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Uganda's Public Health Emergency Supply Chain System in the Awake of COVID-19 Emergency Response: Method and Performance

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Abstract: Global Health Supply Chain Systems have been unprecedentedly strained to the limits following the coronavirus disease 2019 (COVID-19) pandemic outbreak, raising a concern of the possible magnitude of impact likely to be posed on health supply chain systems of low-income countries like Uganda. Uganda experienced its first COVID-19 outbreak on 21st March 2020, 10 days shortly after World Health Organization's (WHO) pandemic declaration. Ever since then, the number of cases in Uganda has gone on to rise every day. This paper aims to examine in detail the experiences and effectiveness of Uganda's health supply chain system in preparedness and response to COVID-19 outbreak. All components of Uganda's public health emergency (PHE) supply chain system and activities undertaken were examined. Ministry of Health (MoH) reports, Logistic Subcommittee (LSC) reports and published journals on COVID-19 were used to inform this paper. Upon declaration of the novel coronavirus (SARS-CoV-2) outbreak a Public Health Emergency of International Concern by WHO on 30th January 2020, MoH activated the Public Health Emergency Operations Center, National Task Force and District Task Forces to coordinate the COVID-19 preparedness and response. On 31st January 2020 the LSC activated the PHE supply chain system components and activities. The National Medical Countermeasures plan was activated. Quantification, forecasting and pipeline monitoring for possible logistics needs of COVID-19 was conducted for 136 districts, 8 regional prepositioning centers, 17 Regional referral hospitals, over 80 public hospitals, 89 quarantine centers, and 75 points of entry. The electronic Emergency Logistics Management Information system (eELMIS) was activated to coordinate all emergency supply chain information and regular reporting of stock status at all levels. Eight (8) regional prepositioning centers for stockpiling COVID-19 supplies were activated. In conclusion, the COVID-19 epidemic outbreak provided a stun on-field test for Uganda's young PHE supply chain system giving it an opportunity to close all the gaps not earlier well-known, and consequently making it even stronger for future epidemics. This paper therefore shares Uganda's experiences, methods and performance and future lessons from which other countries' health supply chain systems can learn from.

Keywords: Public health emergency, Health supply chain system, Medical countermeasures, COVID-19 preparedness and response, SARS-CoV-2, Global Health Security, Uganda

1. Introduction

On 30th January 2020 the World Health Organization (WHO) declared the novel coronavirus (SARS-CoV-2) outbreak a public Health Emergency of international concern (PHEIC) after being notified of a cluster of cases displaying symptoms of a pneumonia of unknown case linked to a sea food market in Wuhan, Hubei province, China, which was later identified as a novel corona virus [1], [15]. By 5th February 2020, the virus had spread through a number of countries, with the total number of confirmed cases mounting to 24, 554 worldwide, with over 20, 000 cases under investigation (figure 1). On 11th March 2020 the WHO declared the novel coronavirus outbreak a global pandemic, with rapidly increasing cases in multiple countries mounting to over 118, 000 cases of the coronavirus disease 2019 (COVID-19) in over 110 countries around the world and a sustained risk of further global spread [2], [16].

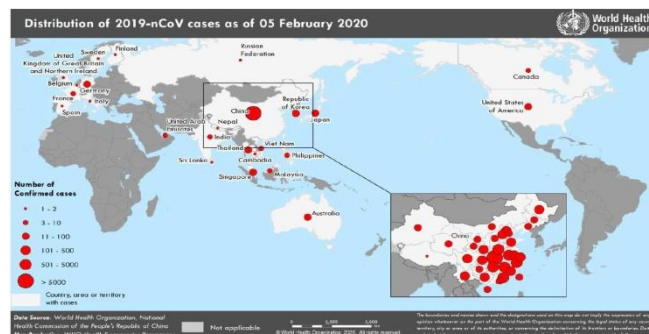


Figure 1: Countries, territories or areas with reported confirmed cases of 2019-COVID, 5th February 2020

Source: who.int

On Saturday 21st March, Uganda registered her first case of COVID-19. Another 8 cases were confirmed by MOH on 24th March, and as of now 06th October, 9, 260 COVID-19 cases and 85 COVID-19 related deaths have been confirmed in Uganda [3]. Globally 36, 403, 901 COVID-cases and 1, 060, 601 COVID-19 related deaths have been reported [18].

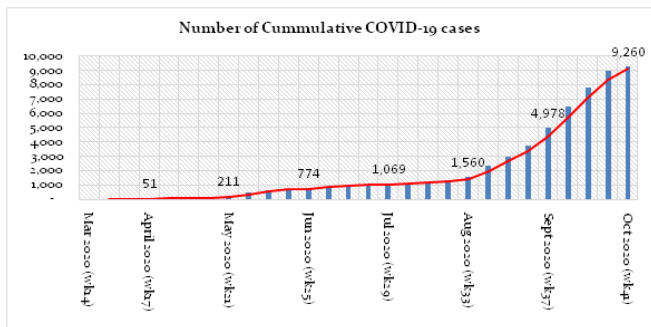


Figure 2: Uganda's trend of COVID-19 cases

Source: MoH COVID-19 situation report, 6th October 2020

With COVID-19 straining global health supply chain systems especially in developed countries, the unprecedented challenges likely to be posed on health supply chain systems of developing countries can't be under-rated [4]. This therefore highlights the importance of having in place robust health supply chain systems in developing countries like Uganda.

In February 2020, Uganda developed the National COVID-19 preparedness and response plan in a bid to align systems to be ready for the COVID-19 pandemic outbreak that had already spread in most African countries. This plan detailed out 6 pillars of focus showing the general strategy and activities to be implemented for the preparedness and response phase. These pillars included: Coordination & Leadership, Surveillance and Laboratory, Case management, Information & Communication Technology (ICT) and Innovation, Risk Communication and Community Engagement and Logistics [5].

This paper focuses on the Logistics pillar of the National COVID-19 preparedness and response plan, it examines in detail the experiences and effectiveness of Uganda's Health supply chain system, particularly the PHE supply chain system.

