kenyan government through the Big four agenda made a commitment to provide UHC by the year 2022; a replica of the Affordable Care Act (ACA) of 2010, or Obamacare, in the United States of America. However, this was a pipe dream, (Panya, 2021). UHC program in Kenya is still in its embryonic stage – with the first pilot phase involving four counties having been completed in 2019. Attainment of UHC in Kenya has remained elusive due to many challenges, which include the following: Rampant corruption in the health sector, for instance, the AOG report, 2015/2016 indicates that the Ministry of Health officials manipulated IFMIS to log fraudulent transactions in the 2015/16 financial year including payments to phony

suppliers; diversion of funds; and double payment of goods. Ksh. 2.4 billion pending bills arose from illegal over-expenditure with Kshs. 515 million diverted from the National AIDS Control Programme. Ksh. 889 million funds to be disbursed to county governments to support their free maternity care programmes and for the supply of 100 portable mobile clinics were diverted. In fact, by 2018, the procured containers are still lying idle at a warehouse in Miritini Mombasa. In 2017 Global Fund Audit Report on the National Tuberculosis, Leprosy, and Lung Disease Programme (NTLDP) found that from the period of 2014-2016 fraudulent per diems valued at KES 583,000 (US$5,744) were given to people who had not attended activities. The investigation further found no reasonable assurance of delivery of services amounting to KES 5,766,200 (US $56,813). In 2018, it was reported that 37 CT scanners were procured at an inflated cost of Ksh. 227 million per unit while the market price at the time was between Ksh. 40-45 million under a deal between the Kenyan and Chinese governments during the 2015/2016 calendar year. The Ministry of Health reported that they abandoned the government-to-government deal and opted to award the tender to Neusoft Medical Systems Co Ltd, a Chinese firm, among other health sectors procurement scandals including misappropriation of funds by NHIF and KEMSA (Oruko, 2018; Panya & Abuya, 2022; Kimathi, 2019; Leftie, 2019; Global Fund (2017) and unequal access to different healthcare services due to poor distribution and use of resources (Kenya Yearbook Report 2020). Inadequate healthcare professionals, for instance, by 2017, Kenya had 24 doctors per 100,000 population and 172 nursing officers per 100,000 population. This is against WHO's requisite standard of 21.7 doctors and 228 nursing officers per 100,000 population, respectively. The country reported a shortfall in nursing personnel. Still, the distribution of healthcare workforce remains skewed in favour of urban and more developed areas yet 70 per cent of the population lives in rural areas where majority of the poor and marginalized reside, (NCPD,2019). Kenya's health system is not able to deal effectively with the growing epidemics and the growing burden of chronic diseases. Kenya is facing an epidemiological as well as a demographic transition with a steep increase among non-communicable diseases (NCDs). For example, while HIV contribution to the burden of disease has decreased by 61% in the period 2005-2016, the combined contribution of ischemic heart disease and cerebrovascular disease has increased by 57% in the same time period, (Kenya National Health Financing, 2018). According to the Kenya Health Policy (2014–2030), the 10 leading causes of death in Kenya are HIV-related ailments (29%), perinatal conditions (9%), lower respiratory tract infections (8%), tuberculosis (6%), diarrhea diseases (6%), malaria (5%), cerebrovascular diseases (3%), ischemic heart disease (3%), road traffic accidents (2%) and violence (2%) (Mounde, 2021).

Table 2: Kenya Universal Health Coverage Indicators and UHC Index In 2018

Indicator	2008	2013	2014	
Prevention health service coverage		45.94%	54.52%	-
Curative health service coverage		39.28%	43.21%	-
Incidence of Catastrophic Health Expenditure		11.4%	6.2%	4.9%
Proportion of the population pushed into poverty		6.1%	4.6%	3.8%
Proportion of the population pushed further into poverty (Extreme poverty)		31.05%	38.12%	36.1%
Overall Service Coverage		**38.86%**	**41.73%**	**67%**
		73.79%	**63.78%**	**63.78%**
UHC Service Coverage Index		**52.25**	**51.55**	-

Source: Kenya National Health Accounts, KHHEUS, KDHS, KHIS reports. (The index is calculated using various sources of data as depicted in the table above)

Table 3: Registered Health Personnel by Cadre, 2014-2018

	2014		2015		2016		2017		2018*	
Cadre	Number	No. Per 100,000 Population	Number	No. Per 100,000 Population	Number	No. Per 100,000 Population	Number	No. Per 100,000 Population	Number	No. Per 100,000 Population
Medical officers	9,149	21	9,605	22	10,376	23	10,921	23	11,667	24
Dentists	1,090	3	1,094	2	1,149	3	1,206	3	1,270	3
Pharmacists	2,355	5	2,994	7	3,169	7	3,373	7	3,582	7
Pharmaceutical technologists	7,041	16	7,895	18	8,673	19	9,358	20	10,126	21
(BSc) Nurses	2,406	6	2,904	7	4,002	9	4,819	10	4,974	10
Registered nurses	38,802	90	41,178	93	47,480	105	51,420	110	52,587	110
Enrolled nurses	22,101	51	22,305	50	22,820	50	23,068	50	23,112	48
Clinical officers	15,960	37	15,443	35	18,674	41	20,680	44	22,626	47
Public health officers	9,039	21	10,110	23	12,564	28	13,895	30	14,879	31
Public health technicians	... 5,969	14	5,969	14	6,752	15	7,078	15	7,239	15
Laboratory technologists..	..	..	4,230	10	6,651	15	10,603	23	11,688	24
Laboratory technicians...	..	..	1,363	3	1,734	4	3,065	7	3,622	8
Nutritionists & dieticians	... 1,471	3	1,691	4	1,853	4	2,106	5	3,066	6
Nutrition & dietetic technologists	1,499	3	2,066	5	2,608	6	3,122	7	4,430	9
Total	**117,159**	**272**	**129,225**	**292**	**149,005**	**328**	**165,333**	**355**	**175,681**	**368**

