USAID GLOBAL HEALTH SUPPLY CHAIN PROGRAM
Procurement and Supply Management

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PMI U.S. PRESIDENT'S MALARIA INITIATIVE
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GHSC-PSM TASK ORDER 2 (MALARIA)

ANNUAL REPORT FISCAL YEAR 2021

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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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Annexes

Acronyms

ABC	activity-based costing
ACT	artemisinin-based combination therapy
API	active pharmaceutical ingredient
APTS ARTMIS	Auditable Pharmaceutical Transactions and Services Automated Requisition Tracking Management Information System
CAPA	corrective and preventive action
CAPeT	Commodity Accountability Performance Tracking
CHAI	Clinton Health Access Initiative
DCAPS	*Direction de la Chaîne d'Approvisionnement des Produits de Santé (*DCAPS)
DRC	Democratic Republic of the Congo
DSC	digital supply chain
3PL	third-party logistics
EAS	East African Standards
EMMP	Environmental Mitigation and Monitoring Plan
EMMR	Environmental Mitigation and Monitoring Report
EUV	end-use verification
FASP	forecasting and supply planning
FY	fiscal year
GDSN	Global Data Synchronization Network

GHSC-PSM	Global Health Supply Chain Program-Procurement and Supply Management
GLN	Global Location Number
GTIN	Global Trade Item Number
HF	health facility
HHR	household registration
HSS	health systems strengthening
ICC	inventory control card
ICT4D	information and communication technology for development
IEE	Initial Environmental Examination
IP	implementing partner
IPTp	intermittent preventive treatment in pregnancy
KSM	key starting material
LGA	local government area
LLIN	long-lasting insecticide-treated net
LQAG	LLIN Quality Assurance Group
LTA	long-term strategic agreement
M-DIVE	Malaria Data Integration for Visualization and Eradication
MIS	management information system
MOH	Ministry of Health
MOU	Memorandum of Understanding

mRDT	malaria rapid diagnostic test
MMV	Medicines for Malaria Venture
MSF	Médecins Sans Frontières
NMCP	National Malaria Control Program
NSCA	national supply chain assessment
NPC	National Product Catalog
OTD	on-time delivery
OTIF	on-time in-full
PBO	piperonyl butoxide
PMI	U.S. President's Malaria Initiative
PPM	Pharmacie Populaire de Mali
PPMRm	Procurement Planning and Monitoring Report for malaria
PO	purchase order
PQ	prequalification
Q	quarter
QA	quality assurance
QAT	Quantification Analytics Tool
QMS	quality management system
QPL	QAT Problem List
RDC	regional distribution center

RDT	rapid diagnostic test
RFP	request for proposal
RO	requisition order
SCISMM	Supply Chain Information System Maturity Model
SDP	service delivery point
SMC	seasonal malaria chemoprevention
SMM	Stock Management Model
SP	sulfadoxine-pyrimethamine
SPA	supply chain automation
SPAQ	SP + amodiaquine
TA	technical assistance
TO2	Task Order 2
TWG	technical working group
UNICEF	United Nations Children's Fund
W&D	warehouse and distribution
WHO	World Health Organization

Executive Summary

The USAID Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM) project is pleased to present this annual report. It summarizes the project's work and performance for the malaria task order, Task Order 2 (TO2), for fiscal year 2021(FY 2021). This work contributes to the U.S. President's Malaria Initiative's (PMI) goals to reduce malaria deaths and substantially decrease malaria morbidity toward the long-term goal of elimination. (See text box.)

GHSC-PSM FY 2021

Delivered enough anti-malarial medicine to treat over 116 million infections

Procured malaria medicines and commodities for 29 countries

Delivered over 47.3 million long-lasting insecticide-treated nets (LLINs) in 24 countries to provide protection from malaria for 94.5 million people

Implemented new assessments of malaria commodity markets to maintain quality and mitigate security risks.

GHSC-PSM made important progress in meeting the project's programmatic goals in FY 2021, even as the COVID-19 pandemic continued to impact malaria commodity supply chains. In FY 2021, GHSC-PSM expanded its focus to cover short-term and long-term COVID-19 mitigation efforts to ensure the uninterrupted supply of malaria commodities across the board.

The project implemented several tools and processes in FY 2020 based on lessons learned from the initial COVID-19 outbreak response. These same strategies continued to streamline our FY 2021 work, including the sourcing strategies for malaria commodities and the project's proactive procurement strategies. Wide-scale implementation of these strategies is one of GHSC-PSM's biggest success stories that contributed to high on-time deliveries (OTDs) for FY 2021.

A. Improved Availability of Health Commodities

In FY 2021, GHSC-PSM procured malaria commodities valued at more than $222 million for 29 countries, including lifesaving medicines for malaria prevention and treatment, malaria rapid diagnostic tests (mRDTs), long-lasting insecticide-treated nets (LLINs), and laboratory supplies.

Almost two years into the COVID-19 pandemic, malaria commodity supply chains continue to face challenges. Thanks largely to new allocation strategies and mitigation tools that were established in FY 2020, and increased collaboration with donors, government, and private-sector partners, GHSC-PSM meets its programmatic commitments to maintain the continuous flow of malaria commodities into countries and deliver technical assistance.

On-time and on-time in-full delivery. GHSC-PSM achieved consistently high OTD and on-time in-full (OTIF) performance for malaria medicines and commodities in FY 2021. Timeliness of GHSC-PSM deliveries remained consistent and extremely strong for standard OTD and OTIF in Q4, with an OTD rate of 96 percent (93 percent for COVID-impacted). (See Exhibit 5.) The OTIF rate in Q3 was 85 percent (81 percent for COVID-impacted) despite the high degree of uncertainty and the extreme volatility in global supply chains caused by the pandemic. (See Exhibit 7).

Commodity cost savings. Over the life of the project, GHSC-PSM has achieved $149.2 million in cost savings for major malaria commodities, compared to baseline prices. (See Exhibit 10.) These savings

represent 24 percent of the total spent on these product categories over the life of the project and 26 percent of the total value spent on malaria products overall. Commodity cost savings are achieved through a variety of means that may vary by product category and are generally expected as products progress through their life cycle. In addition, sourcing efforts aimed at promoting and sustaining competition, such as through targeting messaging of needs/opportunities and minimization of barriers to obtaining significant market share, have also contributed to achievement of cost savings whilst in pursuit of other strategic objectives.

Logistics cost savings. GHSC-PSM has saved $27.4 million on logistics cost savings during FY 2021. Logistics cost savings are broken out into 3 categories:

- Managing open competition in freight lanes - FY21 cost savings of $1.84 million
- RDC warehousing and routing - FY21 cost savings of $262 thousand
- Shipping by ocean rather than air - FY21 cost savings of $25.14 million

Sourcing and procurement strategies. The impact of COVID-19 on malaria commodity supply chains in FY 2021 was compounded by port congestion and air freight delays globally. Also, container shortages severely limited the project's ability to move LLINs. Similar to FY 2020, these transshipment issues were more significant than production issues in FY 2021. The project anticipates these challenges will continue in FY 2022 and is exploring solutions to mitigate risk, such as focusing on air shipments for more agile deliveries. (See Section A.2 for more details.)

Cost Savings for FY 2021

Commodity cost savings for FY 2021 totaled $46.5 million (out of $149.2 million since 2016). This includes:

$23 million in savings on ACTs

$7 million in savings on LLINs

$6 million in savings on mRDTs

$6 million in savings on SPAQ

$4 million in savings on injectable artesunate

The project works closely with suppliers to understand challenges and develop creative solutions, including qualifying new products and vendors, offering alternative products to countries, and identifying manufacturing sources not subject to export restrictions. The project took proactive measures, liaising with potentially impacted suppliers and third-party logistics (3PL) service providers to identify and mitigate potential disruptions. These solutions enabled the project to maintain a strong OTD rate despite COVID-19.

GHSC-PSM invests in and adapts a proactive procurement strategy for key malaria commodities, such as injectable artesunate, artemether lumefantrine (ALu), and sulfadoxine/pyrimethamine + amodiaquine (SPAQ). At the onset of the COVID-19 pandemic, the project designed and executed several strategies to rapidly take action on projected demand and Country Requested Delivery Dates (RDDs) by leveraging a rotating emergency loan fund to secure large volumes of supplier production capacity in markets where supply is particularly constrained. GHSC-PSM places orders based on data-driven demand signals, enabling it to secure production capacity far earlier in the ordering process—often well in advance of receiving actual orders. The intent of these proactive procurement strategies is to ensure access to the supply of critical commodities when countries need them, reduce fulfillment lead times, and hedge against considerable uncertainty and disruption in these markets. Demand data, in part, enables these strategies; these data are derived from country supply plans and the Procurement Planning and Monitoring Report for malaria (PPMRm), which the project translates into country stock risk dashboards

that illustrate the timing and scope of upcoming stock risks. The project designs these strategies in part to mitigate these future stock risks.

Quality assurance (QA). GHSC-PSM looks for continuous improvement opportunities to ensure the quality of products procured on PMI's behalf and ensure these commodities' safety and efficacy. GHSC-PSM implemented proactive adjustments to QA/quality control (QC) activities to mitigate delays related to COVID-19 testing and shipping restrictions for samples and commodities. Building off of risk-based approaches the malaria team had been exploring pre-COVID-19, the project developed a new QA strategy, which modified the inspection, sampling, and testing of a product based on an evaluation of risk of the commodity type, whether the product is manufactured by a WHO PQ'd or SRA-approved supplier, the supplier's quality management systems (QMSs), and the historical data that GHSC-PSM has for that product and supplier. The new strategy decreases the need for sampling, inspection and testing resources and reduces the overall lead time for getting products to patients. (See Section A.3 for more details.)

The project innovated and implemented robust QA and QMS for evaluating LLIN RFPs. These efforts included a strategic process for incorporating the strength of an LLIN supplier's QMS into the allocation process. GHSC-PSM also led the collaboration between Rwanda and an LLIN supplier to proactively generate a quality agreement on the QC activities to be executed before and after an LLIN shipment occurs for Rwanda.

Collaboration on global standards. GHSC-PSM is closely coordinating with the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) to support suppliers in meeting the deadlines for compliance with GS1 standards. In FY 2021, the project supported the adoption of GS1 healthcare global standards through its procurement requirements for pharmaceutical, medical device, sterile kit, laboratory reagent, and LLIN suppliers to adopt standardized product identification and labeling and to exchange product master data. GHSC-PSM also supported the adoption of global standards in supply chain processes through providing technical assistance for adopting standards within country programs. (See Section A4 for details.)

B. Strengthened In-Country Supply Chain Systems

GHSC-PSM builds sustainable country capacity to provide quality health commodities in the right quantities where and when they are needed. Sustainability implies that local entities can manage an effective supply chain with local technical resources. GHSC-PSM works to strengthen national supply chains and improve malaria commodity availability in 22 countries. The project's health systems strengthening (HSS) activities have ranged from providing training and technical assistance to host governments and other supply chain entities to seconding staff to the government to support supply chain functions.

Ongoing international and local travel restrictions due to COVID-19 limited opportunities for in-person training, capacity building, and other activities. Staff based in the U.S. remained remote for all support activities in FY 2021. Country teams adjusted as appropriate, providing remote technical assistance or enacting appropriate safety measures for in-person activities. Strengthening community health systems is a core focus area of the PMI strategy. The project will explore ways to leverage the stockout reduction strategy to expand into other community-level HSS activities in FY2022. In using the stockout reduction

strategy framework, GHSC-PSM aims to help countries identify priority community HSS areas for project support.

Strengthened enabling environments. GHSC-PSM strengthens enabling environments to improve supply chain performance through technical assistance in supply chain leadership and governance. The project supports strategy development and planning to improve supply chains. These strategies reflect findings from country-level assessments, including national supply chain assessments and end-use verification (EUV) surveys. (See Section B.4 for details.)

Improved in-country logistics. GHSC-PSM supports the effective and efficient delivery of health commodities to service delivery points (SDPs) in two ways: first, by providing technical assistance to host governments for warehousing and distribution and, second, by directly distributing commodities within some countries. GHSC-PSM incorporates private sector best practices into public health supply chains by applying lean methodologies, such as activity-based costing (ABC). The project works with Ministries of Health (MOHs), implementing partners (IPs), the private sector, and others with supply chain responsibilities to measure inventory velocity of the supply chain (i.e., how long it takes to move the product from one end of the supply chain to the other) and improve the orchestration of all activities and service levels to reduce the cost of holding inventory and to improve efficiency across all supply chain activities. (See Section B.2 for details.)

Supply planning technology. The project rolled out the Quantification Analytics Tool (QAT) in FY 2021, which resulted in measurable improvement in country supply planning. The QAT has proven critical to help ensure that GHSC-PSM maintains a consistent supply of products to support malaria programs. In FY 2021, the project conducted five remote trainings for 17 countries followed by targeted technical assistance to help countries transition their supply plans from PipeLine to QAT. The project plans to onboard additional PMI-supported countries[1] to QAT in FY 2022, pending Mission funding. In-country staff led QAT trainings for MOH and other partner staff in 6 of the 17 trained countries. By the end of FY 2021, the project onboarded half of GHSC-PSM's portfolio of malaria TO countries on using QAT, allowing MOH and GHSC-PSM country staff to use the tool with minimal support. (See section B1 for details.)

Stockout reduction initiative. The project rolled out a stockout reduction playbook, developed in FY 2020, to all project country offices in support of PMI's initiative to optimize its investments and significantly reduce stockout rates at SDPs. The initiative encourages countries to prioritize activities that have the highest impact in reducing stockouts. In alignment with PMI's new strategy, this technical assistance allows GHSC-PSM to strengthen in-country supply chains to ensure products are consistently available to those who need them. By the end of FY 2021, countries developed investment plans for the initiative and incorporated the prioritized investment plans into their FY 2022 project work plans. (See section B2 for details.)

