



Resilient Health Systems and National Security: Lessons from Kenya's COVID-19 Response

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Abstract

The COVID-19 pandemic exposed critical vulnerabilities in both global and national health systems. It underscored the intricate relationship between public health and national security, emphasizing the need for robust preparedness frameworks. This study examined how inefficiencies in the medical supply chain could impact Kenya's national security and public health preparedness, identified structural flaws that emerged during the crisis, and provided recommendations to enhance Kenya's preparedness. The study explains the existing structural gaps in the medical supply chain regime in the context of pandemic preparedness. It also examines the threats to Kenya's health and national security arising from inefficiencies in the medical supply chain. Grounded in resilience theory, this study emphasizes collaboration and building strong institutions for better service delivery. To provide well-informed recommendations, the study uses a qualitative approach. Using a case study design, the study draws on Kenya's specific experiences during the pandemic to provide insights into strengthening national and regional strategies. The study utilized content analysis of documents, publications, and reports to obtain the relevant data. The study established that, whereas the country had a robust health supply chain capability before and during the COVID-19 pandemic, its reliance on global health supply chains during the pandemic exposed the country to health insecurity. It was also evident that for Kenya to be resilient, it must overcome local inefficiencies resulting in financial mismanagement and a lack of anticipatory resilience. It is also imperative for the country to leverage the potential of the East African Community (EAC) to build regional sufficiency. The findings aim to inform key stakeholders, including the Kenyan government's public health organs.

Keywords: COVID-19, medical supply chain, national security, pandemic preparedness, public health emergencies

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Introduction

The COVID-19 pandemic has been one of the most profound global crises of the 21st century, exposing critical vulnerabilities in health systems worldwide. Across the globe, and particularly in Kenya, the pandemic amplified the intricate interplay between public health and national security, revealing how frailties in one domain can exacerbate risks in the other. While a functional medical supply chain system is considered a foundation for an effective pandemic response, ensuring the timely availability of essential medical equipment, vaccines, and pharmaceuticals (Nayler & Subramanian, 2021), the pandemic laid bare the fragility of global and national supply chains, as disruptions in production, logistics, and distribution hindered the delivery of critical supplies. For Kenya, these inefficiencies not only weakened its public health response but also posed significant threats to national security, as the inability to manage the crisis effectively risked destabilizing the country's socio-economic and political fabric.

The pandemic highlighted the need to be ready to minimize the effects of public health crises. Countries with resilient health systems and well-functioning supply chains were arguably better placed to deal with the crisis (WHO, 2020). On the other hand, during the early stages of the pandemic, countries such as Kenya, which were highly dependent on imported medical supplies, had acute shortages of ventilators, testing kits, and personal protective equipment (PPE) (Toraitich et al, 2022). Pre-existing structural flaws in Kenya's medical supply chain, including inadequate storage facilities, subpar distribution systems, and a lack of local manufacturing capabilities, exacerbated these difficulties. Consequently, the nation's capacity to safeguard its citizens and uphold national security was severely weakened, prompting serious concerns regarding the sufficiency of its readiness structures.

This study argues that COVID-19 highlighted the connection between health supply chain resilience and national security in Kenya, underscoring the crucial importance of reliable access to medical resources in safeguarding public health and stability. Resilience denotes the capacity of (in this context) Kenya's medical supply chain to recover from adverse circumstances brought about by COVID-19, adjust to obstacles, and sustain mental and emotional health amidst difficulties. It entails a process of adaptation and preparation to withstand similar or greater health crises in the future. By learning from the COVID-19 supply chain experience, the country can develop a resilient supply chain system that will enable it to manage future health emergencies, which may threaten Kenya's overall security. This research examines the vulnerabilities of Kenya's medical supply chain system regarding pandemic preparedness and national security. The study aims to provide actionable recommendations for enhancing Kenya's resilience to future public health emergencies by examining the systemic flaws revealed during the COVID-19 pandemic. Ultimately, the findings aim to inform policymakers, public health professionals, and other stakeholders, leading to a more unified and prosperous approach to addressing future crises.

Theoretical Basis

The resilience theory offers a solid analytical lens for examining Kenya's pandemic readiness and national unity, particularly in light of lessons learned from the COVID-19 pandemic. This theory was also selected due to its practical application in analyzing the vulnerabilities of the medical supply chain and informing subsequent policy recommendations for a more prepared supply chain system in the future. The theory highlights individuals', groups', and systems' ability to tolerate, adapt to, and recover from adversity, allowing them to sustain or quickly resume functionality. Central to resilience theory is the argument that resilience is a dynamic process, not a fixed trait. It involves the interaction between risk factors and protective mechanisms, leading to positive adaptation despite significant challenges. This perspective shifts the focus from solely mitigating risks to also enhancing strengths and resources within a system.