Source: NCPD (2019)

The Universal Health Coverage pilot programme was launched on 13th December 2018 in Nyeri, Kisumu, Machakos and Isiolo Counties. These counties were selected as pilot sites based on the prevalence of unique health needs among their populations. Nyeri County was selected due to the high burden of non-communicable diseases; Kisumu due to the high prevalence of infectious diseases like Malaria; Machakos due to high prevalence of injuries associated with road traffic accidents; and Isiolo due to the concerning cases of maternal mortalities. However, of the four Counties, only Isiolo and Machakos carried the limping pilot to its' uneventful conclusion. Kisumu was a non-start from the beginning and Nyeri eventually terminated the pilot due to financial constraints (Wairimu & Ogoti, 2023; Mounde, 2021). Kenya has implemented a variety of reforms in its progress towards UHC including free access to primary care services. For key population groups such as pregnant women and vulnerable populations, changes have been made to the benefits offered by the NHIF and capital investments to improve access to specialized diagnostics and medical services. However, there are key issues and challenges that need to be addressed including, Health Leadership and

Governance issues, and the need to strengthen the strategic health purchasing activities of the health system (MOH, 2020). Health Procurement key interest lies in its contribution to a competitive advantage, in terms of differentiation and the reduction of operating costs in the acquisition of medical supplies, low-cost supply and minimal inventory. Better Healthcare Procurement management ensures superior performance, through the adoption of exemplary sustainable global procurement practices (Panya, 2021). Healthcare supply chain issues such as the inventory optimization must be initiated to manage stock and monitor the supply chain. Simple interfaces would enable staff at the regional, and eventually district level to input issuances and receipts of vaccine stocks. The inventory optimizing systems uses population and target coverage data to automatically generate warnings when stock levels fall below the levels required to meet forecasted demand. Reports are automatically generated and sent monthly via email to procurement department and drugs store managers to ensure that stock records are up to date (Kihara & Ngugi, 2021). The inventory optimizing systems also include a mapping application to visually depict stock levels at each store (Kirui & Maina, 2018).

Statement of the Problem

China has made great efforts to achieve UHC. China has devoted increased public funding to health, the largest increase among BRICS countries. China has almost achieved all of the Millennium Development Goals (MDG), making a major contribution to the achievement of the MDGs globally, and is now moving towards SDGs to achieve UHC by 2030 (Tao, Zeng & Dang, 2020). China's Equalization of Basic Public Health Services (EBPHS) policy has set out financing and governance measures designed to ensure access to health services for all its citizens. EBPHS is one of five priority areas for action in the comprehensive health system reform launched in 2009 in China, with a target date of 2020 to achieve Universal Health Coverage, (Beibei et al,2019). According to Chen & Liu, (2023), China's healthcare system has made great achievements in the management of medical services and public health challenges for the Chinese people. China is positioning its industries to realize its MIC 2025 goals in biotechnology, pharmaceuticals, and medical equipment. The Chinese National Volume-Based Procurement (NVBP) policy, which represents a unique approach to pooled procurement within the pharmaceutical sector has a primary objective reducing drug prices, enhancing access to affordable medications, and improving the overall functioning of the pharmaceutical industry in China. The strategic purchasing of medications has been identified as a potentially promising driver to facilitate an effective healthcare system that consistently delivers affordable drugs, improves health outcomes and responds to changing healthcare demands of the local population (Zhong & Jun, 2019). China's NVBP policy stands out not only for its utilization of public tendering and pooled procurement strategies but also for its unique approach, which involves the integration of these two methods. The procurement process is not undertaken all at once, allowing participating public hospitals the flexibility to make purchases within a specified timeframe rather than at a single point in time. This arrangement ensures that hospitals have the necessary drugs available before the time when the contracted amount should be delivered (Zhu et al. 2023). The Chinese government also uses multiple social and policy tools involving the provision of health insurance, healthcare and medications, aiming to establish sustainable competition and collaboration among government, pharmaceutical manufacturers and society, (Tao et al, 2020).

The Kenyan government made a commitment to provide UHC by the year 2022, however, this seems to be a piped dream. UHC program in Kenya is has stalled. The Universal Health Coverage pilot programme launched on 13th December 2018 in Nyeri, Kisumu, Machakos and Isiolo Counties carried the limping pilot to its' uneventful conclusion. Kisumu was a non-start from the

