

GHSC-PSM TASK ORDER 2 (MALARIA)

ANNUAL REPORT FISCAL YEAR 2022 Q1-Q4

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The USAID Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM) project is funded under USAID Contract No. AID-OAA-I-15-0004. GHSC-PSM connects technical solutions and proven commercial processes to promote efficient and cost-effective health supply chains worldwide. Our goal is to ensure uninterrupted supplies of health commodities to save lives and create a healthier future for all. The project purchases and delivers health commodities, offers comprehensive technical assistance to strengthen national supply chain systems, and provides global supply chain leadership.

GHSC-PSM is implemented by Chemonics International, in collaboration with Arbola Inc., Axios International Inc., IDA Foundation, IBM, IntraHealth International, Kuehne + Nagel Inc., McKinsey & Company, Panagora Group, Population Services International, SGS Nederland B.V., and University Research Co., LLC. To learn more, visit ghsupplychain.org

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Acronyms

3PL	third-party logistics
ACT	artemisinin-based combination therapy
ABREMA	National Regulatory Agency (French)
ADD	agreed delivery date
AL	artemether-lumefantrine
AMF	Against Malaria Foundation
ANC	antenatal care
API	active pharmaceutical ingredient
ARTMIS	Automated Requisition Tracking Management Information System
ARV	antiretroviral
ASAQ	artesunate + amodiaquine
BEO	Bureau Environmental Officer
BMGF	Bill and Melinda Gates Foundation
CAPA	corrective and preventive action
CHAI	Clinton Health Access Initiative
CHW	community health worker
CMAM	Central De Medicamentos E Artigos Médicos
CoC	certificate of conformance
COVID-19	coronavirus disease

CPD	continuous professional development
DFD TWG	District Forecast and Distribution Technical Working Group
DHIS	Demographic Health Information System
DPS	Directorate of Pharmaceutical Services
DRC	Democratic Republic of the Congo
DSC-S&A	digital supply chain strategy and architecture
eLMIS	electronic logistics management information system
EMMR	Environmental Mitigation and Monitoring Report
EPSS	Ethiopian Pharmaceuticals Supply Service
EUV	end-use verification
FASP	forecasting and supply planning
FDA	Foods and Drugs Authority
FP	family planning
FP/RH	family planning and reproductive health
FTO	Francophone Task Order
FY	fiscal year
GAD	goods availability date
GDSN	Global Data Synchronization Network
GHSC-PSM	USAID Global Health Supply Chain Program-Procurement and Supply Management Project

GIZ	German International Development Agency
GTIN	Global Trade Item Number
IFU	instructions for use
IPA	International Procurement Agency
IP	implementing partner
IRS	indoor residual spraying
ISSPM	integrated supportive supervision peer mentorship
ITN	insecticide-treated net
KPI	key performance indicator
KSM	key starting material
LLIN	long-lasting insecticide-treated net
LMIS	logistics management information system
LOP	life of the project
LQAG	LLIN Quality Assurance Group
LTA	long-term agreement
M-DIVE	Malaria Data Integration for Visualization platform
M&E	monitoring and evaluation
MIS	management information system
MNCH	maternal, newborn, and child health
MOH	Ministry of Health

MOP	Malaria Operational Plan
MoU	memorandum of understanding
MQ TWG	Malaria Quantification Technical Working Group
mRDT	malaria rapid diagnostic test
MMV	Medicines for Malaria Venture
NFO	non-field Office
NMCP	National Malaria Control Program
NMEC	National Malaria Elimination Centre
NMSA	National Medical Supplies Agency
NSCA	National Supply Chain Assessment
ONPPC	Niger Central Medical Store
OOS	out of specification
OTD	on-time delivery
OTIF	on time in full
PATH	Program for Appropriate Technology in Health
PBO	piperonyl butoxide
PCMT	product catalog management tool
PFW	prefabricated warehouse
PMI	U.S. President's Malaria Initiative
PMU	Project Management Unit

PPM	Pharmacie Populaire du Mali
PPMRm	Procurement Planning and Monitoring Report for malaria
PO	purchase order
PQ	prequalification
PSCM	pharmaceutical supply chain management
Q	quarter
QA	quality assurance
QAT	Quantification Analytics Tool
QC	quality control
QMS	quality management system
QPL	Quantification Analytics Tool Problem List
RCLO	Regional Commodity Logistics Officer
RDC	regional distribution center
RDT	rapid diagnostic test
RO	requisition order
SCISMM	Supply Chain Information System Maturity Model
SCMP	supply chain master plan
SDP	service delivery point
SIGLUS	Sistema De Informação E Gestão De Logística Das Unidades Sanitárias
SMC	seasonal malaria chemoprevention

SOPs	standard operating procedures
SP	sulfadoxine-pyrimethamine
SPAQ	SP + amodiaquine
SSA	(sole-sourced)semi-synthetic artemisinin
TA	technical assistance
TO2	Task Order 2
TOM	Task Order Malaria
TOR	Terms of Reference
ToT	training of trainers
TRvST	Traceability and Verification System for Health Products
TWG	technical working group
UNICEF	United Nations Children's Fund
VSI	vendor-stored inventory
WHO	World Health Organization
WMS	warehouse management system

Executive Summary

The USAID Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM) project is pleased to present this annual report as a summary of the work and performance of the malaria Task Order 2 (TO2) for fiscal year 2022 (FY 2022). GHSC-PSM contributes to the U.S. President's Malaria Initiative (PMI)'s goals to reduce malaria deaths and substantially decrease malaria morbidity toward the long-term goal of elimination.

GHSC-PSM supports USAID and PMI programs through the procurement, management, and delivery of high-quality, safe, and effective malaria commodities. The project partners with national malaria control programs to improve strategic planning, logistics, data analytics, and capacity building while providing leadership for global supply, demand, financing, and product development.

In FY 2022, GHSC-PSM focused on activities in line with the five focus areas outlined in PMI's 2021 five-year strategy— End Malaria Faster, channeling efforts to end malaria by reaching the unreached, strengthening community health systems, keeping malaria services resilient, investing locally, and innovating and leading. The project also supports PMI stockout reduction initiatives.

A. Improved Availability of Health Commodities

In FY 2022, GHSC-PSM procured malaria commodities valued at more than \$184 million for 29 PMI and USAID-malaria supported countries¹ These commodities included malaria prevention and treatment medicines, malaria rapid diagnostic tests (mRDTs), long-lasting insecticide-treated nets (LLINs), and laboratory supplies. PMI also supported Colombia, a non-PMI country, in procuring LLINs. A continuous reliable supply of malaria commodities is critical to malaria service delivery. Throughout FY 2022, GHSC-PSM improved its processes and tools, including inventory tracking, reduced expiry risk, informed sourcing decisions, and forecasting. The project refined its sourcing strategies for key product categories and executed four strategic tenders spanning six major product categories in preparation for FY 2023 order fulfillment.

In the fourth quarter (Q4) FY 2022, to support PMI's strategic plan to invest locally, the project visited commodity manufacturers in East Africa. GHSC-PSM sought to understand these suppliers' opportunities and challenges in establishing and expanding manufacturing in the near- and long- term, which the project will use to inform its sourcing strategies. The percent of the project's FY 2022 procurement value using long-term agreements ranged from 96 to 100 percent, exceeding the 90 percent target for major product categories. For additional details, see section A1.

GHSC-PSM remained agile in the face of various logistical challenges in FY 2022, overcoming lingering logistics challenges posed by coronavirus disease (COVID-19). By the end of FY 2022, the project experienced significant reductions in previous COVID-19–related impacts, such as freight market volatility, port of origin delays, and restrictions in transport mode, including overland border crossings. The second half of FY 2022 had fewer supply chain disruptions and shipping impacts related to COVID-19. However, in Q3 China's Zero-COVID-19 policy resulted in a strict month-long lockdown impacting

¹ Angola, Benin, Burkina Faso, Burundi, Cambodia, Cameroon, Congo DRC, Côte d'Ivoire, Ethiopia, Ghana, Guinea, Kenya, Laos, Liberia, Madagascar, Malawi, Mali, Mozambique, Myanmar, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Thailand, Uganda, Zambia, Zimbabwe

the Shanghai port, which remained open at a reduced capacity and exports from China quickly returned to normal. This lockdown highlighted how even a few cases of COVID-19 could shut down an entire region. Other origins and destination countries had fewer COVID-19-specific restrictions or impacts. GHSC-PSM refreshed third-party logistics (3PL) rates to align with market-related rates and reduced the number of spot bids. The project anticipates that the refreshed rates and fewer spot bids will shorten booking times and improve origin performance. For additional details, see section A2.

In FY 2022, GHSC-PSM focused on quality assurance across product categories to assess efficacy, detect active ingredients, and investigate potential out-of-specification (OOS) incidents. The project worked with global partners and in-country stakeholders to improve LLIN quality and standardization. GHSC-PSM identified and investigated a potential OOS for sterility in some batches of artesunate injectable kits. In collaboration with the Global Fund, the project also investigated OOS for water content in the artesunate powder; two batches of Pf mRDTs; and, SPAQ packaging. The project investigated a batch of LLINs that was OOS for mesh size and another for piperonyl butoxide (PBO) active ingredient (AI).

In FY 2022 GHSC-PSM issued 333 certificates of conformance. For pharmaceuticals regulated by a stringent regulatory authority (SRA), the project reviewed manufacturers' certificates of analysis (COA) for 26 batches of two artemisinin-based combination therapy products and issued certificates of conformity for all batches. GHSC-PSM reviewed test reports for other pharmaceuticals from qualified independent laboratories for more than 712 batches, most of which were QC tested concurrently with shipments. The project managed pre-shipment inspections and tested 142 orders representing 45.96 million LLINs from nine vendors and 70 orders representing 47.66 million mRDTs from five vendors. GHSC-PSM met or exceeded the target quality assurance lead time key performance indicator, with all four quarters falling above the target of 80 percent and an average annual score of 92 percent. No batches of products showed nonconformity in the first half of the year, while Q3 and Q4 faced a 4 percent and 0.6 percent out-of-specification rate, and the project finalized 100 percent of OOS reports within 30 days of completing the investigation. For additional details, see section A3.

In FY 2022, GHSC-PSM completed changes to the end-use verification (EUV) survey. The project approved more than 36 changes from the 17 GHSC-PSM country offices conducting the EUV, PMI, USAID Family Planning/Reproductive Health, USAID Maternal Neonatal, and Child Health, and the GHSC-PSM EUV team. The project updated the EUV toolkit and the reporting template and trained country teams on survey implementation. EUV countries implemented the EUV updates on a rolling basis. A total of 15 PMI-supported countries conducted EUVs with technical support from headquarters, and 14 EUV countries reported the COVID-19 continuity of care module. To consolidate and standardize EUV information, GHSC-PSM created an automated process for all survey data for PMI and GHSC-PSM analysis. This included 66 linkable EUV surveys conducted after Q2 FY 2020 when the project implemented the standardized survey.

In FY 2022, GHSC-PSM transitioned the Task Order Malaria (TOM) table from the Microsoft Excel™-based table into a Microsoft Power BI™ dashboard to move away from manual updates and improve data visibility and order management. In Q3, the TOM dashboard was introduced to all of the project's PMI and USAID malaria-supported countries.

GHSC-PSM manages data from 29 countries using the Procurement Planning and Monitoring Report for Malaria (PPMRm). In Q3, GHSC-PSM launched monthly PPMRm reporting in 28 countries.² For additional details, see section A4.

On-time and In-Full Delivery

Timeliness of GHSC-PSM deliveries remained high for standard on-time delivery (OTD) and on-time in full (OTIF) in Q1, with 89 percent OTD (81 percent for COVID-impacted) and 89 percent OTIF (82 percent for COVID-impacted). (See Exhibit 7.) The rates in Q2 were 81 percent OTD (68 percent for COVID-impacted) and 81 percent OTIF (71 percent for COVID-impacted). The rates in Q3 were 87 percent OTD (71 percent for COVID-impacted) and 92 percent OTIF (71 percent for COVID-impacted). The rates in Q4 were 87 percent OTD (74 percent for COVID-impacted) and 82 percent OTIF (79 percent for COVID-impacted). The annual OTD rate was 86 percent (73 percent for COVID-impacted), and the annual OTIF rate was 87 percent (75 percent for COVID-impacted).

Commodity Cost Savings

GHSC-PSM achieved \$211.5 million in cost savings for major malaria commodities over the life of the project. In FY 2022, GHSC-PSM achieved \$63.7 million in cost savings alone, representing 21 percent of the total spent on the procurement value for core commodities. The primary drivers of these cost savings were ACTs, which had annual savings in FY2022 of \$23.7 million, where weighted average prices continue to be lower than baseline pricing. LLIN cost savings were also a primary driver, amassing annual savings of \$16.4 million in FY2022, due to overall price reductions in the net market.

B. Strengthened In-Country Supply Chain Systems

GHSC-PSM strengthens national supply chains and improves malaria commodity availability in 22 countries. The project's health systems strengthening activities range from training and technical assistance for host governments to seconding staff to the government to support supply chain functions. In FY 2022, GHSC-PSM developed a Microsoft Excel-based budget template for investment planning as part of the project's stockout reduction initiative, a stage four activity.

In FY 2022, the project introduced the forecasting module in Quantification Analytics Tool (QAT) in 12 TO2 countries. The supply plan module of QAT helps program managers use supply data to improve forecasting and procurement needs up to 24 months in advance. The project provided technical assistance for more than 20 TO2 countries in forecasting and supply planning and received malaria supply plans from 28 PMI-supported countries—100 percent of the project's target. Of those 28 countries, 24 submitted through QAT. GHSC-PSM provided technical support to 10 TO2 countries to adopt GSI standards for product identification, location identification, and data exchange. For additional details, see section B1.

In FY 2022, the project delivered over 51 million LLINs to protect nearly 101 million people in 25 countries. In the second half of FY 2022, the project planned distribution, monitoring activities, and LLIN transportation to designated locations through 3PL service providers for 13 countries. For additional details, see section B2.

² Senegal did not move to monthly reporting and continues to report quarterly.

In FY 2022, the project trained in-country specialists in 17 PMI and USAID malaria-supported countries on all health supply chain systems strengthening areas. The project trained 8,158 people, either exclusively with TO2 funds or through co-funding by other health areas. In Q3 FY 2022, GHSC-PSM conducted an online and in-person hybrid training on “Introduction to Supply Chain Management” for 26 USAID staff; 23 completed the course. For additional details, see section B3.

C. Effective Global Collaboration to Improve Long-Term Availability of Health Commodities

Since the onset of the COVID-19 pandemic, GHSC-PSM has participated in three malaria global task forces—the Malaria Pharmaceutical (Pharma) Global Task Force, mRDT Global Task Force, and the Vector Control Access (the former Insecticide-Treated Net (ITN)/Indoor Residual Spraying (IRS) Global Task Force), to coordinate and manage COVID-19–related impacts on malaria commodity markets and in-country programming. GHSC-PSM also contributes to a sub-working group of the Pharma Task Force that focuses on upstream supply chain challenges in the key starting materials (KSMs) and active pharmaceutical ingredient (API) markets. For additional information, see section C2.

In Q3 FY 2022, GHSC-PSM participated in the [Raising the Floor on Nets – May 2022 Convening \(innovationtoimpact.org\)](#) in Liverpool, England. [The project was part of](#) a panel discussion and working sessions addressing the challenges in LLIN quality and the need for appropriate measuring tools/testing methodology.

At the country level, the project collaborated with Against Malaria Foundation (AMF) in Guinea, Nigeria, and Zambia, to deliver or distribute the AMF-procured LLINs to the designated locations. The project managed quality assurance/quality control for the AMF-procured LLINs in Guinea and Nigeria.

D. Performance Monitoring

GHSC-PSM monitors and reviews project performance with the objective of continual improvement. The project uses a USAID-approved monitoring and evaluation plan with performance indicators that reflect the results framework. Annex A provides the framework, and Annex B provides the list of indicators and their definitions. Annex C details the sources of all the commodities the project procures. Annexes D–F provide project performance as detailed by the indicators.

A. Improved Availability of Health Commodities

GHSC-PSM improves the availability of health commodities in supported countries through procurement and delivery. The project enhances commodity procurement, strengthens global logistics processes, promotes adherence to quality assurance (QA) requirements, and improves data visibility. Activities, achievements, and relevant performance indicators include:

A.1 Enhancing Global Health Commodity Procurement

Under the U.S. President’s Malaria Initiative (PMI)-funded Task Order Malaria (TO2), GHSC-PSM supplies lifesaving prevention and treatment pharmaceuticals, malaria rapid diagnostic tests (mRDTs), long-lasting insecticide-treated nets (LLINs), and lab supplies.

GHSC-PSM Approach to Improving Malaria Commodity Markets

The project enhances supply security, accelerates innovation, and drives value for money—supporting near- and long-term access to appropriate, quality-assured products at sustainable prices.

GHSC-PSM applies a three-step approach to improving global malaria commodity markets:

1. **Conduct market health assessments** for all products to identify risks and market-shaping opportunities.
2. **Design market-shaping interventions** with global partners to inform sourcing strategies.
3. **Conduct strategic sourcing and procurement activities** to implement interventions and improve delivered goods timeliness, reduce costs incurred by recipient countries, and sustain market health.

GHSC-PSM advances strategies for the best value, increases supply chain efficiencies for on-time delivery (OTD), and supports market health across the malaria product portfolios. Through long-term agreements (LTAs), the project expedites order procurement time and standardizes procurement-related decisions. LTAs shorten lead times—from order to delivery—and reduce complexity throughout the supply chain, resulting in cost savings. In FY 2022, 96 to 100 percent of procurement value was managed under LTAs—exceeding the 90 percent target for major product categories in all four quarters. See Annex E, indicator A10.

Proactive Procurement Strategies

GHSC-PSM uses proactive procurements to ensure availability of critical malaria commodities—such as SPAQ—when countries need them. This minimizes the risk of delays, reduces fulfillment lead times, and hedges against market uncertainty and disruptions. The project mitigates stockout risks, ensures timely delivery in constrained markets, and takes advantage of favorable market conditions (e.g., pricing).

