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UGANDA HEALTH SUPPLY CHAIN PROGRAM

Final Report

2014–2020

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Management Sciences for Health

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About UHSC

The US Agency for International Development (USAID)-funded Uganda Health Supply Chain (UHSC) program's aim is to contribute to improving the health status of the Ugandan population by increasing the availability, affordability, accessibility, and appropriate use of good quality essential medicines and health supplies.

Recommended Citation

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Cover photo: Harriet Akello, Pharmacist at Arua Regional Referral Hospital, in a well-organized medicine store. Shelves were provided by the UHSC program. Photo credit: Rachel Nandalenga.

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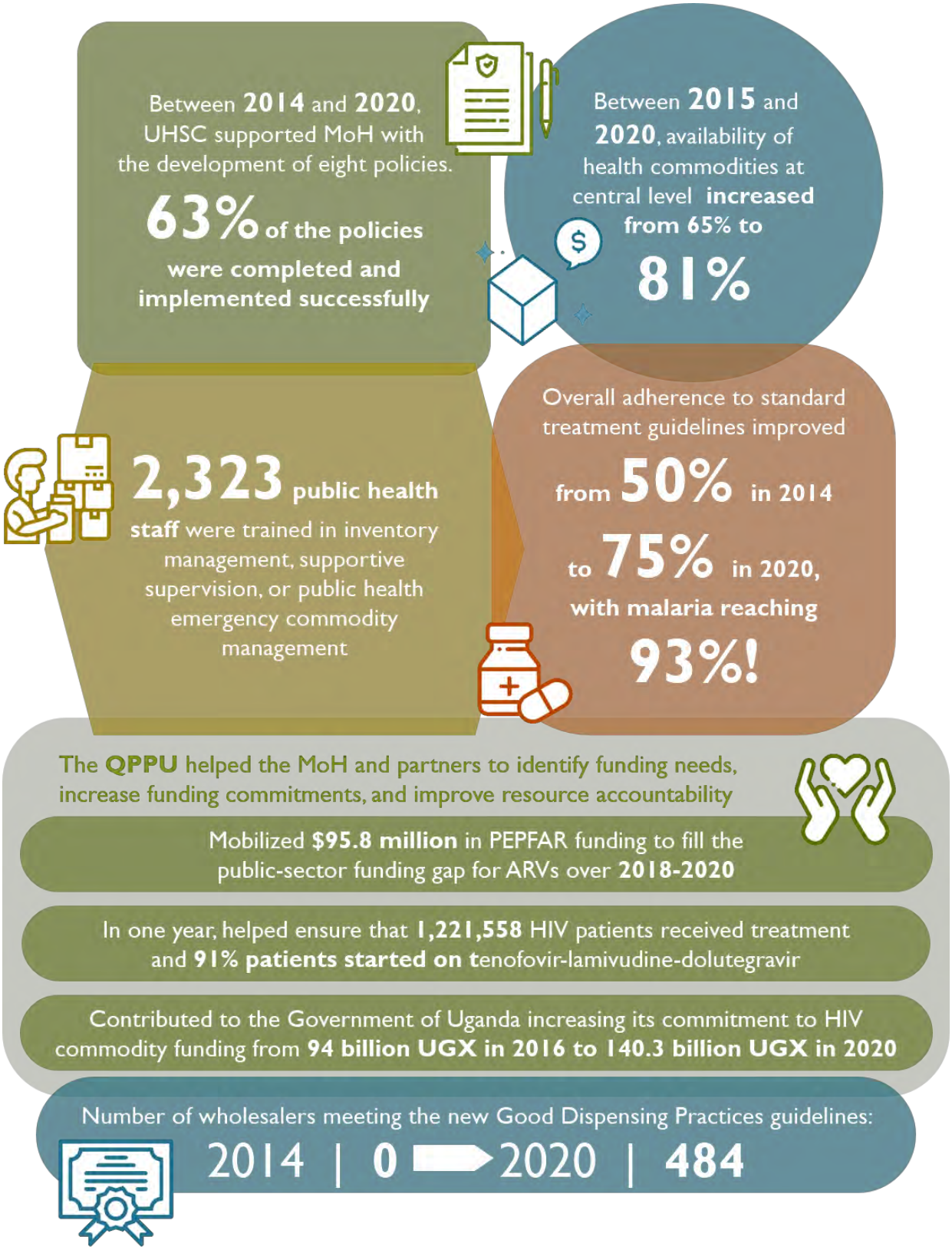
Acronyms and Abbreviations

ACT	artemisinin-based combination therapy
AMR	antimicrobial resistance
ART	antiretroviral therapy
ARV	antiretroviral
GPP	good pharmacy practices
HC	health center
JMS	Joint Medical Store
MMS	medicines management supervisors
MOH	Ministry of Health
MTC	medicines and therapeutics committee
NDA	National Drug Authority
NMS	National Medical Stores
PEPFAR	US President's Emergency Plan for AIDS Relief
PFM	pharmaceutical financial management
PIP	pharmaceutical information portal
PNFP	private not-for-profit
QPPU	Quantification and Procurement Planning Unit
RMNCAH	reproductive, maternal, newborn, child, and adolescent health
SKU	stock keeping unit
SOP	standard operating procedure
STGs	standard treatment guidelines
SPARS	supervision, performance assessment, and recognition strategy
SURE	Securing Ugandans' Rights to Essential Medicines [Program]
TB	tuberculosis
TWOS	tuberculosis web-based ordering system
UGX	Ugandan shilling
UHSC	Uganda Health Supply Chain [Program]
UNHLS	Uganda National Health Laboratory Services
USAID	US Agency for International Development
WAOS	web-based ARV ordering system
WHO	World Health Organization

UHSC Performance Highlights



Introduction

The Uganda Health Supply Chain (UHSC) program, funded by the US Agency for International Development (USAID), aims to assist the Government of Uganda's commitment to improve the health status of the Ugandan population by increasing the availability, affordability, accessibility, and appropriate use of good quality essential medicines and health supplies (EMHS).

The six-year (2014–2020) $39 million cooperative agreement was implemented by Management Sciences for Health (MSH) in collaboration with Harvard University/Harvard Pilgrim Health Care, Euro Health Group, Imperial Health Sciences, Health Promotion and Social Development, and Makerere University College of Health Sciences.

The program built on the achievements and lessons learned under USAID's Securing Ugandans' Rights to Essential Medicines (SURE) program, which ended in 2014. This program focused on health system strengthening to ensure the availability of and equitable access to EMHS and contributed to the achievement of Uganda's national health and development goals.

Vision

The UHSC vision was that by the end of the program, Uganda's supply chain management capacity will be built at all levels; optimized systems will be more efficient, effective, and transparent; management will be stronger due to evidence-based decision making; and affordability will be improved. In addition, the Ministry of Health (MOH) will have taken ownership of and responsibility for the EMHS supply chain, and will have the necessary tools, approaches, skills, and coordinating mechanisms to allow the government to maintain and expand on USAID's investments.

Scope

In addition to the interventions to strengthen central-level institutions and processes, UHSC carried out activities in 135 districts over the duration of the program. Interventions were designed for central, district, and facility levels, from strengthening the management of EMHS at health facilities nationwide to preparing the country's supply chain to respond to a public health emergency.

Approach

To achieve the program's vision, UHSC investments focused on improving supply chain management practices and outcomes at all levels of the system by introducing new supply chain strategies, appropriate tools, policies, and procedures that improve efficiency and transparency, promote effective collaboration, and provide evidence to guide and implement policy change.

These interventions were applied across five specific objectives:

- Improve Uganda's policies and strategies to support cost-effective, equitable, and transparent use of available EMHS resources
- Strengthen country capacity for effective management and use of EMHS
- Increase the availability of and access to reproductive, maternal, newborn, child, and adolescent health (RMNCAH) commodities for priority populations
- Support the scale up of the HIV/AIDS response
- Strengthen the national supply chain for outbreak and epidemic preparedness

By achieving these objectives, UHSC and other EMHS stakeholders helped bolster the pharmaceutical systems and practices in Uganda, providing Ugandans with better access to lifesaving medicines. To ensure the sustainability of these achievements, MOH staff from the Pharmacy Department and technical programs, district-level health managers, and providers were an integral part of designing and implementing UHSC activities.

Result 1. Improve National Policies and Strategies on Using EMHS Resources

Policy development, from concept to actual implementation, is a lengthy process that requires a high level of coordination and engagement among key stakeholders. UHSC helped mobilize key stakeholders and actively contributed technically and financially to the development, dissemination, and implementation of several important pharmaceutical sector policies.

Resource Allocation Equity

In 2014, research had highlighted the inequity of EMHS funding among different health facilities. As a result, awareness was raised about the importance of managing and tracking EMHS funding and budgets at both the MOH and at health facilities.

By end of the program, UHSC had advocated for and facilitated a review of the existing resource allocation formula, which resulted in the establishment of a multisector Medicines Equity Task Force led by the Pharmacy Department. This task force recommended a formula that would guarantee facilities a fixed proportion (30%) of EMHS resources to enable them to function, while distributing the remaining proportion (70%) based on patient load.