beginning and Nyeri eventually terminated the pilot due to financial constraints, (Wairimu & Ogoti,2023, Mounde,(2021). Kenya has however since then implemented a variety of reforms in its progress towards UHC including free access to primary care services. For key population groups such as pregnant women and vulnerable populations, changes have been made to the benefits offered by the NHIF and capital investments to improve access to specialized diagnostics and medical services. However, there are key issues and challenges that need to be addressed including, Health Leadership and Governance issues, and the need to strengthen the strategic health purchasing activities of the health system, (MOH,2020). The attainment of UHC in Kenya has remained elusive majorly due to corruption in the health sector. The AOG report, 2015/2016; indicated that the Ministry of Health officials manipulated IFMIS to log fraudulent transactions in the 2015/16 financial year including payments to phony suppliers; diversion of funds and double payment of goods. Ksh. 2.4 billion pending bills arisen from illegal over expenditure Kshs. 515 million diverted from the National AIDS Control Programme. Ksh. 889 million funds to be disbursed to county governments to support their free maternity care programmes and for the supply of 100 portable mobile clinics diverted. The UN-backed Global Fund has revealed a rot at Kenya Medical Supplies Authority (KEMSA) after it found out that 908,000 mosquito nets, 1.1 million condoms and tuberculosis drugs worth Sh10 million had disappeared from its warehouse. Global Fund, which finances the fight against HIV/Aids, tuberculosis and malaria, has also raised the red flag over suspected fake suppliers demanding Sh1.66 billion from KEMSA. The National Health Insurance Fund (NHIF) also loses Sh10 billion every year through fraudulent claims. This follows an expose that revealed that a number of private hospitals in Nairobi and Meru Counties are part of an elaborate syndicate working with unscrupulous NHIF staff to rob unsuspecting citizens and government of the healthcare funds. In 2017 Global Fund Audit Report on the National Tuberculosis, Leprosy, and Lung Disease Programme (NTLDP) found that from the period of 2014-2016 fraudulent per diems valued at KES 583,000 (US$5,744) were given to people who had not attended activities. The investigation further found no reasonable assurance of delivery of services amounting to KES 5,766,200 (US $56,813). In 2018, it was reported that 37 CT scanners were procured at an inflated cost of Ksh. 227 million per unit while the market price at the time was between Ksh. 40-45 million under a deal between the Kenyan and Chinese governments during the 2015/2016 calendar year. These and many others hamper the achievement of UHC in Kenya.

A comprehensive literature review on the strengthening of healthcare supply chain to facilitate Universal Health Coverage in Kenya by Ranabhat *et al,* (2023) looked at the Universal Health Coverage evolution, ongoing trend, and future challenge; Bassoum & Faye, (2022) reviewed the institutional model on Universal health insurance in Africa; Zachary *et al, (*2020) looked at the Universal Healthcare in the United States of America; Friebel *et al, (*2018) looked at how to achieve high-quality Universal Health Coverage in the United Kingdom (UK); Tao *et al, (*2020) reviewed the 10 lessons on how to achieve Universal Health Coverage from 10 years of healthcare reform in China. Further, Zhimin & Xu1, (2022) analysed the China's Actions to Achieve Universal Health Coverage for Children; Fianko & Dzogbewu (2021), Afrifa et al, (2011), Njagi & Muli, (2020), Kumar, et al., (2017), Wright, (2016), Janet et al, (2020), Kihara & Ngugi, (2021), Kirui & Maina, (2018), Muthoni & Maitho, (2019), NCPD (2019), Kihara & Ngugi (2021) and Yousef (2016) revealed that an existing gap on best solutions on how to strengthen of healthcare supply chain to facilitate Universal Health Coverage. From the literature reviewed, there is very little research done on role of healthcare supply chain practices in achieving UHC which this research intends to provide. The existing research has not provided clear evidence on the link between supply chain practices like

inventory optimization, supply chain integration, supply chain analytics and strategic purchasing. This research therefore intends to add into the body of knowledge an immense contribution that shall give relevant information and tools to researchers and assist future scholars, researchers find enough, and adequate materials to further their studies on how to achieve Universal Health Coverage through strengthened healthcare supply chains.

Study objectives

The general objective of this study is to find out the impact of health supply chain in facilitating Universal Health Coverage (UHC) in Kenya.

METHODOLOGY

This research problem was studied through the use of a descriptive research design. According to Cooper and Schindler (2003), a descriptive study is concerned with finding out the what, where and how of a phenomenon. Descriptive studies are not only restricted to fact findings, but may often result in the formulation of important principles of knowledge and solution to significant problems (Mugenda & Mugenda, 2003), which was the basic purpose of the study. This article builds upon an earlier article published by Business Daily Africa: "*Effects of covid 19 on Universal Healthcare Provision".* To identify the key factors in strengthening healthcare supply chain to improve UHC in Kenya, we reviewed the empirical literature on UHC looking from global perspective, regional to local models offered by both the private sector including NGOs and public institutions. This review looked at the studies from recent journal publications that use rigorous methodologies to demonstrate a positive link between supply chain management and attainment of UHC goals. All studies included in the review appeared in the peer-reviewed journals, or represent rigorous, large-scale research studies submitted to various Universities and subjected to peer review. This Article also relied heavily on other secondary data as is the case with most desktop studies where existing information is used for analysis and to draw vital conclusions. Some of the specific sources of data for the study included books, journal articles, unpublished papers, and government reports, organizational and private Web Pages. This type of research approach was employed to analyse the substantial number of articles which had been reviewed on the current research topic so as to answer specific questions based on previous works. It is for these reasons that the present paper utilized this approach to examine what different researchers have found on the role of supply chain management of the achievement of UHC goals.