1.1 Uganda's Public Health Emergency supply chain system

In 2018 following the Ebola outbreak in the Democratic Republic of Congo (DRC), the MOH through US Agency for International Development (USAID) funding and technical assistance from Uganda Health Supply Chain program (UHSC) established Uganda's first PHE Supply chain system. This was in preparation of Uganda's health system in the awake of the likely Ebola threat from DRC along the western-Uganda districts bordering DRC [6]. This later became a strength that Uganda would leverage over other African countries without established PHE supply chain systems once the COVID-19 pandemic outbreak reached the East African block [7]. Figure 3 shows progression of COVID-19 pandemic in Uganda verses other East African countries.

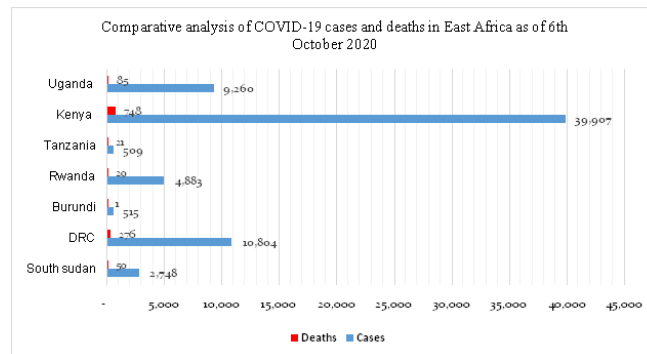


Figure 3: Comparative analysis of COVID-19 cases and deaths in East Africa as of 6th October 2020

Source: MoH COVID-19 situation report

Uganda's PHE supply chain system is composed of a coordination structure at National, Regional, District and facility or Emergency treatment unit (ETU) levels. It is guided by the National Medical Counter Measures (MCM) plan which details out the framework under which Uganda's PHE supply chain system operates from the coordination framework including roles and responsibilities of each supply chain actor; Activation of the 4 MCM plan phases (Pre-response, Activation, Response and Recovery); Use of the electronic Emergency Logistics Information System (eELMIS) to track routine transactions and movement of emergency supplies at all levels (National, Regional, District and ETU level); Standard quantification methodology for quantifying for emergency supplies; Communication protocol and reporting activities; Financing for emergency supplies; A Standard catalogue of MCMs used during preparedness and response for the priority epidemics in Uganda including COVID-19; Standard operating procedures during emergency response to be followed by the National Task Force (NTF), Logistics Subcommittee (LSC), procurement agents, Public Health Emergency Operations Center (PHEOC), Incident manager, quantification team lead, logistics and transport teams of key PHE supply chain activities on governance and organization, triggers, financing, commodity forecasting, procurement and sourcing, stockpiling, storage and warehousing, transport and customs clearance for goods in emergency response, among others.

1.2 Coordination structure

The coordination structure for the PHE supply chain system in Uganda (figure 4), is headed by the NTF which is a multi-sectorial and multidisciplinary task force of the PHEOC that leads and coordinates responses to public health emergencies. It comprises of key ministries, agencies, and departments as well as partners and relevant stakeholders and works through its subcommittees. Under the NTF there is LSC which is one of the subcommittees of the NTF which spearheads the coordination of the logistics function [6]. Below the LSC, there are regional prepositioning centers or nodes forming the regional coordination structure. At the regional prepositioning centers, MCMs are stockpiled for preparedness and aimed at raising the level of responsiveness in the event of a public health emergency. Below the regional prepositioning centers, there is the District LSC of the

District Task Force (DTF) or District rapid response team at the district. The District LSC coordinates all logistics activities at the district level including but not limited to provision of regular reports.

At the national level, the line ministries are represented in both the NTF and its LSC. At the district level the district

response teams are composed of staff from both the district health team and district veterinary office. Where facilities do not have the capacity, preparedness supplies for both the animal and human health sectors can be prepositioned in the same location within a district or prepositioning location.