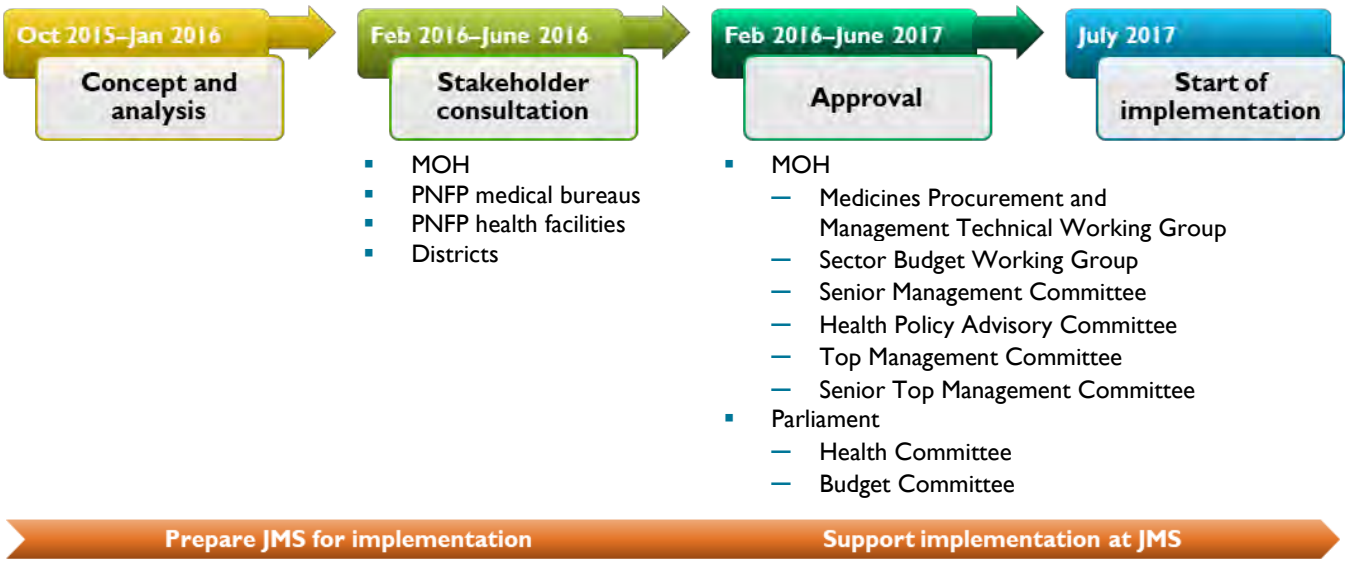
UHSC oriented medicines management supervisors (MMS) across the country on the new formula, and the National Medical Stores (NMS) started implementing it in four districts. Equity performance is now monitored using the "equity index" developed by UHSC, as a key monitoring and evaluation indicator for the National Pharmaceutical Sector Strategic Plan 2015–2020. Annual measurements are made of vertical and horizontal equity in allocations of government and private not-for-profit (PNFP) sector funding. UHSC study data provided baseline measurements.

Private Not-for-Profit Sector Credit Line

At the start of the program, PNFP facilities were receiving a primary health care grant as a government subsidy. The grant was previously sent directly to the health facilities, and although at least 50% of it was to be used for the purchase of EMHS, in reality, 35% was spent on other things. Moreover, facilities had been purchasing commodities from different sources, including private pharmacies, at higher prices and of unassured quality.

During the life of the program, UHSC supported the establishment of a credit line at the Joint Medical Store (JMS) for PNFP facilities to purchase EMHS with the primary health care grant proceeds (Figure 1). The rationale for establishing a credit line was to ensure the optimal use of available funds through pooled procurement and, therefore, access to more competitive prices of quality-assured commodities. To prepare for implementation, UHSC worked with JMS and PNFP medical bureaus to develop an implementation plan, monitoring and evaluation plan, and communication plan. UHSC also consulted with the MOH to create a list of all PNFP facilities eligible to benefit from the credit line. With input from PNFP health facilities and the medical bureaus, UHSC finalized the list of EMHS that would be available through the credit line and shared it with the MOH. In 2014, the Ugandan shilling (UGX) 7.4 billion credit line was launched for 539 PNFP facilities, replacing the system that had been in place since 2003. This credit line signaled a major milestone of the joint efforts of the UHSC, PNFP, JMS, Kampala City Council Association, diocese officials, and others to establish a cost-effective and transparent EMHS procurement mechanism for PNFP facilities. The EMHS credit line for PNFPs brings complete visibility and accountability to how Government of Uganda primary health care funds are spent in this sector. By 2020, 100% of the facilities had placed orders through the private health care grant and JMS had fulfilled 99% of them. This smooth implementation was made possible by UHSC's assistance to JMS to process facility orders, follow-up on deliveries, conduct product price reviews, and collate information for the JMS' financial accountability reports to the MOH.

Figure 1. Process to establish the PNFP credit line



Push-Pull Distribution

The MOH conducted a comprehensive evaluation of the EMHS kit supply system in 2013 at lower-level health facilities, health center (HC) II, and HC III. The evaluation showed that most items were either under- or over-supplied, with only about 20% of items adequately supplied. This finding was not surprising given that kit quantities were not associated with the number of patients served at a specific facility; all facilities at a particular care level received a kit with the same amounts of the same products.

In collaboration with the Pharmacy Department and NMS, UHSC conducted a two-year randomized, controlled, longitudinal three-arm pilot study in 10 districts to assess the feasibility of shifting HC II and HC III facilities from kits to an order-based supply system. Based on the positive results, a group of more than 50 stakeholders agreed to the need to phase in a switch from a push to a pull system for all lower-level facilities, and UHSC developed a scale-up implementation plan.

Research and Advocacy

UHSC published the following research articles in peer-reviewed journals during the program.

Theme series on medicines management in Uganda

- Pharmaceutical system strengthening in Uganda: implementing a holistic, evidence-informed, long-term strategy. *Journal of Pharmaceutical Pharmacy and Practice*, 2018.
- Article 1: Supervision, performance assessment, and recognition strategy (SPARS)—a multipronged intervention strategy for strengthening medicines management in Uganda: method presentation and facility performance at baseline. *Journal of Pharmaceutical Pharmacy and Practice*, 2016.
- Article 2: Longitudinal study assessing the one-year effects of supervision, performance assessment, and recognition strategy (SPARS) to improve medicines management in Uganda health facilities. *Journal of Pharmaceutical Pharmacy and Practice*, 2018.
- Article 3: One-year impact of supervision, performance assessment, and recognition strategy (SPARS) on prescribing and dispensing quality in Ugandan health facilities. *Journal of Pharmaceutical Pharmacy and Practice*. In publication process.
- Article 4: Impact assessment of supervision, performance assessment, and recognition strategy (SPARS) to improve supply chain management in health facilities in Uganda: A national pre and post study. *Journal of Pharmaceutical Pharmacy and Practice.* To be published.

- An exploratory study on equity in funding allocation for essential medicines and health supplies in Uganda's public sector. *BMC Health Services Research,* 2016.
- First regulatory inspections measuring adherence to good pharmacy practices in the public sector in Uganda: a cross-sectional comparison of performance between supervised and unsupervised facilities. *Journal of Pharmaceutical Pharmacy and Practice,* 2016.
- Competency in supportive supervision: a study of public sector medicines management supervisors in Uganda. *Journal of Pharmaceutical Pharmacy and Practic*e, 2017.
- Evaluating inter-rater reliability of indicators to assess performance of medicines management in health facilities in Uganda. *Journal of Pharmaceutical Pharmacy and Practice*, 2018.
- Costs and effectiveness of the supervision, performance assessment, and recognition (SPARS) strategy for medicines management in Uganda. *Journal of Pharmaceutical Pharmacy and Practice*, 2019.
- Inter-rater reliability and validity of good pharmacy practices measures in inspection of public sector health facility pharmacies in Uganda. *Journal of Pharmaceutical Pharmacy and Practice*, 2019.

UHSC also contributed to the following publications:

- Chapter 8: Improving access to high cost medicines in low income countries in Africa: creating a functioning pharmaceutical system in Uganda. In: *Equitable Access to High-Cost Pharmaceuticals,* edited by Zaheer-Ud-Din Babar. 2018.
- Pilot Study of the Order-Based (Pull) EMHS Supply System at Health Center III and HC II Facilities in Selected Districts in Uganda.
- A Needs-Based Allocation Formula for Essential Medicines and Health Supplies in Uganda.
- Strengthening the Uganda Community Health Supply Chain System Strategy and Implementation Plan.
- Technical assistance to review National Medical Stores operations to inform on an optimal cost structure.
- Technical assistance to review Joint Medical Store operations and inform on an optimal cost structure: Report.
- In Respect of a Consultancy to Survey on Antimicrobial Consumption at Joint Medical Stores and National Medical Stores of Uganda for the Year 2017.

Result 2. Strengthen Systems to Manage EMHS

UHSC used a holistic approach to strengthening systems to manage medicines in Uganda. This approach strategically linked regulatory, managerial, financial, and educational interventions at all levels—central to facility—to increase access to quality EMHS.

Joint Medical Store Operational Improvements

Under the SURE program, an assessment of JMS warehouse capacity and procedures, inventory management, procurement, and sales functions had resulted in a list of recommendations for JMS to make its operations more efficient.

UHSC reinforced these recommendations, and a 2018 assessment showed that JMS had implemented 83% of the 60 recommendations, resulting in substantial improvements in operational and financial performance; for example, JMS reduced distribution costs from 5.0% to 2.3% in just six months after implementing recommended changes to transport loading practices, distribution schedules, and routing. With UHSC's continued support, JMS's central warehouse capacity was increased by 2,000 pallet positions, and inventory management efficiency improved with the procurement of shelving racks.

Handover of e-GPP and e-GDP to the National Drug Authority

The National Drug Authority (NDA)–SURE program collaboration to create and implement a good pharmacy practices (GPP) certification for public sector dispensaries and to plan and develop a good dispensing practices (GDP) certification for wholesalers were innovative and potentially high-impact initiatives to increase service and product quality in both the public and private sectors. As of 2014, the NDA had inspected 939 public and PNFP facilities.

By 2020, NDA had inspected 1,837 facilities for GPP certification—a nearly 200% increase since 2014, with 62% meeting certification standards. To roll out GDP, UHSC worked with NDA to orient 300 wholesale pharmacists and owners (61% of wholesale pharmacies) on the new national quality assurance standards and started phasing in GDP inspections in 2015. In 2017, 497 wholesalers were licensed under phase 1 standards. In 2018, 484 of 643 wholesalers received phase 2 licenses, which covers infrastructure standards, complaints, counterfeit handling, and recall procedures; 151 wholesalers were required to take corrective action. UHSC also worked with NDA to digitize the GPP and GDP systems to ease data entry and allow for electronic data quality checks and automated generation of inspection reports. These systems were turned over to NDA, which now manages them independently.