FINDINGS AND DISCUSSIONS

Inventory optimization and Universal Health Coverage (UHC)

Inventory optimization is a method of balancing capital investment constraints or objectives and service-level goals over a large assortment of stock-keeping units while taking demand and supply volatility into account (Kihara & Ngugi, 2021; Musau & Ngeno, 2017). Inventory optimization ensures the right product at the right place, right time, right quantity and right quality to meet the demand and supply of goods and or services (Teplická & Čulková, 2020). Inventory management optimization can be done by classifying inventory and demand forecasting model for better prediction of demand to manage inventory (Muiruri & Ochiri,2019). In Kenya, stockouts of essential drugs and commodities have persisted for several years (Global Fund,2021, Green, 2022). An audit report of grants from the *Global Fund to Fight AIDS, Tuberculosis and Malaria in Kenya and Mozambique* identified gaps in the procurement and supply chain processes in both countries, contributing to essential drugs and commodities going out of stock. Data from recent rounds of Performance Monitoring and Accountability (PMA) 2020 show that 46–67% of facilities in surveyed countries in Sub-Saharan Africa reported a stockout of at least one family planning method in the past three months. The frequency of stockouts varies across geographic locations, types of facilities, and method type, (Tumlinson *et al*,

2023). To meet an increased demand for modern contraception, healthcare supply chains need to be strengthened to avoid stockouts caused by factors such as transportation delays or procurement failures. Studies indicate that stockout of essential medicine may result in poor clinical outcomes, including drug-resistant mutation and increased mortality (Abimbola, Briggs, Pradhan, Bogue, Schreiber, Dini, Hitesh & Ballard, 2022). For instance, stockouts can lead to a woman being denied the right to access a method of her choice, increasing the risk for contraceptive discontinuation and unwanted pregnancy, (Tumlinson *et al*, 2023). A study by Varun, Harwin, Luk, Dewilde, Ongarora, Abuga, Prashant, (2022), indicates that, poor inventory control skills, inadequate systems, limited overage/underage costs, and resource constraints are major causes of the observed mismatch between demand and supply of medical supplies in Kenya. Limited overage/underage costs, and resource constraints seem to be exacerbated in part by two more fundamental issues: lack of regulation in the prescription drug market, and low barriers to entry.

The objective of inventory optimization model is to minimize a wide range of costs, which might include those incurred by supply, manufacturing, warehousing, and transportation investments and activities, subject to constraints on customer service and available resources (Kihara & Ngugi, 2021). Effective inventory management therefore must enhance the strategic competitiveness of an organization. Various companies control inventory by adopting various techniques by confirming the lowest cost and product availability. It also assists organizations to evade funds tied down, stock-out, theft, holding cost, reduced utilization of equipment or machines, and obsolescence or spoilage (Aamir & Rasheed, 2023). Inventory management practices enables the production capacity of a manufacturing organization to continue operations at optimum capacity and ensures the availability of a company's products in the market when they are needed. It also ensures optimum operational levels for organizations through ensuring that the company has sufficient stocks for operations (Okumu & Bett, 2019). In some countries, staff numbers are inadequate to run an efficient warehouse operation and existing staff lack training in inventory management. These shortcomings increase the risk of stock-outs, overstock, and expiry (USAID, 2018). Strategic inventory planning is therefore crucial and must entail decisions making about the design and implied operating capabilities of the institution's supply chain network linking suppliers, manufacturing and distribution facilities, and customers (Musau & Ngeno, 2017). In order to avoid maverick expenditure, medicine selection and quantification must be adequately guided by the essential medicines list and standard treatment guidelines. If forecasts and supply planning do not account for available storage space, then there may be insufficient storage space for the procured stock. Similarly, uncoordinated, parallel procurement systems can lead to the procurement of unnecessary quantities (USAID, 2018).

The main goal of inventory Optimization and supply chain management is to reduce the cost of healthcare without sacrificing service typically by improving the efficiency or productivity of the system (Kihara & Ngugi, 2021). Effective inventory management is among the key features for success, whereas, ineffective inventory virtually disrupts profitability, productivity and loss of shareholders' wealth. Organizations must neither maintain excessive inventory to avoid tying down funds and carrying costs nor maintain too low inventories as these two conditions always affect firm performance, (Aamir & Rasheed,2023). Effective management of inventory in the company must be planned from the first activity that relates to stocks purchase. It is necessary to understand what stocks the company needs, in what volume, when to order stocks, how to transport stocks to the company, etc. All mentioned information must be followed up through planned information systems for the area of inventory management in the hospitals, which are presently very different, based on the principle

of simulation, operation research, statistical methods (Teplická & Čulková,2020). Inventory management is achievable through operation at absolute minimum stock out events with prompt response to market fluctuations while at the same time carrying minimal buffer stocks (Okumu & Bett, 2019). Inventories therefore, needed to be controlled in such a manner, as to leverage on organizational productivity and overall performance (SOPHIA,2019). Poor inventory management are often linked to insufficient financing and human resources, or other inefficiencies higher up in the supply chain. Rigid financing rules may prevent medical stores from allocating their revenue to adequately fund operational needs (USAID,2018).