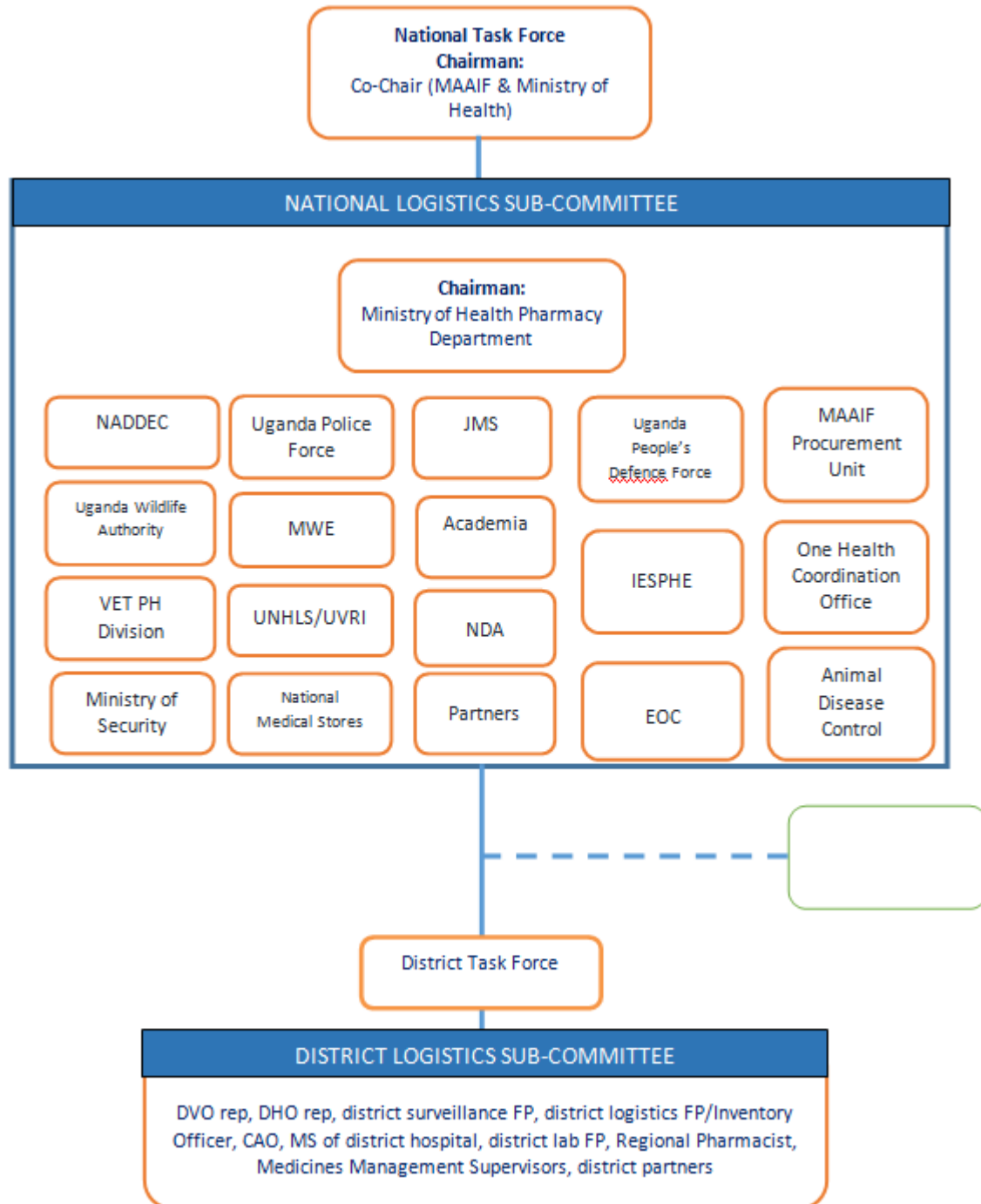


Figure 4: Coordination Structure for PHE Supply Chain system in Uganda

Key: CAO: Chief Administrative Officer; EOC: Emergency Operations Center; ESD: Epidemiology and Surveillance Division; FP: focal person; JMS: Joint Medical Store; MAAIF: Ministry of Agriculture, Animal Industry and Fisheries; MS: Medical Superintendent; MWE: Ministry of Water and Environment; NADDEC: National Animal Disease Diagnostics and Epidemiology Center; NDA: National Drug Authority; UNHLS/UVRI:

Uganda National Health Laboratories /Uganda Virus Research Institute; VET PH: Veterinary Public Health, IESPHE: Integrated Epidemiology Surveillance Public Health Emergency.

Source: Uganda National MCM plan, 2019

2. Methods

This section describes Uganda's PHE Supply Chain system and its components and all activities that were undertaken by MoH and its partners from national to health facility levels during COVID-19 emergency response to the time of writing this paper. LSC reports, MoH COVID-19 reports, and published journals on COVID-19 were received to inform the content of this paper.

3. Results

Uganda's COVID-19 supply chain emergency response efforts included: Activation of Coordination structure of PHE supply chain system, Quantification, Forecasting, and Pipeline Monitoring for COVID-19 Supplies for high risk level districts with Points of entry (PoEs), Capacity Building at National and Sub-National Levels, Activation of the eELMIS; and Regular reporting and Data visibility.

3.1 Activation of Coordination structure of PHE SC system

Upon declaration of the coronavirus outbreak a PHEIC by WHO on 30th January 2020, the MoH activated the PHEOC, NTF and DTFs for coordination of the COVID-19 preparedness and response. Upon activation of the NTF, all its subcommittees including the LSC got activated to kick start off the COVID-19 preparedness and response.

The LSC which is chaired by the MoH pharmacy department held an urgent meeting on 31st January 2020 to activate the PHE supply chain system including its coordination structure guided by an already existing framework within the National MCM plan. The LSC initiated MCM supply chain operations to support COVID-19 preparedness and response. Supply chain assets and supplies in line with the appropriate response levels of the PHEOC were activated. These supply chain activities per level of activation comprised of the following:

Level I (watch mode), surveillance and monitoring for possible logistics needs of COVID-19 emergency preparedness and response and Level II (alert mode), preparations for responding to the potential COVID-19 crisis. In level I & II, the LSC through using risk mapping information from surveillance teams identified high risk level districts with PoEs (figure 5). These districts were categorized into three based on risk of importation of COVID-19; Category 1 (all border districts, these were 40 in number), Category 2 (all districts along the transnational trunk roads connecting PoEs) and category 3 (the rest of the districts in the country). A special consideration was also given to districts at critical PoEs and points of congregation (Entebbe, Kampala, Wakiso, Busia, Tororo/Malaba, Katuna, Cyanika), and all districts with RRHs and National Influenza Center (NIC) sentinel sites (Kabale, Jinja, Lira, Fort portal, Mbarara) and any other emerging districts at risk.

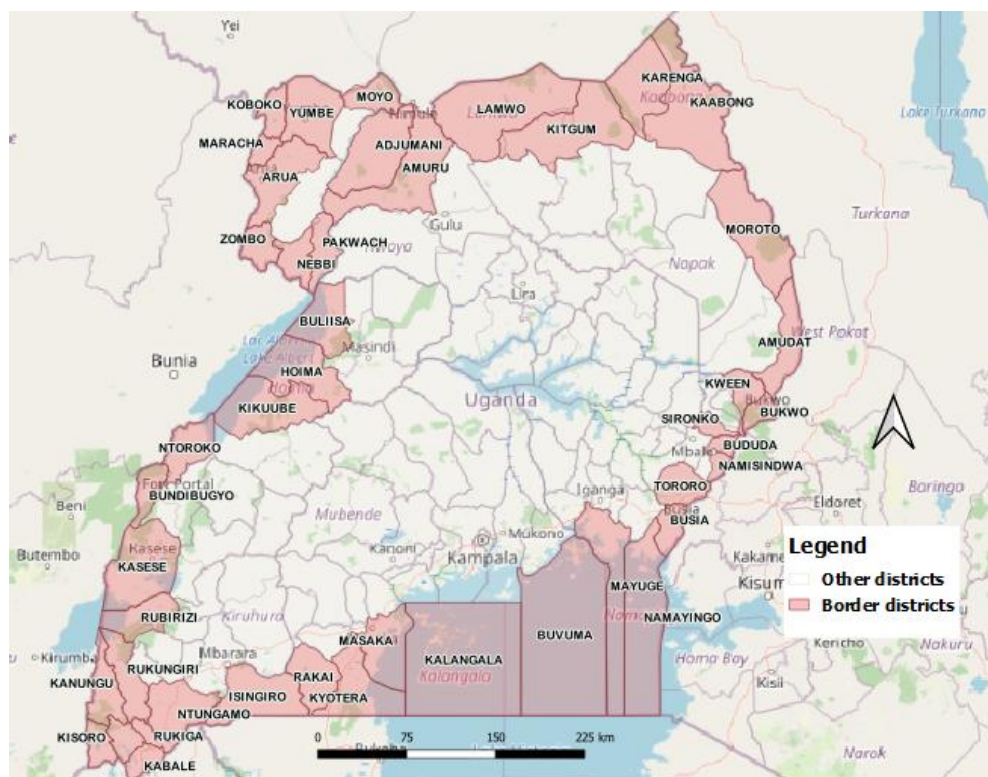


Figure 5: Map of Uganda highlighting the border districts (Category 1)