Pharmacy students learning how to use RxSolution. Photo credit: Sheila Mwebaze

Pharmaceutical Management Information Systems

RxSolution Rollout

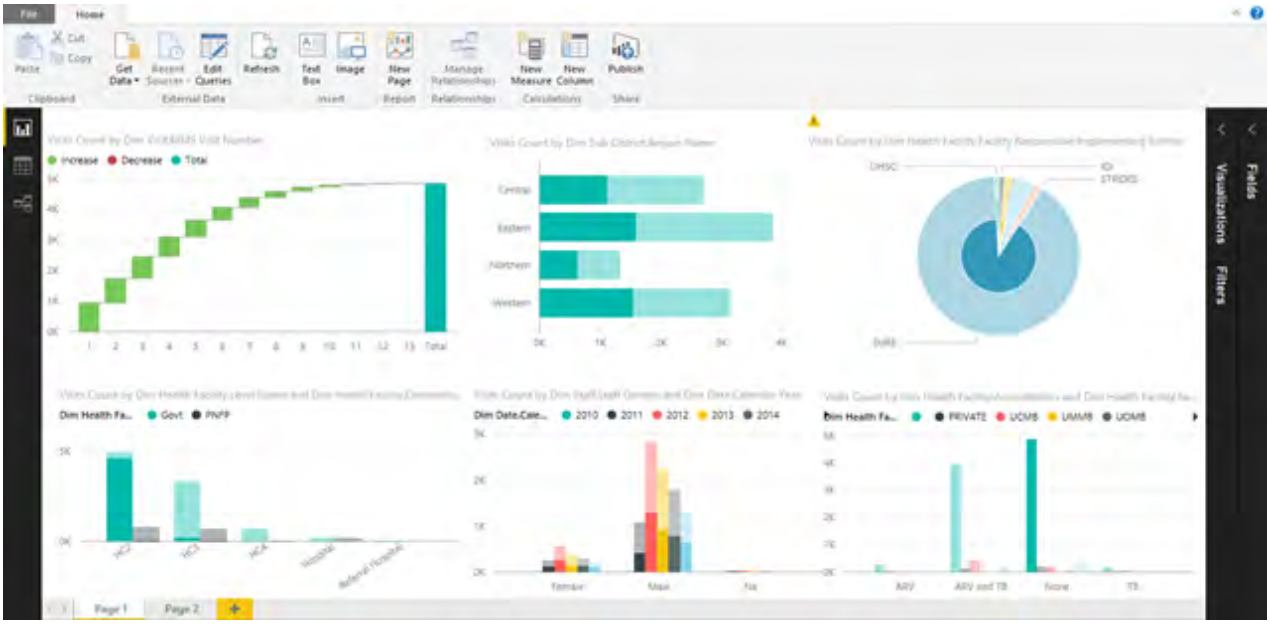
A previous analysis of 16 different electronic medicines management systems led to the MOH selecting RxSolution as the best system for Uganda because of its functionality, potential for supporting dispensing and lab testing, and free usage. By the end of 2014, 92 facilities were using RxSolution to track inventory and generate reports, such as stock status. As of 2020, 277 facilities were using the system, 54 more facilities than the target set for that year (Figure 2).

UHSC improved the RxSolution value and experience by creating a 1,000-item electronic product catalog to ease ordering and reduce errors, achieving real-time stock status synchronization, and creating dashboards in the pharmaceutical information portal (PIP) to help visualize stock data. Implementation responsibility was shifted from UHSC by training more than 100 personnel to provide support, including the MOH help desk and implementing partners. RxSolution was also integrated in the preservice curricula at four Ugandan training institutions through an e-learning course.

Figure 2. Facilities using RxSolution: target vs. actual

Figure 3 shows the PIP's dynamic data visualization capability, where the user can select the data to be analyzed. UHSC integrated several other data streams in the PIP during the program, such as MMS performance and medicines management indicators, which allow users to access information easily from one place. Major advances in data visualization, including customized dashboards with data maps, facilitate informed decision-making, and automated emailing of overstock, understock, expiry, and short-dated item reports allow for quick responsiveness. In 2018, PIP usage doubled thanks to such enhancements. In 2020, UHSC transitioned PIP administration to the MOH Information Technology Unit.

Figure 3. Pharmaceutical information portal



Now that I have access to the PIP, we shall use it to improve our performance as a district, but also to track performance of our MMS.

—Dr. Kiwanuka George, District Health Officer, Gomba

Antiretroviral and Tuberculosis Medicines Web-Based Ordering and Reporting Systems

Problems with HIV-related reporting rates and completeness made it difficult to meet donor requirements. The introduction of the web-based antiretroviral (ARV) ordering system (WAOS) solved this problem and also decreased the central level's time-consuming compilation of facility orders. Of 1,001 accredited antiretroviral therapy (ART) sites, 20% were using WAOS in 2014.

By 2020, 100% of the more than 1,500 accredited ART sites used WAOS. The data have been used to change best practices, such as updating accreditation guidelines to incorporate logistics management capacity standards. UHSC also helped produce Uganda's official ART patient totals by triangulating data from WAOS, the Data for Accountability, Transparency and Impact system, and the DHIS2. These numbers are the basis for forecasting and quantifying national HIV commodity requirements and are key performance indicators for the US President's Emergency Plan for AIDS Relief (PEPFAR) and the Global Fund to Fight AIDS, Tuberculosis and Malaria.

UHSC launched the tuberculosis (TB) web-based ordering system (TWOS) in 2018. After the first year of implementation, reporting using the system averaged 75%. Like WAOS, TWOS data inform evidence-based decisions. UHSC helped the MOH to use data to monitor facility ordering patterns, and to guide the redistribution of medicines and implementation of isoniazid preventive therapy.

WAOS and TWOS provide 100% visibility of facility data on stock levels, orders, and receipts of medicines and diagnostic supplies, which improves managers' ability to make informed decisions.

National Medical Stores and Joint Medical Store ERP

With UHSC assistance, JMS designed and incorporated a stock keeping unit (SKU) system in the enterprise resource planning system (ERP), put standard operating procedures (SOPs) in place, and trained staff. An important step in modernizing supply services, SKUs minimize inventory wastage, enable easy product identification, and allow JMS to increase distribution cost-effectiveness. Another milestone for JMS was the launch of electronic ordering for their customers through RxSolution and the ERP. JMS managers now have full visibility of distribution operations, with a performance indicator dashboard linked directly to their ERP.

A new ERP will help streamline operations at NMS. Photo credit: Sheila Mwebaze

As NMS transitioned to its new ERP, UHSC spearheaded the move, including training and mentoring the NMS change management team to lead the change-over process. UHSC conducted a change readiness and resistance assessment for NMS staff, which informed the development of the NMS change management plan. Documents developed for NMS' internal use included: an organizational impact analysis, training plan, risk assessment and mitigation plan; facility technology and change management assessment report; easy-to-understand explanations of process flows for staff; and communication materials to engage districts and stakeholders for the scale-up. UHSC support wrapped up with a costed five-year change management strategy document for NMS to implement through to completion.

Quantification and Procurement Planning Unit

Since its launch in 2010, the Quantification and Procurement Planning Unit (QPPU) has successfully managed national quantifications, gap analyses, and supply planning in coordination with MOH technical staff from HIV/AIDS, TB, laboratory, reproductive health, and malaria programs. The quantification reports generated have been used to mobilize resources to address gaps and avert stock-outs.

The QPPU continued to operate under UHSC as the central hub for national forecasting, quantification, and for stock status and pipeline monitoring. However, its responsibilities were expanded to cover other categories, such as maternal, newborn, child, and adolescent health; integrated community case management; vaccines; blood; and COVID-19. In addition to acting as an early warning system for stock-outs, the QPPU's stock status reports have improved transparency and stakeholder accountability; for example, QPPU's estimated gap for HIV test kits resulted in the expedited procurement of 30,000 units.

The QPPU tracks EMHS orders and flags risks to product availability. For instance, the delivery performance of two ARV procurement agents from July 2015 to December 2016 was clearly a red flag for using supplier B (Table 1).

Table 1. ARV procurement agency performance: July 2015–December 2016

ARV supplier	No. of orders	On-time delivery	30–59 days late	>60 days late
Procurement agent A	63	36 (57%)	9 (14%)	18 (29%)
Procurement agent B	8	0 (0%)	5 (63%)	3 (37%)

QPPU-generated data and analyses had significant financial implications and prevented stock-outs of lifesaving EMHS. The QPPU:

- Reviewed Global Fund procurements and found $14 million in savings from procurement and supply management costs and products, which was used to avert a predicted stock-out of ARVs.
- Produced an analysis showing a $9.2 million gap for commodities under the HIV test and treat program. PEPFAR provided $11.2 million to procure the needed products.
- Predicted ARV and lab supply deficits, and based on the QPPU's quantifications and supply plan, the Global Fund provided emergency funding of $26.6 million for ARVs and $10 million for lab supplies.
- Created procurement and supply management savings of $20.7 million, which were used to procure additional underfunded commodities, such as ARVs and HIV test kits.

Civil society collaboration on choosing a first-line treatment for pregnant women

UHSC worked closely with the AIDS Control Program, National Advisory Committee on HIV, development partners, and a civil society group, Women Living with HIV, to resolve an issue regarding access to the new ART regimen containing dolutegravir (DTG) that Uganda had adopted as the preferred first-line treatment. Preliminary results from a Botswana study showed an increased risk of neural tube defects in babies born to women taking DTG. As a result, most, if not all, African countries decided to exclude women of reproductive age from using DTG while awaiting guidance on the issue from the World Health Organization (WHO) in March 2019. In the meantime, Women Living with HIV insisted that all women needed to be given a choice about

whether to use DTG, because it has fewer side effects than efavirenz used in the current regimen. UHSC worked with the AIDS Control Program to develop SOPs to guide health workers on how to implement the solution agreed upon, which was to obtain informed consent should a woman of reproductive age choose to use DTG.