This study observes that applying a resilience approach to analyzing Kenya's experience with COVID-19 facilitates a nuanced examination of how the nation can enhance its readiness for future public health emergencies. It first enabled the authors to identify systemic strengths and weaknesses, highlighting the

advantages and disadvantages of Kenya's healthcare and governance systems. Understanding these elements can help develop strategies to reinforce strengths and strengthen areas of weakness. Second, the theory's emphasis on adaptable capacity, preparedness, anticipation, and risk-taking provided the authors with insights to focus on amplifying the necessity of experience-based learning and flexibility in health supply chain resilience. In the Kenyan context, this entailed evaluating the management of the COVID-19 health emergency and applying the knowledge gained to enhance future pandemic responses.

The resilience theory was also applicable to this study, as it promoted a balanced approach that combined risk minimization and resource mobilization. For Kenya, this entails anticipating possible health hazards and aligning economic and social resources to support public health activities. At the heart of resilience lies the clarion call for the security of the neighborhood, the protection of the community, and the security of the nation. The effectiveness of resilience theory was further illustrated by its ability to help the writers examine the relationship between Kenya's national cohesion and pandemic readiness. This is because the theory provides a thorough framework for enhancing Kenya's preparedness for upcoming crises by highlighting the dynamic mechanisms that allow societies to navigate and recover from public health crises.

Literature Review

Kenya's Health System Response to COVID-19: Strengths and Challenges

The government moved quickly to lessen the pandemic's effects when Kenya confirmed its first COVID-19 case on March 12, 2020 (Wangari et al., 2021). Proactive governance was shown by the creation of the National Emergency Response Committee (NERC) and the application of policies such as travel restrictions, partial lockdowns, and public health campaigns (Mwakisha et al., 2024). In order to provide personal protective equipment (PPE) and increase awareness in informal settlements, multisectoral collaboration was used to assist these initiatives, including partnerships with civil society organisations (Barasa et al., 2021). According to academics, Kenya's quick reaction to the outbreak was influenced by its past experience with infectious disease outbreaks like Ebola and HIV/AIDS, which allowed the nation to keep the case burden below international projections (Ogira et al., 2022).

Kenya's health system encountered many difficulties in spite of these advantages. According to Wangari et al. (2021), resource reallocation and public anxiety about catching COVID-19 in medical facilities have caused disruptions to vital health services, such as HIV, TB, reproductive health, and non-communicable disease (NCD) care. The system was under stress, especially in the early months of the pandemic, due to shortages of PPE, testing kits, and intensive care unit capacity (Barasa et al., 2021). The difficulties of putting health policies into practice in a recently devolved governance structure were reflected in the poor coordination between the national and local governments, which made response efforts even more difficult (Kiarie et al., 2022). These results are consistent with a larger body of research on the resilience of health systems, which highlights the significance of strong governance, appropriate funding, and enough human capital to withstand shocks (Witter et al., 2023).

Health System Resilience as a Pillar of National Security

The connection between national security and the resilience of the health sector was highlighted by the COVID-19 pandemic. According to Daoudi (2020), health crises have the potential to jeopardise national stability by upsetting economies, exacerbating social inequality, and eroding public confidence in government. Small enterprises and workers in the informal sector, who make up a sizable section of the population, were negatively affected economically by lockdowns and restrictions in Kenya (Mwangi et al., 2025). Health systems play a dual role in addressing both health and socioeconomic stability, as seen by the government's efforts to strike a compromise between reducing morbidity and preserving the economy through initiatives like cash transfers and tax breaks (Mwakisha et al., 2024).

Kenya's experience demonstrates how the ability of a resilient health system to respond and recover quickly enhances national security. For example, policymakers were able to address shortages in diagnostics, treatments, and vital health services by using the Kenya Health Information System (KHIS) and WHO evaluation tools to enable real-time monitoring of health care capacity (Kiarie et al., 2022). Furthermore, Kenya's capacity to monitor COVID-19 transmission and guide focused interventions was improved by the repurposing of pre-existing surveillance systems, such as the Global Influenza Surveillance and Response System (GISRS) (Wangari et al., 2021). These adaptable strategies are in line with international frameworks for health system resilience, which place a strong emphasis on combining data-driven decision-making, governance, and community participation (Haldane et al., 2021).