The project places proactive procurement orders based on demand signals data, such as projected stockout risk and peaks in demand that correspond to seasonal market constraints. This way, GHSC-PSM secures production capacity earlier in the order process, often before receiving orders.

For instance, the project procures most sulfadoxine-pyrimethamine + amodiaquine (SPAQ) approximately one year before the requested delivery dates. The project has two eligible suppliers to procure SPAQ. The increased global demand for seasonal malaria chemoprevention (SMC) campaigns necessitates a proactive procurement to secure timely supply in advance of the campaigns. GHSC-PSM aggregates planned quantities from malaria operational plans (MOPs) and forecasts demand months before receiving requisition orders to proactively procure the product.

In Q1, the market for all malaria pharmaceuticals portfolios returned to a pre-COVID-19 state as there were no systemic delays to goods availability dates, except for SP. The project determined that routine fulfillment without proactive procurement was the best way to procure SP in FY 2022. See strategic sourcing activities below for more details.

In FY 2022, the project planned to implement vendor stored inventory (VSI) as a new sourcing strategy for AL that entails proactive procurement of AL and vendor contracts to store goods on-site until they receive firm purchase orders against the manufactured stock. Due to delays negotiating and finalizing supplier contracts targeted for VSI, the project anticipates VSI implementation in FY 2023.

The project did not consider other proactive procurements aside from those outlined above because the procurement lead times stabilized to pre-COVID-19 averages, thus reducing the risk of not meeting country requested delivery dates.

Supplier Engagement and Vendor Negotiations

The project engages with suppliers for all malaria commodities to support market health and deepen our strategic relationships:

- **Supplier-specific forecasts.** GHSC-PSM generates and shares supplier-specific aggregate forecasts with each supplier based on a demand allocation approach for select commodity categories to improve planning and manage stakeholder expectations. In FY 2022, the project expanded its forecasting to include rolling quarterly forecasts for high-volume commodities for greater supply chain visibility.
- **Re-solicitation.** The project periodically re-solicits pricing, registration status, and other information germane to strategic and operational objectives, keeping vendors abreast of GHSC-PSM objectives for the product category and allowing suppliers to generate offers that reflect market conditions and support market health.
- **Commodity risk assessments.** GHSC-PSM evaluates monthly programmatic impact to update commodity risk profiles—the project examines the geographical sourcing of commodities, market updates, and supplier-specific ability to meet GADs. GHSC-PSM draws information about sourcing KSMs, raw materials, and packaging materials to mitigate and minimize near- and long-term supply disruptions.
- **Business reviews.** GHSC-PSM had ad-hoc business review meetings with suppliers based on needs by each commodity, including performance reviews based on scorecards that emphasize five components: 1) purchase order line-level on-time performance; 2) occurrence and severity of inability to meet contractual requirements; 3) occurrence and severity of quality and regulatory incidents; 4) compliance with Global Standards for product traceability; and 5) qualitative internal feedback on supplier communication, flexibility, and responsiveness. The

project shared supplier performance scorecards with suppliers quarterly to monitor and address performance issues. Performance metrics promote supplier performance improvements while informing order allocation decision-making. These efforts positively impact the project's overall supply chain performance.

- **Supplier visits.** At the end of FY 2022, GHSC-PSM visited manufacturers of malaria commodities in East Africa. The visits included tours of the manufacturing facilities, observation of the manufacturing processes, and key personnel interviews to increase knowledge of the products and identify potential quality control challenges and opportunities to increase efficiency. The visits provided opportunities for discussions on the challenges of manufacturing in Africa.

Strategic Sourcing Activities

In FY 2022, GHSC-PSM sourcing efforts focused on the following strategic priorities:

- **Development and implementation of FY 2023 sourcing strategies.** In FY 2022, the project refined its sourcing strategies for key product categories to align them with long-term objectives and current market conditions. The project issued four strategic tenders spanning six major product categories in preparation for FY 2023 order fulfillment. Strategic priorities differ depending on the product category and associated market dynamics. In preparation for FY 2023, major factors spanning all key product categories included combatting rising costs and promoting regionalization of manufacturing closer to the end users.
- **Regionalization of malaria commodity manufacturing.** Throughout FY 2022, the project worked to understand the challenges and opportunities associated with establishing and expanding the manufacturing of malaria commodities in Africa. The project issued a request for information to suppliers across all major product categories, including those operating in Africa. GHSC-PSM solicited input from suppliers on establishing a presence on the continent, obstacles—both experienced and perceived—and suggestions to increase the probability of success.

Upstream supply chain

In FY 2022, GHSC-PSM faced numerous upstream challenges that impacted the malaria supply chain of key raw materials and active pharmaceutical ingredients (APIs), which were attributed to latent risks, such as reliance on limited sources of key ingredients, and government-imposed environmental restrictions, including the Chinese New Year, the Beijing Olympics, and protracted COVID-19 disruptions. The project reviews all upstream suppliers and KSM source locations and communicates directly with many of the API suppliers. Whenever GHSC-PSM learns of upstream challenges from its suppliers of finished pharmaceutical products (FPPs), the project assesses the severity and scope, such as how many suppliers are impacted because they use the same source. However, even though suppliers generally source from the same upstream base, they are protected from all being in the same situation due to other factors such as, each FPP's timing combined with PQ sources, stock on hand, and ordering cadence. If the API/KSM issue will delay requested delivery dates (RDDs), the project goes to secondary or tertiary suppliers. In the second half of FY 2022, access to active ingredients and key starting materials improved significantly with fewer supplier delays largely due to the end of Olympics and lunar New Year in China, fewer container shortages, and fewer COVID-19-related challenges.

Forecasting

In FY 2022, the project expanded its efforts to provide suppliers that receive target volume allocations with quarterly forecasts of production needs and annual forecasts to inform their planning. This information increases supplier visibility, which increases suppliers' ability to prepare for future demand. GHSC-PSM can then increase the use of the optimal suppliers based on their ability to fulfill orders from recipient countries.

Promoting Market Health

A GHSC-PSM objective across product categories is promoting and sustaining market health. In FY 2022, GHSC-PSM's activities for increased market health included messaging to suppliers on strategic priorities, incentivizing product development through tenders, and outreach to potential suppliers to expand the supply base.

Freight Efficiency

GHSC-PSM evaluated freight costs and unit costs to reduce costs to recipient countries in sourcing decisions. Since FY 2020, GHSC-PSM has sought opportunities to achieve freight efficiency through improved packaging. The project saved space in units per pallet and units per container by collaborating with suppliers and using the following approaches:

- Including expected freight costs in evaluating best value.
- Using benchmarking to inform suppliers of where they stand relative to competitors to incentivize change where warranted.
- Sharing best practices in areas, such as pallet sizes to improve container loading efficiency; and keeping stacking heights within the range required for aircraft and containers. These adjustments can maximize the available container space, optimize shipping carton size, and highlight opportunities for suppliers' improvement.

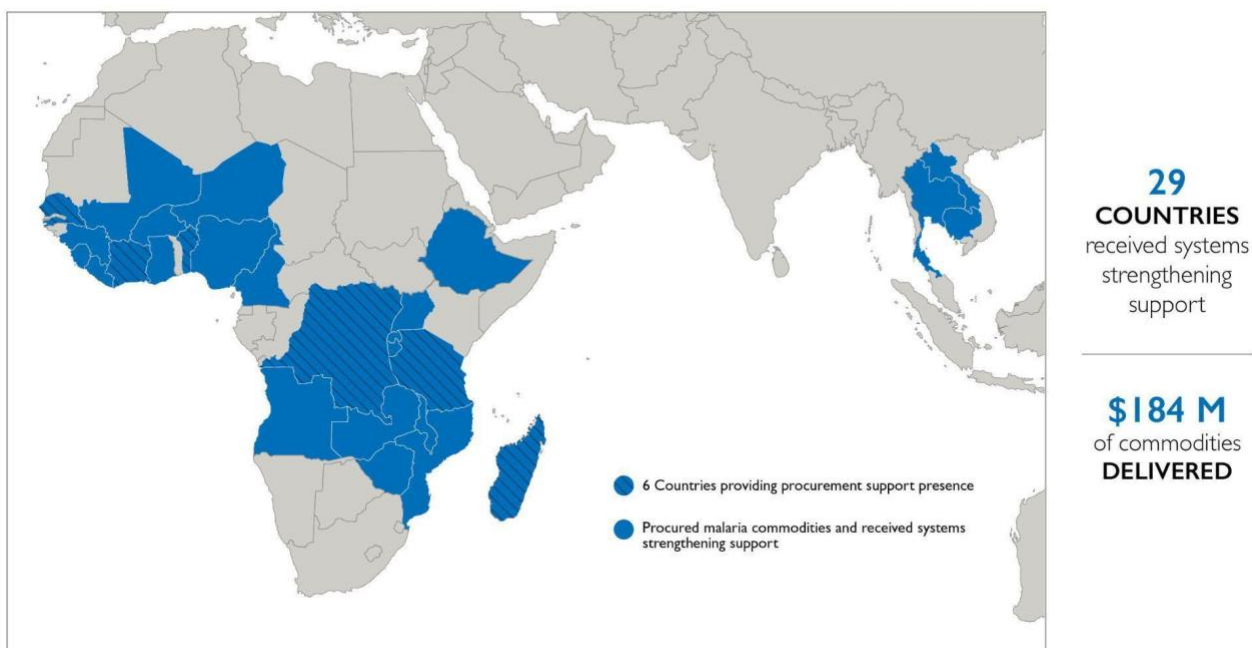
Procurement of Malaria Commodities

For procurement and end-to-end order management—from receipt through to delivery and payment—GHSC-PSM requires planning, open communication, and coordination among a broad group of internal and external supply chain stakeholders. In FY 2022, GHSC-PSM collaborated with stakeholders, such as USAID Missions, suppliers, logistics providers, and customs agents, to support 29 PMI -supported countries³ plus Colombia in procuring more than \$184M in commodities (see Exhibit I below). This included project headquarter staff providing procurement support to six countries where GHSC-PSM has no field presence.⁴

³ Angola, Benin, Burkina Faso, Burundi, Cambodia, Cameroon, Côte d'Ivoire, DRC, Ethiopia, Ghana, Guinea, Kenya, Thailand, Laos, Liberia, Madagascar, Malawi, Mali, Mozambique, Myanmar, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Uganda, Zambia, Zimbabwe.

⁴ Benin, Côte d'Ivoire, the Democratic Republic of the Congo (DRC), Madagascar, Senegal, and Tanzania

Exhibit I. Countries for which GHSC-PSM procured malaria products in Q1–Q4 FY 2022



Cost Savings on Malaria Commodities

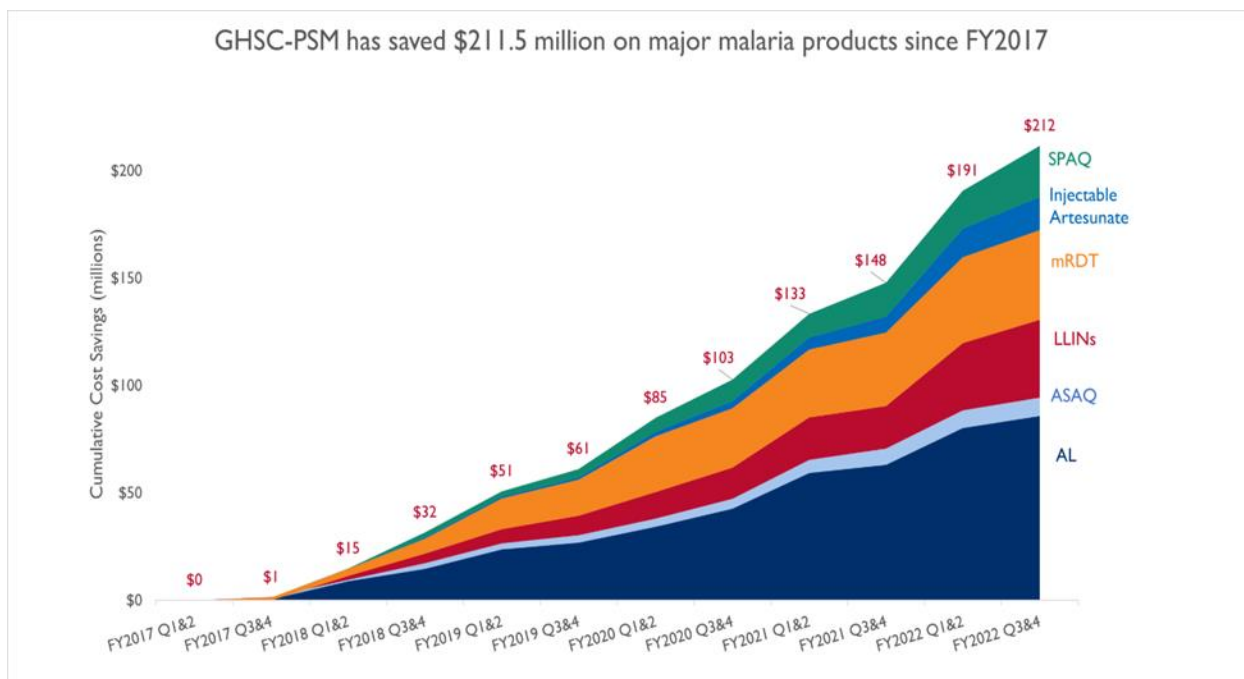
Commodity cost savings are calculated in comparison to baseline prices of each commodity—when the project began tracking cost savings for that commodity. Cost savings calculations are adjusted for inflation and are the averages of cost savings by tracer product type. Commodity cost savings on core malaria products reached \$211.5 million over the life of the project (LOP) compared to the baseline prices in 2017 and 2018. In FY 2022, cost savings were \$63.7 million, representing 21 percent of the total procurement value for core commodities and 19 percent of the total procurement value for all malaria products. Artemisinin-based combination therapies (ACTs) amassed \$23.7 million in savings—the weighted average prices for ACTs were lower than baselines—but AL 6x3 and AL 6x4 had some cost increases compared with previous fiscal years. Most vendors increased commodity pricing, driven by rising prices in the API market. Pricing for artesunate + amodiaquine (ASAQ) products remained consistent throughout FY 2022, as GHSC-PSM procured the product from a single vendor this year.

In FY 2022, GHSC-PSM almost doubled the life of the project LLIN cost savings, amassing \$16.4 million this year alone, for a total LOP savings of \$36.3 million, as compared to project savings through FY 2021, which amounted to \$19.8 million. These savings were primarily driven by overall price reductions in the LLIN market. In FY22, piperonyl butoxide (PBO), and single-pyrethroid 170 (cm in height) nets decreased in price, while cost of single single-pyrethroid 150 (cm in height) bed nets rose slightly. The project used a mix of vendors, engaging with seven different LLIN suppliers in FY 2022. GHSC-PSM followed the ongoing trend for LLINs and started procuring PBO or dual active ingredient (Dual AI) nets due to mosquito resistance to single-pyrethroid nets.

Artesunate injectable 60 mg vial cost savings increased dramatically in FY 2022, doubling the life of the project’s cost savings to \$15.4 million. The cost savings were primarily due to lower offered prices resulting from increasing competition for market share. In FY 2022, the project procured its largest volume of artesunate injectable 60 mg vials yet at the lowest prices since GHSC-PSM began tracking cost savings.

In FY 2022, the project achieved \$7.6 million in cost savings for mRDTs. Procurement volume decreased in the second half of FY 2022. The project generated increased cost savings on SPAQ in FY 2022 due to GHSC-PSM’s allocation of a greater proportion of procurements to lower-cost suppliers than in previous periods as well as supplier price reductions.

Exhibit 2. Cumulative cost savings of \$211.5 million on major malaria products since 2017



Commodity Procurement Indicators

GHSC-PSM procured malaria commodities worth over \$184 million in FY 2022, including regional distribution center (RDC) stockpile orders and direct drops to countries, as shown in Exhibit 3.

Exhibit 3. GHSC-PSM procurement totals for FY 2022

Product category	Value
ACTs	\$ 32,619,255
Laboratory	\$ 1,170,439

Product category	Value
LLINs	\$ 96,770,864
Other non-pharmaceutical products	\$ 84,993
Other pharmaceuticals	\$ 66,730
mRDTs	\$ 18,633,940
Severe malaria medicines	\$ 16,816,218
SMC	\$ 14,682,067
SP	\$ 3,994,218
TOTAL	\$ 184,838,725.28

Annex C lists GHSC-PSM sources of mRDTs, LLINs, ACTs, laboratory supplies, and other pharmaceutical products.

In FY 2022, the project procured 100 percent of all core product categories (Exhibit 3) through framework contracts, except for LLINs, laboratory products, and one small order of other non-pharma commodities. Procurements through framework contracts represented 92 percent of LLIN procurements, 98 percent of lab procurements, and 95 percent of other non-pharma procurements. When aggregated across all product categories, the overall framework contracting percentage by commodity value for FY 2022 was 98 percent, exceeding the annual target of 90 percent. GHSC-PSM uses several indicators to measure its performance. Procurement results are summarized in Annex E.

A.2 Strengthening Global Logistics Processes

The project continues to employ strategies initiated within the COVID-19 environment as new challenges in FY 2022 slowed the processing and clearance of products for delivery. These challenges included container shortages, erratic vessel scheduling, truck driver shortages, transshipment and border crossing delays, local government restrictions, and minimal port office staff. Illness among personnel also affected project service providers. In Q3, a strict month-long lockdown in Shanghai impacted freight and logistics. China's Zero COVID-19 policy remains a risk for orders with China as an origin. Lockdowns under the policy cannot be predicted and are implemented without warning. Even a few positive cases can bring the region to a near standstill, and these lockdowns will continue with any new COVID-19 cases. In FY 2022, GHSC-PSM collaborated with third-party logistics (3PL) providers and USAID Missions to mitigate these issues and meet demand across countries to deliver malaria commodities to 29 countries.