Supply Chain integration and Universal Health Coverage (UHC)

The best and most successful organizations recognize that they will only prosper in the long term if they satisfy the aspirations of their stakeholders: including customers; suppliers; employees; local communities; investors; governments; public interest; and environment groups (Panya & Were, 2018). The main role of Healthcare Supply Chain Management in UHC is to control the extended flow of goods, services and information starting from raw materials and going finally to the end user. It provides a connection between local and global companies to integrate the process of management and to manage the interaction between all members of a supply chain and subsequently improves visibility (Chepkonga, 2021). Supply Chain Integration (SCI) refers to the linkages between departments, functions, or business units within a firm, including the network of direct suppliers and their suppliers, and direct customers and their customers, (Mutwiri, Marendi, Riro, & Ratemo,2019). Healthcare supply chains have been described as highly fragmented and complex, showing limited improvements in cost and quality over the years, (Abdulsalam,2016). The healthcare sector consists of institutions that manufacture medical equipment and medications, provide medical services, provide medical insurance and facilitate the provision of healthcare to patients, (Chepkonga, 2021). This presents a conglomeration of multiple actors whose effective integration is paramount to enhancing health system goals. Healthcare integration is characterized by several activities, including sharing information, technology, risk, and establishing long-term contracts and production improvement through coordination (Afrifa, Amoah, Fianko & Dzogbewu, 2021). The integration of the health sector helps create visibility within the upstream supply chain, reducing uncertainty for the focal firm. Close relationship between key suppliers and the focal firm facilitates their mutual exchange of information about products, processes, schedules, and capabilities, helping develop production plans, produce goods on time, and improve delivery performance, (Amoako, Kwabena; Famiyeh, & Adaku, 2019). Poor health sector integration remains a potential source of inefficiency in the health sector. Integration in this sector must take into account organizational units or levels of other units or levels (Nyawira, Njuguna, Tsofa, Musiega, Munywoki, Hanson, Mulwa, Molyneux, Maina, Normand, Jemutai, and Barasa, 2023). Some of the challenges in the healthcare supply chain includes contract noncompliance, lack of inventory control, excess inventory levels, stock-outs, costly emergency deliveries and expensive equipment rework. Integration through e-procurement systems in healthcare can reduce purchasing costs through the consolidation of supplier networks and creation of supplier partnerships (Chepkonga, 2021).

The public health supply chain comprises of heterogenous associations of organization's departments of procurement, planning, and drug regulatory board, human resources, and health programs in the ministries of health; central medical stores; donors; non-governmental organizations; regions and districts; health facilities; community health workers; and private sector partners like third-party logistics providers; as well as drug manufacturers and distributors (Mutwiri, Marendi, Riro, & Ratemo, 2019). Integrating these

organizations would ensure control of the flow of material for the products, the flow of finance, and the information flow to the performance of every supply chain, (Mogaka,2023). For Kenya to achieve UHC, the state needs to mobilize additional resources for the health sector. Currently, Kenya's level of public expenditure on health is estimated to be only 2% of GDP. Improving health system efficiency is a potential strategy for expanding the fiscal space for health (Nyawira *et al,* 2023). Supply chain integration gauges the extent to which supply chain partners work collaboratively together to gain reciprocally beneficial outcomes. Supply chain integration means the co-operation between various functions in the supply chain, (Chebichii, Namusonge & Makokha, 2021). The adoption of internal supply chain integration provides several benefits to organisations, including the possibility of increasing the market share, profits, customer loyalty and better differentiation of product and service from that of competitors (Pakurár et al., 2019).

Depending on the category of supplies, the healthcare sector has two options for purchasing. One is to purchase through a main contracted distributor, the other option is to purchase through a government medical organization that contracts a manufacturer and purchases for a group of health facilities. Supply Chain Management in healthcare should ensure complete end to-end visibility of information among suppliers, manufacturers, distributors and customers, (Chepkonga, 2021). For a supply chain management to be successful it needs a cross-functional integration of key business processes within the firm and across the network of companies that form part of its supply chain. For instance, when manufacturing firms integrate with suppliers, they are able to share order and inventory information with suppliers, and prepare high-quality materials and services on time, (Mutwiri, Marendi, Riro, & Ratemo, 2019). Supplier integration not only improves the efficiency and effectiveness of the information and physical flows between manufacturers and suppliers, but also ensures seamless processes and cohesive supply networks that cannot be easily matched by competitors and therefore enhancing the performance of medical supplies, (Amoako, *et al,* 2019, Zhang, *et al,* 2018).

Big Data Analytics and Universal Health Coverage (UHC).

Big Data refer to a new generation of architectures, designed to economically extract value from very large volumes of a wide variety of data by enabling high velocity capture, discovery and/or analysis. It is a complex system, that require data bases for data to be stored in programs and tools to be managed, as well as expertise and personnel, able to retrieve useful information and visualization to be understood (Batko & Ślęzak, 2022). Healthcare, nowadays has become very complex that, the computation required in understanding the DNA, the medication, disease prevention, rehabilitation, palliative care at various regional levels, which might be domestic or global is complicated (Sonnati 2017). Innovations that apply Digital Technologies in low-and middle-income countries (LMICs) are viewed as a catalyst for improved healthcare systems. These innovations range from delivery of medicine and blood in remote places using drones, management of maternal and child health information in urban and rural areas, , improvement of in service healthcare worker efficiency, delivery of financial information to hospitals and health workers, monitoring of patients, secure sharing of health records (Blockchain), connection of medical devices (Internet of Things), predicting and prevention of diseases like cancer (Artificial Intelligence), Improved planning, organization and management of health services and improvement of personal health through use of wearable devices which monitor analyze and transmit patient information (Bundi1, Kirongo & Thiga,2020). Digitization of public procurement processes for instance E-payments have been assessed as a more effective method of blocking leakages or channels of leakages for revenue generation, salary payment,

contract payment and an end-to-end transaction involving public procurement. The advantages of the adoption of electronic payment includes, the ability to overcome costs and physical barriers to payments including governmental revenue collection; and opportunity to rapidly scale up financial services using various technologies such as smartphones, retail points of sale (Panya& Abuya, 2022). Data analytics, mostly run-on cloud data to enable healthcare firms to easily conduct analytics data from diverse sources, protecting the data from cyber theft and ensuring data privacy and security (Rehman *et al.,* 202, Salau 2017). Big data has become popular because of its ability to interpret, analyze and make accessible information out of huge amounts of heterogenous data from different sources like hospitals, insurers, pharmaceuticals, researchers and government agencies, (Jönköping, 2018).