Gaps in Kenya's health system, however, revealed weaknesses that might jeopardise national security. Critical solutions, such as hiring more health workers during the crisis, were delayed by counties' and facilities' lack of financial autonomy (Barasa et al., 2021). Furthermore, the dangers of external vulnerability during periods of global supply chain disruptions were underscored by Kenya's dependence on imported medical goods, with 94% of medications coming from outside the country (Tessema et al., 2021). In order to guarantee health security, a crucial aspect of national security in low- and middle-income countries, these difficulties highlight the necessity of independence and diverse supply chains (Daoudi, 2020).

Lessons for Future Preparedness

A number of lessons can be learned from Kenya's response to COVID-19 in order to create robust health systems that support national security. To start, systemic gaps can be addressed by bolstering primary health care (PHC) and combining global health security (GHS) and universal health coverage (UHC) frameworks (Lal et al., 2021). According to Kenya's experience, funding for PHC infrastructure—such as networks of community health workers and diagnostic capabilities—is essential for early health crisis identification and response (Kiarie et al., 2022). Second, resource mobilisation can be improved by encouraging public-private partnerships (PPPs). Stronger PPPs were recommended by respondents in the study by Barasa et al. (2021) to address medical supply shortages and enhance the responsiveness of the health system.

Third, for crisis management to be effective, national and subnational governments must better coordinate. Despite being intended to improve local decision-making, Kenya's decentralised governance structure revealed coordination issues that caused answers to be delayed (Wangari et al., 2021). Roles and responsibilities at all levels of governance must be clearly defined to plan for the future. Lastly, it is crucial to incorporate pandemic preparedness into national security planning. According to Mwangi et al. (2025), Kenya's creation of the Public Health Emergency Operations Centre (PHEOC) in response to new threats like Ebola serves as evidence that recognising health crises as national security risks helps prioritise resource allocation and improve intersectoral collaboration.

Methodology

Grounded in the phenomenological paradigm, this study employed a qualitative research approach, which allowed the authors to focus on individuals' and institutions' subjective interpretations and experiences (McLeod, 2024). This is ideal for studying context-specific phenomena, such as Kenya's response to the COVID-19 pandemic. The study was particularly well-suited for this approach, as it allowed the authors to investigate the lived experiences and perspectives of stakeholders involved in health supply chain management during the pandemic and to consider its broader impact on national security.

Desktop research was used in the study, with a case study methodology centred on the Kenya Medical Supplies Authority (KEMSA). Due to its ability to systematically examine pre-existing data, reports, and academic literature, desktop research is especially well-suited for policy and governance investigations. Due to its crucial role in acquiring, distributing, and overseeing medical supplies in Kenya, KEMSA was selected as the case study. This method enabled a critical analysis of institutional readiness and the

challenges in the health supply chain, particularly in terms of their implications for national security in the event of a public health emergency.

To access these sources, a systematic search was undertaken through scholarly platforms such as MyLOFT, Google Search, and Google Scholar, with carefully selected keywords and inclusion criteria related to the study aims guiding this endeavour. To acquire credible, up-to-date data, the official websites of important institutions were reviewed, including Kenya's Ministry of Health, the Kenya National Bureau of Statistics (KNBS), and international organisations such as the World Health Organisation (WHO) and KEMSA. These sources were analysed to provide comparative insights and to place Kenya's preparation within a larger global health framework. Proper reference and attribution were meticulously followed when citing existing literature and data sources, ensuring academic integrity and adherence to ethical research standards. Furthermore, steps were taken to guarantee the reliability and accuracy of the study findings.

Nonetheless, the report admits several limitations. Using secondary sources increases the risk of researcher bias, as the researcher's position influences the interpretation of existing data. Furthermore, limitations in data availability and accessibility caused issues, notably for real-time government reports and confidential policy documents. Despite these constraints, stringent procedures were implemented to enhance the validity and reliability of the findings, including cross-referencing multiple sources and triangulating data where possible. These efforts ensure that the study contributes to a more comprehensive understanding of current health supply chain readiness concerns and national security.