Impacts of COVID-19 on Freight and Logistics

Q3 and Q4 FY 2022 saw a decline in COVID-19-related supply chain disruptions. The Chinese authorities kept the ports, including the Shanghai port, operating at reduced capacity so that carriers could maintain schedules. Other origins and destination countries had fewer COVID-19-specific restrictions or impacts.

- **Freight costs.** By the end of FY 2022, any volatility in the freight market was unrelated to COVID-19 impacts. In Q3, GHSC-PSM implemented the first contract freight rates since before the pandemic—indicating stability in freight markets. Freight rates saw fewer fluctuations, better predictability in shipping costs, faster bookings, and fewer spot rates.
- **Origin challenges.** China’s Zero COVID-19 policy remains a risk. Through the latter half of FY 2022, COVID-19 had less severe impacts on shipping, compared to other times since the pandemic began. By the end of Q4 2022, there were no COVID-19-related delays at ports of origin affecting GHSC-PSM routes.
- **Air freight.** In Q3, concerns over the COVID-19 Omicron variant from Q1 subsided and related supply chain restrictions were lifted. Higher-than-normal reliance on freighter service continued, mainly serving large commercial markets and leaving traditionally underserved markets with less air freight capacity.
- **Ocean freight.** In Q3 and Q4, the effect of COVID-19 on the ocean freight market decreased significantly, including the end of Shanghai’s lockdown. Exports from China quickly returned to normal, and trucking shortages and port delays were not as severe.
- **Intra-Africa.** In Q3–Q4, COVID-19 had minimal effect on air freight into Africa. In Q3, the South African National State of Disaster lifted Omicron restrictions. This was significant because South Africa had the highest reported cases in the region. Through Q3–Q4, no significant COVID-19 restrictions existed in any transport mode, including at overland border crossings.
- **Temperature control.** GHSC-PSM and 3PLs weigh risks according to consignment regardless of the mode of transportation to identify the most appropriate temperature-controlled supply chain solutions and to maintain cargo integrity. COVID-19 regulations impacted carrier operations at airports where numerous operators have fewer staff than at pre-pandemic levels. Additionally, there continue to be fewer flights to destinations the project services, meaning that not all temperature cargo can move as booked. Examples include sourcing the best routing from the available carriers that can arrive in time for clearance and delivery, and avoiding routings that could cause weekend arrivals to avoid any delays.

Deliver/Return

GHSC-PSM operates a fourth-party logistics model (4PL), contracting 3PLs to obtain market updates, global impacts, and trends through reports, webinars, and weekly calls. In Q1 and Q2, 3PLs continued spot bidding. Under the current rate refresh, if the market is upset, the 3PLs can reject a shipment award or accept it contingent on using the revised rates. For rejected awards, GHSC-PSM considers booking with a secondary or tertiary 3PL or opening the lane to spot bidding. This rate refresh secured competitive rates in a less volatile but more expensive market. For example, China’s Zero COVID-19

policy led to extended lockdowns that made trucking to the Shanghai port and port activities more expensive and caused container shortages and challenges in vessel scheduling.

With spot bidding, 3PLs could secure hard-to-obtain equipment by looking outside ocean freight contracts and negotiating with carriers at the market level. However, spot bids increase the shipment lead time because of the quoting process—awarding and booking activities following the rates sourced, evaluated, and applied to subsequent operations. In Q2, GHSC-PSM opened a rate refresh between four 3PLs to cover a broader lane portfolio to ensure viable sourcing solutions where shipping constraints exist. Uncertain market pricing dictated that GHSC-PSM conduct a rate refresh every six months instead of annually. GHSC-PSM will continue to spot-bid large shipments to obtain competitive pricing since 3PLs can typically use larger loads to increase their buying power and drive down air and ocean freight costs. There was not a significant reduction in spot bids in FY 2022 because the project continued to price lanes not included in the rate refresh, as well as following the process for spot-bidding large shipments and shipping to any new countries.

On-time Delivery and On-time Delivery in Full

GHSC-PSM achieved an OTD rate of 86 percent in FY 2022. Quarterly and annual project performance exceeded the target of 80 percent.⁵ (See Exhibit 4.)

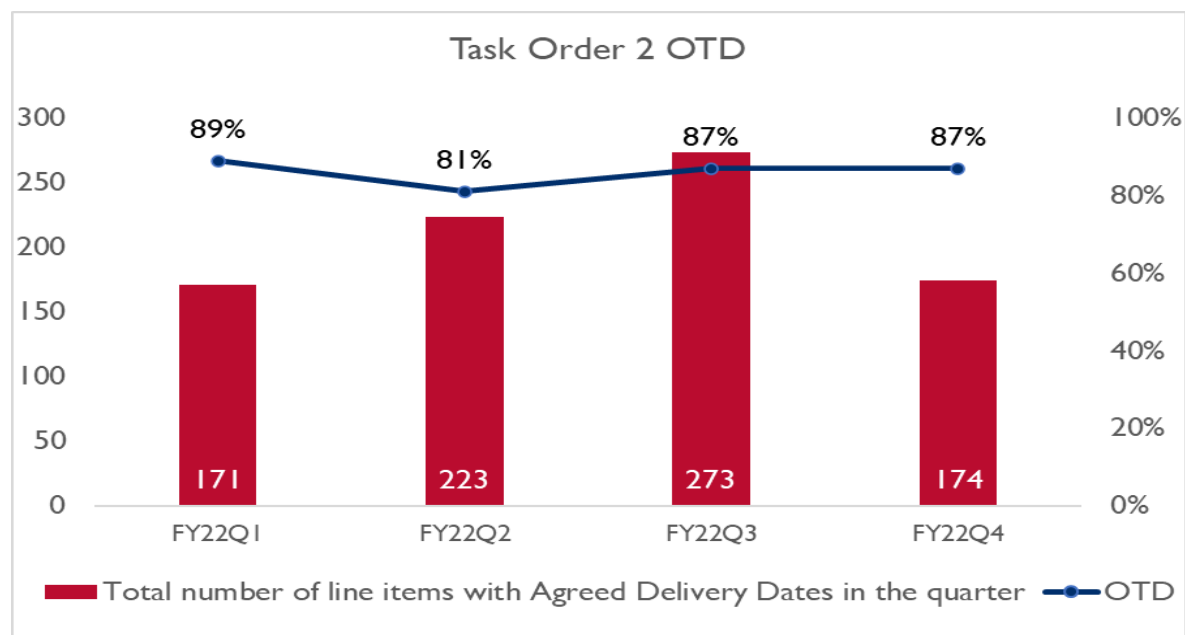
⁵ During COVID-19, GHSC-PSM will present two versions of its usual OTD indicator. The first will be the “standard” version, calculated according to the indicator definition as laid out in the project’s monitoring and evaluation plan and in accordance with all associated policies/standard operating procedures (SOPs). These policies and SOPs allow for USAID-approved adjustments to agree delivery dates in the case of interruptions that are beyond the project’s manageable control, including pandemic impacts. The “standard” version of OTD will therefore show the project’s performance, controlling for impacts of COVID-19 and other external disruptions. The second calculation of OTD is the “COVID-19-impacted” version. This version follows the same rules and definitions as the standard indicator, but the “control” for COVID-19 impacts will not be used. All COVID-19-impacted line items will be assessed as on time or not, according to the agreed-to delivery date at the time the order was approved. This version of the indicator will show the full impact of supplier and logistics delays because of manufacturing shutdowns, port and border closures, and other COVID-19 control measures. The delays cannot be attributed to GHSC-PSM, but the project is committed to sharing these outcomes in the interest of full transparency and acknowledgement of the challenging and unprecedented circumstances presented by COVID-19.

Exhibit 4. Comparison of OTD and COVID-impacted OTD rates for FY 2022

Time Period (FY 2022)	OTD	COVID-impacted OTD
Quarter 1	89%	81%
Quarter 2	81%	68%
Quarter 3	87%	71%
Quarter 4	87%	74%
FY2022	86%	73%

The OTD rate measures the number of line items per quarter that were delivered on time, following agreed-to delivery dates, out of the total number of line items per quarter with agreed-to delivery dates in the quarter (Exhibit 5).

Exhibit 5. OTD and volume of deliveries of malaria commodities, Q1 FY 2022–Q4 FY 2022



OTD and OTIF for specific malaria product categories are provided in Annex E.

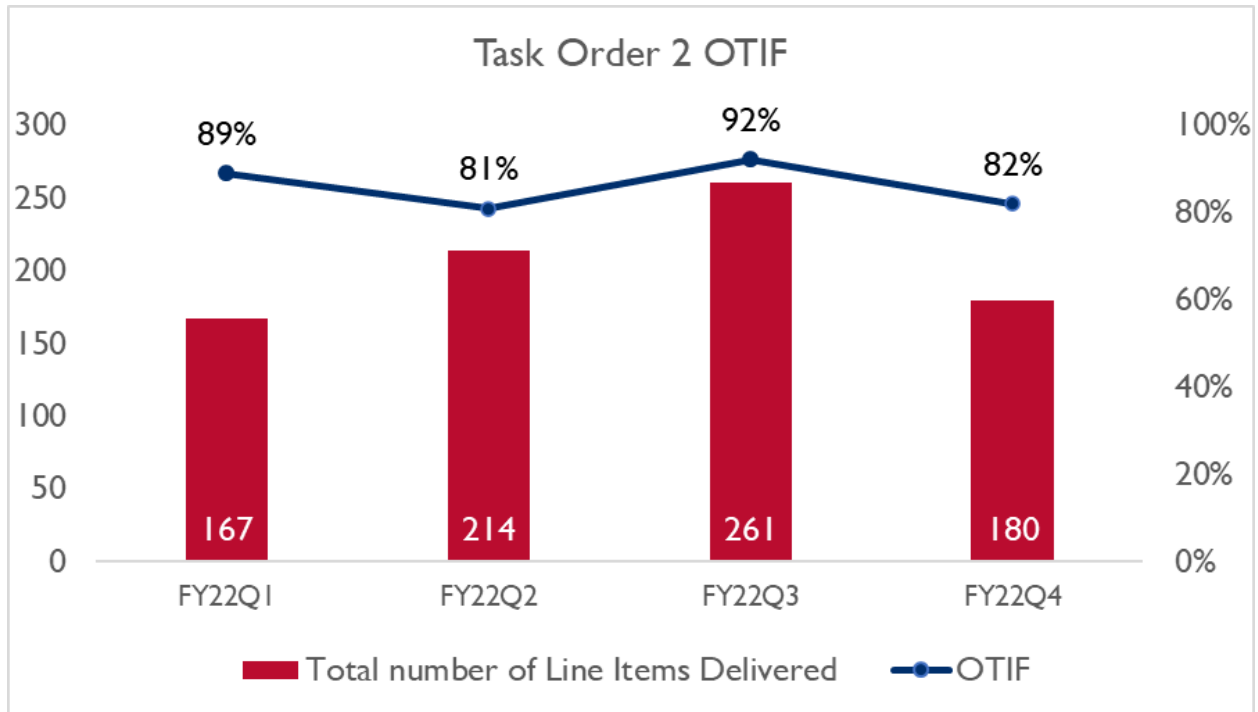
GHSC-PSM’s OTIF rate measures the percentage of deliveries during a given period delivered on time and in full. Delivering late orders in a subsequent month and split-shipment deliveries reduce the OTIF rate. For OTIF, project performance continued to exceed the target of 80 percent, reaching 87 percent for FY 2022. (See Exhibit 6.)

Exhibit 6. Comparison of OTIF and COVID-impacted OTIF rates for FY 2022

Time Period (FY 2022)	OTIF	COVID-impacted OTIF
Q1	89%	82%
Q2	81%	71%
Q3	92%	71%
Q4	82%	63%
FY2022	87%	74%

In FY 2022, the project’s OTIF rate for malaria commodities maintained strong performance. (See Exhibit 7.)

Exhibit 7. OTIF for malaria commodities, FY 2022 Q1–Q4



Cost Savings on Logistics

GHSC-PSM saved \$25.4 million on TO2 logistics in the first half of FY 2022 by managing open competition in freight lanes, optimizing the RDC network to three strategically placed warehouses, and shipping by ocean over air. The savings tracked are compared to a sole-sourced model with limited competition in freight lanes, using the network of five RDCs that were used at the onset of the project and tracking what ocean shipments would have cost if they were sent by air.

Exhibit 8. Task Order malaria logistics cost savings



Open Competition in Freight Lanes

GHSC-PSM manages freight lanes through open competition rather than a sole-sourced 3PL. This improves service and cost savings on shipping rates through scale and competition for shipping lanes. Logistics savings are the difference between the rates awarded to the selected 3PL and the average of the two most expensive 3PLs. This method compares all shipping lanes and simulates the rates that would likely be obtained under a non-competitive 3PL model. Based on this methodology, GHSC-PSM Task Order 2 generated \$1.5 million in cost savings in FY 2022 due to open competition for freight lanes.

RDC Warehousing and Routing

The project saved money on logistics for malaria commodities by optimizing a network of RDCs. GHSC-PSM generated savings through:

- Warehousing savings from the lower costs at the Belgium RDC, measured against the costs at the previously used RDCs. However, there have been specific circumstances in past fiscal years where other RDCs have been used for TO2 shipments to handle special country requirements (e.g. Mozambique and DRC). These cost savings are generated by simulating the costs of product stored at the previously used RDCs with their accompanying rates compared to the actual invoices from the Belgium RDC.
- Transportation savings from shipping costs on actual commodities that moved through the Belgium RDC, compared to what shipping would have been for those commodities under the previous five-warehouse model. These cost savings are generated by simulating the shipping costs using the average rates per freight lane quoted by multiple freight forwarders compared to the shipping cost from the Belgium RDC using the average rates per freight lane quoted by multiple freight forwarders. This generated \$321,000 worth of cost savings for malaria commodities in FY 2022.

Shipping by ocean over air. Since FY 2019, Task Order 2 (TO2) has tracked cost savings from orders shipped by ocean that would have historically been shipped by air. The methodology for tracking these savings is to compare the selected ocean rates quoted by the awarded 3PL against the cheapest of all 3PL air rates quoted in the annual 3PL rate refresh. TO2 generated \$23.7 million in cost savings in FY 2022 by shipping orders by ocean instead of air.

In total, TO2 generated \$25.4 million in logistics cost savings in FY 2022.

Logistics and Delivery Indicators

This section presents performance on logistics and delivery-related indicators not shown above. Values for these indicators are in Annex F.

Product Loss

In FY 2022, the project did not lose any ACTs due to expire at the Belgium RDC. However, GHSC-PSM experienced minimal losses of other malaria products under its control. The value of product loss at the Belgium RDC due to theft, damage, or causes other than expiry amounted to \$2,262 in FY 2022. The total amount was due to damage to SPAQ products while in transit to the Belgium RDC.

GHSC-PSM manages product shipments to countries, as well as some storage and distribution within countries. In FY 2022, product losses that occurred in project control due to theft, damage, or expiry totaled \$27,183 (less than one-tenth of a percent annual loss). See Annex G for more details.

Cycle Time

Cycle time is the time from order entry to the product's arrival in the destination country. The project considers several factors when assessing cycle time:

- **Anticipated high demand and early order placement.** Typically, countries simultaneously enter a large volume of orders around the PMI annual call for orders, which takes into consideration the next year's funding cycle and serves as a reminder for order placement in preparation for seasonal demand. Orders often have delivery dates in the distant future that do not necessitate the entirety of the time between order placement and delivery to process and

fulfill the order. While this provides visibility into demand and allows for effective supply planning, it can also lengthen cycle times.

- **Funding availability.** Due to shifts toward early order entry, the time between orders and available funding grows larger. Country FY funding obligations lag behind order entry by several months. The project works with countries to spend down remaining pipelines from the previous fiscal year, conduct budget analyses, and prioritize the most urgent orders. The project uses a limited emergency loan fund to process cross-country proactive procurements for critical commodity categories and to issue one-time country-specific loans to avoid funding delays and meet the most urgent needs. However, there is a gap between the funding requirements for orders entered by countries before and during the PMI annual call for orders, and the funding available to process those orders. All orders subject to available funding must be placed on hold, which is common and can be extensive.
- **Validation of specifications.** Complex or uncertain order specifications can increase the time required to prepare the order for procurement, increasing the cycle time. This is most common for laboratory items; orders with scopes of work that are not defined fully at order entry (e.g., last-mile distribution plans for LLINs); and orders for which countries are still determining the type, amount, and required delivery timeline. Clarification discussions are common for malaria commodities and are outside of the project's control but can extend processing times, which increases cycle times.
- **Mode of shipment.** In 2019, the project shifted from a default air shipment preference to ocean shipment, which was more cost-efficient and feasible for all categories other than LLINs that had already defaulted to ocean freight. This strategy increases overall cycle times because ocean shipments are less flexible than air, with fewer options for rapid or expedited delivery. Also, the project aligns many QA and logistics processes with the ocean strategy to reduce logistics cycle times. That notwithstanding, some products are still shipped by air if the need is urgent.
- **COVID-19.** The pandemic affected manufacturing and logistics processes and early cycle time segments. Country lockdown added additional lead times for some commodities. This resulted in lengthy tendering events for some lab supplies and lengthy discussions with countries about alternative products. From a logistics standpoint, the imbalance and the shortage of containers further constrained supply chains, increasing the overall cycle time for shipment of goods by ocean.
- **Challenging destinations.** GHSC-PSM serves complex destinations such as Democratic Republic of Congo (DRC), which has up to 10 delivery destinations per commodity. This is many times the number of delivery lines for the average country order—all with the same requested delivery date, each requiring individual processing along the same timeline. DRC accounted for over a fifth of the malaria shipments delivered in FY 2022. These orders are labor and time-intensive due to the complexity of this destination. Moreover, the project delivers to some inland destinations; these orders entail longer delivery timelines and skew the malaria commodity average cycle time.
- **Cycle time as a lagging indicator.** Cycle time does not capture improvements in order processing until the orders are delivered.