LLIN delivery. In FY 2021, many countries maintained LLINs for continuous distribution, and a few launched or continued large-scale LLIN distribution campaigns as a key malaria prevention strategy. The project delivered more than 47 million LLINs to protect nearly 95 million people in 24 countries (See section B.2 for details.)

[1] Angola, Burkina Faso, Cameroon, Ghana, Malawi, Mali, Rwanda, Sierra Leone, Tanzania. and Uganda

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

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

COVID-19 Global Task Forces on Malaria Commodities. GHSC-PSM participated in task forces established in FY 2020 to help global partners coordinate and manage COVID-19–related impacts on malaria commodity markets and in-country programming. GHSC-PSM joins members from USAID/PMI, the Global Fund, World Health Organization (WHO), United Nations Children's Fund (UNICEF), the Clinton Health Access Initiative (CHAI), the Gates Foundation, Médecins Sans Frontières (MSF), Medicines for Malaria Venture (MMV), and other organizations on task forces focused on:

- mRDTs[2]
- Malaria medicines[3]
- Vector control access (indoor residual spraying and insecticide-treated nets)[4]

These task forces provide a valuable forum for information exchange on market risks and promote better collaboration across the global malaria community. They are supplemented by one-off working sessions and communications to discuss acute risks, issues, and opportunities.

GHSC-PSM collaborates with MMV on key topics discussed in the Malaria Pharma Task Force Key Starting Material/Active Pharmaceutical Ingredient (KSM/API) working group, which seeks to increase visibility and identify and mitigate risks related to the upstream supply of KSM and API for finished malaria pharmaceutical products. In Q4, the working group focused on evolving developments in the sulfadoxine KSM market. The key starting material DCMP (4,6-Dichloro-5-methoxypyrimidine) has experienced ongoing economic constraints impacting production. It is used in the manufacturing of one of the key medicines procured for malaria prevention in children, SPAQ, and is also used in the manufacturing of sulfadoxine-pyrimethamine (SP), which is used for intermittent preventive treatment in pregnancy (IPTp). Mainly manufactured in China, the pollutant and energy-intensive nature of DCMP production has been exacerbated by known offline periods during the summer months, China's carbon neutral policy (several KSMs and APIs are energy intensive), and price increases in the crude oil and coal markets. Intelligence shared in this forum, from direct calls and inquiries with both KSM and API suppliers to understand their constraints and supply statuses, as well as their strategies for supply security, has enhanced the project's negotiation position. Insights from the working group are reducing duplication, providing a broader picture of market dynamics and strengthening the project's ability to

[2] The mRDT Task Force members include USAID/PMI, CHAI, Foundation for Innovative New Diagnostics, the Gates Foundation, the Global Fund, the Malaria Consortium, Médecins Sans Frontières, PATH, GHSC-PSM, UNICEF, United Nations Development Program, UNITAID, and WHO.

[3] The Pharma Task Force is led by MMV. Members include the Asia Pacific Leaders Malaria Alliance Secretariat, CHAI, the Gates Foundation, GHSC-PSM, the Global Fund, Impact Malaria, the Malaria Consortium, MMV, MSF, Pan-American Health Organization, PATH, PMI, UNICEF, and WHO.

[4] The ITN/IRS Task Force is led by the Alliance for Malaria Prevention. Members include the Against Malaria Foundation, CHAI, the Gates Foundation, GHSC-PSM, the Global Fund, Innovative Vector Control Consortium, International Federation Red Cross, MMV, MSF, PMI, Population Services International, Results In Health, UNICEF, UNITAID, and WHO.

maintain goods availability dates confirmed by suppliers, towards the continuous supply of this life saving drug.

GHSC-PSM also works with the Global Fund, UNICEF, and the Malaria Consortium to share demand information and to coordinate procurement planning for SPAQ for FY 2022 seasonal malaria chemoprevention (SMC) campaigns. In Q4, the project identified opportunities for pooled procurement with the Global Fund in order to hit minimum order quantities with artesunate suppositories manufacturers, which secured timely supply of artesunate suppositories as GHSC-PSM was able to secure earlier production. The project continues to lead and facilitate monthly meetings with PMI, Global Fund, and UNICEF to collaborate around mRDT procurements, supplier engagement, and stockout prevention.

D. Performance Monitoring

GHSC-PSM monitors and reviews project performance with the objective of continual improvement. The project 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 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 through procurement and delivery to supported countries. The project accomplishes this through enhanced commodity procurement, strengthened global logistics processes, adherence to quality assurance (QA) requirements, and improved data visibility. Activities and achievements in these areas and relevant performance indicators are summarized below.

A.1 Enhancing Global Health Commodity Procurement

Under the PMI-funded malaria task order (TO2), GHSC-PSM supplies lifesaving malaria prevention and treatment medicines, mRDTs, LLINs, and lab supplies. New processes and tools introduced in FY 2021 allowed the project to leverage data sources, standardize order processes to support and systematize supply chain planning and decision making, and increase collaboration with other donors, private sector partners, and national government offices.

GHSC-PSM Approach to Improving Malaria Commodity Markets

On behalf of PMI, GHSC-PSM contributes to shaping global malaria commodity markets to enhance supply security, accelerate innovation, and drive value for money. This supports near- and long-term PMI access to appropriate, quality-assured products at sustainable price points.

GHSC-PSM applies a three-pronged 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** in collaboration with global partners to inform sourcing strategies.
3. **Conduct strategic sourcing and procurement activities** to implement interventions and realize the benefits of improved timeliness for delivered goods, reduced costs incurred by recipient countries, and sustained market health.

GHSC-PSM advances strategies to achieve the best value, increase supply chain efficiencies for on-time delivery (OTD), and support market health across the malaria product portfolios. The project increased the percentage of strategic long-term agreements (LTAs) to streamline procurement processes by leveraging agreed-upon terms and conditions. With LTAs, the project can use allocation strategies that reduce the time required to execute the procurement process on an order-by-order basis and support standardized procurement-related decision making. The primary benefits of increased LTAs include shorter lead times from order placement to delivery, as well as cost savings due to reduced complexity, time, and effort throughout the supply chain. The percent of procurement managed under LTAs in FY 2021 remained high, ranging from 88 to 95 percent, exceeding the target of 85 percent. (See Annex E, indicator A10.) Increasing the project's understanding of the end-to-end supply chains in which it operates, primarily further upstream from the manufacturers from whom it procures finished products, was a key strategic initiative in FY 2021. Through this effort, the project sought to better understand potential vulnerabilities and improve supply chain security and resilience.

Proactive Procurement Strategies

In Q1 FY 2021, GHSC-PSM conducted an evaluation of market risk and demand for artemisinin-based combination therapy (ACT), sulfadoxine-pyrimethamine (SP), SP + amodiaquine (SPAQ), and severe malaria medications to determine how best to mitigate risks and ensure timely delivery and access to these critical commodities. The project determined that proactive procurement effectively reduces fulfillment lead times and ensures access to sufficient supply to meet demand. The idea was to place orders for large volumes of these products based on projected demand, the urgency of need, inventory and average monthly consumption levels in recipient countries, and supplier production capacities. With PMI's approval, in Q1 FY 2021, GHSC-PSM leveraged the emergency loan fund to enable procurement of country-specific requisition orders in addition to projected demand the project had not yet received orders for.

To maximize use of the fund, GHSC-PSM applied the proactive procurement strategy in stages. In Q1–Q2 FY 2021, the project proactively procured the remaining FY 2021 demand for artemether-lumefantrine (ALu), followed by projected FY 2022 demand for artesunate injectable. Under this strategy, GHSC-PSM placed inventory orders to secure the production of these commodities in line with demand, with vendors determined to offer best value. These orders create a de facto "stockpile" for future expedited delivery to recipient countries.

In Q3 FY 2021, the project began converting the contractual letter finalized in Q2 into purchase orders for the proactive procurement of artesunate injectable. This activity is ongoing as additional demand for artesunate injectable materializes. Meanwhile, all proactively procured supply of ALu was used to fulfill country requisitions.

With PMI's support and approval of an updated sourcing strategy for SPAQ, in Q3 and Q4 FY 2021, the project executed a proactive procurement to secure all projected demand for campaigns in FY 2022 in advance of approval of country-specific requisition orders.

At the end of Q4 FY 2021, GHSC-PSM conducted an evaluation of market risk and demand for ACTs, SP, SPAQ, and severe malaria medications and determined that risk was not sufficient to justify any additional proactive procurements for FY 2022.

Supplier Engagement and Vendor Negotiations

The project engages with suppliers for all malaria task order commodities to support market health and deepen our strategic relationships. Key activities in FY 2021 included:

- **Supplier-specific forecasts.** GHSC-PSM generates and shares supplier-specific aggregated forecasts based on the project's demand allocation approach for select commodity categories to improve planning capabilities and manage stakeholder expectations.
- **Re-solicitation**. The project periodically re-solicits pricing, product, and registration information, keeping vendors abreast of project objectives for the product category and allowing suppliers to generate offers that reflect market conditions and support market health.
- **Commodity risk assessments**. In FY 2021, the COVID-19 pandemic continued to impact many GHSC-PSM suppliers, their upstream supply chains, and freight availability, increasing risk and extending supply chain lead times. GHSC-PSM evaluates programmatic impact to update

commodity risk profiles monthly, examining the geographical sourcing of commodities, market updates, and supplier-specific ability to meet goods availability dates based on information about sourcing of key starting materials (KSMs), raw materials, and packaging materials, to mitigate and minimize near- and long-term supply disruptions.

- **Performance reviews**. GHSC-PSM business review meetings with suppliers included supplier 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. Performance metrics promote supplier performance improvements while informing order allocation decision making. These efforts positively impact the project's overall supply chain performance.

Strategic Sourcing Activities

In FY 2021, GHSC-PSM sourcing efforts focused on the following strategic priorities:

Supply Risk Mitigation

Upstream supply chain analysis

COVID-19 highlighted previously known risks that contribute to the potential for supply shortages, delays, or other supply chain disruptions. In particular, government-imposed lockdowns during the pandemic disrupted the normal supply of global health commodities by limiting suppliers' ability to produce goods in the quantities required to meet global demand.

Continuing an effort that began in FY 2020, in FY 2021 GHSC-PSM expanded its analysis of the supply chains in which the project operates to understand the manufacturer landscape upstream from the finished product. This included looking at component materials in all major product categories and at a range of other inputs, such as KSMs used to produce active pharmaceutical ingredients (APIs) and packaging materials. The primary objective of this initiative has been to identify supply chain vulnerabilities—such as finished product supplier reliance on a single source or dependence on materials from a particular geographical area—that could manifest as significant disruptions. Once the project identifies vulnerabilities, it evaluates potential market-shaping interventions or sourcing strategy changes to mitigate identified risks. In parallel, GHSC-PSM increased its collaboration with entities further upstream to promote transparency and proactive risk management.

Forecasting

Seen as a key tool in preventing delays, GHSC-PSM improves upon its forecasting processes to increase supply chain visibility and supplier preparedness. By refining existing processes, GHSC-PSM expects to increase its forecast accuracy and frequency, provided to the individual supplier level, for the subsequent informing of supplier production planning and component material procurement decisions. In preparation for FY 2022 procurements, the project expanded its efforts to provide suppliers receiving target volume allocations with quarterly production forecasts, in addition to annual forecasts, to better inform supplier planning. By increasing supplier preparedness for forthcoming demand, GHSC-PSM expects to identify and use the optimal supplier to fulfill orders from recipient countries, increasing the value derived by the project.

Increasing market health

Promoting/sustaining market health is a key GHSC-PSM objective across all product categories. In FY 2021 the project focused on combating market health challenges in LLINs, rapid diagnostic tests (RDTs), and SMC products presented by factors such as insecticide resistance, HRP2 gene deletion, and limited global capacity, respectively. The project's pursuit of increased market health includes ongoing messaging to existing suppliers on key strategic priorities, incentivization of new product development through strategic tenders, and outreach to potential new suppliers.