Finally, reflexivity was maintained throughout the research process, fostering critical awareness and reflection on the researchers' biases, assumptions, and perspectives. This reflexive approach enhanced the credibility of the findings by ensuring that personal or institutional biases did not unduly influence the analysis. By engaging in continuous self-evaluation, the study upholds transparency and rigour in its methodological approach, thereby reinforcing the reliability of its conclusions on the critical nexus between pandemic preparedness and national unity in Kenya.

Results and Discussion

Global Supply Chain Vulnerabilities to COVID-19

The COVID-19 pandemic was unprecedented in its scope and impact, ranking among the most serious public health catastrophes in recent history. Unlike localised infections like Ebola or Zika, COVID-19 led to near-universal lockdowns, halted worldwide transportation networks, and exposed the vulnerability of just-in-time production techniques. Global health supply chains (GHSCs), structured primarily for efficiency, broke under unprecedented pressure from rising demand for key items such as PPEs, ventilators, and vaccines (Gereffi, 2020). Factories in China and India, the world's largest producers of medical supplies, were forced to close. At the same time, vaccine nationalism among wealthier nations left low-income countries like Kenya vulnerable to delayed COVID-19 Vaccines Global Access (COVAX) shipments (World Health Organisation, 2020). Figure 1 below summarises the conundrum posed by COVID-19. Even the most advanced healthcare systems were overwhelmed by the immense strain of this pandemic. The pandemic highlighted the fragility of the global health system and its inability to withstand significant shocks. Still, this COVID experience gave governments and their IGO/NGO partners a chance to reflect and prepare for future pandemics.



Figure 1: Global Supply Chain Vulnerabilities to COVID-19. Source: Mekonen, Z. T., Fenta, T. G., Nadeem, S. P., & Cho, D. J. (April, 2024).

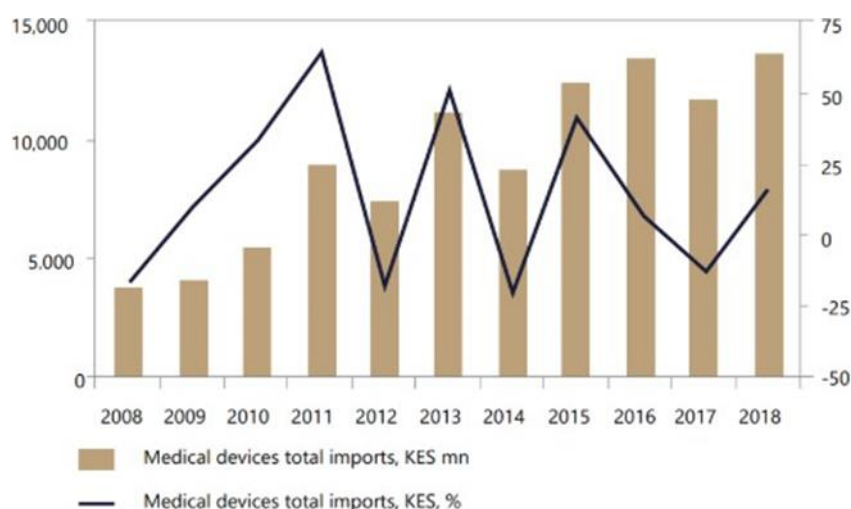
Kenya has been heavily dependent on GHSCs, where a considerable quantity of medical equipment and drugs are imported (Toroitich et al., 2022). Even the most basic materials were difficult to obtain for the nation's already ineffective and underfunded health system. During the pandemic's peak, hospitals turned away patients due to acute oxygen shortages, and medical personnel were forced to reuse personal protective equipment, posing a significant risk to their health (Human Rights Watch, 2021). Health supply networks that prioritise profit over readiness are ill-prepared to deal with crises of this size, as this catastrophe made clear. However, this loss presents a valuable teaching moment: an opportunity to reconsider supply networks from a resilience perspective.

KEMSA and Local Supply Chain Vulnerabilities

KEMSA was established under the KEMSA Act of 2013, which is responsible for acquiring, storing, and delivering vital medical commodities to public health facilities nationwide. It was also established to ensure fair access to medications, leverage economies of scale, and maintain emergency stockpiles in the event of a crisis. As the primary health products and technologies (HPT) supply chain provider, KEMSA plays a crucial role in ensuring health security in Kenya. During the COVID-19 pandemic, KEMSA played a pivotal role in Kenya's resilience. As KEMRI (2021) observes, this authority demonstrated domestic supply chain efficiency at the time, in contrast to the tribulations faced at the global level. Besides the legal framework within which KEMSA operates, Kenya has instituted the Kenya Health Policy 2014-2030 as the framework that directs the country towards achieving the highest standards of health provision while being sensitive to the needs of its people. To provide universal access to high-quality essential medications, essential health technologies, and pharmaceutical services in Kenya, the Kenya National Pharmaceutical Policy serves as the overarching guiding policy for HPT. The HPT Supply Chain Strategy for 2020-2025 was also implemented to enhance the efficiency of supply chain logistics. Amendments to the KEMSA Act 2019 enabled county-level reach (MOH, 2020).