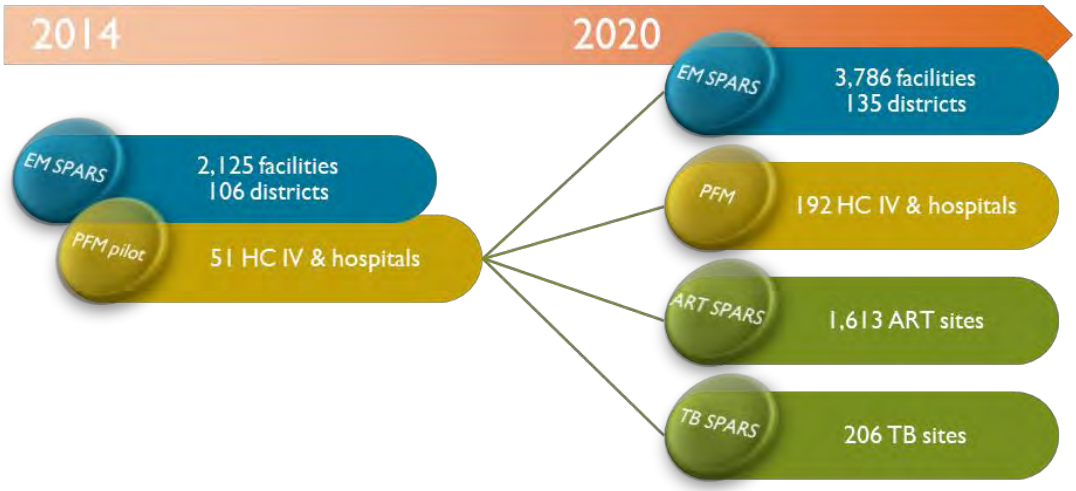
National Malaria Control Program

The US President's Malaria Initiative supports Uganda to help reduce malaria through several methods, including routine End-Use Verification (EUV) surveys. Over the program's life, UHSC helped conduct 10 EUV surveys. The tenth EUV survey (EUV 10), implemented in early 2020, assessed malaria case management and the availability and use of anti-malaria medicines and commodities at 75 randomly selected public and PNFP health facilities. Among the results, the survey team found that of the 6,790 sampled malaria cases (100 cases per facility on average), 93% were parasitologically confirmed compared with 92% in EUV 9, 2% were treated despite negative test results, and 3% were treated without testing. This showed a marked improvement in adherence to Uganda's test and treat policy. However, improvement was needed at hospitals, where 14% of cases were diagnosed clinically and 3% were given treatment despite a negative test result. The findings supplemented health facility monitoring efforts and were widely disseminated to stakeholders to inform policy decisions and strengthen the health system's malaria commodity supply chain.

SPARS Scale-Up and Enhancement Program

After SPARS was adopted as a national strategy in 2011, a subsequent SPARS rollout plan documented the implementation costs and mapped implementing partners' district-level responsibility. As of June 2014, the 188 trained MMS had carried out over 7,900 supervision visits in just over three years, reaching 2,125 (55%) facilities in 106 districts (95%). To build the financial management capacity at HC IV and hospital levels, UHSC adapted SPARS to address pharmaceutical financial management (PFM) and piloted it at 51 facilities.

Figure 4. Growth of SPARS over the UHSC program



The success of SPARS led to the MOH approving the expansion and modification of the strategy for different health areas, including ART, TB, and laboratory (figure 4). UHSC worked with each MOH program to develop an implementation plan, training materials, and assessment tools for their respective areas. The original SPARS program was renamed Essential Medicines (EM) SPARS. Nationwide rollout continued with the inclusion of PNFP facilities and the rollout of PFM at high-level facilities. By the end of UHSC, EM SPARS was active at 3,786 facilities in 135 districts; PFM was rolled out to 192 HC IV and hospitals; ART SPARS covered 1,613 ART sites; and TB SPARS covered 206 sites. As part of its transition plan, UHSC prepared regional USAID implementing partners to take over technical and

financial support for SPARS in 89 districts. By the end of UHSC, 76% of public and PNFP health facilities were meeting their EM SPARS target, exceeding the target of 75% (Figure 5). Of a maximum score of 25, the average EM SPARS score among the implementing facilities in 2014 was 15.6 compared with 18.5 in 2020 (Figure 6).

Figure 5. Percentage of facilities with adequate (20/25) EM SPARS scores: 2014 vs. 2020

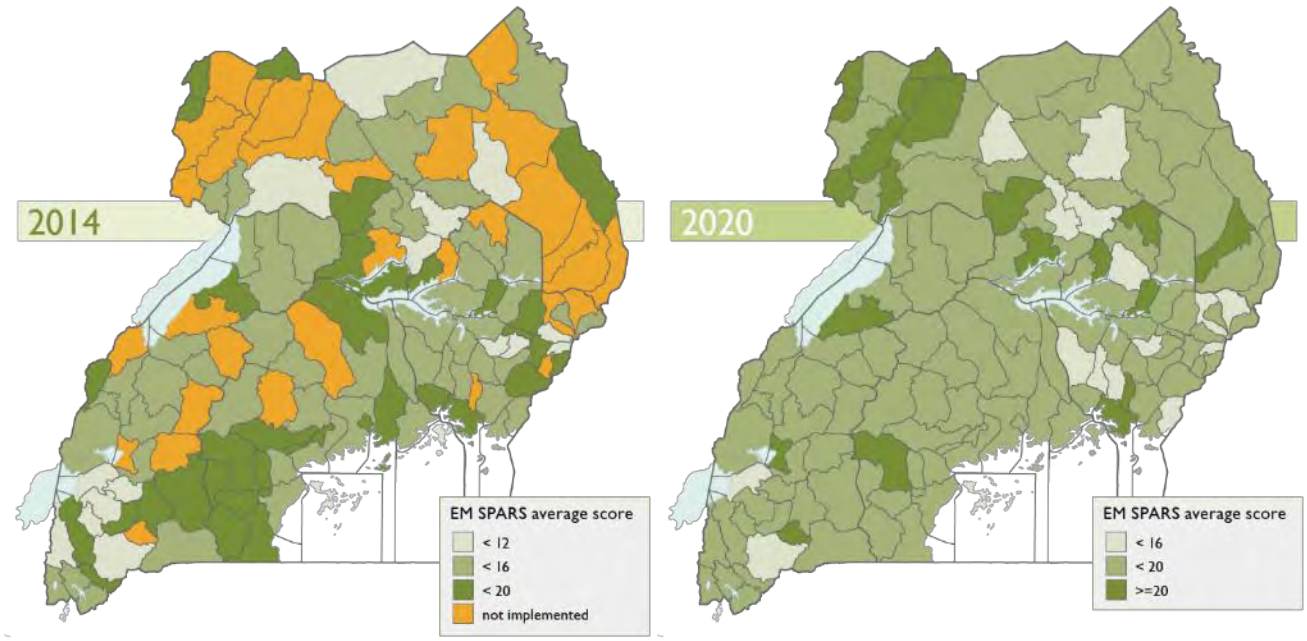
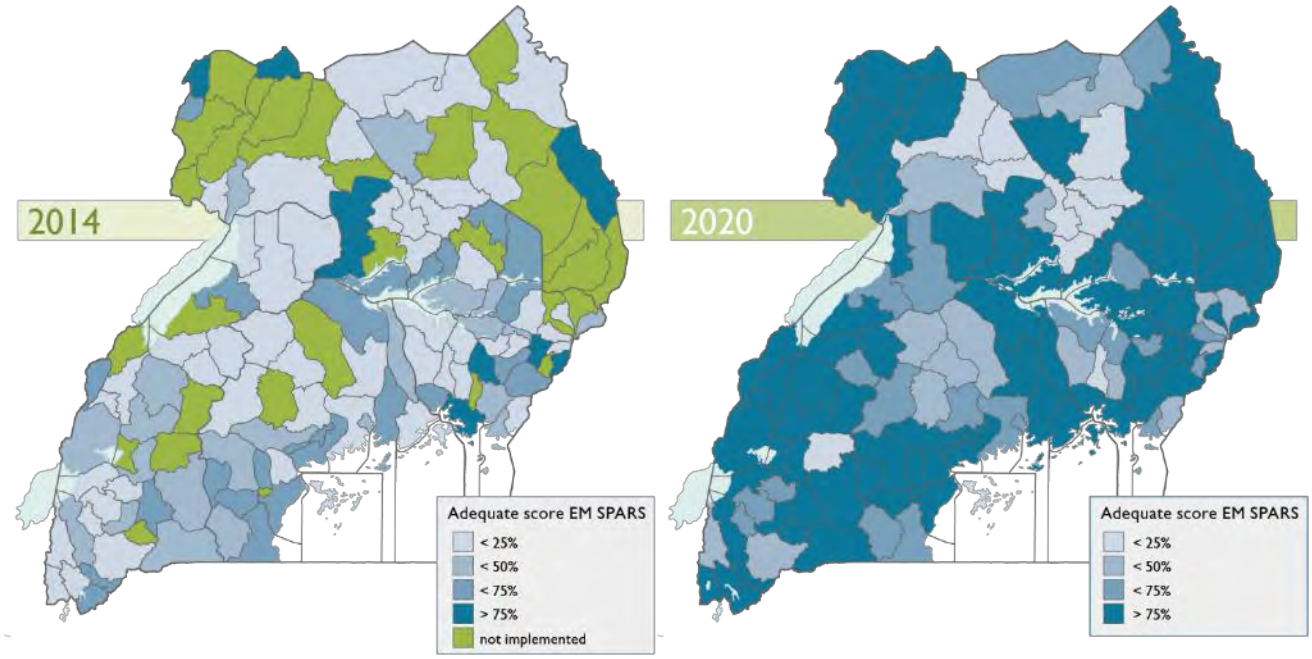


Figure 6. Average EM SPARS scores: 2014 vs. 2020



An MMS traveling to a health facility to make a supportive supervision visit. Photo credit: Sheila Mwebaze

SPARS Expansion

ART SPARS

The ART SPARS supervision tool, which emerged from collaboration between UHSC and the AIDS Control Program, has four indicator domains: (1) ART patient management; (2) ART stock management; (3) traceability of ART commodities; and (4) ordering and reporting quality. By the end of UHSC, 87% of all public and PNFP ART clinics in the country were using ART SPARS as a continuous performance improvement initiative, with 55% achieving their target scores.