Source: Uganda national COVID-19 preparedness and response plan, 2020

District logistic subcommittees (DLSCs) in these high risk level districts with points of entry were activated. These DLSCs are composed of trained health staff at the district

level in the area of PHE supply chain management. These supported continuous assessment of COVID-19 logistic needs for the districts through lower level quantification

and forecasting. Reports for district current stock-status of COVID-19 emergency supplies and orders were routinely submitted to the LSC through the eELMIS a designated information system for handling the emergency supply chain.

In Level III (response mode) which involves deployment of MCMs as directed by the NTF, the LSC through the NTF mobilized central warehouse (National Medical Stores, Joint Medical Stores) and partners (WHO, World Food Programme, IOM, UNICEF, Global Fund, UNFPA etc.) for COVID-19 emergency supplies, which later were allocated to the district or regional prepositioning center orders then deployed to the districts or regional prepositioning centers respectively. An incident manager appointed at the NTF serves as the focal point for coordinating response activities and the NTF contact for the LSC. Respective Resident District Commissioners (RDCs) are responsible for coordinating all district law enforcement agencies including Uganda Police Force (UPF) and Uganda People's Defense Forces (UPDF) on security and surge capacity for logistics assets and MCM supplies [7].

The LSC was responsible for tracking and documenting all COVID-19 MCM resources throughout the emergency response.

3.2 Quantification, Forecasting, and Pipeline Monitoring for COVID-19 Supplies

This involved planning, forecasting for future demand, and determining quantities and costs of COVID-19 emergency supplies to be procured for both stockpiling during the preparedness and response phase, while taking into account the country's supply chain, service, and resource capacities.

During emergency response, careful logistics planning is critical to ensure that there is no scarcity in ETUs or facilities, as scarcity would result into further epidemic

spread and deaths [8]. Quantities of MCMs to stock pile and supply to districts must only be made after careful assessment and use of the right quantification methodologies [9].

As part of the LSC's mandate, the LSC kick started off the quantification process by developing an initial incident-specific MCM requirement list of medicines and medical supplies, medical equipment etc. for COVID-19 that are available for immediate deployment to the identified high risk level districts with PoEs, Public Hospitals and Quarantine centers.

MoH's procurement agencies and central warehouses (NMS & JMS) together with partners (WHO, USAID, WFP, IOM, UNICEF, Global Fund, UNFPA etc.), worked with the LSC, prepositioning centers, District LSCs through the Quantification and procurement planning unit (QPPU) and technical support from UHSC to conduct an MCM gap analysis that guided acquisitions or requests to drive the deployment of COVID-19 MCM assets and supplies with clear verification and evidence of need.

National Medical Stores (NMS) is a government-owned agency that supplies Essential Medicines and Health Supplies (EMHS) to all government health facilities using a combination of a "pull" ordering system and "push" system. Joint Medical Stores (JMS) is a private not-for-profit medical supplier owned by the medical bureaus, which provides medicines for PNFP facilities using a pull-based distribution system [10].

Through the eELMIS which is the main information system for the emergency supply chain in Uganda, central warehouses and partners declared their stock status and available contribution in terms of COVID-19 emergency supplies to the LSC [11]. This guided and supported the LSC to address the MCM gap between stock-on hand verses outbreak requirement, and allocating orders from regional prepositioning centers and districts to suppliers (NMS, JMS and partners) (figure 6).

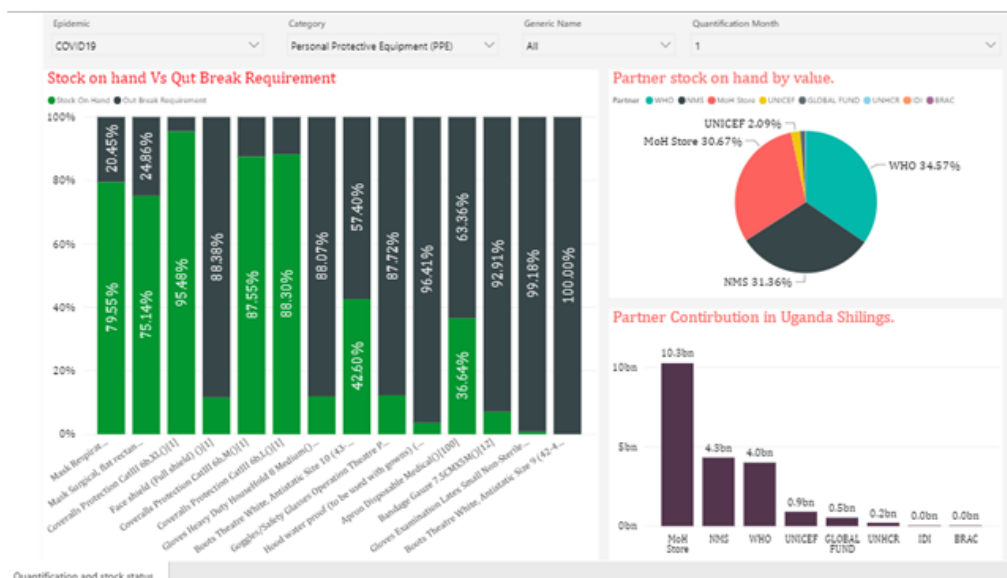


Figure 6: Dashboard from the eELMIS showing COVID-19 stock gap and partner contribution as of 6th October 2020 Source: eELMIS

With guidance from an existing framework of guidelines for managing MCMs for public health emergency in Uganda and a clearly streamlined quantification methodology (figure 7), the QPPU used the following assumptions for quantification and stockpiling: Average disease incident rates and a record of the risk level of districts especially districts with PoEs; Quantities of COVID-19 commodities available at the prepositioning centers and district stores; Commodity consumption rate

for COVID-19 outbreak; Lead time and stockpile period; National guidelines for management of COVID-19; Standard test menu, techniques, and list of supplies for health laboratories in Uganda as outlined in the National COVID-19 preparedness and response plan Laboratory manual and lastly the anticipated burden COVID-19 is likely to inflict on the health system and surrounding communities.