While Kenya is a leading regional manufacturer of medical supplies, it still relies on imports. This is illustrated in Figure 2, and, arguably, the trends of post-COVID have been maintained. KEMSA demonstrated impressive agility by collaborating with local manufacturers to produce PPE and sanitisers; for example, it worked with 14 Kenyan textile enterprises to produce over 10 million masks, thereby reducing its import dependency.

Figure 2: Kenya's Overall Medical Imports 2008-2018.



Source: Jaza Rift (April 2024).

By September 2021, KEMSA had secured over 5 million vaccine doses through its participation in the global COVAX effort (Mwaniki, 2021). KEMSA even gained international acclaim at the Global Health Supply Chain Summit (GHSCS) in Lagos, Nigeria, for its innovative Integrated Logistics Management Information System (i-LMIS) and Last Mile Smart Net Distribution Project. This reflects Kenya's advancements in health supply chain technology. KEMSA's i-LMIS system, which has been recognised for improving commodity security, accurate forecasting, and optimum demand planning, has also received recognition for its success in improving the delivery of crucial health supplies (Capital FM, November 2024).

Nevertheless, systemic inefficiencies and instances of corruption tainted these attempts. Audits by the Parliamentary Committee on Health revealed that PPE was irregularly acquired, and senior KEMSA managers interfered in the procurement processes (Parliament, 2021). Front-line workers were endangered due to delivery delays, and vaccinations and expired reagents were wasted due to inadequate inventory management. Additionally, by December 2021, only 40% of Kenya's COVAX vaccine doses had been administered, partly due to a lack of cold chain infrastructure in remote areas, such as Turkana County, where insufficient refrigeration facilities led to vaccine expiration (Muchiri et al., 2022). These difficulties highlighted a crucial weakness: although KEMSA was very good at regular procurement, it lacked the institutional capacity to handle crises and plan.

The Nexus between Supply Chain Vulnerabilities and National Security

Health supply chains must be reliable, resilient, and secure. This ensures their usefulness to a nation. In contrast, vulnerabilities within Kenya's health supply chains have serious consequences for national security. An inconsistent supply chain hinders the country's ability to respond quickly to health issues, leading to increased disease transmission, mortality, and social unrest. When key goods are delayed or unavailable, public trust in government institutions deteriorates, laying the groundwork for political instability and economic decline (Mwaniki et al., 2021). According to Norris and Rodgers (2021), a health supply chain affected by infiltration from counterfeiting, foreign dependence, inadequate infrastructure, and imprudent stockpiling produces myriad challenges for a state. This may range from the wastage of resources to the supply of substandard goods, which can directly endanger populations. When there is a failure to access required supplies in the event of GHSC meltdowns, lockdowns become longer, mortality rates increase, and, simultaneously, the integrity of the healthcare system is compromised.

In her research, Kimenye (2022) states that securitising a country's health security threats is essential to focusing public attention on effectively resolving national security dangers that may arise from the

security sector. Securitising health emphasises the realisation that state stability, system resilience, and human well-being are intricately linked and require coordinated, multisectoral action to safeguard. Building on this position, this study argues that the broader implications of health security for national security underscore the need for resilience even more. By lowering mortality rates, limiting financial losses, and preserving public confidence in the government, a strong health system helps avert societal instability. On the other hand, the COVID-19 health supply chain failures led to social unrest and economic shocks, in addition to acute public health emergencies. The pandemic served as a wake-up call for Kenya, whose health system had long been strained by persistent underfunding and inefficiencies. It became clear that maintaining vital health services is as important for national security as it is for public health.