- Factors outside the supply chain.** Supplier-specific quality issues, client-requested holds, country-specific import challenges, and in-country quantifications which result in changes after an order is in process contribute to lengthy cycle times. In Myanmar and Kenya, circumstances outside of the project's control resulted in lengthy order processing delays; suppliers held goods at their sites due to ongoing import challenges. The project uses new hold status fields in the Automated Requisition Tracking Management Information System (ARTMIS) to account for scenarios where an order requires no active processing or fulfillment activity by the project during this hold period. This tracking allows GHSC-PSM to calculate active (i.e., dwell-adjusted) cycle times that reflect precise processing time on orders. This applies to cycle time segments before purchase order (PO) execution, so the cycle time for any country-specific challenges is not adjusted. In FY 2020, the project adjusted and clarified the hold status policy and throughout FY 2022, reported dwell-adjusted cycle time.

The average cycle time of FY 2022 was 339 days (see Exhibit 9), against a target of 340 days. This is an improvement of 26 days over FY 2021, which averaged 365 days. Comparing quarter by quarter, FY 2022 showed further improvements, with a slight increase in Q4. In FY 2021, end-to-end results by Q4 were 357 days. The average cycle time in FY 2022 was lower, with an average of 358 in Q1, 346 in Q2, 321 in Q3, and 340 days in Q4.

Since FY 2021, the project has reported on dwell-adjusted cycle time. In FY 2022, the most common reasons for holds were orders awaiting country FY funding obligations and confirmation of order specifications and quantities. GHSC-PSM analyzes hold usage and dwell-adjusted cycle time to identify insights and opportunities for process improvement to drive gains in global supply chain responsiveness.

Exhibit 9. Task Order 2 cycle times for FY 2022

Time period (FY 2022)	Overall average cycle time (days)	Dwell-adjusted cycle time (days)	Average cycle time without DRC (days)
Q1	358	300	349
Q2	346	311	292
Q3	321	280	305
Q4	340	307	328
FY2022	339	298	315

Cross-cutting Process Improvements

The project invests in process improvements to reduce cycle times, including:

- Using the emergency loan fund strategically to execute proactive procurements based on demand data. This contributes to reducing the lead time from requisition order (RO) entry through the delivery of goods against the agreed delivery date (ADD).
- Implementing standardization protocols and a workflow checklist to streamline the RO approval process.
- Implementing a tool to support rapid and accurate budget scenario planning, allowing faster feedback to countries regarding available budget versus budget needed for orders placed.
- Using supply planning exercises in-country to create accurate and actionable supply plans, reducing upfront order clarifications.
- Managing the impact of COVID-19 by identifying and mitigating supply and freight risks.
- Aligning procurement, QA, and logistics processes.
- Implementing management systems to identify and manage orders lagging at any point in the order lifecycle.
- Deploying the Task Order Malaria (TOM) Power BI dashboard, which pulls salient information from various modules, including Quality Assurance Management System and logistics management information system (LMIS) data, along with specific fields available in ARTMIS as a source of truth to provide daily updates to data users.
- Establishing system connections to facilitate the flow of data stored in a Power BI data flow referenced by the TOM report, thus avoiding redundancy of entering the same data into multiple systems for reporting purposes. This reduces the chances of data entry errors and the level of effort from users who maintain data across multiple systems.

Managing the Malaria AL Stockpile

In the RDC in Belgium, GHSC-PSM maintains PMI's malaria emergency stockpile of a relatively small cache of ACTs (specifically AL) for rapid allocation to countries based on need. Stockpile quantities are based on historical data and estimated to satisfy emergency orders. The estimation is repeated multiple times per year to create frequent replenishment of orders based on the remaining stock. In FY 2022, the project delivered five item lines in three inventory orders (IO) to the Belgium RDC. GHSC-PSM reviews the information at least quarterly (more frequently if required) to identify any shelf-life issues with the current stock, to match probable use of stocks with risk of expiry to orders that are not normally fulfilled by the RDC, and to determine any new quantities needed for procurement. In FY 2022, the project received \$177,853 in AL for pre-positioning at the Belgium RDC (Exhibit 10).

Exhibit 10. GHSC-PSM AL total product received at the RDC in FY 2022

Product	Number of treatments delivered to the Belgium RDC
AL 20/120 mg dispersible tablet, 6x2 blister packs	36,000
AL 20/120 mg tablet, 6x3 blister packs	198,000
AL 20/120 mg tablet, 6x4 blister packs	135,000

GHSC-PSM used this stock to fill urgent or emergency orders of AL to four countries (Exhibit 11). Using the quality control (QC)-tested commodities held in the RDC, reduced delivery and cycle times and prevented stockouts. The quantities available at the stockpile are larger than the sum of the units received given that there were previous stocks available prior the arrival of the shipments listed above.

Exhibit 11. AL deliveries by country from the stockpile in FY 2022 (door delivery date in-country)

Recipient country	Product	Number of treatments delivered
Burundi	AL 20/120 mg tablet, 6x3 blister packs	177,000
Cameroon	AL 20/120 mg tablet, 6x3 blister packs	84,810
Uganda	AL 20/120 mg dispersible tablet, 6x1 blister packs	287,820
Uganda	AL 20/120 mg tablet, 6x4 blister packs	62,700
Zambia	AL 20/120 mg dispersible tablet, 6x2 blister packs	1,203,630

Remaining Shelf Life for Warehoused Commodities

GHSC-PSM tracks inventory and shelf life to balance expiry risks while maintaining enough stock to respond to urgent and unforeseeable needs. As shelf life dwindles, the project sends inventory reports to the client and recipient countries to generate awareness of available stock on hand. It identifies potential recipients through in-country consolidated stock reports. For details on shipments from the RDC, see Section A1.

By the end of FY 2022, GHSC-PSM had no ACTs stockpiled at the RDC, with a new shipment in transit arriving in early FY 2023. The project consistently meets the shelf life targets in part due to frequent stock rotations to meet emergency and urgent demand.

Backlogged Line Items

The percentage of undelivered promised line items at the end of the FY 2022 was one and a half percent. This is below the target of five percent.

A.3 Adhering to Quality Assurance Requirements

GHSC-PSM ensures the quality of the malaria commodities delivered through a comprehensive quality assurance/quality control (QA/QC) program.

Strategies and Innovations

In FY 2022, GHSC-PSM expanded testing capacity for pharmaceuticals and LLINs by onboarding new laboratories following the third-party laboratory request for proposal, performing method transfers, and validation at additional pharmaceutical testing laboratories. In Q1, the project added two AL hard-tablet products and completed method transfer for a new artesunate injectable at a primary lab. In Q2, GHSC-PSM completed suitability testing for sterility testing of the two artesunate injectables at secondary labs and managed confirmatory testing to verify the lab's capability to test the product. The method transfers and validations allowed the project to broaden the number of laboratories capable of testing key high-volume products.

In Q4, GHSC-PSM visited LLIN manufacturers in Tanzania and pharmaceutical manufacturers in Uganda and Kenya to support vendor-stored inventory (VSI), and foster Africa-based manufacturing and robust quality assurance for LLIN production. The project learned about African manufacturing opportunities, challenges, and the impacts of manufacturing expansion. GHSC-PSM gained a greater understanding of the LLIN manufacturing process and quality management systems (QMSs).

In FY 2022, GHSC-PSM collaborated with the Rwandan government and LLIN suppliers to reconcile the differences between country-level QC requirements and methodology specifically for the post-shipment inspection of LLINs, with WHO and PMI/GHSC-PSM QC requirements. The project ensured the implementation of QC activities according to the agreements on a subsequent FY 2022 delivery. The LLINs met Rwanda QC requirements. Rwanda accepted the LLINs and included them in its countrywide distribution.

Collaboration

In FY 2022, the project participated in the Second Convening of Raising the Floor on Nets in Liverpool. GHSC-PSM served on a pre-shipment QC panel discussion and participated in working sessions on net quality, performance, durability, and possible solutions to address challenges. The project discussed partial and complete manufacturing with suppliers in Africa. The suppliers noted barriers, including logistics for raw materials, taxes and additional costs, political instability, regulatory requirements (WHO PQ certification), and workforce.

The project collaborated with global partners and in-country stakeholders on LLIN quality requirements. GHSC-PSM led discussions and activities in bed net quality and QMS as the chair of the LLIN Quality Assurance Group (LQAG)—a global working group of procurers focused on LLIN QA/QC convened by PMI. The project collaborated with global partners on quality investigations. For more details, please see *Fostering Quality in LLINs, mRDTs, and Pharmaceuticals* (section A.3).

Promoting Supply Chain Health

In FY 2022, GHSC-PSM reviewed strategic sourcing and procurement documentation on QA for LLINs, pharmaceuticals, and mRDTs for inclusion in the USAID-governed Restricted Commodity Waiver list; 312 products were eligible for procurement. The project completed a review of additional quality-assured products for 11 pharmaceutical products, two mRDTs, and one LLIN product (see Exhibit 12.)

Exhibit 12. Products Reviewed for Eligibility

Product category	Product subcategory	Product detail
Pharmaceuticals	SP	1,000-tablet jars of sulfadoxine-pyrimethamine (500 mg/25 mg)
Pharmaceuticals	SP	Sulfadoxine-pyrimethamine (SP) 500 mg/25 mg tablets (Falcistat)
Malaria Rapid Diagnostic Tests (RDTs)	mRDT	Paracheck Pf: Rapid test for <i>P. falciparum</i> malaria device HRP2 (Pf), 10 packs
Malaria rapid diagnostic tests (RDTs)	mRDT	ParaHIT f Ver. 1.0 Rapid Test for <i>P. falciparum</i> Malaria Device - 10 pack
Pharmaceuticals	ACTs	Artemether/lumefantrine 20mg/120mg tablets

Pharmaceuticals	ACTs	Artemether/lumefantrine 20/120mg dispersible tablets
Pharmaceuticals	ACTs	Artemether/lumefantrine 80/480mg tablets
Pharmaceuticals	SMC	Sulfadoxine-pyrimethamine 500/25mg + amodiaquine 150mg dispersible tablets (SPAQ)
Pharmaceuticals	SMC	Sulfadoxine-pyrimethamine 250/21.5mg + amodiaquine 75mg dispersible tablets (SPAQ)
Pharmaceuticals	SMC	SPAQ DT 12.5+250+76.5mg
Pharmaceuticals	SMC	SPAQ DT 25+500+153mg
Pharmaceuticals	SP	Sulfadoxine-pyrimethamine dispersible tablets 250 mg/12.5 mg
Pharmaceuticals	SP	Sulfadoxine-pyrimethamine dispersible tablets 500 mg/ 25 mg
LLINs	LLIN	Yorkool G3 LN

GHSC-PSM works with labs so they can test the products, promote QC, and increase testing capacity for key products. In FY 2022, the project completed a method transfer/verification for five products; method transfers for an artesunate injectable 60 mg product and an artemether lumefantrine 20mg/120mg hard tablet and method verifications for sterility testing for another artesunate injectable product and chloroquine and one for primaquine tablets.

GHSC-PSM ensures QC testing efficiency and capacity for key products by expanding the number of testing labs.

Fostering Quality Products and a Robust QMS

In FY 2022, GHSC-PSM had no products reported for recalls. GHSC-PSM facilitates robust QA and QMSs for the products it procures through comprehensive investigations and collaborations with partners and donors.

Fostering Quality in Pharmaceuticals

In FY 2022, GHSC-PSM's risk-based QA testing strategy identified potential out-of-specification (OOS) results for sterility in some batches of artesunate injectable kits. The project initiated an investigation to determine the validity of the test results and placed a hold on product distribution. GHSC-PSM explored several strategies and tested hypotheses to determine the root cause of the sterility OOS—whether contamination happened at the third-party laboratory during testing or at the supplier during the manufacturing process. After testing, data review, and collecting evidence, a root cause of the OOS could not be assigned. PMI concurred with GHSC-PSM's recommendation to prioritize patient safety, reject the OOS product batches, and adjust the testing strategy moving forward.

In FY 2022, the project investigated an OOS for water content in the artesunate powder. The third-party testing lab reported results higher than the specification which requires no more than 0.5 percent of water content. GHSC-PSM determined that various appropriate methods for water content testing were available and consulted the supplier on which of the various testing methods was appropriate for their product. The lab performed four studies/hypotheses using the various methods, and most yielded conforming results. The project concluded that while the test results were inconsistent, data from a stability study conducted by the supplier indicated no risk to the safety or efficacy of the product due to water content. GHSC-PSM recommended releasing the product, and PMI concurred.

In FY 2022, GHSC-PSM initiated a collaborative investigation with the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) into a SPAQ packaging OOS. The project received complaints from a recipient country of incorrect packaging of seven blisters from five batches of SPAQ. The blisters contained four tablets of amodiaquine instead of three tablets of amodiaquine + one tablet of SP. GHSC-PSM froze procurements, reported the incident to the supplier, and requested a corrective and preventive action (CAPA). The project worked with the supplier to identify the root cause. The packaging OOS was attributed to the salvaging and de-foiling blisters after an inspection camera rejected them. The project will review the supplier's CAPA and recommend to PMI whether or not to resume procurement with the supplier.

Fostering Quality in LLINs

In FY 2022, the project investigated an OOS on mesh size for a batch of LLINs. GHSC-PSM determined that when using the 100-centimeter square tool, the third-party laboratory's results were 23 holes per square centimeter. However, using the one-inch square tool, the mesh size met the specification, reporting 24 holes. The project reviewed data and evidence and concluded that the marginal difference in mesh size had little to no impact on the efficacy of the LLINs, given that all other parameters met WHO specifications. The project recommended accepting the batch, and PMI concurred. GHSC-PSM notified the supplier to monitor the mesh size parameter during in-process and finished product testing.

In FY 2022, GHSC-PSM investigated a batch of OOS LLINs for the PBO active ingredient (AI) at a third-party laboratory. The specification for PBO content is 10 g/kg \pm 25 percent, and the batch in question was below the specification. The project requested a phase II investigation reviewing the lab's

procedures and conducted additional testing, resulting in two OOS results and one passing result. GHSC-PSM notified the supplier and requested that it perform an internal investigation. The supplier submitted a report with additional testing performed by its laboratory for review. The laboratory test results tended toward the lower spectrum of the AI specification, and the data showed that some nets in this batch met AI content specifications and some did not. Based on the review of all relevant documentation and test results, GHSC-PSM recommended rejection of the batch, and PMI concurred.

The project took steps to prevent LLIN product quality issues from a supplier's new baling system that could save roughly 15 percent of freight space but showed signs of impacting the product's dimensional stability. GHSC-PSM engaged the LLIN supplier and discussed the potential impact on the product with LLIN LQAG. GHSC-PSM and other LQAG global procurers requested the supplier pause its implementation of the new baling system and continue to use the existing baling system for PMI orders. GHSC-PSM and LQAG liaised with WHO PQ to ensure applicable data and documentation were in place to support use of the new baling system.

Fostering Quality in mRDTs

In FY 2022, GHSC-PSM investigated mRDTs following complaints from recipient countries about the long read time and erroneous or invalid results. Complaints also included preferences, such as round lancets over painful blade lancets and inverted cups over blood collection pipettes. The project presented the complaints to the suppliers, who retested the batches and provided a preliminary report. The samples were retested under several temperature conditions, and all complied with the instructions for use (IFU). The project performed a preliminary investigation by comparing the IFU for mRDTs in its portfolio and noted that different brands of mRDTs have different IFU. GHSC-PSM determined that the root cause of the long read time was countries' unfamiliarity with the brand of mRDTs and their corresponding IFU. The project determined that the erroneous results correlated with improper opening of the buffer bottle, which led to an incorrect quantity of buffer dispensed. Additionally, it was determined that unfamiliarity with using pipettes instead of inverted cups led to challenges in collecting the correct blood volume using pipettes. Based on these findings, the supplier modified the mRDT kits to replace the pipettes with inverted cups and the blade lancet with a round blood lancet. The supplier has submitted these modifications to the WHO Prequalification Team for approval.

In FY 2022, GHSC-PSM investigated two batches of *P. falciparum* mRDTs reported as OOS for high false positive rates by a third-party testing laboratory. The maximum threshold for false positives is less than 10 percent, and the lab reported that four batches had high false positive rates. To understand the OOS and the potential of a systemic issue, the project engaged a Center for Disease Control and a WHO third-party testing laboratory to each conduct additional tests, increasing the sample size tested per batch. The samples tested by these third-party laboratories passed. GHSC-PSM recommended releasing the batches based on an increased sample size from additional testing, providing a more accurate and reliable outcome; PMI concurred.

Certificates of Conformance

GHSC-PSM maintained a high level of productivity in FY 2022, issuing 333 certificates of conformance (CoCs) for 210 pharmaceuticals, 54 mRDTs, 67 LLINs, and two lab commodities that met quality requirements. This allowed the project to release these commodities for distribution.

Pharmaceuticals Regulated by a Stringent Regulatory Authority

Malaria pharmaceuticals regulated by a stringent regulatory authority do not require laboratory testing according to PMI policy. GHSC-PSM reviewed the manufacturer's certificate of analysis before shipment. In FY 2022, the project reviewed 26 batches of two ACT products' certificates of analysis. The project found satisfactory results for all batches and issued CoCs.

Other Pharmaceuticals

GHSC-PSM uses qualified independent laboratories to inspect, sample, and test other pharmaceuticals—including generic AL, artemether injectables, artesunate injectables, artesunate suppositories, generic artesunate + amodiaquine (ASAQ), SP tablets, SPAQ tablets, and various essential medicines before shipment. Activities are described below.

In FY 2022, the project reviewed third-party test reports on 712 batches before releasing the orders for distribution. Most batches were tested for QC concurrently with shipment using a risk-based approach for WHO prequalified products to ensure they met delivery timing requirements.

LLINs and RDTs

In FY 2022, the project managed pre-shipment inspections and testing of 142 orders, representing 45.96 million LLINs from nine vendors. The project reviewed all test results before clearing orders for distribution.

GHSC-PSM managed pre-shipment inspections and tested 70 orders representing 47.66 million mRDTs from five vendors. The project reviewed all test results before clearing orders for distribution.