Organizations are looking for ways to use the power of Big Data to improve their decision making, competitive advantage or business performance. Big Data is considered to offer potential solutions to public and private organizations (Batko & Ślęzak, 2022). Data is acquired for business operations of healthcare services; additionally, huge amounts of health data is obtained, kept, and analysed in order to enhance procedures and processes of healthcare supplies and services (Sadeghi and Musolu, 2020). The amount of data generated in healthcare is growing at an incredible rate. However, the sector has not been able to proficiently utilize data management and analysis in order to interpret data effectively. As a result, healthcare administrators risk becoming overwhelmed by an avalanche of irrelevant information (Salau, 2022). In most developing economies like Kenya, their ministries of health are responsible for provision of key health systems functions, including budgeting for priority areas, and provision of health services. Irrespective of their level of development, developing economies require reforms in their health systems, by embracing digital technologies, in readiness for future emerging health needs and to attain Universal Health Coverage (UHC) and to strengthen their health systems (Bundi , Kirongo & Thiga, 2020). With the increasing adoption of electronic health records (EHRs) and patient's monitoring systems, there has been a continuous flow and pile up of large volumes of data and physiological data that calls for mining and analysis. The rising acknowledgement of the potential of big data in healthcare has created an interest in collecting and pooling EHR and other patient related data in national databases which provide information on rare diseases that would otherwise have been difficult to analyze without huge sample sizes, (Jönköping, 2018 ,Simpao, Ahumada, & Rehman, 2015). While digitization of procurement services is important, other factors like institutional incentives and capacities and strong leadership are key for enhanced efficiency, improved service delivery and reduced opportunities for corruption. The traction of digital technologies in reducing fraud and corruption entirely depend on the institutional context. Any system will only be as good as the practices that complement it and the human face behind it (Panya & Abuya, 2022)

The World Health Organisation (WHO) aims to enhance billions of people's health by 2023 by reforming data governance and standards, boosting country capacity, and leveraging partnerships to acquire, analyze, and use data (WHO, 2021). Data analytics aids in the improvement of day-to-day operations and the provision of improved patient care by utilizing existing data to analyze trends and perform predictive modelling. The introduction of an e-tendering business model in partnership with the private sector allowed the government to outsource the manual and electronic distribution of bid documents and removed the need to maintain various supplier source lists as all suppliers could now access all procurement information from the website and participate in any tender they chose. The result is an open and transparent procurement environment supported through user fees at no cost to government (Lobong, & Keji, 2020, Panya & Awuor,2023). Analytics in healthcare is rapidly

being considered as the industry's future, (Salau, 2022). Proper use of the data will allow healthcare organizations to support clinical decision-making, disease surveillance, and public health management (Batko & Ślęzak,2022). Universal Health Coverage (UHC) means that all people and communities can use the promotive, curative, rehabilitative and palliative health services they need, of sufficient quality to be effective, while also ensuring that the use of these services does not expose them to financial hardship. Digital Technologies if applied in UHC can enhance the attainment of other health-related SDGs, (Voorhoeve, 2022). Achieving UHC and health-related SDG targets would require concerted shift from disease-centered curative interventions towards more multisector, prevention-oriented policy action that addresses the social determinants of health, while honoring the UHC promise of leaving no-one behind (Bundi, Kirongo & Thiga, 2020). Digitizing health records in an attempt to improve healthcare delivery, has accumulated large amounts of data. This data has the potential of being used in clinical decision support, management of population health and many other functions. The volume of such data and information in Health Coverage is likely to increase with time as technology is incorporated to facilitate healthcare performances, (Jönköping, 2018; Simpao, Ahumada, & Rehman, 2015). Overall, data analytics in the healthcare supply chain has the potential to revolutionize how healthcare practitioners employ advanced technology to acquire insight from clinical and other data sources and make well-informed decisions. Data analytics in healthcare may then be coupled with analytical software to anticipate medical outcomes and enhance overall patient care quality (Salau, 2017).

Strategic Purchasing and Universal Health Coverage (UHC)

Procurement in Africa is prone to malpractice and corruption. Studies indicate that the vast scale of malpractice and corruption means serious amounts of money go to waste. The quantum of money changing hands through corruption in public procurement is estimated between $390-400 billion per annum all over the world, (Panya & Awuor, 2023). Strategic purchasing is currently receiving renewed and increasing attention as one of the strategies to achieving Universal Health Coverage. Policy debates are moving away from performance-based financing to a broader approach of strategic purchasing and much attention is given to the wider environment of purchaser– service provider relationships (Etiaba, Onwujekwe, Honda, et al. 2018). Strategic purchasing involves a rigorous process of searching for the best ways to maximize health system performance, deciding which interventions should be purchased, how to purchase, and from whom to purchase, (Ezenduka, Obikeze, Uzochukwu & Onwujekw, 2022). It the act of deliberately directing health funds to priority populations, interventions, and services, and actively creating incentives so funds are used by healthcare providers equitably and aligned with population health needs (Gatome-Munyuaa, Isidore, Orokia & Cashinda,2022). In strategic purchasing, buyers use pooled funds to source for healthcare services for certain groups or the entire population, using levers that encourage healthcare providers to improve health service quality and efficiency (Etiaba, Onwujekwe, & Honda, 2018). The objectives therefore, are to enhance equity in the distribution of resources, increase efficiency, manage expenditure growth and promote quality in health service delivery. It also serves to enhance transparency and accountability of providers and purchasers to the population. This contributes to the ultimate goals of maximized health outcomes and equity in health gains, financial protection and equity in financing as well as responsiveness (Mathauer, 2017). It also allows purchasers to align incentives between the government and Health Coverage providers to encourage desired behaviors. Incentives should be understood beyond financial rewards. Instead, incentives should consider the whole system of rewards and sanctions that control and influence behavior (Bill & Melinda Gates Foundation, 2020). In addition, purchasers must also ensure that mechanisms are in place to identify