Nursing officer Lilian Atoo at the Moroto Regional Referral Hospital's ART clinic. Photo credit: Sheila Mwebaze

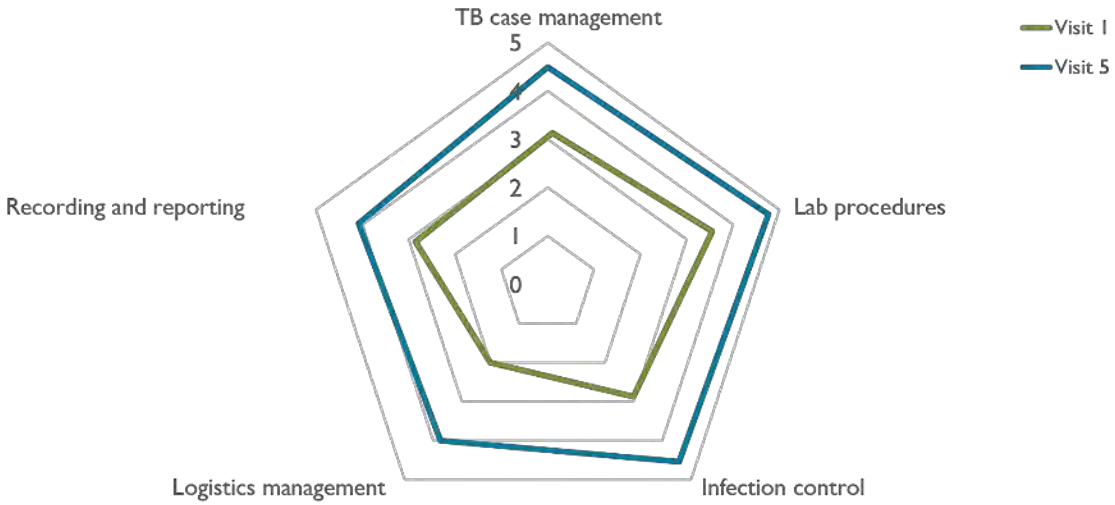
TB SPARS

Starting in 2016, UHSC partnered with the National Tuberculosis and Leprosy Program to pilot TB SPARS at 203 TB treatment sites in 20 districts. Supervisors were trained and equipped with supervision tools, computers, modems, motorbikes, and riding gear. Every two months, the supervisors assessed facility performance in five domains and worked with staff to implement improvement plans. Using 21 indicators, TB SPARS measures performance in TB medicines management and other areas critical to providing quality TB care: (1) TB case management; (2) lab procedures; (3) TB infection control; (4) logistics management; and (5) recording, reporting, and information system.

Facility scores after the pilot improved in all five areas (Figure 7). The domain with the greatest percentage increase in the score since baseline was recording and reporting (87%) and the lowest was laboratory procedures (30%). There were also some dramatic changes in individual logistics management indicators: the correct use of stock cards increased from an average of 17% at visit 1 to 81% at visit 5, and the availability of a basket of tracer items increased from 68% at visit 1 to 90% at visit 5.

The National Tuberculosis and Leprosy Program recommended a national rollout. UHSC transitioned to regional implementing partners' support of the 20 TB SPARS districts, where the average score was 21.5/25, and 89% (184/206) of the facilities met the target score of 20.

Figure 7. Average facility TB SPARS performance score of pilot facilities at visits 1 and 5: November 2016–September 2018



Commenting on the results of TB SPARS, Henry Kawungu, the clinical officer at the Mateete Health Centre III, said: "We now have more children enrolled in care, and our lost to follow-up patients have also been brought back in for care."

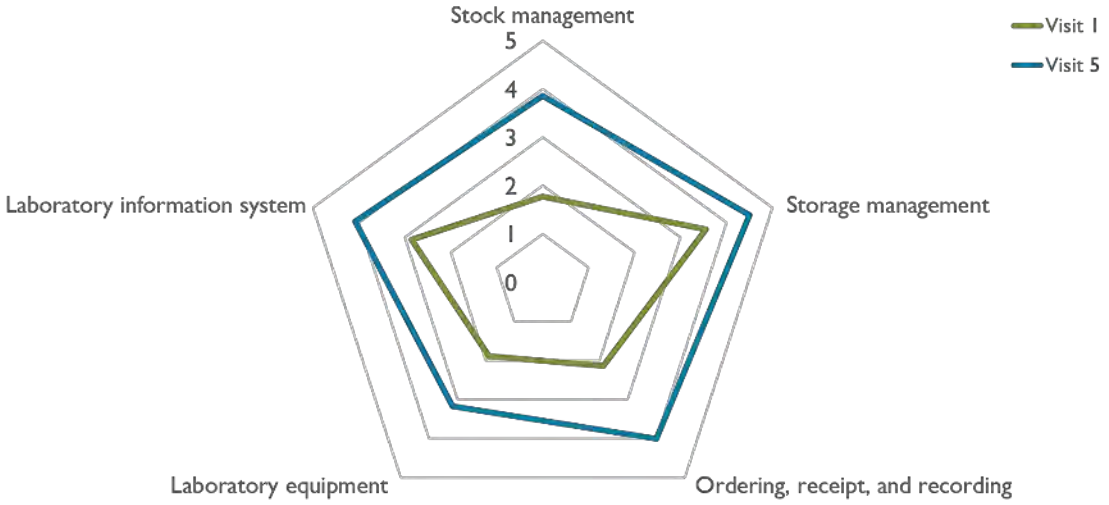
Lab SPARS

In collaboration with Uganda National Health Laboratory Services staff, UHSC developed and then piloted Lab SPARS at 292 facilities in 20 districts from 2017 to 2018. The Lab SPARS performance assessment tool has 27 indicators in five categories: (1) stock management; (2) storage management; (3) ordering, receipt, and reporting; (4) laboratory equipment; and (5) laboratory information system. With visits every two months to facilities, the 42 Lab SPARS supervisors worked with lab staff to use the assessment results to examine their weakest areas.

> *"The purpose of the first visit was simply to unearth the issues. We observed [that] the lab data were incomplete, inaccurate, and were not used in planning. There were poor reorder calculations. The worst performing domain was ordering, and receipt and recording. We discussed the challenges, we identified and cleaned and rearranged the lab and store. On subsequent visits, we reviewed the progress that had been made, and we encouraged staff. You need to push forward with everyone in the health facility; you can't do it on your own."*
>
> — Sam Opio, Lab SPARS supervisor for Apapai HC IV

After the pilot, the facilities dramatically improved their performance in all five domains between the first and fifth Lab SPARS supervision visits (Figure 8). The 36 control facilities saw no improvement. The average facility score was 18.6/25, and 59% (172/292) of the facilities met their targets. UHSC shifted support of the activity in the 20 districts to implementing partners.

Figure 8. Average facility Lab SPARS performance score of pilot facilities at visits 1 and 5: August 2017–September 2018

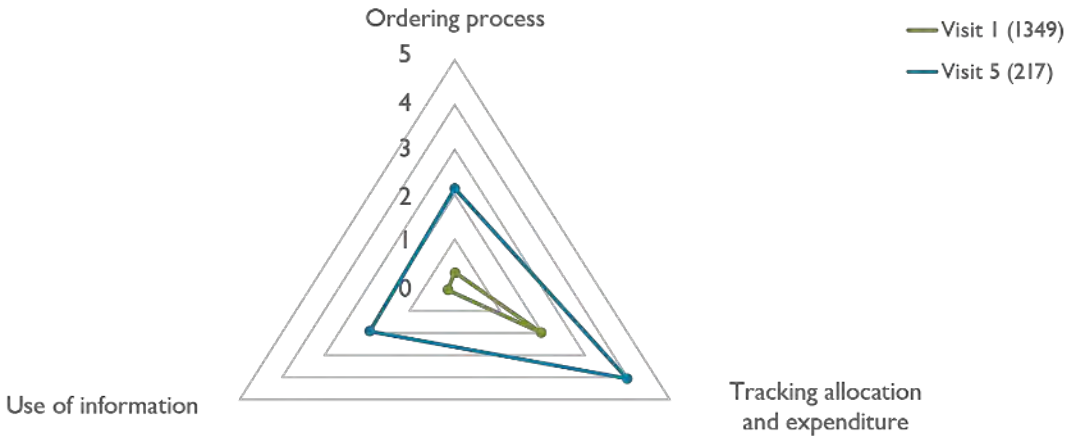


Pharmaceutical Financial Management Supervision

During UHSC, the PFM component was incorporated in EM SPARS for HC IV and hospitals that order their own products. The PFM training for MMS consists of classroom training conducted by Makerere University's Pharmacy Department, a UHSC partner, and practical training, which includes how to mentor and coach staff being supervised. UHSC also developed and rolled out a PFM electronic reporting system that enables visibility into facility performance and the production of PFM progress reports for managers to track progress and identify areas of need.

By the end of the first year of the intervention, 141 of 1,351 facilities supervised (10%) had achieved the 80% target PFM score. The greatest improvements were in tracking budget allocations and expenditures, and the ordering process (Figure 9). By April 2020, 45% of 192 public HC IV facilities and hospitals had met the 80% target.

Figure 9. Average government facility PFM performance scores at visits 1 and 5: October 2017–September 2018



Improving the Effectiveness and Sustainability of SPARS

Peer support strategy. UHSC and the Pharmacy Department jointly initiated a peer support strategy as a means of sustaining SPARS after the program ends. The strategy is based on using regional pharmacists as peers to provide targeted technical support to MMS and district health staff to maintain supply chain system improvements. The peers provide help through such tools as SOPs and training on EM SPARS and supportive supervision and mentoring.

Making supervision more supportive and effective. Based on a SURE study showing that more than 75% of MMS lacked good supportive supervision skills, UHSC worked with its partners, Makerere University and Harvard University, to create a five-day, hands-on supportive supervision course on communication, problem solving, target setting, feedback, tool use, and data interpretation. The training incorporates an innovative element to enhance real-life skills by using video of participants to illustrate supportive supervision performance practices, both good practices and marginal ones. Makerere University incorporated the video exercise in its training program for new MMS.