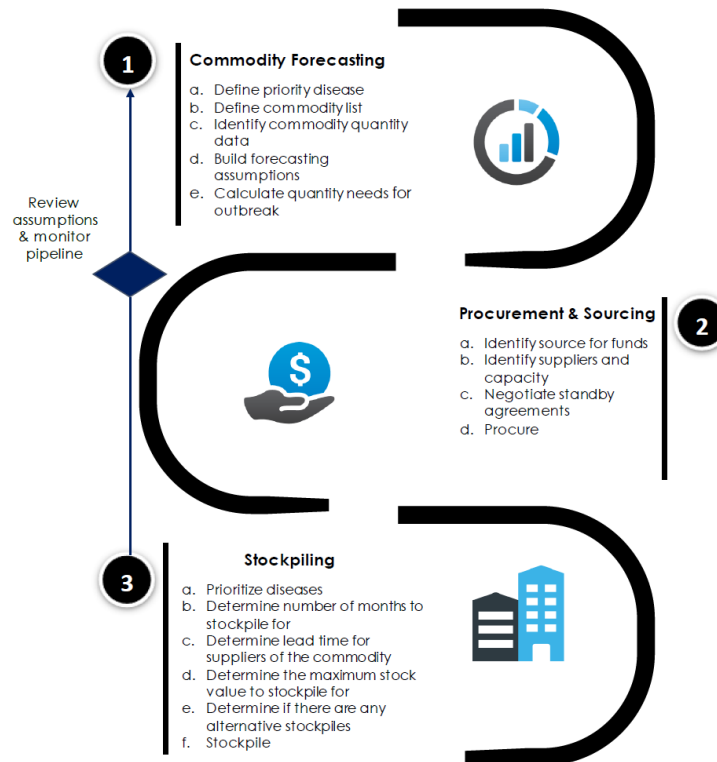


Figure 7: Steps in Quantification of COVID-19 supplies for preparedness and response

Source: Uganda guidelines for Managing MCMs, 2019

As a part of continuous support to review quantification needs and specifications of Infection Prevention and Control (IPC) supplies and Personal Protective Equipment (PPE), members from the QPPU participated in the case

management pillar and scientific advisory committee meetings to review assumptions for IPC requirements e.g. Oxygen and other supplies (Figure 8)

23	National Forecast requirement by Pillar				
24	Requirement (1 month)	Requirement (3 months)	Requirement (6 months)	Comment	
25	Case Management PPE	1,490,549,928	28,607,968,971	59,798,569,862	
26	Case Management Treatment	28,113,278	539,573,378	1,127,856,263	
27	Case Management Oxygen requirements	90,455,850,560	97,373,543,080	100,832,389,340	UGX 87 billion is for one off purchase of equipment.
28	IPC	28,982,871,362	75,584,927,167	145,488,010,874	
29	Surveillance including POEs	5,432,456,182	10,245,916,058	17,466,105,871	
30	Laboratory**	54,277,882,616	162,833,647,847	325,667,295,693	
31	TOTAL (UGX)	UGX 180,667,723,926	UGX 375,185,576,500	UGX 650,380,227,904	
32	TOTAL (USD)	\$ 48,829,114.57	\$ 101,401,507.16	\$ 175,778,439.97	
33	**Lab requirement Includes the need for UBTS which is 14,944,760,400 billion for 6 months				
47					
48	National funding gap per category				
49	Row Labels	Sum of 1 month Gap [UGX]	Sum of 3 month Gap [UGX]	Sum of 6 Month Gap [UGX]	Comment
50	Biohazardous Waste Management	129,856,541	571,097,178	1,274,366,397	
51	Blood Collection and Testing Reagents	-	5,472,380,200	12,944,760,400	
52	Disinfection Consumables	3,773,114,817	14,032,354,623	30,227,452,721	
53	Drugs and Medical Consumables	42,585,147	583,191,877	1,206,292,065	Includes commodities for COVID-19 treatment
54	Medical & Non-Medical Equipment	4,925,733,684	5,770,846,184	6,951,414,934	
55	Personal Protective Equipment (PPE)	3,461,001,062	17,203,956,913	82,221,173,652	
56	Oxygen equipment and consumables	61,657,162,960	68,574,855,480	72,033,701,740	Tripple packaging
57	Test Kits & Lab consumables	3,810,980,294	44,216,075,197	192,974,633,022	includes lab consumables
58	Grand Total	UGX 77,800,434,505	UGX 156,424,757,652	UGX 399,833,794,931	

Figure 8: example of a summary of quantification done by QPPU for COVID-19 MCMs required by each pillar

Through support from the existing national and regional coordination teams who are also trainers of trainers (ToTs) in PHE supply chain management, the LSC provided continuous support to districts in compilation of quality orders, use of the eELMIS to track district stock-status and any other logistic technical support. This technical support was also extended to partners like NMS, JMS, WHO, UNICEF, UNFPA etc. on the use of the eELMIS.

LSC meetings were held every day at the Emergency Operations Center (EOC) where the QPPU gave updates to the stakeholders on the stock-status, quantification, procurement tracking or pipeline stock information of COVID-19 emergency supplies in the country. Partners and other stakeholders also gave updates about their logistics support to the COVID-19 response. A COVID-19 emergency stock gap report was compiled for both the Incident commander and Commissioner Pharmacy department for planning and informing budget allocations.