Freight Efficiency

In recent years, GHSC-PSM expanded efforts to reduce costs incurred by recipient countries by emphasizing unit cost and freight cost with suppliers. Rising global freight costs, largely attributable to ocean vessel and container shortages, were an unfortunate impact of COVID-19 in FY 2021. These shortages highlight the need to pursue new avenues to further minimize costs and the freight needed (e.g., number of containers) to deliver goods by the requested delivery date. In FY 2020, GHSC-PSM began including expected freight costs in best-value evaluations of eligible suppliers and emphasized the benefits of freight efficiency through improved packaging. Since FY 2020, the project has achieved substantial space-saving gains in areas such as units per pallet and units per container by collaborating with suppliers of various commodities using the following approaches:

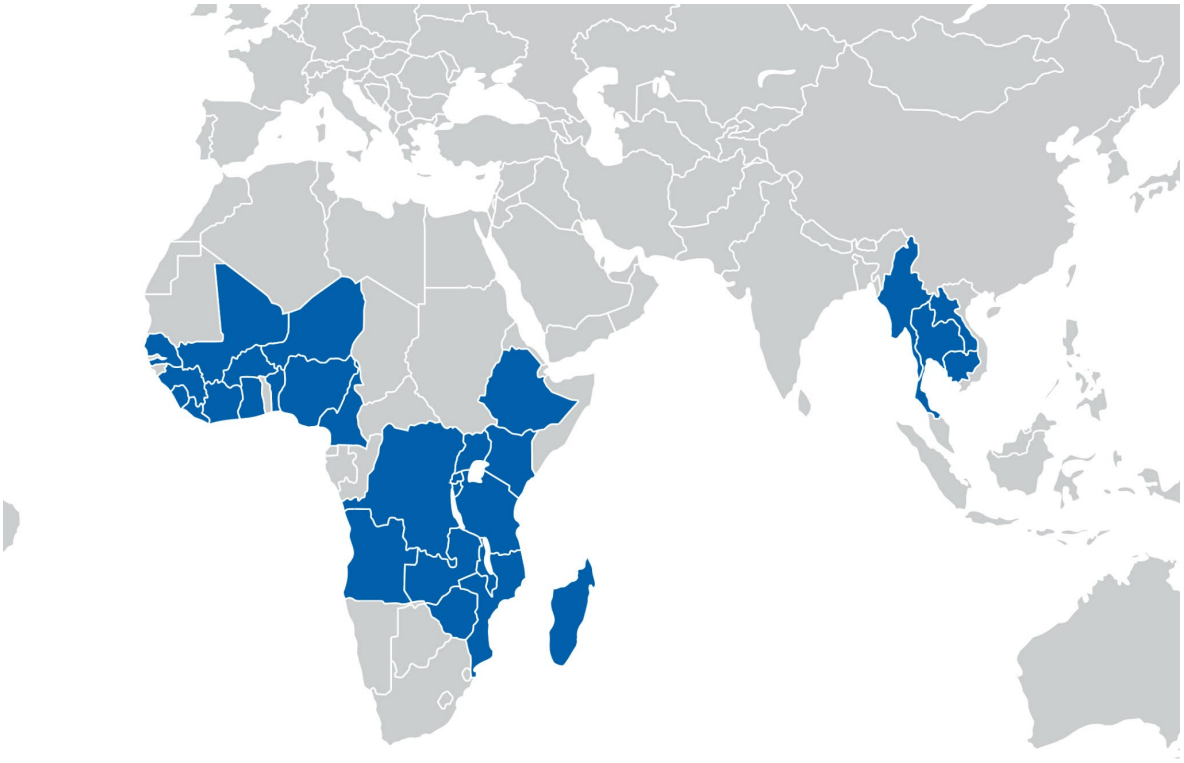
- Including freight costs in evaluation of best value
- Using benchmarking to inform suppliers of where they stand relative to competitors to incentivize change where warranted
- Sharing best practices such as pallet sizes and stacking heights, optimizing the size of shipping cartons, and highlighting opportunities suppliers can consider for potential improvement

Based on supplier quotes, the average potential gains from suppliers making improvements in freight efficiency (in increased units per container) were 17 percent for LLINs, 27 percent for ALu, and 41 percent for mRDTs. The maximum potential space savings, for an individual supplier/product combination, were 26 percent for LLINs, 67 percent for ALu, and 127 percent for mRDTs.

Procurement of Malaria Commodities

Procurement and end-to-end management of orders—from receipt through delivery and payment—require planning, open communication, and careful coordination with a broad group of stakeholders within and external to the supply chain and the project. In FY 2021, GHSC-PSM collaborated closely with external stakeholders from USAID Missions, suppliers, logistics providers, customs agents, and others. Project staff at headquarters and country offices provide this support. Headquarters staff provided procurement support for six countries where GHSC-PSM has no field presence—Benin, Côte d'Ivoire, the Democratic Republic of the Congo (DRC), Madagascar, Senegal, and Tanzania.

Exhibit 1. Countries for which GHSC-PSM procured malaria products in FY 2021



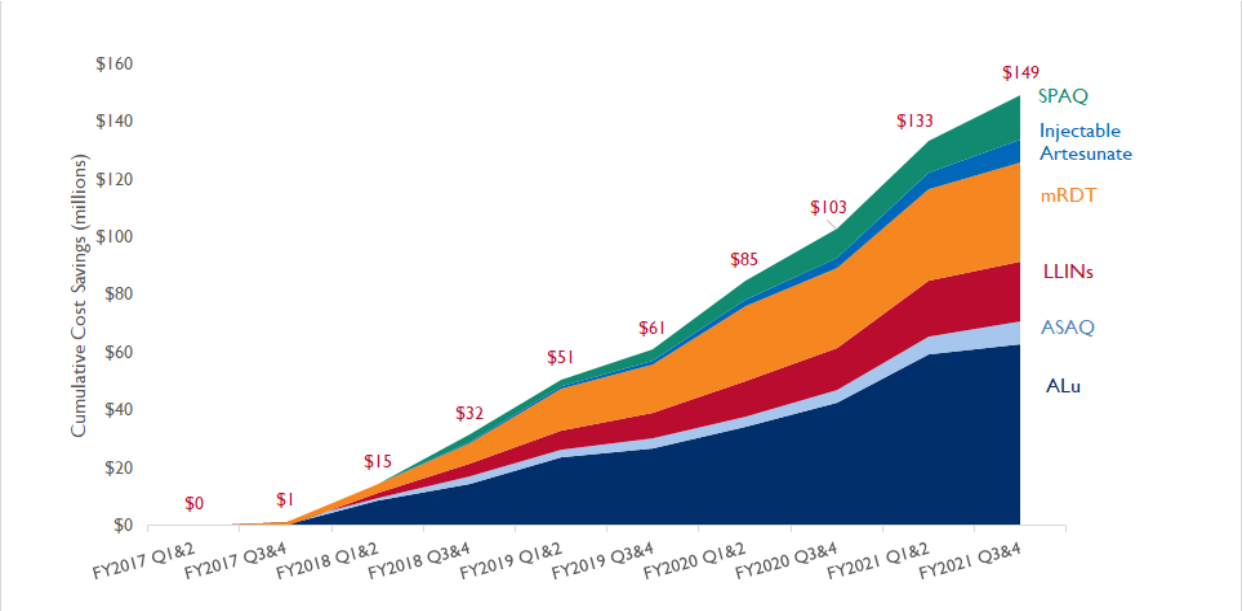
In FY 2021, GHSC-PSM procured malaria commodities valued at more than $222 million in total for 29 countries.[5] (See Exhibit 1 above.)

Cost Savings on Malaria Commodities

In FY 2021, GHSC-PSM achieved $47 million in cost savings on malaria commodities, representing 21 percent of the total procurement value in the same time period. The project achieved $149 million in cost savings for major malaria commodities over the life of the project. (See Exhibit 2.) These savings represent 17 percent of the total spending on these product categories, and 16 percent of the total value spent on malaria products overall. Commodity cost savings are achieved through a variety of means that may vary by product category and are generally expected as products progress through their life cycle. In addition, sourcing efforts aimed at promoting and sustaining competition, such as through targeting messaging of needs/opportunities and minimization of barriers to obtaining significant market share, have also contributed to achievement of cost savings whilst in pursuit of other strategic objectives.

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

Exhibit 2. Cumulative cost savings of $149 million on major malaria products since 2017



Commodity Procurement Indicators

GHSC-PSM procured malaria commodities worth over $222 million in FY 2021, including regional distribution center (RDC) stockpile orders and direct drops to countries (Exhibit 3) as shown in Exhibit 9.

Exhibit 3. GHSC-PSM procurement totals for FY 2021

Product category	Value
ACTs	$44,888,734
Laboratory	$ 901,080
LLINs	$99,483,019
Other non-pharmaceutical products	$895,879
Other pharmaceuticals	$70,297
Other rapid test kits	$39,375
RDTs	$43,043,577
Severe malaria medicines	$16,365,897
SMC	$11,272,143

SP	$5,115,345
TOTAL	**$222,075,346**

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

GHSC-PSM uses several indicators to measure its performance. Procurement results are summarized below, with details provided in Annex E. In FY 2021, GHSC-PSM procured nearly 100 percent of all product categories in Exhibit 3 through framework contracts, with the exception of LLINs, mRDTs, and Other RTKs. Procurements through framework contracts represented 80 percent of LLIN procurements and 95 percent of mRDT procurements. Other RTKs included a single order of G6PD RTKs, which was non-framework. When aggregated across all product categories, the overall framework contracting percentage by commodity value for FY 2021 was 90 percent, exceeding the annual target of 85 percent.

A.2 Strengthening Global Logistics Processes

In FY 2021, GHSC-PSM delivered malaria commodities to 29 countries. The project built upon significant advances in shipping strategies initiated in FY 2019 and remained flexible in the challenging COVID-19 environment as the pandemic continued to impact the supply chain. GHSC-PSM used tools and strategies developed in FY 2020 to mitigate risk and ensure the continuous flow of products to countries. Wide-ranging logistics challenges were felt at shipment booking, with origins and destinations impacted by reduced passenger flights, truck driver shortages, transshipment and border crossing delays, local government restrictions, and minimal port office staff, which slowed processing and clearance of products for delivery. GHSC-PSM collaborated closely with third-party logistics (3PL) providers and USAID Missions to mitigate these issues and ensure that the project meets demand across countries.

Impacts of COVID-19 on Freight and Logistics

Throughout FY 2021, deliveries faced a constrained shipping environment impacted by COVID-19 shutdowns. GHSC-PSM worked with 3PL providers to identify solutions for ensuring continuous, reliable supply. (See Cost Savings on Logistics section below for further details.)

- **Freight costs**. In FY 2021, GHSC-PSM identified ocean lanes with high historical value and compared them against lanes identified for upcoming orders. By considering which of the project's existing lanes could ship orders with upcoming goods availability dates and adding new origin variants to these lanes, the project reduced the number of ocean spot bids needed for FY 2021 shipments. Spot bids for ocean shipments were requested for new shipping lanes. This spot-bid approach continued through the remainder of FY 2021. The project expects to have new rates in place in Q1 FY 2022. While the project uses spot bids for large shipments and when a rate is unavailable, we anticipate the overall number of spot bids will decrease significantly.

- **Origin challenges.** Import/export activities remained constrained. Limited passenger flights, due to government directives, impacted air freight capacity. Inter-country trucking faced delays from seasonal weather events. Europe's COVID-19 policies restricted ground handling crews, and

container imbalance (more exports than imports or vice versa) made it harder to book refrigerated (reefer) equipment.

Climate also impacted the accuracy of the sailing schedule. The 2021 typhoon season started early, with the first super typhoon forming in mid-April. By the end of July, severe weather in the Pacific abruptly exploded as eight tropical depressions formed within a week. By mid-July, the third typhoon of the season made landfall near Shanghai, causing damage and disrupting supply lines. The storm also contributed to rainfall and flooding in other parts of eastern China. Meanwhile, other tropical storms affected southern China and northern Vietnam. In September, Typhoon Chanthu briefly shut down ports in Shanghai and Ningbo. The shutdowns due to weather further aggravated supply chain disruptions due to COVID-19. Ningbo's Meishan terminal resumed operations for only 18 days before Chanthu arrived following a two-week lockdown due to a single coronavirus infection.

- **Airfreight.** During FY 2021, the air freight market was highly volatile, with very high demand and decreased capacity. Passenger demand remained low due to COVID-19 restrictions, and airlines operated with reduced schedules. This led to a higher-than-normal reliance on freighter service, which does not have the capacity to keep up with the new markets and mainly serves large commercial markets. The demand for airfreight increased in an already overfilled market when the ocean freight market became more unstable in FY 2021.

  Increased demand and reduced capacity resulted in higher air freight prices and severely restricted service into areas that are not valuable commercial markets. All year, the project faced challenges in securing flights into traditionally underserved countries in Africa (e.g., Burundi, Malawi, and Sierra Leone) while facing increases in costs to all destinations.

- **Ocean freight.** Throughout FY 2021, the ocean freight market experienced direct effects of COVID-19, such as a shutdown for the entire port of Ningbo (third-busiest global container port) for two weeks due to a single positive COVID case. Knock-on impacts continue to be felt by the project on vessel scheduling and container availability.

  The market faced critical network congestion due to a convergence of factors, including the limited capacity of warehousing, ports, and terminals that increased the number of days the containers were occupied. This reduced the number of containers, chassis, and railcars to move goods to and from ports. Ocean carriers implemented surcharges related to container and chassis availability, and shippers abandoned containers at ports when there was nowhere to deliver their goods.

  As capacity needs increased and the disparity between supply and demand grew, ocean freight prices climbed. Ongoing struggles with disrupted schedules and port congestion kept ocean rates eight to nine times the pre-pandemic norm.

- **Intra-Africa.** Early in FY 2021, COVID-19 transit policies impaired truck shipments within Africa and at border posts. Intra-Africa saw delays between Kenya and Uganda, Mozambique and Zimbabwe, and between Zimbabwe and Zambia. One example, Beitbridge, a town in Zimbabwe

on the border with South Africa, saw extended delays over the end of Q1 FY 2021 as COVID-19 staff scheduling protocols stranded commercial and private vehicles. The project had to use other routes through Botswana to avoid this bottleneck.

During the last half of FY 2021, inter-Africa trucking remained impacted by COVID-19. One example of continued problems is found in both Zimbabwe and Ghana. Cross-border customs officials are short staffed due to COVID-19, resulting in regular delays. Also, the various safety measures impact the amount of time for cargo to clear at the borders. In particular, Zimbabwe has been experiencing delays at the Mozambique border when trucking in cargo that arrived from Beira. DRC has experienced trucking delays caused by bad weather affecting the road conditions to remote locations such as Mbuji Mayi and Kalemie. Strikes in Mali and Malawi have also caused delays. In spite of these challenges, the project began to see signs of improvement in early FY 2022.

In-country and cross border trucking has not seen the same severe COVID impacts from a year ago, but other factors persist, such as the coup in Guinea, fuel shortages in Uganda, or conflict in Ethiopia, but not to the extent that deliveries are being adversely affected. In-country distribution has been challenging with issues such as COVID restrictions, weather, protest, fuel shortages or sporadic conflict which have combined to affect trucking schedules.

- **Temperature Control.** GHSC-PSM and the 3PLs weigh the risks consignment-by-consignment regardless of mode to maintain cargo integrity in identifying the most appropriate temperature-controlled supply chain solutions.

Deliver/Return

Through FY 2021, GHSC-PSM sourced freight rates from the market on a spot bid basis. This helped the project secure competitive rates in the volatile market and source viable solutions when constraints existed in certain origin locations. For example, in China, frequent lockdowns directly affected trucking to port as well as vessel capacity, which drove prices higher. Using spot bids increases the likelihood that 3PLs can secure hard-to-obtain equipment by allowing them to look outside of ocean freight contracts and negotiate with carriers at the market level. However, spot bids increase the shipment lead time due to quoting, awarding, and booking activities as the rates are sourced and evaluated and then applied to subsequent operations.