The MMS for Mukono HC IV updates the spider graph that tracks SPARS performance. Photo credit: Sheila Mwebaze

Operational improvements. With the SPARS initiative well established, UHSC designed and carried out strategies to improve program functioning and efficiency. For example, to improve MMS' adherence to recommended intervals between supervision visits to their assigned facilities, UHSC initiated routine text reminders to MMS about the facilities that were due for a visit. The SPARS performance assessment tool was updated to improve indicator reproducibility, incorporate changes to treatment guidelines, and expand MMS supervision areas. The program also introduced learning visits, whereby all MMS in the district make joint supervisory visits to improve their understanding of the SPARS indicators.

Preparing new health workers to manage EHMS

UHSC worked with training institutions, the Ministry of Education and Sports, the National Curriculum Development Center, and affiliated health regulatory agencies and boards to integrate preservice medicines management curricula in health care workers' training programs. UHSC's partner, Makerere University, spearheaded the engagement with the other Ugandan training institutions. After piloting, 13 institutions began teaching the new material in 2016.

Appropriate Medicines Use

The introduction of SPARS provided a mechanism for facilities to self-identify medicine use problems, monitor progress, and address prescribing practices, which resulted in significant improvements in prescribing for common conditions, such as diarrhea, malaria, and respiratory tract infections at all levels of care based on standard treatment guidelines (STGs) (Figure 10 to Figure 12).

To systematically address medicines use, UHSC helped the Pharmacy Department establish an Appropriate Medicines Unit, which participated in the development of Uganda's national antimicrobial resistance (AMR) strategy and initiated an advisory group to lead updates of the Uganda Clinical Guidelines and Essential Medicines and Health Supplies List of Uganda, which were published in 2016 and disseminated widely. UHSC supported the development of core references: *The Practical Guidelines for Dispensing in Lower Level Health Facilities 2014* was the first reference of its kind in Uganda, which was followed up with the publication of *The Practical Guidelines for Dispensing for Higher Level Facilities* in 2015.

Figure 10. Appropriate prescribing for diarrhea based on adherence to STGs: 2014–2020

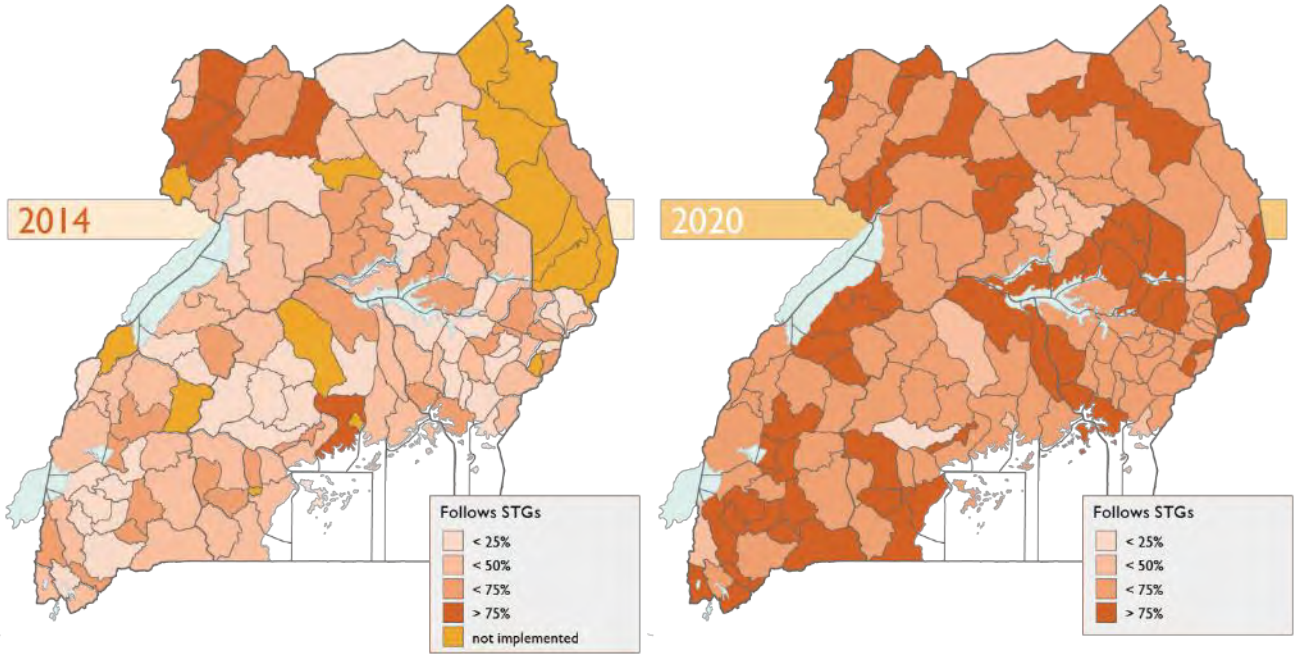


Figure 11. Appropriate prescribing for malaria based on adherence to STGs: 2014–2020

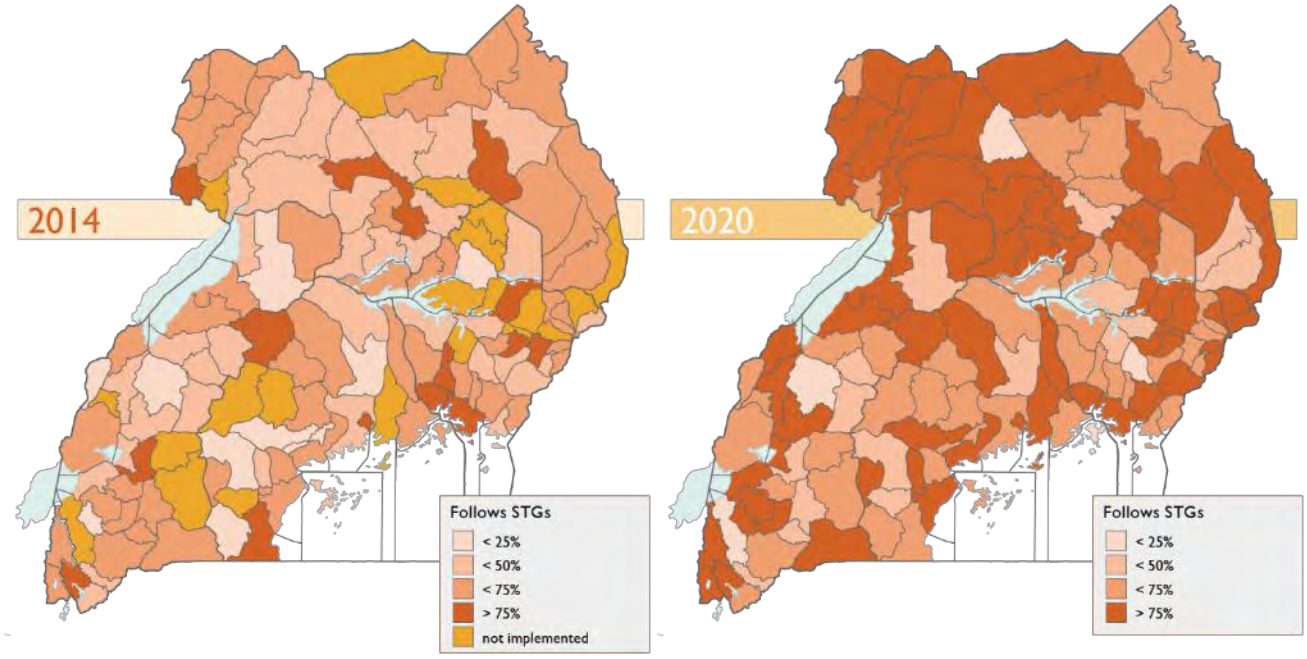
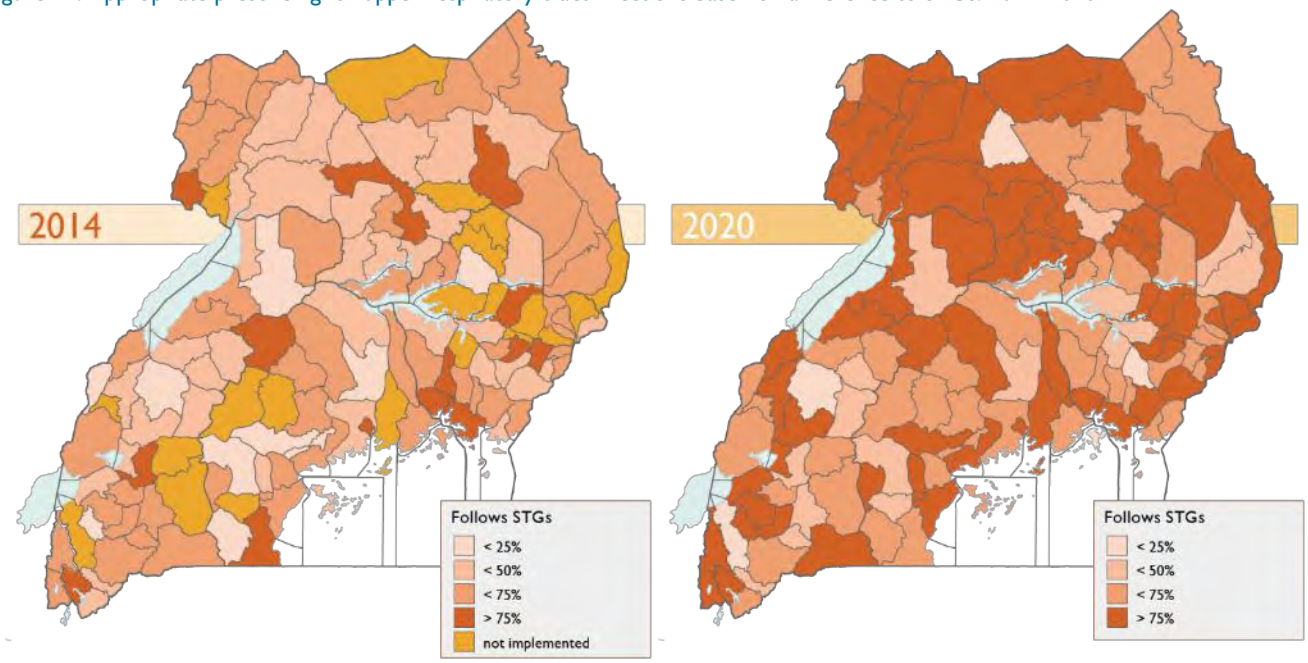


Figure 12. Appropriate prescribing for upper respiratory tract infections based on adherence to STGs: 2014–2020



Uganda's First Antimicrobial Consumption Survey

UHSC supported the Appropriate Medicines Unit to conduct the country's initial survey of antibiotic consumption, which collected national-level data from NMS and JMS and data from select health facilities. The survey used standard Anatomical Therapeutic Chemical/Defined Daily Dose methodology to measure drug consumption and analyzed consumption according to WHO's Access Watch and Reserve (AWaRe) classification. The survey found, for example, that the consumption of Watch and Access-Watch at both NMS and JMS was high, especially at the HC II level and at training institutions. The three most consumed drugs at JMS were amoxicillin, doxycycline, and ciprofloxacin (Access-

Watch), whereas those most consumed at NMS were cotrimoxazole, amoxicillin, and metronidazole. Moreover, human drugs were supplied to veterinary service centers, revealing the use of human drugs in the veterinary industry. The results, which were presented at two national AMR conferences, provided a clearer picture of how antimicrobials were used and how use could contribute to AMR.