Resilience is key to overcoming these vulnerabilities. Resilience theory contends that systems must have specific fundamental characteristics to resist shocks—namely, redundancy, diversity, adaptability, and transformation. Kenya's health supply chain, which relied mainly on imports from China and India, lacked the required redundancy. Its centralised procurement procedure through KEMSA Limited has limited adaptability, allowing little room for quick response or creativity during crises (Kamau & Njoroge, 2022). By incorporating resilience theory into health supply chain management, policymakers may reconfigure the system to absorb shocks while adapting and recovering quickly from disturbances. Putting resilience first entails using tactics that go beyond effectiveness. For instance, decentralising procurement could increase responsiveness and alleviate bottlenecks by allowing county governments to oversee at least 30 percent of medical supplies. This is particularly true in rural areas, where investing in cold chain infrastructure, such as mobile storage units and solar-powered refrigerators, is essential to ensuring vaccine equity. Utilising cutting-edge technology, such as artificial intelligence for demand forecasting and blockchain for supply chain transparency, can improve operational efficiency. Additionally, regional cooperation among East African Community (EAC) countries to share emergency supplies, pool resources, and negotiate lower costs will promote a more resilient and cohesive supply chain network (McDade et al., 2020).

The consequences of doing nothing are severe. Kenya runs the risk of experiencing crises again if it lacks resilience. Supply chains will continue to be stressed by climate change, new diseases, and geopolitical unrest. A clear illustration of how environmental conditions can exacerbate pre-existing vulnerabilities is the 2022 Horn of Africa drought, which disrupted transportation networks and delayed the delivery of pharmaceuticals to northern Kenya. To protect the country against upcoming disruptions, a robust supply chain with multiple supply sources and alternative logistics options, such as airlift capability, is crucial. The COVID-19 pandemic has provided valuable lessons that must be addressed immediately. KEMSA's history, marked by its initial triumphs in local PPE manufacturing, has been marred by later mismanagement and inefficiencies, underscoring the need for thorough reforms. Transparency and accountability must serve as the foundations of health supply chain management. Implementing open tender processes and real-time expenditure tracking could reduce the possibility of corruption and ensure that funds are allocated towards life-saving items. Furthermore, transitioning from a reactive to a proactive strategy through scenario planning and supply chain stress testing can significantly improve disaster readiness.

Expected Pandemic Resilience

From the foregoing, it is noteworthy to state that in a pandemic of such magnitude, extraordinary resilience was expected because the severity of the problem was largely unforeseen. The COVID-19 pandemic exposed vulnerabilities within global and national health systems. This suggests that it is the government's responsibility to put in place mechanisms that cushion healthcare systems against the impacts of public health crises. Whereas it is reasonable to expect nations to have the resilience to manage crises effectively, the unprecedented scale of the pandemic overwhelmed even the most advanced health systems (Barker et al., 2020). For Kenya, the pandemic brought forth glaring gaps in the medical supply chain, governance structures, and national security, all of which contributed to the country's struggle in

responding effectively to the crisis (Mwai, 2022). Despite these challenges, Biddle et al. (2020) have it that resilience was demonstrated through adaptability, resource mobilisation, and collaborative efforts between public and private institutions.

According to Mogere et al. (2023), one of the key expectations during an epidemic of such scale was the ability of health systems to withstand shocks and ensure continuous service delivery. However, the COVID-19 crisis revealed several structural flaws in Kenya's medical supply chain, such as inadequate storage facilities, insufficient distribution systems, and a lack of local manufacturing capacity. Consequently, these weaknesses led to acute shortages of essential medical supplies, such as ventilators, personal protective equipment, and testing kits. Given that resilience theory emphasises adaptability and resource mobilisation, Kenya's ability to swiftly respond to these shortages by sourcing alternative supplies and scaling up local production was an indicator of the country's determination to withstand the crisis. However, the nation's reliance on imported medical supplies exposed its vulnerability, underscoring the need for long-term investments in domestic production and supply chain efficiency.

In the words of Irura and Bett (2020), resilience in an epidemic is partly about the health system's capacity and national unity and governance. Reflecting on the seven dimensions of human security as conceptualised by the UNDP (1994), health security is an essential part of human welfare, as it protects against diseases and unhealthy lifestyles. Thus, it is possible to argue that health security is a key consideration in national security since failures in pandemic response pose risks to social stability. Likewise, the pandemic affected economic security, a key dimension of human security, as basic incomes were impacted. Notably, Mutinda (2022) reports that Kenya faced socioeconomic disruptions, characterised by widespread job losses, economic downturns, and public discontent over the handling of the crisis. The government's measures, such as lockdowns and curfews, while necessary, also led to unintended consequences, including economic hardship and protests. Although expectations were that the government would make efforts to strike a balance between health and economic security, the reality was that it emphasised the health dimension of human security, which consequently affected the people's livelihoods. Towards this, it is safe to say that negation of one welfare over the other may portend profound effects on the well-being of the citizens.