The project engages with 3PLs for market updates through reports, webinars, and weekly calls to keep the project abreast of global impacts and trends. In Q4, GHSC-PSM evaluated the annual request for proposal (RFP) released in Q3 2021, which was postponed from FY 2020 due to volatile market conditions. This RFP reflects perceived market stability and obtains more competitive market pricing while it provides for a rate check within six months to align with the logistics market. Until this point, if the market is upset, the 3PLs can reject a shipment award or accept it contingent on the use of revised

rates. If the award is rejected, GHSC-PSM considers booking with the secondary or tertiary 3PL or opens the lane to spot bidding.

On-Time Delivery and On-Time In-Full Delivery

GHSC-PSM achieved an on-time delivery (OTD) rate of 93 percent in FY 2021. Quarterly and annual project performance exceeds the target of 80 percent.[6] (See Exhibit 4.)

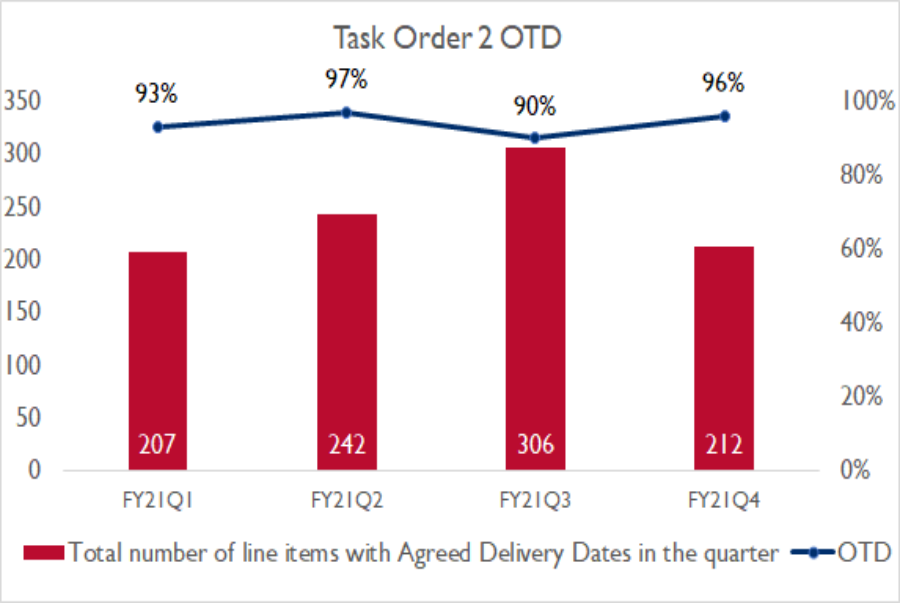
Exhibit 4. Comparison of OTD and COVID-Impacted OTD rates

Time Period (FY 2021)	OTD	COVID-impacted OTD
Quarter 1	93%	81%
Quarter 2	97%	71%
Quarter 3	90%	84%
Quarter 4	96%	93%
FY2021	93%	82%

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

[6] 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 agreed 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 5. OTD and volume of deliveries of malaria commodities, FY 2021



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

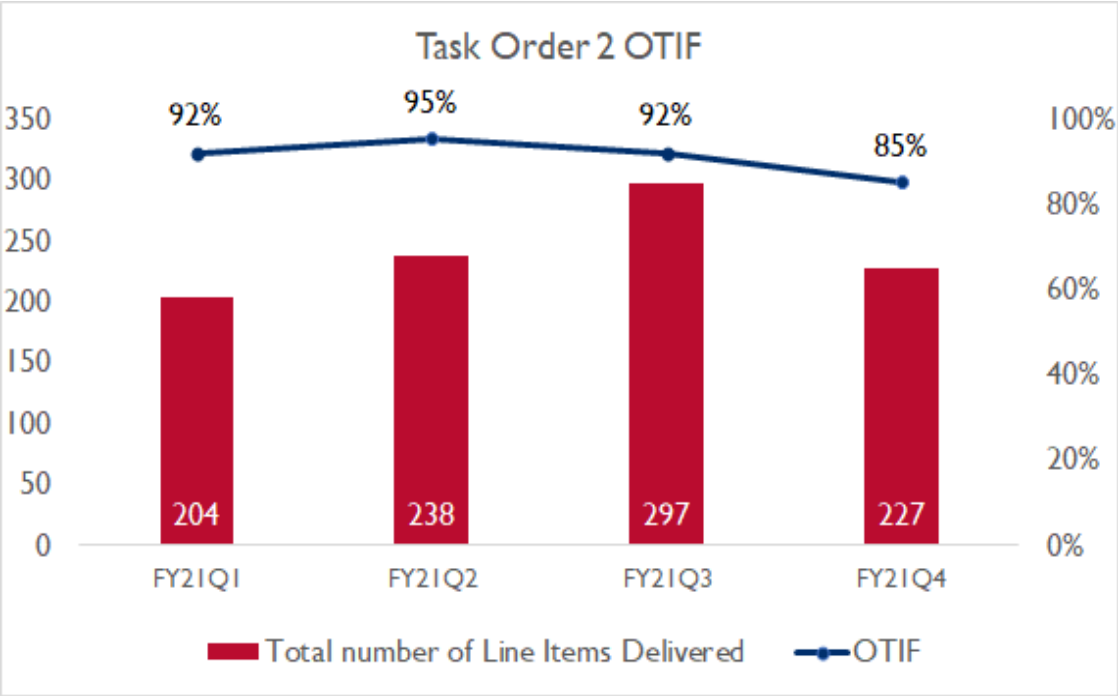
GHSC-PSM's OTIF rate measures the percentage of deliveries during a given period delivered on-time and in full. Delivery of late orders in a subsequent month to the agreed-upon delivery date drives down the OTIF rate, as can split-shipment deliveries, which helps explain the difference between OTD and OTIF rates. For OTIF, project performance continued to exceed the target of 80 percent, reaching 91 for FY 2021. (See Exhibit 6.)

Exhibit 6. Comparison of OTIF and COVID-impacted OTIF rates

Time Period (FY 2021)	OTIF	COVID-impacted OTIF
Q1	92%	72%
Q2	95%	70%
Q3	92%	87%
Q4	85%	81%
FY2021	91%	78%

In FY 2021, GHSC-PSM's OTIF rate for malaria commodities maintained strong performance. (See Exhibit 7.) Aside from COVID-19–related delays, the project experienced delays related to waivers, weather, and conflict or civil unrest.

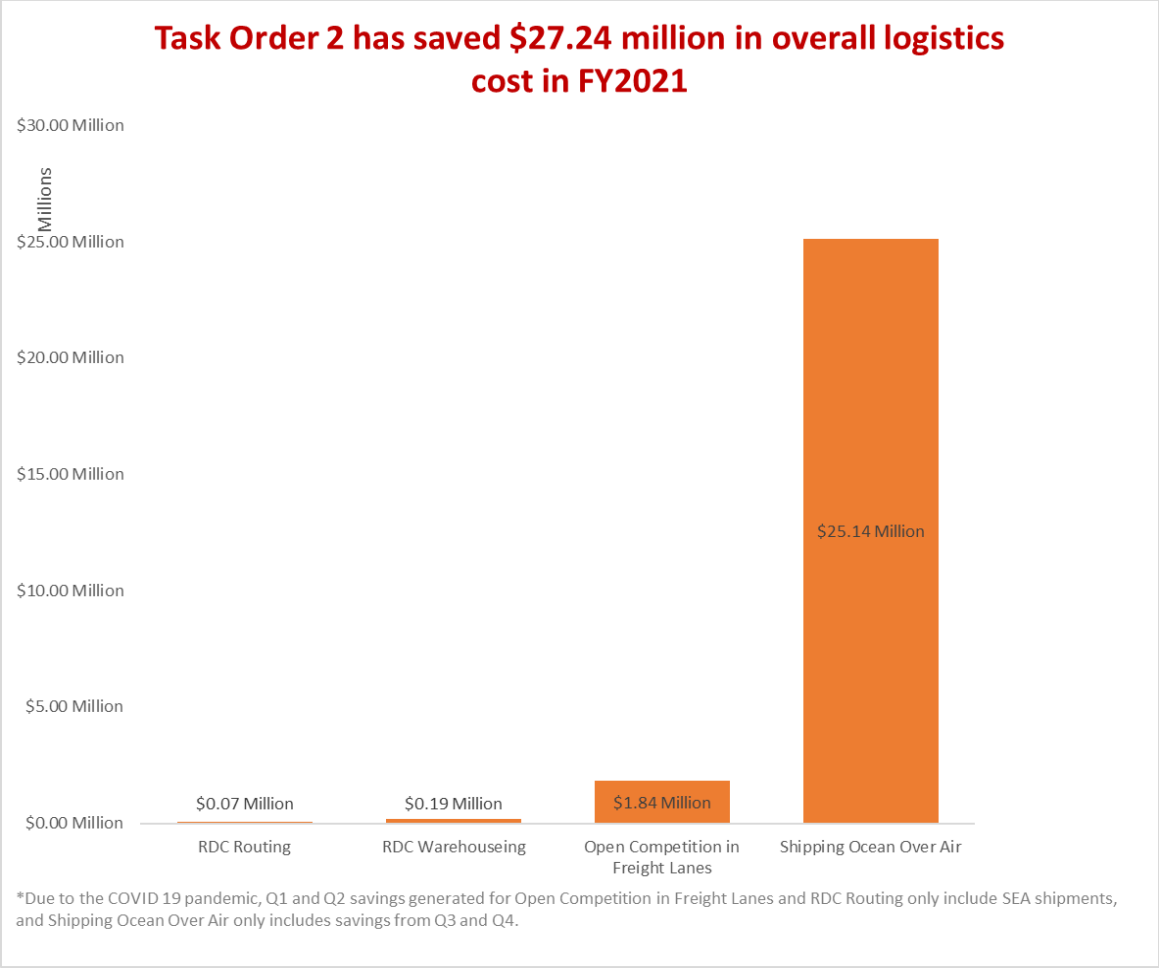
Exhibit 7. OTIF for Malaria Commodities, FY 2021



Cost Savings on Logistics

GHSC-PSM TO2 saved $27.24 million on logistics costs during FY 2021 through managing open competition in freight lanes, RDC warehousing and routing, and shipping by ocean rather than air.

Exhibit 8. Cumulative TO2 Malaria Logistics Cost Savings



Open competition in freight lanes. The project 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 provides a comparison for all shipping lanes and simulates the rates that would likely be obtained under a non-competitive, 3PL model. Based on this methodology, TO2 generated more than $1.84 million in cost savings in FY 2021 due to open competition for freight lanes. Because of the COVID-19 pandemic the project could calculate cost savings for Q1 and Q2 for sea shipments only, whereas Q3 and Q4 include both air and sea shipments. This is explained in greater detail below.

In April 2020, GHSC-PSM recognized that air freight market rates were increasing rapidly because of the COVID-19 pandemic. During this time, the project placed a hold on the Annual 3PL Rate Refresh for air shipments and the ocean rates were extended until the end of November 2020. As a result, the project, in consultation with USAID, decided to manage air shipment pricing under a spot-bid model and review ocean shipments case by case with the expectation that impact on pricing would be nominal. In December 2020 the project refreshed ocean freight rates and used them to calculate ocean cost savings

from December 2020 to the end of March 2021. This is why cost savings from sea shipments could be calculated in Q1 and Q2, while cost savings from air shipments could not be calculated as air shipping remained utilizing the spot bid process.

GHSC-PSM had projected that the logistics market would stabilize after April 2021; however, it did not. COVID-19, and specifically the Delta variant, continued to impact the freight logistics market for air and sea shipments. Due to the fluctuations in logistics costs throughout the pandemic, 3PLs were unable to honor sea and air annual rates. The project employed spot bids on both sea and air lanes to maintain competition among 3PLs while still meeting market demand. For this FY 2021 GHSC-PSM IDIQ Annual Report, the project, in consultation with USAID, adjusted the FY 2019 rate cards to account for the shift in the market, determined by taking the average of all spot bids acquired per order to arrive at a market increase rate per shipment. This rate was then applied to the FY 2019 rates per shipment to adjust the actual cost to current market values. The market adjustment made to the FY 2019 rates provide what can be called the FY 2021 rates. Utilizing these FY 2021 rates, the final cost savings figures were calculated as the difference between the rates awarded to the selected 3PL and the average of the two most expensive 3PLs, as done in previous years.

RDC warehousing and routing. The project saved money on logistics for malaria commodities by optimizing the project's network of RDCs. Savings were generated through the following methods:

- Warehousing savings from lower costs at the project's three RDCs, measured against the costs at the previously used network of five RDCs.
- Transportation savings from shipping costs on actual commodities that moved through the three RDCs, compared to what shipping would have been for those commodities under the previous, five-warehouse model.