Strengthening Medicines and Therapeutics Committees

WHO recommends hospital medicines and therapeutics committees (MTCs) as an important way for countries to improve medicines use and combat AMR. After conducting a literature review to identify success factors for MTCs at the beginning of the program, UHSC worked with the MOH's Appropriate Medicines Unit to draft a national MTC strategy and guidelines to revitalize these critical bodies at hospitals. The strategy incorporated WHO guidelines and lessons learned from MTCs in other countries and Uganda-specific recommendations that UHSC obtained from a survey and focus group discussions with hospital directors, pharmacists, and nurses in select district and regional hospitals. UHSC worked with staff from seven regional referral hospitals to revitalize their MTCs, including training and working with them on MTC functions; appropriate medicines use principles; and practical steps to identify, investigate, and address medicines use issues.

The MTCs successfully carried out drug indicator surveys and medicines use evaluation studies at their hospitals, and proposed intervention strategies to tackle problems. The strategies included decentralizing testing services, increasing the availability of rapid diagnostic tests for malaria, and providing additional education and performance feedback for prescribers. The MTCs' actions have produced lower rates of injection use in the outpatient department and better adherence to test and treat for malaria. Providers now use the *Uganda Clinical Guidelines* for prescribing. The Appropriate Medicines Unit is taking the lead in the coordination, integration, and harmonization of the approaches and activities of different stakeholders who want to support MTCs.

Improving Malaria Case Management in One Ugandan Hospital

With support from UHSC, the revitalized and newly trained MTC members at Moroto Regional Referral Hospital in northeastern Uganda identified several prescribing problems. They selected inappropriate practices in malaria testing and treatment as their first priority. MTC members saw that too many patients were diagnosed with malaria and prescribed artemisinin-based combination therapy (ACT) even though they had not been tested or tested negative. A few cases had even received ACT without a malaria diagnosis at all.

The MTC embarked on a phased approach to improve adherence to the test-and-treat policy. The first step was to introduce rapid diagnostic tests (simple tests that do not require specialized equipment or personnel) at outpatient clinics and in wards so that nurses could quickly test patients. Informational sessions were held with prescribers on the importance of the test-and-treat policy. Pharmacy staff were instructed to only dispense antimalarial medicines to patients with positive test results and a prescription from an authorized prescriber. Because patient requests for specific medicines could influence clinicians' prescribing decisions, regular patient education sessions were also held in the outpatient department.

The MTC's second step was to collect monthly data on a sample of 100 outpatients being treated with ACTs to verify adherence to the test-and-treat policy. The monthly survey proved the intervention's success. Since the survey was implemented in May 2017, the testing rate among patients receiving ACTs increased from 45% to 86% in March 2018, and the percentage of patients receiving treatment with a negative test result decreased from 31% to 9%. In addition, the percentage of patients treated who had tested positive increased from 14% to 77%.

Dr. Francis Alfred Ogwang, Moroto's MTC chair, said, "The MTC has given us a good basis for decision-making. We can now track medicine use and minimize the unnecessary waste of our antimalarial medicines." Dr. Ogwang is confident about the Moroto MTC's sustainability because of "reliable and skilled personnel, management commitment, resources, and engagement platforms with staff and patients through continuous medicines education and patient education sessions." He stressed that hospital leadership's ongoing commitment is critical to ensuring that the MTC has a sufficient budget and resources to succeed.

Principal Clinical Officer, Dorothy Ajiambo, with Shallon Nomanyota in the Outpatient Department at Mbarara Regional Referral Hospital. Photo credit: Sheila Mwebaze

Result 3. Access to Vital Medicines among Priority Populations

To support the Government of Uganda's commitment to strengthening community-level health services, UHSC assisted the MOH to develop a strategy addressing weaknesses in the supply chain for RMNCAH commodities. UHSC subsequently developed and tested standardized procedures and tools to manage EMHS for this level, which the MOH institutionalized for use across all community health programs.

RMNCAH Supply Chain Management Strategy

UHSC's facility and supply landscape surveys indicated that although many village health teams operated in both the public and PNFP sectors, the processes and tools that they used to order, deliver, and report on commodities—many related to RMNCAH—were not standardized, and multiple development partners were supplying the commodities through parallel systems.

Community health worker, Betty Achilla, examines a baby from one of the 31 households she supports. Photo credit: Sheila Mwebaze

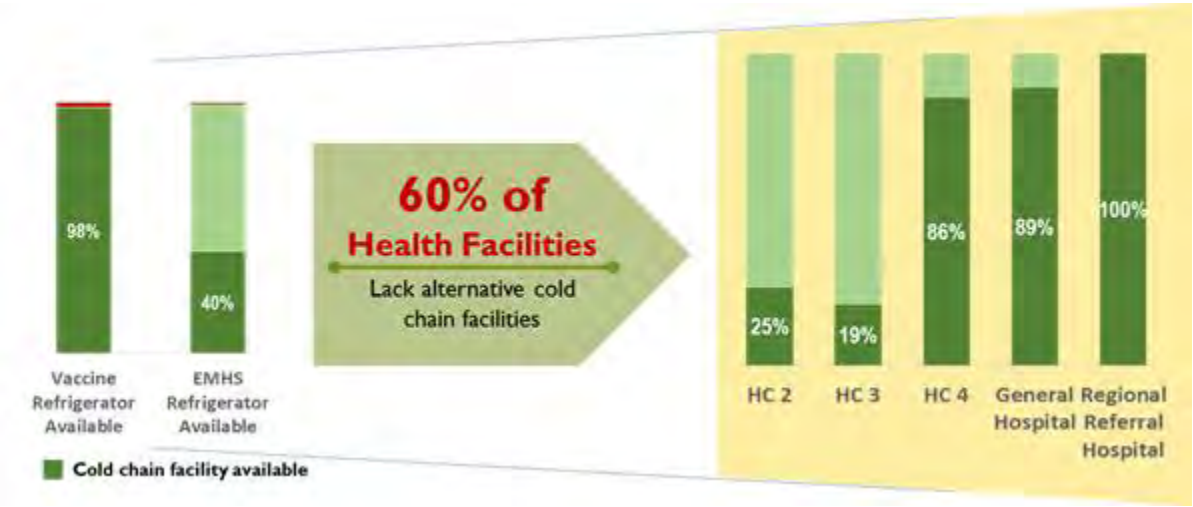
With the Pharmacy Department and Reproductive Health and Child Health Divisions, UHSC used these survey results to draft *Uganda's Community Health Supply Chain System Strengthening Strategy: 2016–2020*. Many of its recommendations were implemented during the program. For example, the four standardized community logistics management tools that UHSC designed and piloted with a diverse task force were nationalized by the MOH and scaled up with support from several implementing partners, including UNICEF, Malaria Consortium, Save the Children, TASO, PATH, and FHI 360.

Peer village health team supervisor, Robert Owili, of Kiru HC II, stands next to his medicine box and safety box, hung on the roof of his house. Photo credit: Sheila Mwebaze

Integrating Oxytocin in the Vaccine Supply Chain

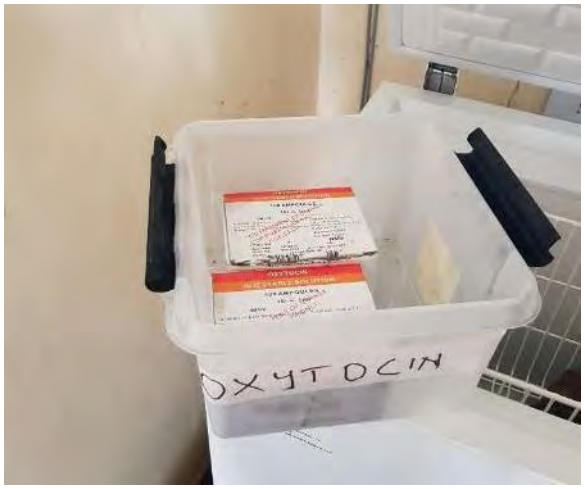
In Uganda, four in ten maternal deaths result from excessive bleeding during delivery. Oxytocin is the first-line treatment for managing the condition. The product requires cold storage to remain effective. As UHSC's 2019 assessment showed, most lower-level heath facilities (HC II and III), at which one-half of facility-based births occur, lacked refrigerators, apart from those used exclusively for vaccine storage (Figure 13). The inadequate cold chain conditions put oxytocin potency at risk, resulting in preventable maternal deaths. In 2017, the MOH issued a directive to allow co-storage of oxytocin and vaccines; however, this directive was poorly implemented, with only 32% of facilities aware of it.

Figure 13. Availability of cold chain facilities by level of care in 183 health facilities: 2019



With support from an innovation grant from the Reproductive Health Supplies Coalition, UHSC spearheaded a phased initiative to integrate oxytocin in the vaccine cold chain, starting at the district level. UHSC established a multisectoral integration taskforce that led the development of implementation guidelines, SOPs, visual aids, and a supervision checklist. Through a six-month pilot, district and health facility staff were instrumental in refining these materials.