The LSC through the chair logistics sub-committee, as one of its weekly deliverables, prepared a report to the Minister for Health on a weekly basis. The minister later presented this weekly logistics report to the cabinet to give the country direction on the COVID-19 emergency response.

Activation of the eELMIS System (Supporting facilities, districts, partners to have access and use)

One of the determinants of a functional supply chain system is presence of a robust information system to track movement of MCMs from central warehouses to regional prepositioning centers (nodes), districts stores then lastly to ETUs and also track routine transactions at every level (national, regional, district and facility) of the supply chain.

The PHE supply chain system is supported by a robust electronic information system known as the electronic Emergency Logistics Management Information System (eELMIS). The eELMIS is a MoH web-based tool that tracks real time emergency transactions of orders, receipts, issues and reports of emergency supplies. It facilitates receiving and responding in real time to node, district or facility (ETU) orders for MCMs in any public health emergency [11], [12]. Through this tool, health facilities and partners at the national, regional, district, and facility levels can enter their emergency stock requests into the system. The LSC then processes the orders through the EOC (figure 9). In addition, through the eELMIS, different donors, like UNICEF, WFP, Red Cross, among others, are able to coordinate and share information on commodities electronically to support the response operation. This creates transparency and accountability, and prevents duplication of efforts.

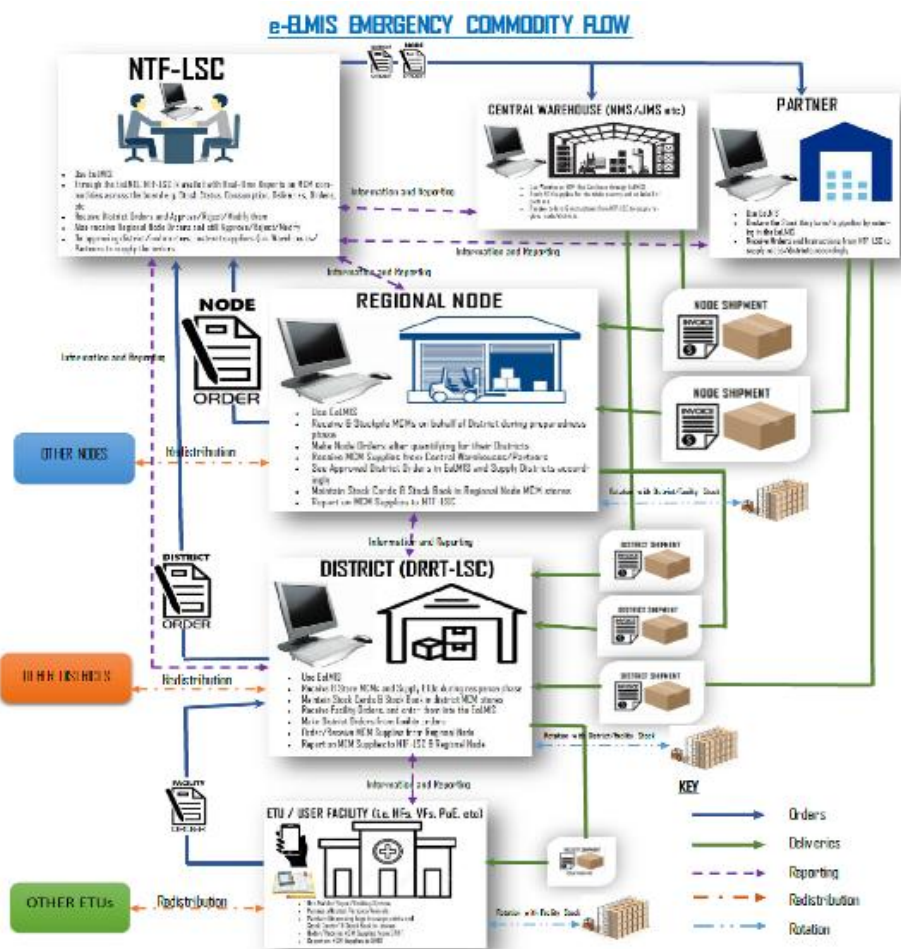


Figure 9: eELMIS COVID-19 emergency Commodity Flow

Source: Uganda guidelines for Managing MCMs, 2019

During Uganda's COVID-19 emergency preparedness and response, the eELMIS was one of MoH's strongest assets. Through using the eELMIS the LSC was able to execute its logistic coordination role especially the quantification function and coordination of all stakeholder contribution i.e. donors, partners to the dot.

Through the eELMIS, the LSC was able to effectively track and coordinate COVID-19 treatment centers and prepositioning sites for MCM orders. Emergency Orders for COVID-19 supplies for all the 17 Regional Referral

Hospitals (RRH) were processed through the eELMIS and deliveries made to the respective hospitals. In addition to the RRHs, all public hospitals in 136 districts had their orders for supplies such as PPEs administered through the eELMIS (figure 10). Six (6) prepositioning sites (Mbarara, Masindi, Arua, Kasese, Mbale, Entebbe, Kotido and Lira) were remotely supported on the eELMIS to submit their orders through the e-ELMIS to the LSC. However, only Arua prepositioning center was fully functional during this time of the response.