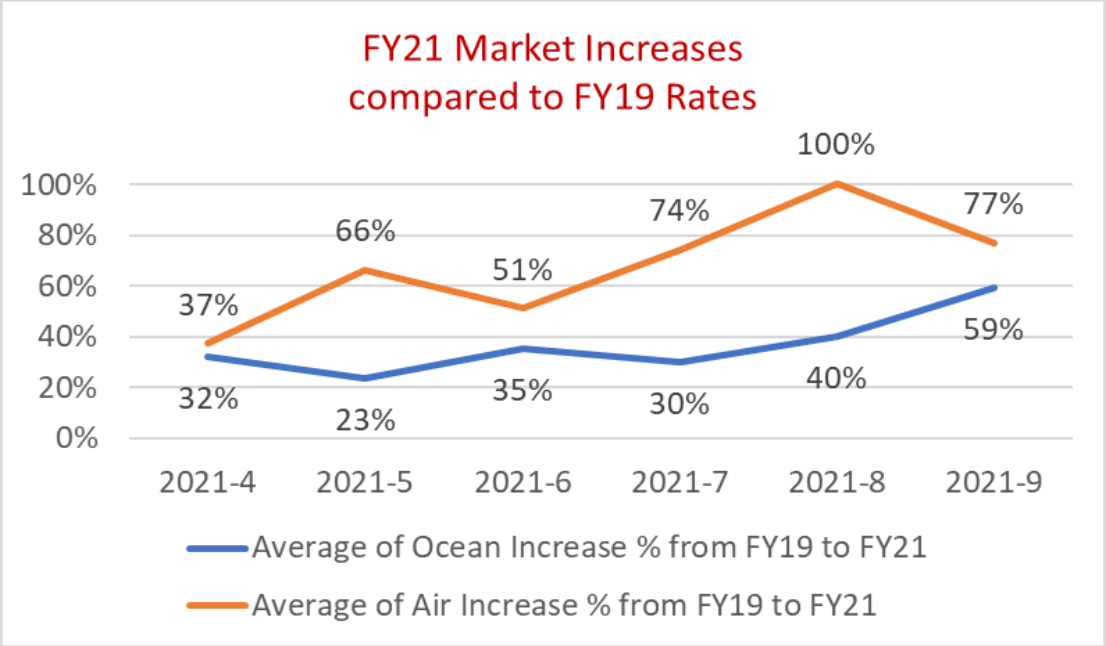
This generated $262 thousand worth of cost savings for malaria commodities in FY 2021.

Shipping by ocean over air. In FY 2019, TO2 began tracking cost savings from orders that 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 $25.14 million in cost savings in Q3 and Q4 FY 2021 by shipping orders by ocean instead of air. Q1 and Q2 cost savings could not be generated, due to the COVID-19 pandemic as mentioned above.

The cost savings generated from shipping orders by ocean instead of air has increased significantly since the last time this figure was reported pre-COVID-19. The most recent reporting period where this metric was tracked was Q1–Q2 FY2020, resulting in $2.22 million in cost savings. The increase can be explained by two main drivers.

1. Shipping rates for air shipments have increased more drastically than ocean shipments. Since this metric compares the two shipping methods, the wider gap between air and ocean has increased cost savings. Exhibit 9 shows the market increase from FY19 rates compared to the spot rates received in FY21.

Exhibit 9. FY 21 Market Increases Compared with FY19 Rates



2. Proportionally, more orders have shipped by ocean than by air compared to FY19 and FY20. More ocean shipments will inevitably lead to more cost savings. Exhibit 10 shows the proportion of air and ocean shipments.

   Exhibit 10. Air and Ocean Shipments[7]

Reporting Period	Air	Ocean
FY 19 Q3–Q4	75%	25%
FY 20 Q1–Q2	64%	36%
FY 21 Q3–Q4	27%	73%

In total, TO2 generated $27.24 million in logistics cost savings in FY 2021.

[7] These figures do not include LLINs or Laboratory products. Both of these product categories were not part of the shift from air to sea mode of shipment as they were already primarily shipped by ocean.

Logistics and Delivery Indicators

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

Product Loss

In Q3–Q4 FY 2021, there was no product loss due to shelf life. GHSC-PSM experienced minimal losses of malaria products under its control at the RDC. In FY 2021, the project lost only $32 worth of ACTs due to expiry, the smallest expiry of malaria commodities recorded over the life of the project. This loss was attributable to a small quantity of ACTs in the RDC that could not be redirected. The value of product loss at the RDC due to theft, damage, or causes other than expiry was minimal, totaling $2,127 in FY 2021.

Beyond the RDC, GHSC-PSM manages the shipment of products to countries, as well as some storage and distribution within countries themselves. Product losses that occurred in project custody, either in transit, in country, or while in project-managed storage, totaled $261,773 in FY 2021 (less than one tenth of a percent of the annual delivery total). These included small damages, missing items, and thefts. Also, one larger incident occurred in Nigeria, where a project-subcontracted warehouse got caught up in looting during the #EndSARS protests, resulting in more than $155,000 in malaria commodities lost, alongside other health area commodities. The project submitted an insurance claim for the losses and stepped up security at its other warehouses in Nigeria in response.

Cycle Time

Cycle time measures 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.** Countries typically enter a large volume of orders simultaneously around the annual PMI call for orders, which takes place in anticipation of the availability of next year's funding, and serves as a deadline for order placement in preparation for seasonal demand and the PMI funding cycle. 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.** Country FY obligations tend to 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 lag between the funding requirements to meet requested delivery dates for orders entered by countries before and during the annual PMI call for orders, and the funding available to process those orders. All orders subject to funding availability must be placed on hold, which is common and can be extensive.
- **Validation of specifications.** Complex or uncertain specifications of an order increase the time required to prepare the order for procurement, increasing the cycle time. This is most true 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 type,

amount, and required delivery timeline. Clarification discussions are common for malaria commodities and are often outside of the project's procurement team's control, but can extend processing times, which increases cycle times.

- **Mode of shipment.** In the second half of calendar year 2019, the project shifted from a default preference for air shipment to ocean shipment, which was more cost-efficient and feasible for all categories other than LLINs, which were already primarily shipped by ocean. This strategy for malaria commodities increases overall cycle times because ocean shipments are less flexible than air, with fewer options for rapid or expedited delivery. The project aligns many QA and logistics processes with the ocean strategy to reduce logistics cycle times. While ocean shipments allow for concurrent QA, due to COVID-19 there are still instances where shipping by ocean can cause a longer cycle team (see in the next bullet for additional details).
- **COVID-19.** Every step in the order life cycle is longer and more labor intensive due to COVID-19, lengthening overall cycle times compared to pre-pandemic performance. Manufacturing and logistics processes can easily identify and account for the impact of COVID-19, but the pandemic also impacts earlier cycle time segments. Country lockdowns, border closures, personal protective equipment exportation bans, and manufacturers focusing on COVID-19 commodities at the expense of malaria commodities caused some products to be difficult to source. This resulted in lengthy tendering events and, for unidentifiable supplies, lengthy discussions with countries about alternative products. Moreover, when suppliers temporarily shut down during COVID-19 outbreaks, the project was compelled to cancel or reallocate orders to other suppliers, resulting in duplicated work that added to cycle times. Also, as a result of the pandemic, from a logistics standpoint the imbalance of containers, as well as the shortage of containers, further constrained supply chains, increasing the overall cycle time for shipments of goods by ocean.
- **Challenging destinations.** The malaria task order serves complex destinations such as DRC, which has up to 10 delivery destinations per commodity. This is many times the number of lines of delivery for the average country order—all with the same requested delivery date, each requiring individual processing along the same timeline. DRC alone accounted for more than a quarter of the malaria order lines in FY 2021, and these orders are labor and time intensive. Moreover, the project delivers to some inland destinations, which entails longer delivery timelines and skews the malaria commodity average cycle time. (See discussion below.)
- **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.** Country-specific import challenges (e.g., in Burma and Kenya, where circumstances outside of the project's control resulted in lengthy delays to order processing and holding of goods at supplier sites pending resolution to importation challenges), supplier-specific quality issues, client-requested holds, and in-country quantifications that result in changes after an order is in process contribute to cycle times.

The average cycle time for FY 2021 was 365 days. (See Exhibit 11.) Cycle time was consistent with FY 2020, which averaged 360 days, and consistent within the year, with end-to-end results within two days of each other in Q1, Q3, and Q4 (355–357 days). Average cycle time was higher in Q2 (386 days) due to a high proportion of orders delivered to DRC, which tends to have complex orders that require additional time for validation and sourcing, as well as long processing times for logistics waivers. While averages have remained stable, cycle times vary widely, depending on the country, product, logistics context, and numerous other order-specific factors, as discussed above.

In FY 2019, the project piloted 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 processing time more precisely for any order. This applies to cycle time segments before purchase order (PO) execution, so the cycle time for any country-specific challenges like those described above are not adjusted. The project adjusted and clarified the hold status policy to begin implementation in early FY 2020 and has been reporting dwell-adjusted cycle time throughout FY 2021.

Data showed that dwell-adjusted cycle times were 34 days shorter than non-dwell-adjusted results on average. A total of 38 percent of malaria line items were placed on hold at some point during processing. The most common reasons for holds were orders awaiting country FY funding obligations and confirmation of order specifications and quantities. GHSC-PSM continues to analyze hold usage and dwell-adjusted cycle time to identify additional insights about active cycle times and opportunities for process improvement to drive gains in global supply chain responsiveness.

Exhibit 11. Task Order 2 cycle times for FY 2021

Time Period (FY 2021)	Overall average cycle time (days)	Dwell-adjusted cycle time (days)	Overall average cycle time without DRC (days)
Q1	357	328	336
Q2	386	362	330
Q3	355	327	340
Q4	357	303	343
FY2021	365	331	339

Cross-cutting process improvements. The project invests in process improvements to reduce cycle times, including:

- Strategic use of the emergency loan fund to execute proactive procurements based on demand data. This contributes to reducing the lead time from requisition order (RO) entry through goods availability, as well as the time between RO entry and agreed-to delivery date.
- Implementing standardization protocols and a workflow checklist to streamline the RO approval process.
- Implementing a tool to support more 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 up-front order clarifications.
- Managing the impact of COVID-19 by identifying and mitigating supply and freight risks.
- Aligning procurement, QA, and logistics processes.
- Implementing management structures to identify and manage orders that are lagging at any point in the order lifecycle.

- Entering into and increasing the number of long-term agreements with suppliers in an effort to implement an ordinal allocation sourcing strategy, where by reducing the cycle time in processing orders, and reducing the level of effort of issuing one off RFQs and performing individual bid evaluations.

Managing the Malaria ALu Stockpile

In the RDC in Belgium, GHSC-PSM maintains PMI's malaria stockpile of a relatively small cache of ACTs for rapid allocation to countries based on need. The quantities for the emergency stockpile are estimated to be able to satisfy the emergency orders based on historical data. The estimation is repeated multiple times per year by presentation to create frequent replenishment orders based on the remaining stock at the time. In FY 2021, the project received $1,189,037 in ALu to be pre-positioned at the RDC (Exhibit 12).

Exhibit 12. GHSC-PSM ALu total product received at RDCs for FY 2021

Product	Number of treatments delivered to the RDC
ALu 20/120 mg dispersible tablet, 6x1 blister packs	600,000
ALu 20/120 mg dispersible tablet, 6x2 blister packs	1,193,400
ALu 20/120 mg tablet, 6x3 blister packs	371,400
ALu 20/120 mg tablet, 6x4 blister packs	517,380

GHSC-PSM used this stock to fill orders to three countries in urgent or emergency need of ALu (Exhibit 13.) The project fulfilled urgent needs for these destinations using quality control (QC)-tested commodities held in RDCs, which reduced delivery and cycle times and prevented stockouts.

Exhibit 13. ALu deliveries by country from the stockpile in FY2021 (door delivery date in-country)

Recipient country	Product	Number of treatments delivered
Liberia	ALu 20/120 mg dispersible tablet, 6x1 blister packs	292,980
Liberia	ALu 20/120 mg dispersible tablet, 6x2 blister packs	336,180
Liberia	ALu 20/120 mg tablet, 6x3 blister packs	261,180
Liberia	ALu 20/120 mg tablet, 6x4 blister packs	269,580
Laos	ALu 20/120 mg dispersible tablet, 6x1 blister packs	4,020

Laos	ALu 20/120 mg dispersible tablet, 6x2 blister packs	4,020
Laos	ALu 20/120 mg tablet, 6x3 blister packs	2,010
Laos	ALu 20/120 mg tablet, 6x4 blister packs	4,020
Sierra Leone	ALu 20/120 mg dispersible tablet, 6x1 blister packs	300
Sierra Leone	ALu 20/120 mg dispersible tablet, 6x1 blister packs	210

Remaining Shelf Life for Warehoused Commodities

GHSC-PSM tracks inventory and remaining shelf life closely to balance the risk of expiry 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 stock-on-hand available to be offered. In-country consolidated stock reports identify potential recipients. (For details on shipments from the RDC, see Section A1.)

By the end of FY 2021, GHSC-PSM had $900K of ACT stockpiled with over 74 percent of weighted average remaining shelf life. Frequent stock rotation to meet emergency/urgent demand ensured that the project consistently met the shelf life targets quarter-over-quarter in FY 2021.

Backlogged Line Items

The percentage of promised line items that were undelivered at the end of FY 2021 was 1.3 percent. This is well below the target of 5 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.

Quality Assurance
In FY 2021, GHSC-PSM implemented proactive adjustments to QA/QC activities to mitigate delays related to COVID-19 testing and shipping restrictions for samples and commodities. Building off of risk-based approaches the malaria had been exploring pre-COVID-19, the project developed a standard GHSC-PSM QA strategy PMI approved for implementation in Q4. The strategy expanded the adjusted QA/QC processes, which modified the inspection, sampling, and testing of a product based on an evaluation: risk of the commodity type, the supplier's Quality Management System (QMS), and the historical data that GHSC-PSM has for that product. With this QA strategy, the QA team can monitor the quality of all products while focusing resources and attention on products deemed as higher risk. The process also allows further evaluation for decreased randomized testing, assessing, and driving efficiency in QC processes on consignments deemed as low risk while continuing to ship all products concurrently with testing. The new strategy decreases the need for inspection sampling and testing resources and the lead time overall for getting products to patients.

GHSC-PSM looks for continuous improvement opportunities to ensure the quality, safety, and efficacy of products procured on PMI's behalf. In FY 2021, the project completed out of specification (OOS) investigations for 1 mRDT and 2 LLINs and engaged the WHO PQ team on suppliers' QMS with the Global Fund and UNICEF to improve quality and QMS for LLINs.

In FY 2021, the project completed the review and made eligible 16 new products (four pharmaceutical products comprising two used for SMC, one ACT and one severe malaria product; 10 mRDTs; and two LLINs) in support of strategic sourcing and procurement. These activities expand the supplier pool and allow greater flexibility and access to commodities amid COVID-19 constraints particularly as the market experienced uncertainty with mRDTs, including suppliers pivoting toward producing COVID-19 RDTs instead of mRDTs.