and reflect people's needs, preferences and values in purchasing decisions, and hold healthcare providers accountable to the people (Etiaba, Onwujekwe, & Honda, 2018).

UHC goals and targets are often characterized by expansion of national health insurance, community-based health insurance, performance-based financing, and user fee replacement programs, all of which link payment to data on service delivery (Chu, Kwon, & Cowley, 2019; Gautier & Ridde, 2017; Bill & Melinda Gates Foundation, 2020). As governments develop and implement strategies to achieve UHC, they should focus on three inter-related objectives: (1) Mobilizing more resources for health; (2) Reducing financial barriers to access and increasing financial protection; and (3) Using available funds optimally to achieve health system goals (World Health Organization, 2010). The role of Strategic purchasing in achieving UHC is not a new discourse to African governments as it is explicitly embedded in their national policy documents and plans across the continent (Mathauer, 2017). Despite that, most governments in sub-Saharan Africa continue to procure health services without making effective use of the full range of strategic levers available including a well- defined benefit or essential services package that targets the country's health priorities, contracts with public and private providers that specify and enforce quality standards, provider payment methods that disburse flexible funds to frontline providers and create incentives that are aligned with health system objectives, and performance monitoring with accountability, low per capita national income or gross domestic pro-duct (GDP), inefficiency translating economic activity into government revenue through tax collection, and inadequate priority for health in public budgets com-pounded by under execution of health budgets,(Gatome-Munyuaa, Isidore, Orokia, & Cashinda, 2022). Making purchasing more strategic is integral to the UHC third objective of getting "more health for the money." It also serves as a lever for: Aligning incentives to improve service delivery in the public sector, using public funds to purchase services from the private sector, and so improving access, Alleviating reliance on vertical health programs to improve efficiency, reducing out-of-pocket payments to improve financial protection and equity (Bill & Melinda Gates Foundation, 2020). Governments are required to play a stewardship role by providing a clear policy framework and appropriate guidance to ensure that resource allocation and purchasing decisions are linked to public health priorities (Etiaba, Onwujekwe, Honda, 2018).

Strategic purchasing is particularly important for countries in sub-Saharan Africa because public funding for health has often not kept pace with UHC commitments. In addition, there is wide variation in progress toward UHC targets and health outcomes on the continent that does not always correlate with per capita government health spending, (Gatome-Munyuaa, Isidore, Orokia, and Cashinda, 2022). Making purchasing strategic is a process not a destination. The design and implementation of purchasing reforms should be evidence-based, take political, social, cultural, institutional context into consideration and engage a wide range of health system stakeholders, (Bill & Melinda Gates Foundation, 2020). Manual systems have been a source of major inefficiencies in the regulation and operations of the procurement function. Manual procurement system is inadequate due to lack of transparency in various stages of procurement such as tender evaluation and award. To meet today's operating challenges, institutions are turning to ICT to improve their services to suppliers and other customers in order to lower operating costs and improve performance. Digitization of procurement offers smoother and faster process flow, efficient distribution of information, and decentralization of tasks (Panya & Awuor, 2023). As countries world-wide are undertaking health financing reforms to achieve Universal Health Coverage (UHC), they are increasingly discussing, designing, and testing approaches for making health purchasing more strategic (Khalifa, Jabbour, Mataria, Farid & 2021).

To strengthen the purchasing function of healthcare financing and move towards strategic purchasing, African countries must undertake healthcare purchasing reforms and a introduce a mandatory affordable patient friendly health insurance scheme targeting the uninsured (Etiaba, Onwujekwe, Honda, 2018). Countries at all levels of income are considering or implementing reforms to improve the purchasing function so as to address the constant challenge for health system stewards, address new opportunities and challenges that have emerged and that require adaptions in how best to procure health services over time (Mathauer, 2017). Careful consideration of the interaction of new purchasing mechanisms with existing mechanisms is essential, and the design of purchasing mechanisms should be the result of on-going and deliberate decision-making processes around how to best achieve a set of prioritized health outcomes, (Bill & Melinda Gates Foundation, 2020). To make progress toward Universal Health Coverage (UHC), developing countries can also make progress by using available resources more effectively by ensuring accountability and transparency in their health procurement processes, (Gatome-Munyuaa, *et al,* 2022). Strategic purchasing must aim to improve the way ministries of health, health insurance agencies, and other purchasers make key decisions about the interventions they cover, the providers they contract, and payment methods in order to improve access, equity, efficiency, quality of care, and financial protection,(Khalifa, Jabbour, Mataria, Farid& 2021). For sustainable Universal healthcare coverage, there is a need for strategic sourcing to ensure the availability of quality medical products at a fair price, adequacy in stocks of essential health medicines and supplies, and delivery of medicines and supplies in good time as requested by health facilities (Kitaka & Omwenga, 2022).