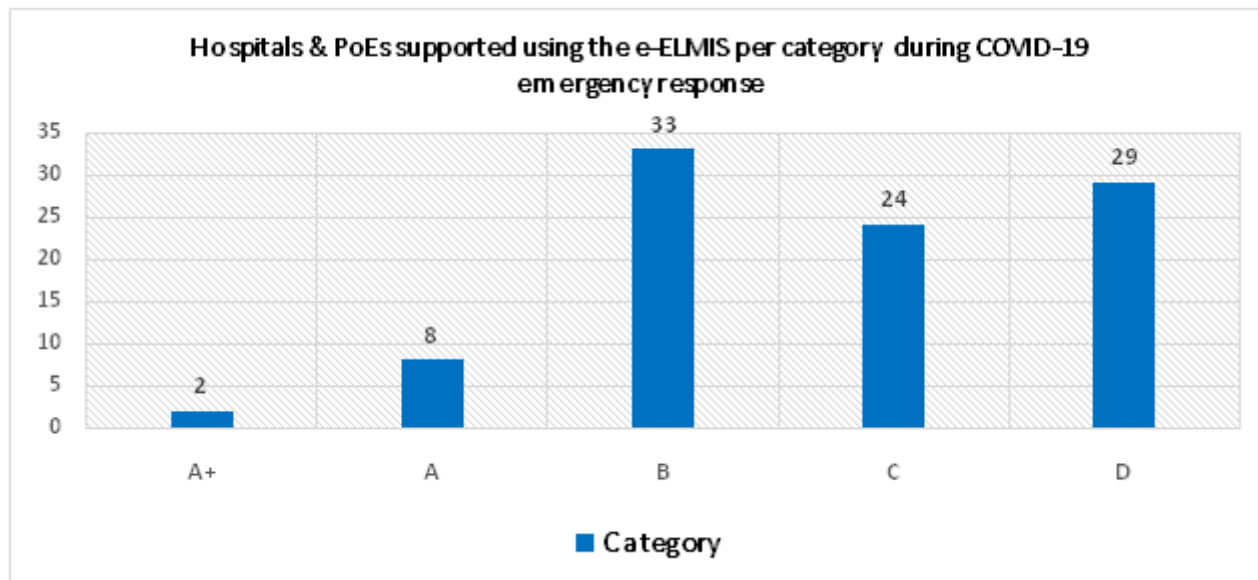


Figure 10: Hospitals and PoEs supported using the e-ELMIS per category during COVID-19 emergency response

Source: LSC report, May 2020

All high risk level districts with PoEs (Category A & A+) routinely updated their stock status and made orders for their COVID-19 supply needs through the eELMIS. These requests were approved at the LSC and deliveries of COVID-19 commodities made. From the risk mapping done by the MoH surveillance team, 75 boarder points of entry were identified. All districts (category B, C, D) with no eELMIS accounts, access accounts were created for the DLSC commander who is also the District Health Officer (DHO) and the district stores focal person in each district. These supported routine updating of the COVID-19 stock status in the eELMIS and submitting their orders when necessary as advised by the NTF.

The eELMIS also supported tracking of COVID-19 supply procurements initiated by donors, Global Alliance for Vaccines & Immunization (GAVI), Global fund, Islamic development fund, World Bank, UNITAID, UNICEF, CNOC, Belgium development Agency (ENABEL), United Arab Emirates (UAE), Private Sector Foundation Uganda (PSFU), US Defense Threat Reduction Agency (DTRA), FreO2 foundation, Dragon Deeds LLC and Government of Uganda (GoU) among others.

Through technical support from UHSC, the LSC routinely supported the functionality of the eELMIS. Continuous review and harmonization of the catalogue list for COVID-19 commodities was done. In addition to that,

routine system queries from the field (frontlines) were attended to through troubleshooting.

With the eELMIS monitoring Uganda's PHE supply chain system back to back at all levels i.e. National, Regional, District, and ETU level during COVID-19 emergency response, the earlier feared unprecedented challenges likely to be posed by COVID-19 pandemics on health supply chain systems of developing countries as forethought by Ivanov, D. (2020) [4] in his paper "Predicting the impacts of the epidemic outbreak on global supply chains", were almost unheard of.

Capacity building at National, Regional, district and facility levels in PHE SCM and eELMIS use for COVID-19 response

Uganda's COVID-19 supply chain emergency preparedness and response has been leveraged on earlier efforts of 2018 and 2019 of streamlining Uganda's PHE supply chain system in preparing for the likely Ebola threat from DRC. As part of the Ebola preparedness efforts, a capacity building drive to strengthen PHE supply chain coordination teams at all levels i.e. National, Regional and District levels in the then new area of PHE SCM and use of the eELMIS had been successfully executed. A total of 770 core health professionals at the national, regional and district level had been successfully trained to form the core of the national coordination team,

regional coordination team and the district coordination team (figure 11). These were also trained to be Trainers of trainers (ToTs) for Uganda in the area of PHE SCM and

eELMIS use, only waiting to be called upon in case of any epidemic outbreak.

Coordination level category	No. of participants
1. National coordination team	25
2. Regional coordination team	66
3. District coordination team	679
TOTAL	770

Figure 11: Number of core health professionals trained per coordination level in PHE SCM and eELMIS use in 2019

Source: Primary source

During the current COVID-19 epidemic outbreak in Uganda, through use of already existing structures and frameworks of PHE supply chain system coordination, the LSC called upon these ToTs to support the present PHE SCM & eELMIS capacity building needs of the COVID-19 emergency preparedness and response. Some of the activities done under COVID-19 capacity building drive included: Supporting NMS staff on how to manage COVID-19 commodities and building their capacity to process COVID-19 orders generated in the eELMIS after approval by the NTF. Access accounts for the e-ELMIS were created for NMS staff and NMS stock-status for COVID-19 emergency supplies made up to date in the eELMIS to improve visibility and transparency at the national level.

Other partners including UNICEF, WHO, WFP, UNFPA were trained in the eELMIS and given access accounts to track their stock-status and have it reflected in the system. This helped the LSC in tracking partner contribution solve the COVID-19 emergency stock gap.

Furthermore, 17Regional Referral Hospitals (RRHs) were supported in eELMIS use. Access accounts were created for the pharmacists (responsible for logistics). These were trained how to track their stock-status and how to make COVID-19 emergency orders and submit them in the eELMIS system.

In addition to RRH support, 14 National Task Force LSC members were trained in the eELMIS NTF module and given access rights. They were trained on use of the eELMIS dashboard for high level presentation of updates on what's transpiring in terms of COVID-19 logistics in the country. They were also oriented in the eELMIS order

functionality to enable them see and track orders or requisitions that have come through for COVID-19 emergency supplies.

The capacity building efforts are continuous and still ongoing by the LSC

Activation of Regional prepositioning centers for stockpiling COVID-19 supplies

One of the measures of how functional a PHE supply chain system is, is its minimal response time to deliver PHE supplies to frontlines to contain an outbreak [13]. Having in place established prepositioning centres or stockpiling centres or nodes for emergency commodity stock piles, expedites movement of MCMs to ETUs to facilitate on time response for both timely treatment of infected patients to break the pattern of further spread and also protection of health workers.