Key Performance Indicators

Throughout FY 2022, the project met or exceeded the in-target QA lead time key performance indicator (KPI). Target QA lead-time is 80 percent, and the results were 83.56 percent in Q1, 91.84 percent in Q2, 96.88 percent in Q3, and 87.72 percent in Q4.

Zero batches of products showed nonconformity in Q1 and Q2 (the target is less than 1.0 percent). In Q3, 3.99 percent of batches of products showed nonconformity, and in Q4, 0.6 percent of tested batches showed nonconformity.

In FY 2022, GHSC-PSM finalized 100 percent of OOS reports within 30 days of completion of the investigation, exceeding the target of 90 percent.

Cost Savings

In FY 2022, the total cost savings resulting from the risk-based testing totaled \$195,649.38, which was determined by comparing the cost of testing every batch to the cost of the randomized testing.

A.4 Improving Data Visibility

GHSC-PSM increases data visibility at all levels of the supply chain. The project uses several systems to synthesize and improve critical information on order status and priorities, commodity flow, and health commodity management.

ARTMIS

ARTMIS, the project's information system, provides visibility into GHSC-PSM procurement and delivery. External users, such as PMI, USAID offices, and GHSC-PSM country offices, can view order updates and performance information through procurement and delivery dashboards. GHSC-PSM enhances system efficiency, improves data quality, and increases visibility into its supply chain operations. The project makes enhancements to improve data visibility, including the life of project data. Specific improvements to ARTMIS in FY 2022 included:

- Maintained integration with the Malaria Data Integration for Visualization (M-DIVE) platform, which provides daily updates on the order, shipment, and catalog data for visualization, for the full PMI interagency team. Through Q4 FY 2022, GHSC-PSM provided monitoring and evaluation results to M-DIVE. The project added two new fields in the integration for better visibility within M-DIVE: the prime line ship number and the fiscal year.
- Maintained integration of the Quantification Analytics Tool (QAT) and ARTMIS storefront to review tagged orders in the report and analyze module. The project supported testing efforts to improve the handling of changed or canceled orders.
- Provided adaptive maintenance to the ARTMIS integration with the Procurement Planning and Monitoring Report for malaria (PPMRm). GHSC-PSM enables the application to pull daily order shipment updates.
- Enhanced solution so that purchase orders open directly in Microsoft Word™ format, reducing user clicks.
- Refined vital reports, including freight estimate versus actual, requisition order history, and TOM table. Added fields to the ad hoc reporting (i.e., additional IWorldSync Global Data Synchronization Network™ (GDSN) attributes).
- Maintained the automated feed from the GDSN to update attribute data from network suppliers for items in the GHSC-PSM catalog with attribute data.
- Supported the transition of the LMIS to the new InforNexus platform to provide further details and insight into batches and logistics orders.
- The project will launch the Ivalua module upgrade in ARTMIS in FY 2023 to improve in-system business processes for supplier management, including risk management, sourcing, and contract management.

TOM Country View Dashboard

The TOM Table provides end users with up-to-date status information for orders in progress through visuals generated from ARTMIS data. It brings critical delays to the attention of end users to facilitate management decisions, bi-weekly reviews, and status briefings. In Q3 of FY 2022, GHSC-PSM transitioned from an Excel-based TOM table to a Power BI dashboard. The TOM country view dashboard pulls data from the various systems of truth and eliminates manual TOM table updates.

The project implemented the dashboard design in two phases. In phase one, GHSC-PSM developed the TOM Power BI country view dashboard, which mimics the Microsoft Excel (R) version. GHSC-PSM adopted several change management measures to ensure a smooth transition to the dashboard. In Q2, the project conducted a pilot using the dashboard with PMI, country offices, and Missions in a handful of countries. In Q3, the project rolled out the dashboard to all countries.

Salient pieces of information for end-users include:

- Where is my order?
- When can I expect to receive my order?
- Is it too late to change my order?
- Has my order been delayed/is my order on hold for some reason?
- Is anything needed from me for my order to progress?

Phase two begins in FY 2023. The project is building a TOM management view dashboard for enhanced order portfolio, exceptions, and data quality management.

Vision

The TOM management view dashboard interface and analytics will enable an efficient, targeted portfolio across all malaria commodities and better exception management across all PMI-funded countries.

- Identify and diagnose issues and mitigate them as they occur.
- Retroactively review issues for targeted process improvements.

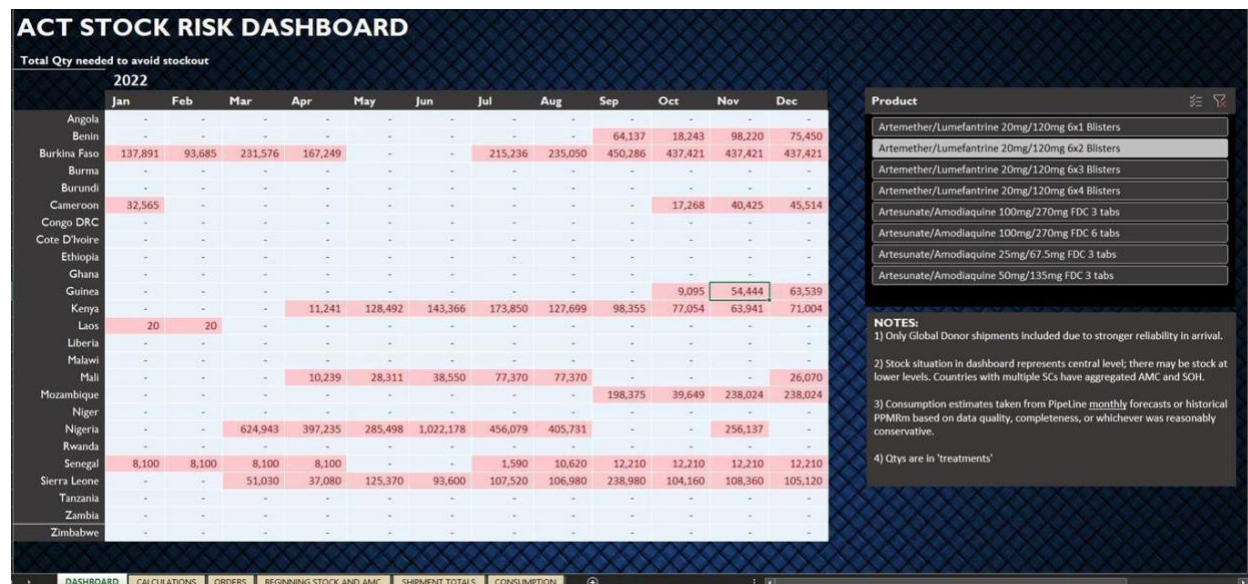
TOM Country View Dashboard Highlights:

- Provides daily updates and summary statistics of a country's current orders through a robust report.
- Provides end users with a single source to access order information.
- Minimizes manual manipulations, and the final TOM reflects data pulled from the systems' record for better visibility.
- Provides regular insights on order status so stakeholders can make informed supply chain decisions.

The TOM Power BI dashboard retains the simplicity of the Excel-based TOM table. GHSC-PSM implemented change management measures, including developing a dashboard user guide and tutorial videos, conducting hands-on training, and hosting regular office hours for TOM users on the dashboard's use cases and navigation. The goal is to ensure a smooth transition from TOM Excel-based reporting to the TOM Power BI dashboard.

Stockout Risk Dashboards

Stockout Risk Dashboards help to provide a global view of country stock levels at the central level. The dashboards combine inventory, consumption, and shipment data into one report that predicts stock levels 12 months into the future. During periods of market constraints, the dashboards have been utilized to inform allocation strategies and scenario-based planning to prevent stock risks. The main inputs into the tool are PPMRm data and supply plan data. Although some countries face data quality challenges, this dashboard has been instrumental in clarifying and validating the demand signals received through both of those data inputs. Through this validation process, the project has been able to proactively make decisions based on the best available data.



Country Assessments: End-Use Verification Surveys

The end-use verification (EUV) survey monitors the stock status of malaria commodities and examines malaria diagnosis and treatment practices at the health facility level. Since 2018, the survey has undergone significant changes to ensure that the methodologies align with improved precision in data used for decision-making. In Q3-Q4 FY 2022, the project collected data for 18 EUVs. For the entire year, 27 EUVs were conducted in 15 countries (including Benin and DRC, conducted by GHSC-TA Francophone TO). Some countries conducted multiple surveys during this time period.

EUV Change Board

In FY 2021, the project performed a change board process to align the survey to data used for decision-making. GHSC-PSM approved more than 36 changes from the 17 country offices conducting the EUV.

In FY 2022, GHSC-PSM completed the EUV survey changes. The project revised the EUV toolkit and resources and held an online training in English and another training in French for country teams and technical backstops to explain the survey changes, orient country teams to the updated tools and resources, and provide guidance on implementation.

In Q3, nine countries implemented the updated survey and made corrections to the master product list, Power BI report template, and survey tool. In Q4, the project created a French version of the Power BI report template and implemented nine surveys for a total of 27 EUVs conducted in FY 2022.

EUV Data Consolidation

The change board process improved data consistency, but EUV data were not standardized across all surveys. For example, inconsistent product naming conventions across locations and time led to errors, as data from one product could be entered under several different names.

In FY 2022, to consolidate and standardize EUV information, GHSC-PSM created an automated process for ingestion of all survey data into consolidated tables for PMI and GHSC-PSM analysis. PMI uses consolidated tables to generate key indicators and indicator tables. These tables will enable an annual interactive EUV survey report and allow the user to query individual surveys, follow key indicator trends for and across countries, and see changes in key indicators across countries and time.

The new process uses open-source coding—Python and YAML Ain't Markup Language—and is transparent, repeatable, and continuously improves with every survey added. This system maintains a list of all historical non-standardized product names and maps them to a standardized product name. A subject matter expert has validated the mapping of non-standard names to the correct product. Now, when a survey is loaded into the consolidated table, the automation checks the product name entered against the standardized list. If a product's name does not match, it searches previously recorded alternate spellings of product names. If it finds a match in the standardized list, the name is automatically updated. The historical data are maintained in the original files. The user of the consolidated table can now 1) compare data across time and countries, as product names are consistent across surveys, 2) build trust in the naming conventions, and 3) rapidly identify issues, update the mappings, and regenerate the consolidated tables in a straightforward and expedient process.

In FY 2022, the consolidated tables contained 66 surveys as compared to 55 in 2021 that are classified as linkable—these are surveys conducted after Q2 FY 2020 when the project implemented the standardized EUV survey. Surveys classified as non-linkable (use of non-standard questions, or sampling process) are not included in the consolidated tables; non-linkable surveys are mostly historical, conducted before February 2020. These non-linkable surveys were stored and retained for use in unprocessed form. In FY 2022, the level of effort to include new surveys was reduced due to automation and the timely availability of consolidated tables after the release of the EUV report. Efficiency improved with the addition of more surveys, and this increased the reliability of the consolidated table and standardization across the surveys.

Country EUV Examples

In the first half of FY 2022, nine GHSC-PSM TO2 countries conducted EUVs with technical support from headquarters. Nine GHSC-PSM countries reported the COVID-19 continuity of care module, developed in Q4 FY 2020. In the second half of FY 2022, 13 GHSC-PSM TO2 countries conducted EUVs, and 12 reported the COVID-19 continuity of care module.

The project shared the EUV reports and recommendations with Ministries of Health (MOHs), National Malaria Control Programs (NMCPs), and other stakeholders to inform decision-making. Examples are below.

Burkina Faso

In Q3 FY 2022, an EUV survey in Burkina Faso identified major challenges, including high stockout rates at the service delivery points (SDPs) and order delivery delays. Orders intended for delivery in Q1 were received in Q3. Compliance with malaria diagnosis guidelines, stock card data accuracy rates, and storage conditions in the SDPs and the district warehouses required improvements. To address these challenges, GHSC-PSM recommended that:

- The government's Health Commodity Supply Chain Directorate and partners that procure malaria commodities place orders early to ensure timely delivery and prevent stockouts.
- NMCP and partners train health workers on the new guidelines for SDP-level malaria treatment.
- Supportive supervision and on-the-job training be extended to strengthen stock monitoring.

Liberia

In Liberia, the Q3 FY 2022 EUV identified the major factors impacting ACT availability as the transition from ASAQ to AL and resupply delays from the central medical stores to county depots and SDPs. However, with the completion of the ASAQ phase out, the availability of AL will improve as more SDPs get resupplied with AL. According to the survey, staff shortages and space constraints are the most reported stock management challenges. The project recommended that the MOH and its partners build SDP stock management capacities in record keeping and reporting and that the MOH and partners provide SDPs with stock cards, job aids, and mentorship on the importance of updating stock cards.

Burundi

In Burundi in Q4 FY 2022, the EUV highlighted increased stockouts of malaria commodities. To address this challenge, GHSC-PSM proposed that project and national counterparts review the national quantification assumptions. The project recommended that the health district pharmacy manager guide the health facility pharmacy managers in estimating malaria supply needs.

To address the gaps in stock card updates, the project advocated that the Integrated National Program in the Fight Against Malaria alongside GHSC-PSM sensitize district medical directors to prompt health facilities to obtain health commodity resupplies from the district health pharmacies on time.

Procurement Planning and Monitoring Report for Malaria

In FY 2022, PPMRm managed data from 29 countries.⁶ PPMRm is a monthly report of data on central and subnational stock and quarterly report for commodity security, along with updates on key malaria commodities from PMI-supported countries. Information from PPMRm assists with order prioritization, including reallocating orders or stock to mitigate the risk of stockouts or expiries. GHSC-PSM used shipment data in PPMRm to inform collaborative meetings with global donors to plan shipment logistics, assess supplier capacities, and coordinate orders.

⁶ Angola, Benin, Burkina Faso, Burundi, Cambodia, Cameroon, Côte d'Ivoire, Democratic Republic of Congo, Ethiopia, Ghana, Guinea, Kenya, Laos, Liberia, Madagascar, Malawi, Mali, Mozambique, Myanmar, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Thailand, Uganda, Zambia, Zimbabwe

PPMRm New Platform

Since 2008, PMI-supported countries have generated quarterly reports using the PPMRm reporting platform. Data providers in the 29 PMI and USAID malaria-supported countries enter stock and commodity information into data fields and provide context about commodity-level management. In FY 2020, GHSC-PSM responded to PMI's request for monthly PPMRm reports, increased functionality, and improved user-friendliness, by the development of a new PPMRm platform. This platform includes previous functions to update commodity security and report stock-levels but has a more user-friendly interface. A revised ARTMIS data flow system increases shipment data accuracy and reduces the level of effort in providing and reviewing PMI's shipment data. The new platform allows monthly data reporting to identify and address stock issues sooner. In Q2 FY 2022, GHSC-PSM tested the new PPMRm platform in all 29 countries and in Q3, the project launched the platform. Thus far, the platform has generated five monthly reports.

PPMRm Country Examples

Based on PPMRm data, the project took the following actions at the global or national level during the second half of FY 2022:

- Identified and mitigated stockout risks and recommended or took actions to expedite PMI or Global Fund shipments, such as:
 - In Q3: **Cameroon** (artesunate injectable 60 mg), **Ethiopia** (AL 6x3, artesunate injection 60mg)
 - In Q4: **Zambia** (artesunate injectable 60 mg), **DRC** (artesunate suppository 100 mg), **Mali** (AL 6x4), Niger (AL 6x1, AL 6x2, mRDTs)
- Deferred shipments to prevent overstocking:
 - In Q3: **Madagascar** (artesunate suppository 100 mg), **Guinea** (SP)
 - In Q4: **Madagascar** (artesunate injection 60 mg), **Kenya** (mRDTs)

Adoption of Standards-based Identification, Barcoding, and Data Sharing

GHSC-PSM requires that suppliers of pharmaceuticals, medical devices, sterile kits, laboratory reagents, and LLINs adopt standardized product identification and labeling and exchange product master data leveraging GSI standards. These supplier requirements include:

- **Identification:** Assigning Global Trade Item Numbers (GTINs) that identify trade items and Global Location Numbers that identify business entities and locations.
- **Capture:** Labeling specified packaging levels with barcodes encoded with GTIN, batch/lot, expiration date, serial shipping container code, and (for pharmaceuticals and LLINs) serial number.
- **Sharing:** Exchanging product master data through the GDSN.

FY 2022 saw remarkable progress in supplier implementation of these requirements, laying the groundwork to use these data in global and national supply chain processes and systems; advancing

compliance requires regular engagement with suppliers for existing and new items. In FY 2022, through this ongoing engagement, the project:

- Collected, validated, and added GTINs for over 30 TO2 items to the GHSC-PSM catalog.
- Collected and performed initial checks on master data for over 50 new TO2 items through the GDSN, and maintained data on existing items. In Q4 alone, the project sent and received more than 500 messages in the GDSN across all health areas.
- Communicated, collected, and validated information regarding serialized packaging as part of the final-phase deadline in GHSC-PSM's supplier requirements.

GHSC-PSM supports adopting Global Standards in supply chain processes by providing technical assistance within country programs, as described in Section B1.

B. Strengthened In-Country Supply Chain Systems

B.1 Improved Strategic Planning and Implementation Related to Supply Chain Management and Commodity Security

Forecasting and Supply Planning

GHSC-PSM provides technical assistance to develop and validate supply plans, aggregate commodity demand, and evaluate and reconcile seasonal demand with orders. The project's sustained efforts to support country supply planning have resulted in more countries that can independently manage this critical activity.

Countries use supply plans to analyze commodity quantities to order during a specified timeframe for continuous product availability. Supply plans inform GHSC-PSM order planning decisions, strategic sourcing, and RDC stocking. The project's country offices submit supply plans in PipeLine or QAT.

Forecasting Technology

Following the release and introduction of the supply planning module in FY 2021, GHSC-PSM released the forecasting module of QAT in FY 2022, which allows users to design forecasting trees from historical consumption. The new forecasting module replaces forecasting tools such as Quantimed and Excel. The project launched the QAT forecasting module in 12 USAID and PMI-supported countries (Angola, Burkina Faso, Cameroon, Ethiopia, Ghana, Guinea, Mali, Niger, Nigeria, Zambia, and Zimbabwe).