The project also executed an RFP process for its third-party laboratories to expand testing capacity for pharmaceutical and LLIN commodities.

In FY 2021, GHSC-PSM had no reported product recalls.

Certificates of conformance

GHSC-PSM maintained a high level of productivity in FY 2021 despite constraints posed by COVID-19. The project issued 506 certificates of conformance (CoCs) that ensured commodities met quality requirements and allowed the release of commodities for distribution. The CoCs per commodity type were: 326 for pharmaceuticals, 80 for mRDTs , and 100 for LLINs.

The project responded to a request from PMI to generate a flowchart for communicating testing delays. GHSC-PSM worked with the Quality Management Unit to chart the current protocol for communicating delays to the PMI QA counterpart for review and feedback and to the project's procurement team for follow up in case of supply issues in countries. The project provided a communication process flow to PMI QA, which PMI accepted.

Pharmaceuticals regulated by a stringent regulatory authority

According to PMI-approved instructions, malaria pharmaceuticals, as regulated by a stringent regulatory authority, do not require laboratory testing. In lieu of testing, GHSC-PSM reviews the manufacturer's certificate of analysis before shipment. In FY 2021, the project reviewed certificates of analysis for 68 batches of two ALu products. The project found that all had satisfactory results and all batches issued CoCs.

Other pharmaceuticals

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

- Performed four method transfers from suppliers to third-party testing laboratories for new pharmaceutical products. Method transfers provide the project with flexibility and a broader pool of qualified products.
- Reviewed test reports for more than 1,052 batches before releasing the orders for distribution. Some were QC tested concurrently with shipment to meet delivery timing requirements.

LLINs and RDTs

In FY 2021, GHSC-PSM managed pre-shipment inspections and testing of 164 orders, representing over 54.3 million LLINs from seven vendors. The project reviewed all test results before clearing orders for distribution.

The project also managed pre-shipment inspections and testing of 109 orders representing over 5.5 million mRDTs from four vendors and reviewed all test results before clearing orders for distribution.

Team activity in fostering a more robust QMS

GHSC-PSM investigates quality issues and OOSs and uses these incidents as opportunities to enhance the project's QA QMS as well as assist suppliers in implementing a more robust QMS.

Quality in pharmaceuticals

In FY 2021 the project initiated three investigations for pharmaceutical products (SPAQ, ALu. and artesunate injectable) and engaged with its third-party testing laboratories and suppliers of the products to determine root cause and implement effective corrective and preventative actions (CAPAs) for two of the investigations and continued to investigate the third product.

In FY 2021 as a result of GHSC-PSM's investigation of an OOS for artemether assay in ALu, a supplier of ACTs implemented system controls in its manufacturing process. During the course of the investigation, GHSC-PSM QA suggested that the supplier compare its manufacturing process of the product to the parent company, which is the original producer of the product and had not had any past OOS results, resulting in the identification of the root cause or reason for the OOS. The supplier implemented controls in the product's manufacturing process based on the root cause and performed the appropriate validation of preventative actions to ensure that the solutions implemented effectively reduced variation in assay results for artemether resulting in a more robust QMS.

The project completed the investigation of an OOS for SPAQ. The OOS was for the assay test results of pyrimethamine, which GHSC-PSM's third-party testing lab reported as being less than the stipulated specification for the product. The project worked with the third-party laboratory and the supplier to test several hypotheses to determine a root cause and rejected the batch once the OOS was confirmed. GHSC-PSM supported the supplier with its CAPA investigation by discussing additional studies for Phase III investigation and providing the supplier with samples for testing.

The project initiated an investigation for artesunate injectable for OOS in sterility results in the sodium chloride component. The test results reported by the third-party testing lab indicated an observation of growth in the test specimen. The project continued the investigation by engaging its third-party testing laboratories and product suppliers to determine root cause and will ensure effective CAPAs are implemented once the root cause is identified. This investigation is ongoing.

Quality in LLINs

In FY 2021, the project concluded an investigation of an LLIN supplier for OOS in product testing and a falsified test report by reviewing the supplier's CAPA during implementation. The CAPA resulted in a more robust supplier QMS process with an independent QA manager overseeing production processes.

GHSC-PSM concluded an OOS investigation report (that included feedback from other global procurers) for an LLIN manufacturer that used an incorrect manufacturing process. The project provided the QA report to PMI and presented chronological detail of activities, corrective and preventative actions, and provided a comparison of GHSC-PSM versus Global Fund approaches on the QC process for LLINs, based on a review of the Global Fund's Office of the Inspector General report on the supplier.

The project quickly responded to potential quality issues at an LLIN supplier expected to deliver approximately 30 percent of the project's pyrethroid LLINs. The quality issue under investigation was a change to the manufacturing process via additives to conform to flammability specifications without the appropriate approval from the WHO PQ, thereby making the LLINs not WHO approved. GHSC-PSM along with feedback from other global procurers recommended a pause in procurement to PMI while it engaged with the supplier to understand the scope of the quality issues, the root cause, and the potential impact on the project. The supplier performed a full investigation and implemented CAPAs. The CAPA reports were provided to the project and the supplier's eligibility with the project was reinstated.

In FY 2021, GHSC-PSM completed an investigation into LLINs that were OOS for area weight. The project engaged with the supplier and a testing lab to investigate the root cause, confirm results, and evaluate the impact of the OOS quality on the product. The project determined that the OOS was not due to a lack of control in the supplier's manufacturing process. The LLINs were on the upper specifications for fabric weight to ensure the product met bursting-strength specifications. Noting that this parameter is critical for the durability of the LLINs, GHSC-PSM recommended acceptance of the order; PMI approved and the team continued to engage with the supplier on the progress of their CAPA for this OOS to ensure it is not a systemic issue. The project requested the supplier monitor the fabric weight results for batches manufactured and submit an adjustment to the specification to WHO as appropriate.

Also, as part of the RFP process for LLIN procurement the project performed a QMS documentation review of an LLIN supplier to better understand its QMS systems, determine whether there were any eminent gaps in its QMS, and communicate the importance of a robust supplier QMS to foster continuous improvement in the supplier's QMS.

Quality in RDTs

In FY 2021, GHSC-PSM implemented the proposal for enhanced QA for products procured from an mRDT supplier with a notice of concern from WHO. Based on the proposal for enhanced QA for products procured, mRDTs produced by the supplier were subject to enhanced QA processes requiring 100 percent testing of batches and review of the product design files and the batch records by the project.

In FY 2021, GHSC-PSM successfully managed the inspection, sampling, and testing process for a new G6PD RDT at the request of PMI. This process required engaging with a new laboratory. The project assisted the new laboratory to determine the appropriate testing scheme for the RDTs. This facilitated the QC process of the RDTs to be successfully delivered to the recipient country.

GHSC-PSM also reviewed the new testing scheme at the Research Institute for Tropical Medicine (RITM) lab and assessed its impact on the project as the project implemented the adjusted QA/QC protocol for randomized testing. The project determined that implementing the testing scheme at the RITM lab would not adversely impact GHSC-PSM and would complement the randomization of mRDT testing.

GHSC-PSM investigated a deviation for another mRDT supplier. The supplier informed the project of the non-conformity regarding missing embossed artwork. The supplier reported the incident to WHO and halted the use of the non-conforming mRDTs as a corrective action. Based on the supplier's explanation, the project recommended that PMI approve distribution of the products according to pre-established protocols given the low risk of the non-conformity and that they did not warrant a recall. GHSC-PSM continues to follow up with the supplier on continuous improvement process controls to prevent this type of incident in the future.

Strategies and innovations

In FY 2021, GHSC-PSM worked on a proposal for a project that would create a more robust QC process for LLINs based on a detailed understanding of the supplier's manufacturing processes. This effort led to a collaboration with global procurers (Global Fund, UNICEF) and WHO and broadened the scope from quality-related activities pre-procurement and pre-shipment to the entire lifecycle of the LLINs. The project facilitates collaborative discussions with these global donors and WHO to set meaningful goals and objectives that drive quality and standardization within the LLIN market.

In FY 2021, GHSC-PSM innovated and implemented more robust QA and QMS within the LLIN market. These efforts included a strategic process of incorporating the strength of LLIN supplier's QMS into the allocation process. GHSC-PSM accomplished this by generating a QMS questionnaire for LLIN suppliers in response to the LLIN allocation RFP. The project scored the suppliers' responses and factored the results into the final allocation volumes.

Collaboration

In FY 2021, GHSC-PSM kicked off the discussion on the quality of LLINs and the QMS of manufacturers and initiated a monthly meeting with procurers Global Fund and UNICEF to collaborate on processes to improve quality and QMS for LLINs. To improve LLIN quality and supplier QMS, the project held a working group with the Global Fund and UNICEF and invited the WHO Prequalification program to acquire critical updates on past, current, and upcoming quality assurance activities for the LLIN industry.

In Q4 FY 2021, GHSC-PSM chaired the LLIN Quality Assurance Group (LQAG) working group. The objective of the LQAG is to provide a forum for monitoring and communicating LLIN quality-related concerns and trends to facilitate and/or implement activities to mitigate identified quality issues and potential risks.

GHSC-PSM reviewed the Draft East African Standards (EAS) for LLINs and solicited comments from the LQAG members to provide feedback to EAS governing bodies on the areas where the EAS are misaligned with the WHO PQ requirements, given that the organizations represented by the LQAG adhere to and follow WHO PQ guidelines.

GHSC-PSM led the collaboration with a receiving country and an LLIN supplier to generate a quality agreement on the QC activities to be executed before and after LLIN shipment. The agreement proactively outlined the requirements that govern quality control inspection activities, determined criteria for the inspection's outcomes, and identified responsible parties.

The project and Global Fund collaborate through monthly meetings. PMI and Global Fund engage the same manufacturers, use the same WHO guidance, and often experience similar supplier challenges.

Representatives from both teams discussed QA/QC activities to mitigate COVID-19 restrictions, OOS investigations, and other shared experiences.

QA Indicators

The project met or exceeded the in-target QA lead time key performance indicator (KPI) throughout FY 2021, with 93 percent of QA processes completed within the expected lead time. Target QA lead time is 80 percent of QA/QC activities for commodities completed within the QA lead time.

Cost savings

In FY 2021, the continuation of the risk-based testing along with the adjusted QA/QC protocol resulted in a cost savings of $535K.

A.4 Improving Data Visibility

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

ARTMIS

ARTMIS, the project's information system, provides visibility into GHSC-PSM procurement and delivery. External users, such as PMI, other USAID offices, and GHSC-PSM country office staff, can view important order updates and performance information through procurement and delivery dashboards. In Q3–Q4 FY 2021, the project enhanced system efficiency, improved data quality, and enabled greater visibility into its supply chain operations. The project made further enhancements to improve data visibility, including the historical life of project data. Specific improvements to ARTMIS included:

- Maintained the integration with PMI's Malaria Data Integration for Visualization and Eradication (M-DIVE) platform, which provides daily updates on order, shipment, and catalog data for visualization to the full PMI interagency team. The project provided the monitoring and evaluation results data to M-DIVE through Q3 FY 2021.
- Maintained the integration with the Quantification Analytics Tool (QAT), a new supply plan collection tool, and updated the ARTMIS storefront to review tagged orders in the report and analyze module.
- Provided adaptive maintenance to the ARTMIS integration with the PPMRm; GHSC-PSM supports the PPMRm upgrade by enabling the application to pull in daily shipment order updates while the PPMRm reporting period is open.
- Added new fields (GTIN-related) to the PDF printout of requisition orders.
- Refined key reports, including Batch Selection, RO History, and TOM Table, and added fields to the ad hoc reporting.
- Updated the Websphere Commerce Suite to enhance the user experience, specifically improving the approval page and extending the time-out notifications.
- Maintained the automated feed from the 1WorldSync Global Data Synchronization Network™ (GDSN®) to update the GHSC-PSM catalog with product attribute data for catalog items from network suppliers.

Country Assessments: End-Use Verification Surveys

The end-use verification (EUV) survey is a routine monitoring tool for malaria supply chains that examines malaria commodity availability and malaria diagnosis and treatment practice at the health facility level. EUV provides an opportunity to address stock management challenges. Stakeholders rely on EUV data to address complex supply chain questions. Outputs include commodity availability, stock management and storage conditions, malaria case management practices, and other characteristics in a random sample of facilities. Since 2018, the survey has undergone significant changes to ensure EUV methodologies align with data used for decision making with reliability, trust, and known precision.

In Q1 FY 2021, GHSC-PSM held a three-day change control board meeting to review and approve more than 25 changes that better align the survey with how data is being used for decision making. These changes were suggested by the 17 GHSC country offices that conduct the EUV, as well as PMI, USAID FP/RH, USAID MNCH and the GHSC-PSM EUV team. Throughout the remainder of FY 2021, the stakeholders met to refine the indicators and reports. These changes are expected to be rolled out to country teams in Q2 FY 2022.

In Q4 FY 2021, GHSC-PSM met monthly with EUV country teams and GHSC-PSM Washington-based staff. During these meetings, EUV country teams presented how they used the data to advocate for supply chain improvements and decision making. The presentations give country teams the opportunity to share how they have been using EUV data and for other teams to ask questions and gain insight into data use. GHSC-PSM Ghana and GHSC-PSM Guinea presented on improving ACT availability and developing a matrix to identify issues and corrective actions, respectively.

In Q4 FY 2021, GHSC-PSM[8] piloted a Power BI training course in three country offices that conduct the EUV. The course teaches these country offices' staff to update their EUV reports in Power BI and backstop other countries as needed. The course consists of three components: an online EdX course to learn Power BI fundamentals and two components dedicated to learning the EUV report Power BI structure and how to update it. The project developed nearly 30 training videos to teach participants to update the EUV report in Power BI and conduct data quality checks. The training will conclude in Q1 FY 2022.