Governments should allocate funds based on available information about health provider performance and population health needs, with the ultimate aim of increasing efficiency, equitable distribution of resources, and cost containment (Ekirapa-Kiracho, *et al,* (2022). As countries design and implement purchasing mechanisms to promote quality, efficiency, equity, and address the health needs of the population, this accelerates progress towards meeting the goals of UHC, (Bill & Melinda Gates Foundation, 2020). Policy makers must also purpose to implement strategies to deliver UHC, they must also undertake health financing reforms to mobilize more financing for health and ensure that available funds for health are used optimally and equitably, (Khalifa, Jabbour, Mataria, Farid & 2021). Examining healthcare purchasing arrangements requires the evaluation of the health needs of the population, the planning and design of healthcare services, the qualification and selection of appropriate providers, and the incentivization and management of providers to ensure good performance. Unlike passive purchasing, strategic health purchasing (SHP) is used to control costs and direct the purchasing of desirable quality services. In this way, SHP interventions enhance the health system accountability and financial balance (Ezenduka, et al, 2022).

SUMMARY OF FINDINGS

Universal Health Coverage (UHC) ensures that all individuals have access to needed standard healthcare services without suffering financial hardship from its access. The World Health Organization (WHO) declared health as a fundamental human right upon which all other rights are built. Attainment of UHC in Kenya has remained elusive due to many challenges, which include unequal access to different healthcare services due to poor distribution and use of resources, shortfall in the number of medical personnel, skewed distribution of healthcare workforce, inability of the country's health system to deal effectively with epidemics, corruption in the health sector, the growing burden of chronic diseases. epidemiological as well as a demographic transition with a steep increase among non-communicable diseases (NCDs), health leadership and governance issues, the need to Strengthening

health purchasing activities, among other myriads of issues. This study suggests a number of remedies to the attainment of UHC through Inventory optimization and management, supply chain integration, Supply chain analytics and through strategic purchasing solutions. The main goal of inventory Optimization and supply chain management is to reduce the cost of healthcare without sacrificing service typically by improving the efficiency or productivity of the system. Inventories therefore, needed to be controlled in such a manner, as to leverage on organizational productivity and overall performance. Poor inventory management are often linked to insufficient financing and human resources, or other inefficiencies higher up in the supply chain.

This study found that for Kenya to attain UHC, close relationship between services providers and the consumers of the service is crucial. There is need for key suppliers and the focal firm to facilitate their mutual exchange of information about products, processes, schedules, and capabilities so as to help in develop production plans, produce goods on time, and improve delivery performance. Poor health sector integration remains a potential source of inefficiency in the health sector. For Kenya to achieve UHC, the state needs to mobilize additional resources for the health sector. The role of Supply Chain Management in healthcare sector is to ensure complete end to-end visibility of information among suppliers, manufacturers, distributors and customers, Supplier integration not only improves the efficiency and effectiveness of the information and physical flows between manufacturers and suppliers, but also ensures seamless processes and cohesive supply networks that cannot be easily matched by competitors and therefore enhancing the performance of medical supplies. The study portends that Proper use of the data will allow healthcare organizations to support clinical decision-making, disease surveillance, and public health management. Digitizing health records in an attempt to improve healthcare delivery, has accumulated large amounts of data. This data has the potential of being used in clinical decision support, management of population health and many other functions. The volume of such data and information in Health Coverage is likely to increase with time as technology is incorporated to facilitate healthcare performances. Overall, data analytics in the healthcare supply chain has the potential to revolutionize how healthcare practitioners employ advanced technology to acquire insight from clinical and other data sources and make well-informed decisions. The objectives therefore, are to enhance equity in the distribution of resources, increase efficiency, manage expenditure growth and promote quality in health service delivery. It also serves to enhance transparency and accountability of providers and purchasers to the population. This contributes to the ultimate goals of maximized health outcomes and equity in health gains, financial protection and equity in financing as well as responsiveness.

This study also found that strategic purchasing has a role to play to ensure the success of the UHC Program in Kenya. To strengthen the purchasing function of healthcare financing and move towards strategic purchasing, the government must undertake healthcare purchasing reforms and a introduce a mandatory affordable patient friendly health insurance scheme targeting the uninsured. Strategic purchasing must aim to improve the way ministries of health, health insurance agencies, and other purchasers make key decisions about the interventions they cover, the providers they contract, and payment methods in order to improve access, equity, efficiency, quality of care, and financial protection. Governments should allocate funds based on available information about health provider performance and population health needs, with the ultimate aim of increasing efficiency, equitable distribution of resources, and cost containment.

CONCLUSION AND RECOMMENDATIONS

Policy makers must purpose to implement strategies to deliver UHC, they must also undertake health financing reforms to mobilize more financing

for health and ensure that available funds for health are used optimally and equitably. Examining healthcare purchasing arrangements requires the evaluation of the health needs of the population, the planning and design of healthcare services, the qualification and selection of appropriate providers, and the incentivization and management of providers to ensure good performance. The state should reorient its health financing strategy away from a focus on contributory, voluntary health insurance, and instead recognize that increased tax funding is critical. This study emphasizes that Kenya should move away from passive purchasing, and adopt strategic purchasing practices to enhance the equity, efficiency and quality of healthcare service delivery. The Kenyan government should increase public financing of the health sector in order to meet the Universal Health Coverage goals.

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