In FY 2023, GHSC-PSM expects training for an additional seven PMI-supported countries (Benin, Côte d'Ivoire, DRC, Mozambique, Rwanda, Tanzania, and Uganda) on the forecasting module, including training by country project offices for government counterparts.

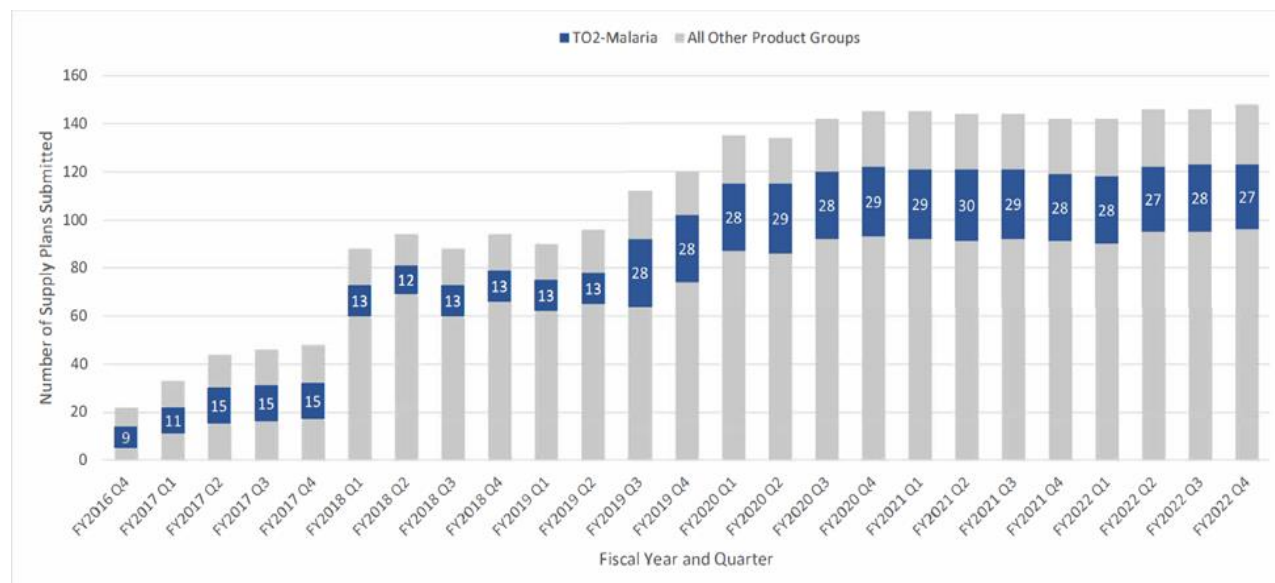
Supply Plan Reviews

GHSC-PSM conducts quarterly supply plan reviews to drive continuous commodity availability and submission in PipeLine or QAT.

Countries that submit supply plans through PipeLine use the GHSC-PSM-built supply chain automation tool to review and address data quality issues each quarter before submitting them to project headquarters. For QAT-submitted supply plans, the built-in QAT problem list (QPL) enables users to identify data issues and correct them before submitting a supply plan. The QPL allows users and reviewers to leave comments for context and provides visibility into comments during quarterly reviews.

In FY 2022, GHSC-PSM received malaria supply plans from 28 TO2-supported countries achieving 100 percent of the target. Of those 28 countries, 24 submitted through QAT.

Exhibit 13. Malaria supply plan submissions and technical reviews over the life of the project



Forecasting and Supply Planning Technical Assistance

In FY 2022, the project assisted more than 20 TO2 countries in forecasting and supply planning (FASP). GHSC-PSM adjusted technical assistance methods to comply with restrictions on travel and large group meetings due to COVID-19. Examples of technical assistance include the following:

- In Q4, in **Malawi**, the project and NMCP conducted a bi-annual FASP review. GHSC-PSM identified US \$2.3 million malaria commodity gaps and US \$14.7 million in 2023 and 2024, respectively. The project and NMCP will use this information to advocate for funding to address the gaps and prevent stockouts.
- In **Sierra Leone**, GHSC-PSM and the Malaria Quantification Technical Working Group (MQ TWG) completed the quantification of malaria commodities. The quantification forecasting was decentralized to the 16 District Forecast and Distribution Technical Working Groups (DFD TWGs). MQ TWG used consumption and morbidity-based methods to identify commodity needs and built the DFD TWG capacity. The MQ TWG aggregated, cleaned, and standardized the forecast results; built assumptions; updated the supply plan using the QAT; validated the results; prepared reports; and disseminated results to key stakeholders. DFD TWG can also use this approach to benefit other disease programs.

Logistics Management Information Systems Technical Assistance

GHSC-PSM improves data accuracy and quality for management information system (MIS) implementation in countries. Country-specific examples are as follows.

- In Q4, in **Liberia**, GHSC-PSM conducted a supply chain information system maturity model (SCISMM) assessment to evaluate the functionality and maturity of the information systems implemented in the country to support supply chain operations. The assessment provided the strengths, weaknesses, and improvement opportunities of existing information systems, including the features needed for interoperability. The SCISMM Assessment Report outlined the findings and recommendations.

During the SCISMM assessment, the MOH highlighted the challenges caused by the disconnected operation between the electronic logistics management information system (eLMIS) and the warehouse management system (WMS), which leads to poor data quality to inform data analysis and decision-making. After site visits and system evaluation, the project recommended the creation of an interoperability feature between the eLMIS and WMS systems by establishing standardized master data (e.g., product, facility, supplier and program) operation. The standardized master data serve as the single source of data reference for sharing and exchanging information across all systems, which will improve data accuracy and quality for distribution and supply planning, reduce duplicate data and entry errors, and increase operational efficiency. The project drafted a detailed implementation approach in the SCISMM Assessment Report. GHSC-PSM will work with the MOH and donors to fine-tune the project plan for further implementation, including resource and budget requirements.

The project with the Health Monitoring Evaluation and Research Unit of the MOH held a brainstorming workshop with implementing partners and stakeholders on enhancing system interoperability. During the workshop, participants identified key challenges, including inconsistent pack sizes of some commodities, different product lists in eLMIS and mSupply, and limited analytics capabilities of both platforms. Participants discussed the foundational and structural aspects of interoperability. For the foundational aspect, the project presented the possibility of establishing the interconnectivity requirements needed between all systems based on its assessment of Liberia systems. For the structural aspect, participants agreed that all products in the eLMIS and mSupply must be reviewed and aligned to have a master product list for validation. By the end of the workshop, participants agreed on next steps, which included validating the master product list that aligns mSupply and eLMIS and a roadmap for interoperability to achieve system linkage by the end of Q1 FY 2023.

- In Q4, in **Malawi**, following the SCISMM assessment, the MOH launched the Digital Supply Chain Strategy and Architecture (DSC-S&A) project to create an integrated national digital health ecosystem. The DSC-S&A project was based on the SCISMM assessment recommendations to build the digital strategy and architecture to improve the end-to-end supply chain operations by leveraging the Open Health Information Exchange framework and GSI standards.
- In Q4, the project scaled up the OpenLMIS rollout to 140 health facilities, and brought a total of 400 total health facilities reported through OpenLMIS. The OpenLMIS goal is to move health facilities away from paper-based manual reporting to electronic reporting. GHSC-PSM planned and implemented the activity with the MOH's Directorate of Health Technical Support Services-Pharmacy Division. The rollout included providing computers, wireless routers, data bundles, and OpenLMIS training to pharmacists at the health facilities. This has improved timely reporting and data quality. Data is now captured at the source in most facilities, minimizing transcription

errors and reducing the workload at satellite sites, which in the past had helped with data entry from paper-based reports.

- In **Mozambique**, the project continued the implementation of Sistema de Informação e Gestão de Logística das Unidades Sanitárias (SIGLUS), a mobile application used in health facilities to collect monthly stock report data. In FY 2022, GHSC-PSM developed SIGLUS v3 based on the latest version of OpenLMIS to ensure interoperability between SIGLUS Web and the SIGLUS Desktop applications. The project helped Central de Medicamentos e Artigos Médicos (CMAM) expand SIGLUS to the trained facilities. In Q4, 1,520 out of 1,580 trained facilities—96 percent—recorded daily stock transactions using the electronic tool, providing visibility into several periodic logistics reports, including consumption, stock availability, stock according to plan, and health facility monthly requisitions. Implementing SIGLUS is a key step in monitoring stockout rates for the stockout reduction strategy.

Improved Data Use

The project helps countries enhance data quality and use. Country-level activities maximize innovation while ensuring data quality and skills transfer and make the LMIS useful for decision-making. Below are specific country examples.

- In Q4, in Niger, GHSC-PSM and the Central Medical Store (ONPPC) management initiated a monthly inventory of malaria commodities in addition to the quarterly inventories. These inventories revealed huge discrepancies between the physical quantities and the recorded stock, highlighting major weaknesses in inventory controls at ONPPC. The discrepancies were mainly related to delays between stock movements and updating these movements in the ONPPC's inventory management system (Sage Cloud 100). In FY 2023, GHSC-PSM and ONNPC will implement SOPs to address these weaknesses.
- In Ethiopia, the project conducted a monthly analysis of malaria commodity stock status at 16 Ethiopian Pharmaceuticals Supply Service (EPSS) hubs and central EPSS, resulting in decisions to re-order, redistribute, expedite, or cancel orders. The monthly analysis assists EPSS to stock malaria products based on inventory policy. Some actions resulting from GHSC-PSM's support to EPSS include:
 - In Q4 FY 2022, addressed 329 emergency orders across 12 EPSS hubs to avert stockouts.
 - In Q4, redistributed eight malaria products worth over 1 million ETB (about \$20,000) between EPSS hubs and health facilities.
 - Prevented stockouts by pre-positioning stock at facilities requiring the commodities. The pre-positioning of stock was done in anticipation of high consumption and the upcoming major malaria season. The project worked with EPSS and RHBs to analyze the facility level Report and Request form (RRF) and also identify facilities that are expected to face high caseloads and used this information to support EPSS for resupplying of malaria commodities for the facilities.

In Q4, in **Burundi**, the project and the national regulatory agencies ABREMA and DSNIS, organized a provincial meeting to assess the quality of malaria commodities logistics reports for Q1 and Q2 FY 2022. 178 participants attended the meeting, representing all 49 health districts. Major recommendations included ABREMA and DSNIS to organize a logistics data analysis training for district and facility staff and for DSNIS to integrate new products into the Demographic Health Information System (DHIS) 2. Participants recommended that the district teams conduct data analysis before validation and that the district pharmacy managers supervise facility-level logistics data analysis.

Global Standards and Traceability

In FY 2022, GHSC-PSM provided eight TO2 countries⁷ with technical support to adopt GSI standards for product identification, location identification, and data exchange.

- In **Nigeria**, GHSC-PSM is piloting activities for net authenticity verification using LLIN campaign data at distribution points, manufacturer-applied identifiers, and data carriers on bags and individual nets. In Q4, GHSC-PSM developed data models for the pilot, KPIs, and business process requirements and configured the LLIN system platform to support the pilot.
- In **Rwanda**, the FDA issued regulations governing the traceability of pharmaceutical products distributed in the market, including the implementation of identification, data capture, and data sharing. This regulation is a key milestone for traceability implementation following a series of GHSC-PSM regulation and policy workshops.
- In **Uganda**, GHSC-PSM automated barcode scanning for warehouse operations of all pharmaceutical products at the Joint Medical Store. This includes using GTIN as a secondary product identifier for 250 store keeping units and printing labels for non-GTIN products supporting barcode labeling to enable barcode data collection for subsequent operations.
- In **Zambia**, GHSC-PSM and the MOH implemented a national product catalog, bolstering national traceability. The project and the Zambia Medicines Regulatory Agency incorporated industry feedback on identification and labeling guidelines to support traceability efforts, making progress on policy and regulations. In Q4, GHSC-PSM and South Africa integrated the GDSN tool with the Product Catalog Management Tool (PCMT) using a phased approach consisting of a manual integration between GDSN and PCMT, including PCMT and WMS Expert.

Stockout Reduction Initiative

Improving the availability of malaria commodities is critical to support PMI's 2021–2026 strategy for reducing malaria mortality and morbidity rates. PMI seeks to reduce malaria commodity stockout rates at SDPs in PMI-supported countries over the next two to three years. The project implemented a stockout reduction initiative in FY 2021, where 20 countries developed stockout reduction strategy investment plans.

In Q2 FY 2022, GHSC-PSM developed an Excel-based budget template for investment planning, an extension of stage four. The template incorporates the investment plan with cost drivers and MOP

⁷Burundi, Ghana, Malawi, Nigeria, Rwanda, Uganda, Zambia, and Zimbabwe

categories and includes partner contributions for FY 2023–2025, along with guidance for use. In Q3, GHSC-PSM introduced this template to 20 country offices to develop their investment plan and FY 2023 work plan budgets. In Q4, six countries drafted budgets after preparing the FY 2023 work plans.

The budget template guides the process through four steps:

1. Review existing investment plan outputs
2. Define the current state of each investment and expected impact
3. Provide costing details for each investment activity
4. Assess outputs to make decisions

In Q4, the project reviewed the master playbook for the FY 2020 stockout reduction initiative to identify cross-cutting guidance for health facilities and community health workers (CHWs) and added specific guidance for CHWs. GHSC-PSM will finalize the amended playbook in FY 2023.

Malaria Community Supply Chain Advocacy Paper and Landscape Analysis

In Q3 FY 2022, GHSC-PSM drafted an advocacy paper to raise awareness around supply chain best practices at the community level, targeting community level facilities and health workers. The paper encourages inclusion of community supply chain practices, highlighting some best practices for long term investment. The paper recommends strengthening transportation and mobile health practices to improve product availability. The advocacy paper is under PMI’s review before finalization.

In Q4 FY 2022, GHSC-PSM conducted a Malaria Community Supply Chain Landscape Analysis Survey to identify malaria community supply chain systems in various PMI-supported countries, and to understand how these systems work. The project received 27 country submissions from 55 key informants. GHSC-PSM reviewed and analyzed the survey results; the final report is expected in the first half of FY 2023.

Malaria Commodities Accountability Initiative

PMI and GHSC-PSM recognized that significant discrepancies between malaria service data and logistics data posed concerns about the use and management of malaria commodities related to country best practices or standard operating procedures. In Q2 of FY 2022, the project introduced a commodity accountability initiative to leverage past successes for a systematic methodology and tool. Through the remainder of FY22 GHSC-PSM and PMI collaborated on the accompanying guidebook. GHSC-PSM, and eventually partners, will use this tool and guidebook in countries to address commodity accountability between service data and the issuance or dispensing of data within their product portfolios. Within the ACT commodity group, in particular, the tool and accompanying guide will identify commodity accountability concerns and help countries determine the root causes for these concerns. This effort will contribute to PMI 2021–2026 Strategy focus areas, specifically, “Innovate and lead” and “Keep malaria service resilient.” As outlined below the accountability initiative hopes to align with the noted strategy focus areas. For example:

Innovate and lead: Leveraging this methodology and tool helps to create a modular approach for countries. Countries will be able to identify areas of their supply chain and then have a targeted approach to the identified accountability issues. It is a standard tool with the potential for targeted approaches. Countries using the tool will be better conditioned to identify accountability issues and address them. By being at the forefront of identifying accountability issues countries will be able to lead in their supply chain efforts at an earlier date.

Keep malaria services resilient: Commodity accountability challenges can undermine effective malaria services by contributing to stock outs and poor utilization of scarce resources. Enabling country programs to identify and address these challenges keeps their services resilient and promotes efficiencies particularly in resource limited environments.

B.2 Improved In-Country Logistics, Including Effective and Efficient Delivery of Health Commodities to Service Sites

GHSC-PSM supports the effective and efficient delivery of health commodities to SDPs in two ways—first, by providing technical assistance (TA) to host governments in warehousing and distribution and second, by distributing commodities in some countries, often through contracts with in-country logistics companies.

Warehousing and Distribution Technical Assistance

GHSC-PSM's TA improves countries' warehousing and distribution processes and strengthens their supply chains. The project incorporates private sector best practices into public health supply chains by applying lean methodologies, such as activity-based costing. The project works with MOH staff, public health staff, non-governmental organizations, the private sector, and others with supply chain responsibilities to measure the velocity (i.e., how long it takes to move the product from one end of the supply chain to the other) and the orchestration (coordination of products) of all activities and service levels.

- In **Mozambique**, GHSC-PSM, Global Fund, and PMI collaborated to expand the assembly of CHW malaria kits from 30,000 to 106,000 per year by the end of FY 2023. The project provided TA to the NMCP and CMAM in assembling and distributing the kits and, starting in Q4, set a monthly production target of 7,000 kits per month. In Q4, 11,342 CHW malaria kits (964,070 AL treatments, 1,984,850 mRDTs, and 22,684 rectal artesunate suppositories) were delivered from Machava Central Warehouse to Cabo Delgado, Nampula, Niassa, and Zambézia provincial warehouses, including Mocuba and Chimoio intermediate warehouses. GHSC-PSM will increase the target to 9,000 kits per month in Q1 FY 2023.

GHSC-PSM will monitor this activity and provide relevant support to CMAM, ensuring the timely availability of commodities at the kitting area to enable uninterrupted production.

The project collaborated with other global partners in building a prefabricated warehouse in Guinea. See Section C1 for more details.

LLIN Distribution

GHSC-PSM collaborates with NMCP and implementing partners for LLIN distribution in various countries. The project provides support, including procurement and delivery TA. In FY 2022, the project delivered over 51 million LLINs to 25 countries for mass and continuous distribution to protect nearly 101 million people (see Exhibit 14).