In FY 2021, 13 GHSC-PSM TO2 countries conducted EUVs. Seven countries conducted the surveys twice and six countries[9] once, with headquarters' support. The survey included the COVID-19 continuity of care module, developed in Q4 FY 2020. Eleven GHSC-PSM countries reported the COVID continuity of care module in FY 2021.

The project shares the EUV reports and recommendations with the MOH, National Malaria Control Program (NMCP), and other stakeholders to inform decision making. Examples appear below.

[8] For this EUV section, GHSC includes GHSC-PSM and GHSC-TA.

[9] Angola (2), Burkina Faso (2), Burundi (1), Cameroon (1), Ethiopia (1), Ghana (2), Guinea (1), Liberia (2), Mali (1), Nigeria (2), Niger (2), Zambia (1), Zimbabwe (2).

Nigeria

In Q2 FY 2021, the EUV identified storage condition challenges in some facilities, such as insufficient shelves and pallets, evidence of rodents, and shortage of thermometers and fire extinguishers. The project advocated for the renovation of storage space to the PMI-supported states.

Several states took actions to address stock management gaps, including incomplete update of inventory control cards (ICCs) and related capacity gaps, such as:

- The project collaborated with the Cross River state's MOH to conduct an intensive training on the malaria commodity logistics system, emphasizing commodity management in Q4.
- In Kebbi state, all Rollback Malaria officers received a mandate to visit facilities under their local government areas (LGAs) to ensure all ICC updates and provide feedback on the resolution to the state logistics management control unit.
- During Q3–Q4, to address inadequate storage space in some health facilities (HFs), the Kebbi State government collaborated with partners and modified and reconstructed the pharmacy stores in batches in those HFs.

Zimbabwe

The MOH used the EUV survey findings to mobilize resources from partners to address identified challenges. In FY 2021, with Global Fund's financial support, district pharmacy managers conducted quarterly on-site technical mentorship using a guide developed by the Directorate of Pharmacy Services on stock and storage management to facility staff in control and elimination continuums. Also, the Global Fund procured 500 data loggers for temperature monitoring through the Medicines Control Authority of Zimbabwe under the quality assurance program for distribution to facilities. The project proposed an additional 1,043 data loggers and 26 remote temperature monitoring systems under the COVID-19 response mechanism grant.

Procurement Planning and Monitoring Report for Malaria (PPMRm)

PPMRm is a quarterly report that provides data on central stock and commodity security along with updates on key malaria commodities from PMI-supported countries. It identifies stock issues, including potential risks, and assists with order prioritization and reconciliation.

Currently, the PPMRm manages data from 29 countries.[10] To standardize reporting, many countries provide forecasted average monthly consumption and include central- and sub-national-level data on stock-on-hand. Expanding the breadth of information provided by the PPMRm will help forecast potential stock issues and enable greater monitoring capacity.

Information from PPMRm assists with order prioritization, including the reallocation of orders or stock to mitigate the risk of stockouts or expiries. The project used supply plan data in PPMRm to inform collaborative meetings with other global donors to plan shipment logistics, assess supplier capacities, and coordinate orders.

Based on PPMRm data, the project took the following actions at the global or national level in FY 2021:

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

- Identified stockout risks and recommended or took actions to expedite PMI or Global Fund shipments to mitigate the risk, such as:
    - In Q1–Q2: Cameroon (ALu and ASAQ, SP, mRDT), Malawi (rectal artesunate suppositories, mRDT), Mali (ALu, artesunate injectable 60mg), Tanzania (SP), Zambia (artesunate injectable 60mg), Zimbabwe (ALu and ASAQ, artesunate injectable 60mg, mRDT, SP).
    - In Q3–Q4: Cameroon (artesunate injectable 60mg, mRDT), Ethiopia (ALu, artesunate injectable 60mg), Ghana (ALu6x3, artesunate injectable 60mg and 120mg, mRDT), Malawi (ALu), Mali (ALu, artesunate injectable 30mg), Tanzania (ALu 6x3), Uganda (ALu 6x4, artesunate injectable 60mg), Zimbabwe (ALu 6x4, SP)
- Postponed shipments to prevent overstocking, such as:
    - Guinea (SP), Rwanda (artesunate injectable 60mg)
- Redistributed stocks within the country, such as:
    - Angola: redistributed the ALu 6x2, 6x3, and 6x4 from overstocked provinces to understocked provinces.
    - Thailand: redistributed overstocked mRDTs to test fever cases in COVID-19 quarantine centers to mitigate the risk of expiry, and to respond to the urgent need at the COVID-19 quarantine centers.

The project noticed unrealistic months of stock (MOS) calculated in the PPMRm reports based on consumption for the commodities with substantial stock held at the health facilities and with extremely low consumption in countries with low endemicity, such as those in the Greater Mekong Subregion (GMS). Such MOS was not appropriate for monitoring stock status and making supply plan decisions. To solve this issue, in Q3, GHSC-PSM provided guidance to the countries in GMS to revise the calculation and interpretation of MOS without changing the data elements in the PPMRm platform.

The project combined the annual consumption and stock holding as total annual needs (TAN), and calculated average monthly consumption (AMC) based on TAN. By using this amended AMC, GHSC-PSM interprets the months of stock on hand (SOH) or shipment by “fill rate”, i.e. percentage of the TAN filled by a SOH or a shipment (MOS/12*100%). The project also applied this concept to the quantities distributed to or available stocks at the subnational level to understand country stock status. This method was tested in Thailand and Laos in GMS in Q4 and it has improved the interpretation and understanding of stock status for better supply plan decision making. The project will explore the applicability of this method to other countries with similar context, or eligible commodities such as rectal artesunate suppositories.

The project is updating the PPMRm platform to make it more user friendly, increase the reporting frequency to monthly, and reduce the level of effort for data submission, in part through the integration with ARTMIS. The new platform allows monthly data reporting to identify and address stock issues earlier. GHSC-PSM tested the new PPMRm platform in all 29 countries in Q3 FY 2021. The project is addressing issues encountered in the testing phase and expects to launch the new platform in FY 2022.

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

Key to improving data visibility is adopting global standards—a common business language that all trading partners can use from manufacturer to dispense—to identify, capture, and share information about products and their movement in the supply chain, along with labeling standards. Trading partners

and systems use their own identifiers and data formats without these standards (e.g., purchasing, inventory management, logistics, reporting). This approach breaks the connection between those systems, creating a high maintenance, error-prone environment that adds complexity, inaccuracy, and cost when aggregating data, and monitoring product movement and can be prohibitive for traceability implementation. In FY 2021, GHSC-PSM supported the adoption of GS1 healthcare global standards through its procurement requirements for pharmaceutical, medical device, sterile kit, laboratory reagent, and LLIN suppliers to adopt standardized product identification and labeling and to exchange product master data. GHSC-PSM also supports the adoption of global standards in supply chain processes by providing technical assistance for adopting standards within country programs as described in Section B1.

At the global level, supplier requirements include:

- Assigning Global Trade Item Numbers (GTINs) that identify trade items and Global Location Numbers (GLNs) that identify business entities and locations
- Labeling specified packaging levels with barcodes encoded with the GTIN, batch/lot, and expiration date
- Exchanging master data through the GDSN

This past fiscal year saw tremendous progress in supplier implementation of GSI requirements, including for malaria commodity suppliers, laying the groundwork to operationalize data in global and national supply chains. Advancing supplier compliance requires regularly engaging with suppliers for existing and new items. In FY 2021, through this ongoing engagement with suppliers of malaria products, the project:

- Collected, validated, and added GTINs for 181 items to the GHSC-PSM catalog.
- Collected master data for 279 new items through the GDSN, and maintained data on existing items.
- Collected and validated data for all required and mandatory GDSN attributes for 12 malaria commodity-specific suppliers.
- Collected and validated GS1-compliant individual net and polybag labels for all LLIN suppliers before the Q3 deadline, resulting in 100 percent compliance with the LLIN phase 2 requirements.
- Collected and validated compliant serialized and serial shipping container code packaging for the upcoming phase 4 deadline in June 2022 for 33% of malaria commodity suppliers, eight months ahead of the deadline.

To improve compliance with and capitalize on the growing maturity of these global standards requirements, the project pursued a series of strategic activities designed to target three goals:

1. **Standardize:** Maximize efficiency while addressing compliance gaps by refining data collection and validation processes. These activities included new procurement-led data collection processes, collaboration with GHSC-QA to review labeling and identification information collected through QA processes, and creation of reusable reference documents, including instructional videos and posters, to answer commonly asked questions in new, accessible formats. Also, to increase usability and access, the project enhances a number of supplier resources that can be found here.

2. **Scale:** Expand use of standards-based data across PMI focus countries and GHSC-PSM activities by familiarizing audiences with existing standards-based data and identifying opportunities for further use. These activities included an activity to evaluate and document the impact of standards-based data on the global supply chain and a workshop to identify areas where GDSN data can be better leveraged.

3. **Share:** Disseminate lessons learned and benefits of standardized data for use by country programs, donors/procurers, and other partners that may be implementing standards in their programs. These activities include a documented set of lessons learned from standards implementation and a reference note documenting the processes and logic GHSC-PSM uses to collect and monitor compliance with standards requirements.

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

In FY 2021, GHSC-PSM provided technical assistance to develop and validate supply plans, aggregate commodity demand, and evaluate and reconcile seasonal demand with orders. The result of GHSC-PSM's sustained efforts to support country supply planning is that more countries can independently manage this critical activity.

Countries use supply plans, which analyze quantities of commodities for order during a specified timeframe, to ensure continuous product availability. Supply plans inform GHSC-PSM decisions for order planning, strategic sourcing, and RDC stocking. The project collects supply plans in PipeLine, QAT, or Excel.

Supply Planning Technology

In early FY 2021, GHSC-PSM piloted the QAT and the QAT supply plan module in PMI-supported countries. The QAT supply plan module leverages new technologies and replaces PipeLine, the former supply planning tool, with an improved user interface, greater analytical capabilities, and automated data exchange that allows program managers to optimize commodity procurement and delivery schedules, monitor the stock status of products, and share data with external platforms and key stakeholders.

In FY 2021, the project conducted 5 remote trainings for 17 countries (Angola, Benin, Burkina Faso, Burundi, Cameroon, Ethiopia, Ghana, Laos, Malawi, Mali, Nigeria, Rwanda, Sierra Leone, Tanzania, Uganda, Zambia, and Zimbabwe) followed by targeted, program-specific technical assistance to help countries transition their supply plans from PipeLine to QAT. Following the trainings, 13 countries submitted their malaria commodity supply plans through QAT. The remaining 4 countries (Angola, Rwanda, Tanzania, and Uganda) were being onboarded in Q4 FY 2021 and either submitted or are

expected to submit a QAT malaria plan for the Q1 FY 2022 supply plan submission cycle. The project plans to onboard additional PMI-supported countries[11] to QAT in FY 2022, pending Mission funding. In addition to the trainings held by GHSC-PSM with in-country project staff, staff from four GHSC-PSM countries led trainings (Benin, Ethiopia, Nigeria, and Zimbabwe) in FY 2021 for Ministries and other partners on using QAT. The project scheduled an additional five country-led trainings (Burkina Faso, Cameroon, Rwanda, Sierra Leone, and Zambia) in FY 2022.

In addition to training and onboarding countries to QAT's supply planning module, GHSC-PSM initiated the development of the second QAT module for forecasting. The project expects to pilot this module in Q2 FY 2022. The project and countries are discussing a training plan for the QAT forecasting module throughout FY 2022.

Supply Plan Reviews

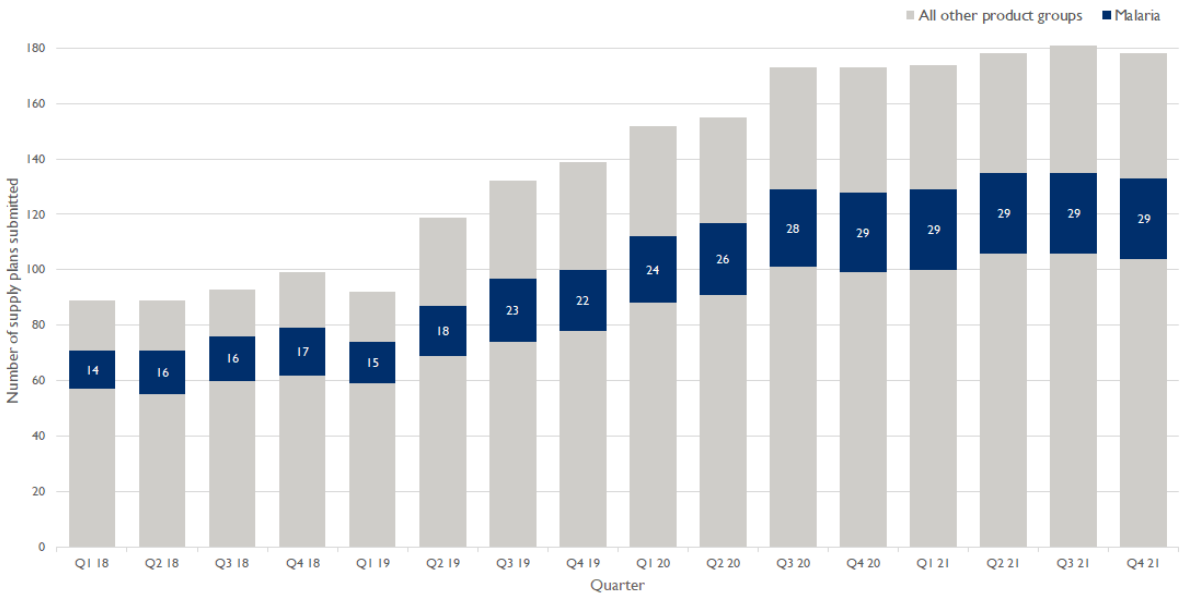
To ensure procurement-ready plans, GHSC-PSM conducts quarterly supply plan reviews to drive continuous commodity availability and submission in PipeLine or QAT.