> *"Health centers that do not have containers for keeping oxytocin in the vaccine fridge are using empty Panadol tins. They place a visible label on the tin written on a plaster, or they write directly on the tin using a marker."*
>
> —Titus Mugalya, Cold Chain Technician, Mayuge District



Oxytocin compartment at Buluguyi HC III
Photo credit: Eric Jemera

Improvised oxytocin container at Bwonda HC II
Photo credit: Eric Jemera

The integration of oxytocin in the vaccine cold chain helped ensure that mothers who experienced postpartum hemorrhage had access to a quality medicine to prevent their death. The MOH committed to nationwide rollout and will incorporate oxytocin in its mainstream guidelines. Implementing partners had started to scale up the practice by the end of UHSC.

Lessons learned from the initiative to integrate oxytocin in the vaccine supply chain included:

- Stakeholder involvement and buy-in were essential.
- Apply a system-wide approach.
- Implementation guidelines, SOPs, and visual aids for oxytocin integration were important to operationalize the policy.
- Implementation and sensitization should target all levels of HFs, even those with separate refrigerators for EM and medical products.
- Tools, such as the Oxytocin Storage Form, were necessary to ensure that ice packs in cold boxes were monitored and regularly changed, and that oxytocin was replenished on the ward.
- Watch for implicit versus explicit resistance and have a strategy to deal with both.
- Joint planning for cold storage space requirements was needed.

Result 4. Support for the HIV/AIDS Response

A 2013 MOH assessment determined that one in five HFs lacked adequate space to store medicines. With Uganda's rollout of the HIV test-and-treat strategy, under which all positive patients were placed on treatment immediately, and with the differentiated service delivery model, whereby stable patients received three months' worth of ARVs at one time, adequate storage space for ARVs became even more acute.

Her Excellency the Ambassador of the United States of America to Uganda, Deborah Malac, handed over the storage units at a ceremony at Luwunga HC III in August 2019. Photo credit: Sheila Mwebaze

In 2019, UHSC orchestrated the construction of 26 medicine storage units in 22 districts in Uganda. Each prefabricated storage unit expanded storage space by 70 square meters and cut down on the costs and building time associated with traditional construction. The units were furnished with 12 shelves, 4 pallets, and a 24-hour backup power system. This intervention will go a long way to help ensure that access to HIV/AIDS commodities is not interrupted.

"Items are on shelves and their expiry dates can be clearly viewed. We can now comfortably issue out medicines using the first expiry, first out approach. The threat of theft is now reduced thanks to the security lights and double door-locking system."

—Rueben Angole, Store Manager, Bundibugyo Hospital

Store Manager, Rueben Angole inside the Bundibugyo Hospital prefabricated medicine storage unit. Photo credit: Joshua Irafasha

Result 5. Prepare the National Supply Chain for Outbreaks and Epidemics

To strengthen Uganda's response to public health emergencies, UHSC collaborated with the MOH; Ministry of Agriculture, Animal Industry and Fisheries; Uganda Wildlife Authority; Ministry of Water and Environment; and the Public Health Emergency Operations Center to build a resilient supply chain system that responds to the needs of public health emergencies, in general, and infectious disease epidemics and pandemics, in particular.

Global Health Security Agenda

Uganda has experienced several disease outbreaks in the past, including viral hemorrhagic fevers (Ebola and Marburg), with fatalities in the general population and among health care providers, further stressing an overstretched health system. The most recent were an Ebola virus outbreak on the Congolese border in 2019 and the COVID-19 pandemic in 2020.

As a signatory to the legally binding WHO International Health Regulations, Uganda has a National Action Plan for Health Security that obligates the country to develop capacities in 19 technical areas. UHSC directly contributed to building Uganda's capacity in three areas: preparedness, medical countermeasures, and emergency response operations. Moreover, through the QPPU, UHSC conducted ad hoc stock analyses to ensure the availability of EMHS needed to fight regional malaria, the Ebola virus outbreaks, and the national COVID-19 epidemic.

UHSC contributions to strengthening Uganda's public health emergency response

- Determined which commodities for animal and human health to stockpile and identified eight regional locations to house the products.
- Drafted guiding documents for the public health emergency supply chain, including a national plan, management guidelines, SOPs for emergency response, and a distribution strategy.
- Provided regional hubs with hardware and training on the emergency stockpile activities and assessed transportation capacity.
- Developed a coordination mechanism for the public health emergency supply chain at national, regional, and district levels.
- Created and deployed the electronic Emergency Logistics Management Information System (eELMIS), a coordination and information management system for the public health emergency supply chain.
- Trained more than 750 national, regional, and district staff in emergency supply chain management and the eELMIS.
- Conducted a field simulation involving two regions and four districts to test the emergency supply chain system and the eELMIS functionality.

Ebola Virus Response

As a new member of the National Ebola Task Force, UHSC succeeded in getting a logistics subcommittee formed to advise the task force on supply chain-related issues. UHSC conducted an Ebola supply needs assessment for preparedness and response in 12 high-risk districts, quantified the supplies, and advised USAID on the need for their procurement and deployment.

Malaria Epidemic Response

UHSC supported the National Malaria Control Program and donor partners to respond to a malaria epidemic in 10 northern districts by preparing monthly national stock status and pipeline reports on antimalarial commodities in PNFP and government facilities. UHSC prepared a commodity supply plan for the WHO's epidemic response plan, which included malaria medicines and diagnostic supplies and a mass distribution campaign of long-lasting insecticide treated nets; developed an allocation plan to guide UNICEF's emergency distribution of malaria medicines to facilities in the region; and compiled distribution plans for indoor residual spraying commodities. The program also followed up with PNFP facilities in the region to ensure that they had sufficient antimalarial medicines and tests on hand.

COVID-19 Response

Uganda put its public health emergency supply chain to the test during the COVID-19 pandemic. UHSC activated the logistics activities of all 135 district rapid response teams and enhanced the eELMIS reports to include online information on orders, stock status, stock gap, pipeline, and funding for pandemic supplies. The eELMIS allowed the MOH to receive and respond in real time to requests for medical supplies during the crisis. Districts, facilities, and donor organizations shared information on supplies and assessed gaps. National, district, and facility-level partners entered their stock requests in the system, and districts and facilities received text alerts on their order status.

QPPU pandemic support included:

- Incorporating COVID-19-related supplies in the catalog of health commodities
- Quantifying and forecasting pandemic commodity needs
- Conducting weekly reviews of COVID-19 commodity stock status and updating procurement plans
- Preparing pipeline information based on commodity flow as the pandemic evolved
- Supporting the preparation of the MOH's weekly reports to the Cabinet

The public health emergency supply chain system performed as planned, helping ensure that epidemic supplies, including personal protective equipment, were available to those who needed them.

Conclusion and Recommendations

UHSC's strengths were that it combined a solid vision of systems strengthening with a holistic approach and the program's technical framework. To ensure sustainability, UHSC made sure that interventions responded to national strategies and were embedded in national plans and systems. Management of many program initiatives could therefore be successfully transitioned to government counterparts. To guide these strategies through to the next stages of successful and sustainable implementation, more effort and resources are needed to:

- Increase data use to ensure that all are using reliable data to drive supply chain interventions
- Build a more robust national electronic logistics management information system that captures data from all health facilities
- Enable interoperability among Uganda's information systems, including the eLMIS and the health management information system, and combine the data in one repository, such as the PIP

Status of UHSC Monitoring and Evaluation Plan Indicators

Indicator	2014 Baseline	2014/15		2015/16		2016/17		2017/18		2018/19		2019/20	
		Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual
Percentage availability of supplies for a basket of 41 medicines and health supplies in last 3 months at NMS and JMS	N/A	N/A	N/A	65%	64%	70%	67%	75%	67%	80%	79%	80%	81%
Average percentage availability of a basket of 41 commodities based on all reporting facilities in the previous quarter	N/A	N/A	N/A	88%	89%	89%	83%	89%	84%	90%	83%	90%	81%
Number of wholesalers licensed according to the new GDP guidelines developed in 2013	0	350	0	350	0	350	497	350	484	350	484	350	484
Number of government and PNFP health facility pharmacies inspected for GPP	939	0	939	2000	939	2000	1618	2000	1837	2000	1837	2000	1837
Percentage of government and PNFP health facility pharmacies certified according to GPP	57%	63%	57%	63%	57%	63%	60%	63%	62%	63%	62%	63%	62%
Number of individuals trained to conduct supply chain, inventory management, and supportive supervision	0	220	126	804	249	1184	401	1471	866	1471	1537	1471	1537
Percentage of facilities with EM SPARS score of 20 and above	38%	38%	38%	45%	71%	50%	59%	60%	68%	70%	75%	75%	76%
Percentage of order based facilities with a PFM score of 80% and above	57%	30%	57%	30%	57%	40%	21%	50%	29%	55%	50%	60%	47%
Average percentage of cases of priority diseases treated in compliance with standard treatment guidelines in reporting period	52%	80%	50%	55%	54%	63%	67%	70%	73%	80%	73%	80%	75%
Percentage of health facilities submitting a quarterly village health team/integrated community case management report	10%	10%	8%	15%	7%	30%	12%	40%	11%	30%	30%	40%	31%
Number of facilities with a computerized functional LMIS (total number of hospitals/HC4)	43	48	11	61	13	75	30	85	101	128	90	160	45
The percentage of ART sites initiated on ART SPARS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	50%	30%	100%	80%	100%	87%
Percentage of facilities scoring at least 80% of the maximum ART SPARS score	N/A	N/A	N/A	N/A	N/A	N/A	N/A	50%	36%	53%	49%	60%	55%
Percentage of facilities with accurate orders	N/A	N/A	N/A	N/A	N/A	N/A	N/A	50%	49%	60%	35%	65%	46%
Percentage of facilities with traceability of ART commodities	N/A	N/A	N/A	N/A	N/A	N/A	N/A	50%	32%	60%	40%	70%	37%