This discourse believes that resilience in an epidemic crisis requires the ability to learn from past experiences and implement reforms to prevent future failures. As cited in Nduhura et al. (2021), Kenya's response to COVID-19 was hindered by systemic inefficiencies, but it also presented an opportunity for institutional learning and policy improvement. Reflecting on the key tenets of resilience theory, it is possible to argue that nations may use times of adversity to develop their resilience and adaptation, which are core approaches to strategic foresight. This means that countries can examine the failures and successes of their pandemic response to strengthen their preparedness for future health emergencies. To achieve this, the Kenyan government may consider investing in a robust health infrastructure, enhancing coordination among stakeholders, and ensuring that national policies align with global health standards. This study takes the perspective that the concept of resilience extends to the role of communities in crisis management. Community-based initiatives played a central role in supplementing government efforts during the pandemic. Notably, Nyakwaka (2022) argues that grassroots organisations, religious institutions, and private sector entities mobilised resources to relieve vulnerable populations, demonstrating the place and/or influence of collective action. Based on the foregoing, it can be seen that a decentralised approach to crisis response aligns with resilience theory, which emphasises the importance of social networks and adaptive strategies in overcoming adversity. Adaptive strategies refer to methodologies that prioritise flexibility and responsiveness to evolving contexts, facilitating ongoing adjustments to plans and activities.

Strategic Leadership in Health Supply Chain Management

The COVID-19 pandemic presented a critical test of strategic leadership in health supply chain management, exposing weaknesses while also highlighting the importance of resilience, adaptability,

and proactive planning in responding to public health emergencies. According to Tran et al. (2021), one of the most notable lessons from the pandemic is the need to build resilient health supply chains that can withstand shocks and disruptions. Strategic leadership in this context involves anticipating potential risks, diversifying supply sources, and investing in local production capacities. It will be recalled that Kenya lacked crucial equipment for health workers, which suggests that leaders must develop self-sufficiency strategies, such as strengthening local manufacturing and enhancing storage and distribution systems to reduce dependence on external suppliers.

A review of existing evidence, conducted by Steele et al. (2022), among others, indicates that the unpredictability of health emergencies requires leaders who can adapt quickly to emerging challenges. During the COVID-19 pandemic, global supply chain disruptions rendered traditional procurement and distribution strategies ineffective. Strategic leadership entails making dynamic decisions, leveraging data for real-time problem-solving, and deploying effective emergency response mechanisms. For instance, Kenya had to reconfigure its supply chain strategies, including repurposing local industries to manufacture face masks and personal protective equipment (PPE). This underscores the need for leaders to remain flexible and innovative by utilising available resources to fill critical gaps during crises.

The centrality of technology cannot be overstated during crises, such as the one witnessed during the COVID-19 pandemic. This assertion is supported by Onyango (2024), who affirms that a well-functioning health supply chain depends on accurate forecasting, efficient inventory management, and rapid distribution, which in turn rely on the type and extent of technology deployed. This study argues that strategic leadership involves leveraging data analytics, artificial intelligence, and digital tracking systems to monitor stock levels, predict shortages, and improve supply chain efficiency. Regrettably, Musyoka and Ouma (2024) contend that the lack of real-time data during Kenya's pandemic response hindered effective decision-making. Subsequently, future supply chain management must incorporate integrated digital systems to enhance transparency and accountability, ensuring that medical supplies reach the right locations at the right time.

It is the observation of this study and that of Kioko (2023) that government efforts, alone, are insufficient in managing large-scale health crises, such as the COVID-19 pandemic. Thus, it is crucial to have strategic leaders who can involve and/or engage private sector actors, non-governmental organisations, and international partners to mobilise resources and expertise. In Kenya, private-sector contributions played a critical role in supplementing government efforts, with companies stepping in to manufacture medical equipment and distribute relief supplies (Nyakwaka, 2022). Thus, it is possible to suggest that future strategies should institutionalise strong PPP frameworks so that there is a coordinated response between public and private entities in times of crisis.