In 2016 a Joint External Evaluation (JEE) was conducted by WHO in a bid to improve Uganda's capacity to manage public health emergencies. One of the recommendations that came out in the Global Health Security Agenda (GHSA) report (2017) after the JEE was to establish a National stockpile strategy for Uganda [17].

In 2019, eight (8) prepositioning centres (nodes) were identified and established in 8 regions of Uganda to enable timely delivery of needed emergency supplies in a decentralised response approach. Each prepositioning centre serves an average of 18 districts around it in a radius of 0km up to 200km (figure 12). These were identified and established also as part of the Ebola preparedness efforts in 2019.



Figure 12: Uganda’s established 8 regional prepositioning centres

Regional prepositioning centres: Arua district store, Kasese district store, Kotido district store, Lira district store, Masindi district store, Mbale district store, Mbarara district store, and Entebbe (NMS)

Source: National Stockpile strategy report, 2019

As part of Uganda’s COVID-19 emergency preparedness and response, regional prepositioning centres were computerised. Through technical assistance from UHSC program and USAID a computer was installed in each prepositioning centre and connected to internet to enable easy connection to the eELMIS.

Support was also given to the node stores focal persons in use and access to the eELMIS. Active access accounts were created for the stores focal persons and the node commander who is the resident DHO of the district in which the prepositioning centre is situated.

Furthermore, during the COVID-19 emergency response, the LSC supported the NTF in effectively tracking and coordinating prepositioning centres for timely quality

COVID-19 commodity orders. The prepositioning centres were supported to update their stock status in the eELMIS and also compile regional orders and submit them through the eELMIS to be processed at the NTF.

Regular reporting and Data Visibility

Keeping the country informed of the current logistics situation on COVID-19 response was one the key roles of the LSC. This role could only be executed with a robust information system providing real time back to back tracking of logistics activities at every level of the PHE Supply Chain and necessitating data visibility.

The eELMIS provided daily reports to the LSC on the country’s emergency stock-status or stock on hand versus the outbreak requirement amount to provide a stock gap analysis to support in top management decision making (figure 13). Added to that, the eELMIS provided a high level presentation of partner contribution in terms physical COVID-19 logistics needs and monetary value (figure 4 above)

PHARMACEUTICAL INFORMATION PORTAL [PIP]		Ministry of Health	
Data Source: EELMIS Data		Pharmacy Division	
National Emergency Supplies Gap Report			
Indicator Key			
Quantity on hand >= 100% of Required stock			
100% < Quantity on hand > 70% of Required			
70% < Quantity on hand > 40% of Required			
Quantity on hand < 40% of Required stock low			
		4 month(s)	
Unit	Pack size	Unit cost (USD)	Unit cost (UGX)
Disinfection Consumables / Biohazardous Waste Management	Gloves Examination Latex Small Non-Sterile[100]	6.00	26,326.00
	Sodium Hypochlorite 6% 5LTR[1]	8.00	30,400.00
Drugs and Medical Consumables	Amoxicillin* 250mg(Capsule)[1000 -]	1000	45,834.00
	Erythromycin Stearate* 250mg(Tablet)[1000 -]	1000	101,446.00
	Ibuprofen* 200mg(Tablet)[1000 -]	1000	13,779.00
	NaDCC* 67mg(Tablet)[1 -]	1	25,840.00

Figure 13: example of emergency stock gap report auto-generated by the eELMIS

Source: eELMIS

Data provided by the eELMIS helped the LSC prepare reports to the Health Minister on a weekly basis, which the minister presented to the cabinet to make top level executive decisions on mobilizing for more COVID-19 logistic resources [11].

4. Discussion

After declaration of COVID-19 outbreak in Uganda on 21st March, MoH activated the NTF and the PHEOC to a response level. All operations were guided by the National COVID-19 preparedness and response plan in place at the time, clearly stipulating out the general strategy and activities to be implemented at each COVID-19 response pillar. With a focus on the 6th Pillar (Logistics pillar), this study looked at Uganda's PHE supply chain system in detail in relation to COVID-19 emergency preparedness and response. An earlier study done by Ivanov, D. (2020) [4] on the effect of the COVID-19 pandemic on global health supply chains revealed a devastating effect the COVID-19 pandemic had caused to supply chain systems of developed countries such as USA, Italy, and Spain among others. Results of this study were further supported by an earlier study done by Calnan et al (2018) [14] who assessed how the Ebola epidemic had negatively impacted global health logistics, calling upon countries to build new frameworks of managing supply chain risks. Wasswa J.H et al (2020) in their study, again highlighted epidemics as a special case of health supply chain risks that must be given attention during risk management planning [8]. Therefore basing on those earlier experiences, Ivanov, D (2020) [4] predicted that the likely impact of the COVID-19 epidemic to health supply chain systems of developing countries like Uganda would even be more devastating. As per the time of writing this paper, it can however be noted that unlike earlier predictions, Uganda's health supply chain system has coped with the COVID-19 epidemic outbreak quite well compared to other African countries and other developing countries outside Africa. This can be attributed to earlier investments Uganda made in its PHE supply chain system during the Ebola preparedness in 2018-19. Through support of USAID and other partners such as UHSC, Uganda's first PHE supply chain system was established in 2019. Uganda is currently leveraging on those earlier efforts in the wake of COVID-19 epidemic outbreak. Hospitals, quarantine centers, PoEs have been able to have a steady supply of MCMs without a breakage. Stock levels at all levels i.e. national, regional, district and ETU level have been constantly monitored through the eELMIS. In addition to that, Stock gap analysis reports have been readily available through the eELMIS to support resource mobilization by the LSC and NTF.

5. Conclusions

Leveraging on the earlier investments in Uganda's PHE supply chain system during Ebola preparedness in 2018-19, the COVID-19 pandemic outbreak has provided a stun on-field test for Uganda's young PHE supply chain system giving it an opportunity to close all the gaps not earlier well-known, and consequently making it even stronger for future epidemics.

This paper therefore shares Uganda's experiences and future lessons from which other countries' health supply chain systems can learn from.

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Author's Contributions

All authors contributed to the write up of this paper.

Ethics Issues

Not applicable

Conflict of Interest

The Authors declare no conflict of interest

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