Exhibit 14. LLIN deliveries in FY 2022

Country	Number of LLINs delivered
Angola	3,453,800
Benin	550,000
Burkina Faso	1,979,227
Burundi	836,804
Cameroon	500,594
Congo DRC	1,594,383
Côte d'Ivoire	346,374
Ethiopia	2,965,684
Ghana	2,391,865
Guinea	3,580,450
Kenya	2,926,829

Country	Number of LLINs delivered
Laos	220,314
Liberia	279,000
Madagascar	1,300,000
Malawi	660,000
Mali	1,864,000
Niger	402,500
Nigeria	13,446,620
Rwanda	3,809,348
Senegal	1,832,845
Sierra Leone	333,000
Tanzania	3,235,605
Thailand	50,000
Uganda	1,600,527
Zimbabwe	1,345,000
Grand Total	51,504,769

In the second half of FY 2022, the project supported 13 countries⁸ in planning for distribution or monitoring activities, and LLIN transportation to the designated locations through 3PL service providers, training, and execution, depending on the project's scope in the countries. These initiatives provide communities, particularly areas with high concentrations of malaria cases, with the nets they need before

⁸ Angola, Burkina Faso, Burundi, Ethiopia, Guinea, Liberia, Mali, Nigeria, Sierra Leone, Rwanda, Thailand, Zambia, Zimbabwe

the rainy season. Distributions can last a few weeks, while logistics, supply planning, procurement, and pre-positioning of the nets can take months.

- In Liberia, the project promoted the uninterrupted supply of LLINs to SDPs. GHSC-PSM and country health teams distributed 130,050 pieces of LLINs to nine counties,⁹ including dispatch to nine county depots and last-mile distribution to 47 health facilities, including clinics and county hospitals. At the end of Q4, GHSC-PSM received an additional shipment of 139,500 pieces of LLINs for routine antenatal care (ANC) and for school-based distribution in Bong and Nimba Counties. In addition, in Q4, the project provided technical support to the Ministry of Health and Ministry of Education to review and validate a School-Based LLIN Distribution Strategy in collaboration with implementing partners. The focus areas include LLIN quantification, training, distribution, social and behavior change messaging and channels, M&E, logistics and reverse logistics, management framework and partnership, as well as reporting and dissemination.
- In **Nigeria** in Q3, GHSC-PSM engaged 10,500 ad hoc personnel (5,067 in Kebbi and 5,433 in Sokoto) and provided orientation on logistics operations at various levels of the supply chain for the upcoming mass distribution of 6 million LLINs (2,800,000 and 3,200,000) across the two states.
- In **Benue** and **Ebonyi States**, the project provided TA in microplanning, engaging state facilitators (23 in Benue and 13 in Ebonyi) to estimate requirements for the mass distribution of 5,928,336 LLIN (3,844,653 in Benue and 2,083,683 in Ebonyi). To protect nearly 12 million beneficiaries in FY 2023, GHSC-PSM conducted a training of trainers (ToT) on LLIN logistics management for 27 personnel from across four PMI-supported states (Akwa Ibom, Ebonyi, Kebbi, Sokoto). The project certified 22 personnel as master trainers for related activities.

Global Collaboration for LLIN Distribution

The project collaborated with other global partners in procuring and distributing LLINs in Guinea, Nigeria, and Zambia. See Section CI for more details.

B.3 Implementing Strategies to Transfer Skills, Knowledge, and Technology for Improved and Sustained Performance

GHSC-PSM transfers skills, knowledge, and technology through TA in workforce development and training. This section describes work in these areas.

Workforce Development Technical Assistance

GHSC-PSM builds sustainable workforces through professionalization, and systematic workforce development approaches, improving countries' ability to sustain programs. Interventions include in-

⁹ Bassa, Bomi, Bong, Cape Mount, Grand Gedeh, Lofa, Montserrado, Nimba, and Sinoe

service and pre-service training, supportive supervision or mentoring, leadership, and change management competencies.

Every year, the project offers USAID personnel the opportunity to participate in an introductory course on supply chain management. In FY 2022, the project applied lessons learned from the virtual Q3 2021 course and hybrid Q2 2022 course. After each offering, the project makes modifications based on participant feedback to continuously improve the course. Modifications included incorporating foundational information at varying interest levels and experience in the supply chain.

In Q3 FY 2022, GHSC-PSM conducted a hybrid training for 26 USAID staff on “Introduction to Supply Chain Management”. The updated course employs self-learning through pre-recorded video lectures, discussion boards, pre-recorded interviews, and seven synchronous live sessions over three weeks. Of the 26 participants who enrolled in the course, 23 completed it within the given timeframe.

In FY 2022, GHSC-PSM prepared an activity to identify workforce development interventions that have resulted in measurable improvements in the supply chain during the life of the project. The project proposed methodologies in a concept note and planned the implementation in two phases. Phase 1 will validate the methodologies via online survey and remote interviews of the targeted audience and key informants in a selected country to identify workforce activities that have contributed to improvement in supply chain performance and the barriers and challenges faced by those implementing these activities. Phase 2 will leverage the lessons learned in phase 1 to modify the methods to answer workforce development improvements in more selected countries. The collection of resulting answers will inform the prioritization and expansion of workforce development activities with greatest impact. The implementation is expected to start in FY 2023.

Additional country examples of workforce development activities include the following:

- In **Ethiopia**, the project and the Ethiopian Pharmaceutical Association (EPA) improved the country's pharmaceutical continuous professional development (CPD) program. The project collaborated with EPA to develop the health programs' supply chain management in-service training curriculum which includes malaria program commodities. The curriculum has gone through an accreditation process for Continuing Education Unit (CEU) credits. The course is now accredited by a recognized course accreditor - Ministry of Health Continuous Professional Development Coordination Unit. The participants taking this course will receive certificates that carry 15 credit units. In addition, in the second half of FY 2022, the project and EPA with a consortium of pharmacy schools reviewed and harmonized the curriculum of an undergraduate Pharmaceutical Supply Chain Management (PSCM) course for pre-service training.
- In **Guinea**, GHSC-PSM and the **German International Development Agency (GIZ)** trained Information Systems Modernization Service staff at the MOH on the management of DHIS2. Participants included representatives from ANSS, DNEMI, GIZ, GHSC-PSM, and SNIS. The training built participants' competence in configuring aggregated data, installing and administering DHIS2, and identifying tasks for the daily management of the platform. DHIS2 is the main platform for collating and analyzing data from various systems within the MOH, such as eLMIS, which impacts the availability of health commodities within the country. GHSC-PSM trained seven national trainers on logistics for the FY 2022 LLIN campaign. The national trainers came from NMCP, GHSC-PSM, Cabinet Diagnosis, and Child Fund. With support from other

NMCP partners, the trainers trained national stakeholders responsible for the timely pre-positioning of commodities at distribution sites, product security, and distribution management. This collaboration ensured national technical support, validating the LLIN security plan that allowed stakeholders, including beneficiaries, to secure LLINs. The detection and prevention of thefts evidenced this in the health districts of Conakry, Forécariah, and Guéckedou.

- In Q4 FY 2022, in **Malawi**, the project conducted integrated supportive supervision peer mentorship (ISSPM) and training for pharmacy personnel in 29 district health offices through the GHSC-PSM Regional Commodity Logistics Officers (RCLOs). ISSPM equips facility pharmacy personnel to address logistics and supply chain performance challenges. RCLOs visited 176 facilities and mentored pharmacy personnel in record keeping, tracing error sources to improve data quality, monitoring and assessing stock status to reduce stockouts, and arranging the drug store in an orderly way to comply with good storage guidelines.
- In **Zambia**, GHSC-PSM collaborated with the Nursing and Midwifery Council to facilitate online learning for two batches of nursing students from Chipata and St. Francis College of Nursing and Midwifery. The six-week self-paced e-learning course focused on health supply chain management and exposed students to supply chain processes, forms, and tools in health facilities. The course complemented the school's logistics management curriculum. Facilitators used WhatsApp and Google Meets to communicate with students during the course. A total of 147 students completed the course and received certificates of completion.

Number of Trainees

In FY 2022, the project trained in-country specialists in 17 PMI and USAID malaria-supported countries on the full range of supply chain health systems strengthening areas.

The project trained 8,158 people, either exclusively funded by the TO2 or co-funded by the TO2 and other health areas. Women made up 39 percent of the trainees, and men made up 61 percent. The countries with the most TO2-funded training recipients were Nigeria (2,602 individuals), Zimbabwe (1,730 individuals), and Cameroon (576 individuals).

B.4 Strengthened Enabling Environments to Improve Supply Chain Performance

GHSC-PSM strengthens enabling environments to improve supply chain performance through technical assistance in leadership and governance. The project supports strategy development and planning to strengthen supply chains. These strategies reflect findings from country-level assessments, including national supply chain assessments (NSCAs) and EUV surveys.

Leadership and Governance

GHSC-PSM's governance work builds supply chain systems led by a strong team with managerial capacity, institutionalized checks and balances, and robust governance oversight, including accountability

and transparent financing. Examples of GHSC-PSM's work in leadership and governance in FY 2022 include the following:

- In **Ghana**, GHSC-PSM and the MOH/Ghana Health Service developed a cost implementation plan for the Supply Chain Master Plan (SCMP) 2021–2025. The objective was to have a comprehensive implementation budget to inform resource mobilization, planning, and future allocation of funds for supply chain interventions. This also involved initial steps for developing a monitoring and evaluation plan for the SCMP 2021–2025 and defining an approach to develop a risk mitigation plan for the SCMP.
- In **Sierra Leone**, GHSC-PSM collaborated with the Directorate of Pharmaceutical Services (DPS) and the National Medical Supplies Agency (NMSA) to update SOPs of the integrated health commodities logistics system. The SOPs were launched to guide the integrated health commodity supply chain operations and system operators to ensure an uninterrupted flow of commodities through multiple levels of the supply chain—ranging from the central and district levels to the peripheral health units and CHWs. GHSC-PSM will collaborate with the DPS and NMSA to develop the SOPs' training curriculum for FY 2023.

Country Assessments: National Supply Chain Assessment

The national supply chain assessment is a diagnostic toolkit that identifies strengths, potential bottlenecks, and opportunities for improvement within a health supply chain. Developed in 2012 and now in version 2.0, NSCAs prioritize areas for root-cause analysis and inform the development of strategic and operational plans to strengthen systems. GHSC-PSM hosts the toolkit, provides technical consultations for interested implementers, and also promotes the tool within the global health supply chain community. To that end, the project hosted a French-language webinar in February 2022 to increase awareness of the French language capabilities of the tool as well as highlight the capability and utility of the tool. Seventy participants attended the webinar representing a dozen countries in sub-Saharan Africa.

Additionally, the project has been supporting countries in the NSCA workstream this year:

- In the second half of FY 2022, the project finished its NSCA activity in Rwanda. GHSC-PSM completed the data analysis, report writing, and stakeholder review and provided feedback in Q4. In collaboration with the MOH, the project intends to host an in-country dissemination event in FY 2023.
- In **DRC**, GHSC-PSM completed data analysis and report-writing in collaboration with the GHSC-TA-Francophone Task Order project. The report is under review. Feedback and a public release of the report are expected in FY 2023.
- In **Burundi**, the project implemented a national stakeholder engagement strategy. The project engaged key entities in the country, such as ABREMA and CAMEBU (the central medical stores), to align with country priorities and timelines for an NSCA in FY2023.

- In **Madagascar**, GHSC-PSM supported the USAID IMPACT project with technical assistance in implementing an NSCA. The project conducted data analysis and is drafting the report due in Q2 FY 2023.

C. Effective Global Collaboration to Improve Long-Term Availability of Health Commodities

GHSC-PSM's global collaboration activities provide research to shape global markets for health commodities and share supply chain information with other donors and collaborators as a global good. GHSC-PSM ensures that the project's supply chain stays current with emerging requirements and effectively manages and shares best practices and lessons learned.

C.1 Engagement with Global Partners for Strategic Coordination

Due to the scale, scope, and complexity of malaria as a public health challenge, global collaboration—sharing information, resources, activities, and capabilities—is essential. GHSC-PSM collaborates with international stakeholders and subject matter experts to address malaria commodity production, QA, and procurement challenges.

Global Collaboration for Sourcing Malaria Commodities

GHSC-PSM has participated in three malaria global task forces since the onset of COVID-19—the Malaria Pharmaceutical (Pharma) Global Task Force, mRDT Global Task Force, and the Vector Control Access (the former ITN/IRS Global Task Force)—to coordinate and manage COVID-19-related impacts on malaria commodity markets and in-country programming. Taskforce members are stakeholders in the global malaria community, including donors and non-governmental organizations like the Global Fund, Bill & Melinda Gates Foundation and Medicines for Malaria Venture. In FY 2022, the frequency of mRDT task force meetings shifted from monthly to quarterly. The task force meetings track COVID-19 related disruptions and delays (Pharma and Vector Control Task Forces), as well as overall market conditions, particularly related to rising costs, supply capacity, and other risks (e.g. hrp2 deletions).

GHSC-PSM provides market intelligence, informs discussions around market health and supply chain risk, and contributes to risk mitigation strategies and interventions. The project participates in smaller working groups as well—GHSC-PSM contributes to a sub-working group of the Pharma Task Force that focuses on upstream supply chain challenges in the KSM and API markets. In Q4, working group members from PATH informed they had received a one-year grant from Bill & Melinda Gates Foundation to assist in developing a full cost of goods sold (COGs) for sole-sourced semi-synthetic artemisinin (SSA), an alternative key ingredient to vegetal artemisinin. PATH will share updates on the activity and engagement with the supplier and solicit input from the working group to guide the COGS model and potential market interventions.

GHSC-PSM participates in a bi-quarterly LLINs Global Donor Collaboration call with Against Malaria Foundation (AMF), The Global Fund, and United Nations Children's Fund (UNICEF) to ensure a steady global capacity for next-generation LLINs, troubleshoot and share information on global upstream supply and logistic challenges, and coordinate on market-wide issues.

Global Collaboration for Quality Assurance Activities

GHSC-PSM meets monthly with the LLIN quality group and the QMS working group LLIN LQAG. The LQAG, which includes GHSC-PSM, PMI, the Global Fund, UNICEF, and WHO Pre-Qualification Team (PQT), gathers information and brainstorms processes to improve QMS for LLINs.

In Q3 FY 2022, GHSC-PSM participated in the 2nd Convening of [Raising the Floor on Nets – May 2022 Convening \(innovationtoimpact.org\)](#) in Liverpool, England, including a panel discussion and working sessions dealing with LLIN quality challenges, including a need for a glossary, for data on net performance, specifications, and requirements that link to net performance, and the need for appropriate measuring tools/testing methodology.

Global Collaboration for Warehousing and Distribution

GHSC-PSM works with international collaborators, donors, and stakeholders, to share warehousing and distribution information and resources. Through these strategic collaborations, GHSC-PSM ensures that the storage, promotion, and delivery of key malaria commodities is responsive to sector best practices while securing the best value, as described in the following illustrative examples:

In **Guinea**, GHSC-PSM collaborated with AMF to deliver AMF-procured LLINs. In Q1 FY 2021, GHSC-PSM drafted and executed a memorandum of understanding (MoU) with AMF, and QA/QC activities took place in the first half of FY 2022. In Q2, GHSC-PSM shipped 3,098,150 AMF-procured LLINs. In Q3, LLIN delivery occurred in seven staggered shipments to the Central Medical Store in Conakry. GHSC-PSM facilitated the shipment and delivery of 3,583,050 units of LLINs of which 3,098,150 were procured by AMF and 484,900 were procured by PMI. Out of these LLINs, 3,228,650 were reserved for mass campaign and 354,400 were kept for the routine distribution.

GHSC-PSM provided technical assistance to the multi-donor effort (Global Fund, Gavi the Vaccine Alliance, and the Government) to build a prefabricated warehouse (PFW) at the Coyah site in Q3 and Q4. Activities included:

- Facilitated signing of a reimbursement protocol between MOH and Global Fund, a requirement for Global Fund to fulfill its commitments to the project for implementing the PFW in Guinea.
- Obtained the signed copies of MoU from all stakeholders stating each party's objectives and commitments formally and clearly. This MoU enables stakeholders to work together in constructing the PFW in Coyah, Guinea.
- Collaborated with other parties to draft tender documents, which will help the project and stakeholders select qualified and interested institutions based on the technical terms agreed upon by stakeholders.
- Developed an 18-month project implementation plan for project managers. The plan will assist stakeholders in understanding tasks and team member accountability for tasks.

In **Nigeria**, the project, AMF, and PMI entered into an MoU in which AMF agreed to procure LLINs while GHSC-PSM was responsible for the QA/QC—inspection, sampling, and testing at one of the project's third-party QC laboratories—and logistics activities, including pickup, shipping, and delivery. In

Q1-Q2 FY 2022, the project implemented QA activities and delivered 3.7 million AMF-procured PBO LLINs in eight staggered shipments to the Akwa Ibom Central Medical Store.

- A condition of the PMI agreement was to give AMF visibility—up to the household level where each net was distributed. To fulfill this requirement, PMI requested that GHSC-PSM immediately transition the mode of LLIN campaign management from paper-based processes to an electronic model. However, challenges associated with this transition delayed the mass distribution campaign of LLINs. The plan is back on track, and the campaign will take place Q1 FY 2023.
- The switch from paper-based to electronic provided the project an opportunity to adopt digital management for LLIN campaigns, which improves efficiency, visibility, and accountability for the commodities and personnel involved.

In **Zambia** in FY 2022, GHSC-PSM, the National Malaria Elimination Centre (NMEC) and its key stakeholders prepared for the 2023 LLIN mass campaign. AMF will procure 6.3 million LLINs, the Global Fund will ship them to warehouse(s), and GHSC-PSM will distribute them to the SDPs in six provinces, including three high-burden districts of the Copperbelt Province. Another partner, the PMI VectorLink project, will issue the LLINs to beneficiaries in the communities. In Q3 and Q4, the project and the partners helped NMEC finalize the LLIN allocation plan. Starting in Q1 FY 2023, the project will deliver the LLINs to the SDPs and provide them with supervisory support. The LLINs will cover Luapula, Muchinga, Northern, and some districts of the Eastern Provinces as guided by NMEC.