Strengthening Local and Regional Health Supply Chains

In the words of Thilmany et al. (2021), the COVID-19 pandemic exposed susceptibilities and/or gaps in global health supply chains, suggesting the need for robust local production and distribution systems to achieve self-sufficiency. This study highlights the importance for Kenya and other African nations to invest in local manufacturing, enhance storage and distribution networks, and enforce effective regulatory frameworks to ensure quality. Through the mentioned approach, countries in the Global South, including Kenya, are likely to reduce their reliance on imports, which will subsequently improve their response to health emergencies and secure timely access to essential medical supplies. Beyond national efforts, Goodarzian et al. (2022) believe that regional collaboration is crucial for strengthening Africa's health supply chain. This suggests that establishing joint manufacturing hubs, implementing pooled procurement mechanisms, and facilitating streamlined intra-regional trade will likely enhance efficiency and cost-effectiveness. This study believes that regional economic blocs, such as the EAC and the AU, should facilitate the seamless cross-border movement of medical goods, enabling countries to support one another in times of crisis.

It should not be overlooked that the COVID-19 pandemic reaffirmed the necessity of promoting workshops, institutional linkages, and the mobility of medical resources for capacity building and supply chain optimisation. This assertion is likewise supported by Woo (2021), who stated that training programs for health professionals, research collaborations, and equipment-sharing frameworks are key approaches to strengthening healthcare resilience. Reflecting on the debilitating effects of COVID-19, there is a need to institutionalise public-private partnerships to drive innovation, with governments creating policies that support the adoption of technology and sustainable supply chain models. Policy reforms and strategic investments are central to enhancing local and regional health supply chains for long-term success. This suggests that governments are duty-bound to prioritise industrial policies, improve regulatory systems, and allocate funding for research and infrastructure. As a result, this will bolster Africa's preparedness for future health crises by promoting self-reliance and sustainability in public health emergency response.

Future Health Emergency Supply Chain Preparedness and Policy Recommendations

Although several suggestions on improving readiness to tackle health crises have been highlighted, this study argues that the government should adopt policies that enhance local manufacturing, streamline procurement, and improve distribution networks. To achieve this, efforts should be made to incentivise local production through tax breaks, research funding, and investment in pharmaceutical and medical equipment manufacturing, thereby reducing dependency on imports. In the view of this study, all the mentioned efforts may not yield significant results without an overarching regulatory framework that spells out quality standards for locally produced medical supplies.

As argued earlier, strategic partnerships with neighbouring countries and beyond are crucial in streamlining supply chains. Consequently, it is recommended that trade policies within economic blocs, such as the EAC and the AU, be harmonised to facilitate the seamless cross-border movement of medical supplies. To synergise supply chains and make them resilient, it is essential to implement pooled procurement strategies that help countries secure lower prices and maintain an adequate stock of crucial medical commodities. To cushion against a shortage of supplies, it is perhaps prudent for governments to develop emergency stockpiles and regional supply hubs, allowing for a quick response during crises and potentially reducing delays caused by supply chain disruptions.

Given that global supply chains rely on technology for seamless integration, it is recommended that countries and pharmaceutical firms incorporate digital tracking systems, AI-driven forecasting, and automated inventory management to enhance real-time decision-making. By establishing a centralised health supply chain management system, authorities will be able to monitor stock levels, anticipate shortages, and ensure the timely distribution of medical supplies across healthcare facilities. To achieve optimum results, this study recommends that governments, such as Kenya's, strive to adopt the best global practices. Once such procedures and policies have been implemented, it is vital to onboard and build the capacity of healthcare workers, logistics personnel, and policymakers through training.

Conclusion

In light of the above review of the lessons from the COVID-19 pandemic, it is concluded that strengthening local and regional health supply chains, adopting strategic leadership in supply chain management, and implementing agile policy frameworks are crucial for building resilience in future health emergencies. This is because the pandemic exposed systemic weaknesses, including over-reliance on imports, inefficient distribution networks, and governance challenges, which hindered timely access to medical supplies. Thus, it can be elucidated that investing in local manufacturing, promoting regional collaborations, leveraging technology, and refining governance structures is likely to improve health supply chain readiness. To address these vulnerabilities, Kenya should prioritise pandemic preparedness by integrating it into its national security framework. This would entail establishing a multi-sectoral and regionally coordinated preparation system that brings together players from the health, defence,

intelligence, disaster management, and finance sectors to predict, plan for, and respond to public health hazards. This approach would enhance early warning systems, facilitate cross-border coordination, and ensure that health emergencies are addressed with the same urgency and consistency as traditional security threats.

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