Global Collaboration for Global Standards and Traceability

- **TraceNet Initiative:** Since 2019, the project, in collaboration with the TraceNet working group, a cross-functional group of LLIN manufacturers, procurers, and donors, has been adopting Global Standards for LLINs. The recommendations and timeline adopted by the TraceNet working group require standards-based identification, data capture (barcoding), and master data sharing in a phased implementation structure between 2020-2022. In Q3 FY 2022, the final requirement for serialization of the individual LLINs and standards-based labels on bales became mandatory. GHSC-PSM engaged suppliers for support in this process and monitored their compliance with this requirement. All PMI LLIN suppliers required to meet this deadline are now serializing their products at the net and bale levels. The project continues to engage strategic partners to share information and lessons learned from implementing the requirements.
- **Traceability and Verification System for Health Products (TRvST) Initiative:** In FY 2022, GHSC-PSM was a key contributor to the TRvST initiative. TRvST is a multi-donor collaboration, including UNICEF, Global Fund, and USAID, to establish a global repository of trusted health product information with functionality enabling verification and traceability for these products. The project provided technical support to the TRvST initiative, including data modeling, supplier engagement, and country technical implementation, specifically in Malawi, Nigeria, and Rwanda. In Q4, USAID funded TRvST for the verification of antiretroviral (ARV) products. GHSC-PSM developed an engagement strategy for ARV suppliers and provided inputs to the data sharing matrix to govern serialized event data. Based on the lessons learned and protocols established for traceability data exchange of the ARV pilot, GHSC-PSM will document

technical and business processes for traceability data exchange to guide traceability data sharing for other products such as malaria products.

- **International Procurement Agency (IPA) Technical Guidance:** Following the 2019 adoption of the GSI Joint Technical Implementation Guide by donors and procurement agents, in FY 2022, GHSC-PSM convened a virtual forum among donors, procurement agents, and strategic partners to share updates on and lessons from global standards adoption across the IPA community. As part of this forum, the community determined that an update to this joint guidance was needed to reflect routine standard updates and incorporate new organizations. GHSC-PSM stepped up as a facilitator for these updates. This work is underway and expected to be completed by early FY 2023.

C.2 Global Market Dynamics Research and Innovations

As described in section A.1, GHSC-PSM conducts market analyses of malaria commodity sourcing activities to ensure stronger, healthier, and more sustainable markets in the long run.

Commodity Risk Mitigation

In FY 2022, numerous production challenges impacted the malaria supply chain. GHSC-PSM navigated government-imposed environmental restrictions, including the Chinese New Year, the Beijing Olympics, and protracted COVID-19 disruptions—the project sources many critical materials in China. Personnel shortages from factories and ports to logistics workers persisted throughout Q2. In Q3 and Q4, access to active ingredients and starting material improved significantly with fewer supplier delays.

The war in Ukraine exacerbated the cost of natural gas, and this contributed to volatility in the vegetal artemisinin market and the rise in the prices of SSA. The GHSC-PSM Commodity Council discussed these factors in Q2, before the FY 2023 artemisinin-based pharmaceutical tender. GHSC-PSM placed orders under the new pharma strategy in Q4 and included tender evaluation criteria to incentivize supplier commitment to use SSA in the equivalent of 20 percent of the volume produced for GHSC-PSM.

In Q2, an out-of-specification (OOS) notice impacted one pre-qualified supplier of injectable artesunate, leading to a severe disruption in the product's supply, affecting orders for 14 countries. After finalizing the OOS investigation and conducting a country-by-country fulfillment plan, the project placed replenishment orders for all countries in Q3. GHSC-PSM QA completed a laboratory test method transfer, and a third supplier of injectable artesunate became eligible for FY 2023 allocation consideration. By the end of Q4, the project mitigated supply disruption of injectable artesunate and brought forward orders for Nigeria and Tanzania to avoid stockouts. This enhanced the supply base, increased batch size, and improved the market health of this severe malaria commodity.

One pre-qualified supplier of rectal artesunate paused production throughout the fiscal year due to low global demand for the product. GHSC-PSM placed only one order with this supplier in FY 2022, for Sierra Leone. The project negotiated with the remaining supplier on production runs to meet country campaign needs for all other demands. To secure capacity for future suppository testing needs, GHSC-PSM began the method transfer process to qualify a second lab in Singapore.

After placing all SMC orders early in the fiscal year, GHSC-PSM met with the Global Fund, UNICEF, and Malaria Consortium in Q3 to discuss FY 2023 campaigns and coordinate order placement timing. In Q4, the Global Fund notified GHSC-PSM QA of packaging discrepancies on tableting and age range for SPAQ products in Burkina Faso. GHSC-PSM worked with the supplier on corrective and preventative actions (CAPAs) and contacted NMCPs in Ghana, Niger, and Nigeria, which had also received this product. Meanwhile, the project secured goods for orders received in Q4, using a combination of fresh stock and stock held at the RDC in Belgium. GHSC-PSM placed an inbound order to replenish the RDC in anticipation of additional volume that countries may request in early FY 2023.

The COVID-19 Omicron variant prompted multiple mRDT suppliers to prioritize COVID-19 diagnostic products in the first half of FY 2022. mRDT production stabilized by the beginning of Q3, with only one supplier communicating challenges receiving raw materials from China.

Container shortages and shipping delays continued in the net market into Q3, impacting the shipment of active ingredients and the movement of the finished product. For example, in Q2, one LLIN supplier manufacturing factory in Thailand overcame a COVID-19 outbreak and production backlog. By the end of FY 2022, the supplier brought forward orders for dual active ingredient (Dual AI) nets for Côte d'Ivoire and Liberia. The Shanghai port lockdown in Q2 impacted two suppliers' shipments to West Africa, delaying requested dates by approximately four weeks. Despite the logistics challenges throughout the fiscal year, GHSC-PSM met country LLIN demand, albeit with longer lead times.

COVID-19 dynamics caused manufacturing challenges and delayed goods availability dates for all suppliers of malaria laboratory equipment, with varying impacts on countries throughout FY 2022. GHSC-PSM worked with manufacturers to ship partial orders to ensure equipment availability in-country as quickly as possible while maximizing freight rates.

Other Global Innovations

At the central and country levels, the project tests and promotes new approaches to ensure the availability of lifesaving commodities for the people who need them. Illustrative innovations from FY 2022 include the following:

- GHSC-PSM emphasized rewarding suppliers with robust quality control systems in the LLIN FY 2023 tender review. The project will pursue market-shaping initiatives related to the promotion of LLIN quality improvement and regionalization throughout FY 2023.
- Throughout the year, GHSC-PSM participated in the KSM/API Working Group and, since Q3, a smaller subset of the working group to discuss volatility in the vegetal and SSA markets and market-shaping interventions. The lack of visibility into vegetal artemisinin supply primarily grown in China, and concerns related to sustained production of the semi-synthetic product currently sole-sourced, highlighted the importance and urgency of this topic.

C.3 Awareness and Advocacy to Improve Availability of Essential Health Commodities

International Meetings and Conferences

GHSC-PSM represents the supply chain point of view in key global meetings and conferences to ensure that donors and governments consider the supply chain in program planning.

In Q1 FY 2022, GHSC-PSM's Cameroon and Ethiopia country offices prepared four presentations on malaria and data visibility work for the American Society of Tropical Medicine and Hygiene 2022 Annual Meeting:

- Strengthening district capacity on data use to improve malaria product availability in Cameroon's North and Far North Regions
- Assessment of primaquine utilization in four health facilities of Ethiopia in the context of malaria elimination strategy
- Patient satisfaction among 26 selected hospitals implementing auditable pharmaceutical transactions and services in Ethiopia
- Applying effective approaches contributes to waste reduction and better availability of essential medicines in Ethiopia

In Q4 FY 2022, GHSC-PSM participated in The People That Deliver Global Indaba. The conference focused on human resources for supply chain management (SCM). Among other cross-cutting presentations, the Cameroon and Malawi country offices made two presentations on data management and the building of local capacity to improve stock management practices. All project presentations:

- Strengthening Malawi Ministry of Health supply chain management: service delivery and data management
- Pharmaceutical workforce development based on the auditable pharmaceutical transaction and service system in Ethiopia
- Zambia's journey to supply chain management technical independence through institutionalization in nursing, biomedical sciences, and pharmacy colleges and universities
- Human capacity development for maximizing health supply chain performance in Guinea: training of potential supply chain managers at higher institutions of learning
- Human resource capacity development in the Angolan health supply chain
- Linking of the demand for and supply of the supply chain management workforce
- A comprehensive approach to address the health supply chain workforce capacity in Ethiopia
- Improvement of the supply chain management environment for workers in Kenya and Rwanda
- Capacity building for improved stock management in Northern Cameroon

Other Malaria Meetings and Events

- In Q4, GHSC-PSM held the annual “Call For Orders” webinar with the country offices.
- In Q4, GHSC-PSM visited an LLIN and two pharmaceutical manufacturers in East Africa to discuss the challenges and opportunities related to expanding new manufacturing locations in Africa as well as toured the manufacturing facilities to understand the manufacturing processes and quality management systems of the suppliers.
- In Q1–Q4, GHSC-PSM participated in the KSM/API sub-working group 10 of the Malaria Pharma Task Force.¹¹ The working group tracked and validated activities in the artemisinin market surrounding the KSM used in all rectal and injectable artesunate and ACTs and also discussed promoting semisynthetic artemisinin.
- In Q1, the project participated in the [Quality in LLINs for Procurers at the Raising the Floor Nets: ITN Quality Convening](#) virtual meeting for the LQAG. GHSC-PSM has chaired this group since it became official in Q4 FY 2021. For more details, see section A.3
- In Q2, the project attended the virtual annual Alliance for Malaria Prevention Partners Meeting. The themes included 1) LLIN access, 2) scale-up of new LLIN types, and 3) COVID-19 adaptations and distribution outcomes.
- In Q3, GHSC-PSM worked with the Global Fund, UNICEF, and the Malaria Consortium to share demand information and coordinate procurement planning for SPAQ for FY 2022 SMC campaigns.

C.4 Coordination and Collaboration within GHSC-PSM

Coordination across Health Areas within the IDIQ

- GHSC-PSM promotes collaboration across health areas and other project funded activities. The project uses its work across multiple health areas to benefit all task orders. Due to the project’s economies of scale, significant cost savings relating to infrastructure (e.g., RDCs and contracts with 3PL service providers) are possible. See section A.2 for additional details on logistics cost savings.
- The project built the ARTMIS information system to manage its supply chain with funding from all health areas. Other enhancements include creating new requisition orders, purchase orders, and inventory order reports, developing a toolbox to estimate lead time and freight costs, and designing integration with other tools. ARTMIS integrates with partner systems like the Global

¹⁰ KSM/API Working Group members include Clinton Health Access Initiative (CHAI), Bill and Melinda Gates Foundation (BMGF), GHSC-PSM, the Global Fund, Medicines for All Institute, Medicines for Malaria Venture (MMV), Maisha Meds, PATH, Unitaid, PMI, and WHO.

¹¹ Pharma Task Force members include the Asia Pacific Leaders Malaria Alliance Secretariat, CHAI, BMGF, GHSC-PSM, the Global Fund, Impact Malaria, the Malaria Consortium, MMV, Médecins Sans Frontières, Pan-American Health Organization, PATH, PMI, UNICEF, and WHO.

Family Planning Visibility and Analytics Network and PMI's M-DIVE. Shared funding allows for specialized support, such as market dynamics, knowledge management and communications, and M&E. See Section A.4.

- GHSC-PSM health areas—Malaria, HIV/AIDS, FP/RH, and MNCH co-fund the project's innovations. GHSC-PSM integrates GSI in supply chain processes through technical assistance to country programs. In FY 2022, GHSC-PSM implemented activities around the newly required serialization requirements, working with USAID to establish expectations for supplier compliance and data collection approaches.
- In FY 2022, the project advanced countries' transitions from FASP tools to QAT. This tool is used for forecasting and supply planning for health commodities across the project's four health areas, which co-funded QAT's development in FY 2021. Twenty four countries implemented the module for supply planning, more 50 percent increase from 13 in FY 2021.
- In FY 2022, the project introduced and implemented the forecasting module in 12 countries. GHSC-PSM will train more countries on both modules in FY 2023 in addition to providing separate country-led training to government counterparts. See Section B.1.
- All health programs continued to implement the EUV survey and collaborated with GHSC-PSM to finalize revision of the EUV survey toolkit. EUV surveys are routine assessments of stock availability and potential causes of stockouts at the SDP level that provide an opportunity to address stock management challenges. The project finalized revision of the EUV survey toolkit in Q2 and created a French version of the reporting template in Q3. For full details on EUV activities in FY 2022, see Section B4.
GHSC-PSM maximizes synergies across health programs. The project develops approaches and systems that diffuse to other areas. Multiple health areas fund most GHSC-PSM country offices. This helps country offices to share the cost of office space, infrastructure, and staff. The health areas also fund or co-fund training, greatly expanding the topics and number of people who benefit. Health areas often share the cost of technical assistance for cross-cutting technical areas, such as FASP, warehousing, distribution, inventory management, and LMIS.

Coordination with Other USAID GHSC-funded Activities

- Separate GHSC contracts—e.g., a Mission-managed task order known as Task Order 5, or Afya Ugavi, in Kenya and a multi-award GHSC-TA contract—provide technical assistance through country offices, including in PMI-supported countries Benin, DRC, Senegal, and Tanzania, and Mission bilateral partnerships in Côte d'Ivoire and Madagascar. USAID Missions in these countries procure health commodities through the GHSC-PSM contract. A project team at the headquarters serves as the point of contact for non-field office (NFO) countries on order, delivery, and commodity security issues, conveying information, and managing data requests.
- The NFO tailors its support based on commodity volume and complexity, import requirements, and in-country programming. To interact effectively with the GHSC-TA contractors, the NFO outlined roles and responsibilities, drafted communication protocols with in-country stakeholders and USAID Missions, and executed and monitored MoUs with the GHSC-TA

contractors. The NFO also coordinates closely with in-country technical assistance projects to manage contracts.

- GHSC-PSM continues to monitor the impacts of COVID-19 and persistent security and adverse weather risks on TO2 commodities in the global supply chain. The project provides regular updates to USAID and GHSC-PSM country directors as needed through various methods, including direct communications with USAID and virtual country director forums.

D. Performance Monitoring

GHSC-PSM monitors and reviews project performance with the objective of continual improvement.

D.1 Indicators

GHSC-PSM has a USAID-approved monitoring and evaluation plan with performance indicators that reflect the project's results framework. Annex A provides the framework, and Annex B, the list of indicators and their definitions. Annex C details the sources of all the commodities the project procures. Annexes D–G provide project performance as detailed by the indicators.

GHSC-PSM's monitoring and evaluation plan includes quarterly semiannual, and annual indicators. The project collects and cleans performance monitoring data; calculates relevant indicators for each reporting period, and reports these indicators in contractual quarterly and annual reports. GHSC-PSM performs extensive QA of OTD data. Headquarters-based M&E specialists review indicator data provided by country offices that are used to calculate the country-level indicators.

As part of the quarterly reporting process, the project reviews quarterly findings. These reviews identify potential calculation issues and provide context for the quarterly report. They support reflecting on progress and prioritizing areas for improvement.

D.2 TO2 Regular Meetings and Review

GHSC-PSM holds internal standing meetings to review TO2 performance across the project and identify areas for improvement. These meetings include:

- A weekly TO2 management team meeting to discuss activities.
- Daily global supply chain meetings to review pending orders and prioritize actions for malaria order management.
- Three GHSC-PSM program management meetings per month (the first, second, and fourth week) on cross-cutting project issues that impact project health areas, including the TO2.

GHSC-PSM standing meetings with USAID/PMI include:

- Weekly GHSC-PSM TO2 meetings with PMI to review pending malaria orders, provide updates on progress in systems-strengthening activities, and present and discuss new sourcing strategies and innovations for PMI approval.
- Biweekly GHSC-PSM TO2 QA and PMI meetings to review progress on QA activities.
- Biweekly GHSC-PSM management team and USAID check-in meetings to review cross-cutting project performance with the USAID Contracting Officer's Representatives.

- Biweekly M&E TWG meetings to develop, review, update, and promote global M&E strategies, processes, and tools for the project; identify and share best practices across countries and other USAID partners; and address technical assistance that has cross-country applicability.
- Biweekly logistics TWG meetings to review deliver/return and 3PL metrics and logistical challenges and issues; participant's present customized logistics solutions to improve project performance.
- Monthly ARTMIS change control board meetings with the USAID technical backstops to review proposed ARTMIS changes, such as correcting defects or new functionalities.
- Biweekly ARTMIS meetings to provide the technical status (e.g., accomplishments, planned roadmap tasks, and risks) to USAID MIS backstops.
- Country MIS meetings, organized by Country Program Management Units, to provide updates to USAID MIS backstops on countries' MIS operations or implementation status.
- Monthly QAT steering committee meetings to update USAID, GHSC-PSM task order directors, GSC, and Commodity Security teams and discuss tool development and country roll-out progress, successes, challenges, risks, project sustainability, and other project management issues.
- Monthly finance TWG meetings to coordinate and standardize financial management across task orders; provide financial reporting; and deliver financial updates across task orders.
- Bimonthly (every two months) GHSC-PSM and USAID Development Data Library Working Group meetings to review requirements and best practices for data sharing with USAID and other partners.

D.3 Other Monitoring

In accordance with USAID's Environmental Procedures (22 CFR 216), GHSC-PSM implements the Initial Environmental Examination and the Environmental Mitigation and Monitoring Plan. Implementation includes services to staff globally, such as a review of technical documents pertaining to 22 CFR 216, guidance and advisory support, training, and capacity building, and direct technical assistance.

In Q2, GHSC-PSM completed the FY 2021 Environmental Mitigation and Monitoring Report (EMMR) and received comments from USAID. The comments were addressed, and the EMMR was resubmitted and distributed to the USAID Global Health Bureau Environmental Officer (BEO) by the end of Q3. In Q4, GHSC-PSM received feedback from the BEO and addressed them in the FY 2022 EMMR through the addition of a new annex that summarizes all activities completed during the reporting period.