GHSC-PSM countries that submit supply plans through PipeLine use the supply chain automation (SPA) tool each quarter to review and address data quality issues before submission to GHSC-PSM headquarters. The project developed the SPA tool in FY 2019 to help countries review and improve data quality, deepening their understanding of data inputs and commodity availability. The tool allows key individuals (e.g., country directors and forecasting and supply planning leads in-country) to track country supply planning performance through an integrated dashboard. For QAT-submitted supply plans, a supply plan review is integrated within QAT called the QAT Problem List (QPL). The QPL allows for a quality check to easily identify problematic data/issues and correct these before committing a supply plan to the server. The QPL allows users and reviewers to leave comments specific to the issue being flagged and provides visibility into those comments during future quarterly reviews for context. Similar to the SPA Tool, the QPL also features a dashboard that allows users to quickly track country supply planning performance.

In FY 2021, all 29 PMI-supported countries submitted a malaria supply plan update through PipeLine or QAT. By Q4, 13 submissions were through QAT. The 100 percent submission of PMI-supported country supply plans exceeded the target of 90 percent.

[11] Burkina Faso, Cambodia, DRC, Guinea, Liberia, Mozambique, and Niger.

Exhibit 14. Supply plan submissions and technical reviews over the life of the project



Forecasting and Supply Planning Technical Assistance

In FY 2021, the project assisted 29 countries in forecasting and supply planning (FASP) including 21 PMI countries. GHSC-PSM adjusted technical assistance methods to comply with restrictions on travel and large group meetings due to COVID-19. Examples of technical assistance follow.

Burkina Faso

GHSC-PSM provided technical assistance to the malaria commodity quantification committee that includes MOH participants and other partners, such as Global Fund, in preparation for the malaria commodity quantification session to forecast FY 2022 malaria commodity needs. This support helped the committee collect and analyze the data before the quantification exercise, which took place in Koudougou in Q4. The project participated in the quantification exercise with the committee, which determined FY 2022 malaria commodity needs and informed supply plan development.

Rwanda

Based on the analysis performed during the supply plan review in Q3, and the continued decrease in malaria cases up to July 2021, GHSC-PSM and the Malaria and Other Parasitic Disease Division (MOPDD) convened to review and revise the 2021–2024 forecast in August 2021. The analysis found an overstock of ACTs and artesunate injectables, and risk of expiries of some ALu 6x4. This exercise resulted in a projected reduction of 20 percent in the forecasted consumption for all ACTs, artesunate injectables, and quinine tablets for FY 2022. Also, to avoid overstocks and expiries, the project pushed the planned shipments of ACTs and artesunate to later delivery dates.

Logistics Management Information Systems Technical Assistance

GHSC-PSM enhances the functionalities and capabilities of country programs' eLMIS by reviewing system requirements, negotiating procurement and contracts, and monitoring operation and performance. In addition to eLMIS activities, the project supports gathering requirements and identifying business processes for other information technology solutions, such as warehouse management systems and eLearning tools. The project guides integration between separate information systems to establish a single data source that is current and accurate for all relevant actors. GHSC-PSM produces SOPs and templates to standardize the project's status reporting and service-level agreements for quality and consistency worldwide.

In FY 2021, the project assisted in designing and implementing eLMIS in 20 PMI focus countries. Examples of technical assistance follow.

Cambodia

GHSC-PSM supported development of a malaria stock data consolidation tool for key malaria commodities extracted from the Stock Module of the National Center for Parasitology Entomology and Malaria Control (CNM)'s malaria information system. The CNM Pharmacy Unit will use the information provided by the Malaria Stock Data Consolidation Tool during monthly supply coordination meetings to review stock status, identify stock issues, and proactively take targeted and informed actions to prevent risks of stockouts and expiries. The project released the first version of the tool and introduced it to the Pharmacy Unit in Q3.

Malawi

GHSC-PSM supports the MOH in the OpenLMIS. In Q3, the project and MOH scaled up OpenLMIS to 100 additional facilities bringing the total to 260, and piloted the OpenLMIS Stock Management Module (SMM) in eight districts. This is part of ongoing efforts to strengthen MOH capacity in OpenLMIS expansion, its management, and use. OpenLMIS improves data tracking, reporting, and ordering of malaria commodities. In Q4, GHSC-PSM updated OpenLMIS from v3.10 to v3.11 on the national production server. Moreover, the project, in collaboration with VillageReach and IDIAS, conducted 54 onsite supportive visits to existing OpenLMIS sites, provided on-the-job training to facility staff, and resolved all issues related to the SMM reported from the pilot facilities. As a follow-up, the project conducted a joint review on the observations through these visits and the progress made so far with MOH's Health Technical Support Services Department, and obtained MOH's approval to roll out the SMM to more sites.

Also, GHSC-PSM with the MOH is developing a digital supply chain (DSC) strategy through a Supply Chain Information System Maturity Model (SCISMM) assessment. The project, in coordination with MOH, conducted a SCISMM assessment in Q3 that analyzed the current in-country supply chain information systems maturity status. The project is drafting a report with findings and recommendations. One of the recommendations is to develop a DSC strategy and architecture for Malawi with a roadmap. The project will complete the development of DSC with MOH in Q1 FY 2022. When completed, DSC will assist the MOH in implementing end-to-end data visibility into health commodities.

Zambia

The project, in line with the government's aspirations, implemented "WarehouseExpert," a new Warehouse Management System (WMS) at Zambia Medicines and Medical Supplies Agency (ZAMMSA). The new system is pivotal in strengthening ZAMMSA's order processing, information management, inventory management, data visibility, and customer service, and improving turnaround time from ordering to delivery. The project worked with ZAMMSA to expand WarehouseExpert to seven regional hubs, allowing for an uninterrupted downstream supply chain (quick downstream order processing and improved order turnaround time). This improves data visibility because it links all regional hubs to the central warehouse WMS and NetLog reports data to the central warehouse.

Improved Data Use

In addition to LMIS development, the project helps countries improve data quality and use. Country-level activities maximize innovation while ensuring data quality, as well as skills transfer and development, and make LMIS useful for decision making. Below are specific country examples:

Malawi

The project implements Commodity Accountability Performance Tracking (CAPeT) by using logistics and malaria case data from OpenLMIS and DHIS2, respectively, to assess discrepancies for improving accountability. The acceptable ratio for Malawi of malaria cases to the quantity of commodities issued from pharmacy stores is 1:1.15. The project supported the NMCP in conducting CAPeT in 30 targeted facilities from 13 districts across the country, in Q4. The project selected facilities from those visited in Q1 and Q2 to assess their performance following implementation of action plans. CAPeT activity, which assesses discrepancy between ALu treatments issued and malaria cases reported in OpenLMIS and

DHIS2, contributes to the reduction of the discrepancy between confirmed malaria cases and ALu treatments, among other interventions, as part of ongoing efforts to improve malaria commodity accountability at the health facilities. Results from this activity showed a general performance improvement in 73 percent of the facilities assessed (i.e. the average discrepancy ratio for 22/30 facilities got closer to the acceptable ratio of 1:1.15). The project shared action plans developed during the visit with the districts, the NMCP, and the project's Regional Commodity Logistics Officers for follow-up and support in subsequent activities.

Zambia

GHSC-PSM monitors stock imbalances and provides technical support with the use of available data analytics platforms like PowerBI. The project shared the analysis results with National Malaria Elimination Center, Global Fund, the Churches Health Association of Zambia, and other key partners to inform supply chain decisions, which involved redistributing stock as well as projecting future stock status. These efforts contributed to improve stock at the health facilities observed through site visits. For example, the project supported the Program for the Advancement of Malaria Outcomes Plus in conducting onsite technical supportive supervision in selected health facilities in Eastern, Luapula, and Muchinga Provinces, which observed 100 percent availability of ACTs and mRDTs on the day of the visit in Q3.

Global Standards and Traceability

GHSC-PSM provided technical support to several PMI-funded countries to adopt GS1 standards for product and location identification and data exchange. Adopting global standards can reduce costs, enhance efficiency, and improve the availability of health commodities in countries' public health supply chains. FY 2021 highlights included:

- In **Rwanda,** the project, the FDA, and MOH advanced the Rwanda National Vision and Strategy for Pharmaceutical Traceability, leveraging GS1 global standards throughout FY 2021. Also, through implementing a national product catalog (NPC), the project played a key role in drafting regulations and guidelines, under review by the FDA, to appropriately label and exchange product identification data to verify products. The project improves stakeholder understanding of global standards through a series of educational sessions on GS1 standards.
- In **Zambia**, GHSC-PSM supports national traceability objectives through the MOH by implementing an NPC. The project identified a vendor to lead the configuration and deployment of the NPC that the MOH/ICT hosts. In Q4, the project conducted a workshop and officially launched NPC. Attendees included 33 in-person and virtual participants across different Zambian government institutions, along with USAID, GS1, and implementing partners. Workshop participants agreed on and refined the NPC requirements. The project worked with the Zambia Medicines Regulatory Authority to finalize the guidelines on standardized identification and labeling of products leveraging GS1 standards.
- In **Nigeria,** throughout FY 2021 GHSC-PSM and NAFDAC advanced a national traceability strategy, including implementation of a NPC. Phase one of implementation focuses on donor-procured commodities; phases two and three focus on private sector groups. In Q4, the project completed the initial product master data assessment of donor-procured commodities from donor-supported partners' (GHSC-PSM, Akesis, and MDS) master data files.

In FY 2021 the project enhanced its Traceability Planning Framework Toolkit as a resource for country programs through the following resources:

- Global Standards for Supply Chain Data Visibility Reference Deck
- National Pharmaceutical Traceability Vision and Strategy Development Reference Note
- Traceability Governance Terms of Reference Guidance and Template
- Model Regulation for Pharmaceutical Traceability
- Guideline for Pharmaceutical Product & Location Master Data Template and Guidance
- Guideline for Identification and Labelling Specification Template and Guidance

These resources have been used across the 7 PMI countries in which GHSC-PSM has active global standards implementation activities[12]. In Q4, the webpage containing the toolkits received 600 unique and 1,055 total page views.

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 to host governments in warehousing and delivery; and second, by directly distributing commodities in some countries, often through contracts with in-country logistics companies.

Stockout Reduction Initiative

Despite government and global partners' investments, SDPs often experience stockouts of critical malaria commodities. PMI seeks to reduce malaria commodity stockout rates at SDPs in PMI-supported countries over the next two to three years. GHSC-PSM country offices started the initiative with developing investment plans. Development of the investment plans included four phases:

Phase 1: Identify data sources and establish targets
Phase 2: Develop a strategy and a playbook
Phase 3: Pilot the playbook in selected countries and refine the playbook
Phase 4: Roll out the playbook to other countries and develop the countries' investment plans

In FY 2020, GHSC-PSM completed the first two phases of a stockout reduction initiative wherein the project used EUV and LMIS data to inform the establishment of a 90 percent target for on-shelf availability at SDPs. The project developed a strategy to reduce stockouts of malaria commodities, produced a playbook to support countries implementing the strategy, and identified country-specific stockout baselines, targets, root causes, and proposed solutions.

In Q1 FY 2021, the project implemented phase three by piloting the Stockout Reduction Initiative Playbook in Cameroon and Liberia. GHSC-PSM used the pilot's results to refine the playbook and corresponding tools and establish a set of technical solutions to inform country investment plans for PMI and work plans to improve stock availability in PMI-supported countries.

[12] Ghana, Liberia, Malawi, Nigeria, Rwanda, Zambia, Zimbabwe

In Q2 FY2021, GHSC-PSM launched the playbook in the 19 remaining malaria-supported country offices[13] (phase 4). Phase 4 included two stages. Stage 1 sought to identify and justify the major activities to be included in PMI FY 2022 work plans. The project focused on a subset of playbook modules to inform investment recommendations, including:

- Identifying and planning engagement with relevant stakeholders
- Setting baseline and stockout reduction targets
- Diagnosing and prioritizing root cause issues
- Prioritizing solutions
- Developing detailed investment plans
- Identifying potential risks and interdependencies that need to be addressed before or during the implementation

The project guided countries through the playbook modules and provided tools to collect and calculate the baseline stockout rates and prioritize solutions. All 21 malaria-supported countries developed investment plans.

To prepare for FY 2022 work planning, in Q3 GHSC-PSM began stage 2 of implementing the Stockout Reduction Initiative Playbook to refine the high-level investment plans developed by countries during stage 1. In stage 2, countries built on stage 1 outputs to include greater detail and incorporate stakeholder input, including refining investment plans and developing deliverables, focused mainly on budget and performance management. During Q4, all 21 countries completed investment plans and incorporated them into FY 2022 work plans.

Warehousing and Distribution Technical Assistance

The project provides TA to improve countries' warehousing and distribution processes to strengthen their supply chains. GHSC-PSM incorporates private sector best practices into public health supply chains by applying lean methodologies, such as activity-based costing (ABC). The project works with MOH staff, public health staff, nongovernmental organizations, and the private sector and others with supply chain responsibilities to measure the inventory velocity of the supply chain (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. Recent activities include supporting Uganda's Joint Medical Stores (entity that holds the storage and distribution contract with USAID) in implementing ABC to improve their understanding of the overall operations costs of their warehouse functions; conducting a storage and distribution assessment in Cambodia to fully understand the storage and distribution capacity in the country; and updating warehouse and distribution (W&D) contract templates with the W&D working group.

Mali

GHSC-PSM supported the Pharmacie Populaire de Mali (PPM) to monitor the maintenance plan of the Bamako prefabricated warehouse. As a result, the Bamako prefabricated warehouse functions and guarantees the safety of malaria products delivered by donors and the government. The PPM reduced

[13] Angola, Burkina Faso, Burma, Burundi, Cambodia, Ethiopia, Ghana, Guinea, Malawi, Mali, Mozambique, Niger, Nigeria, Rwanda, Sierra Leone, Thailand, Uganda, Zambia, Zimbabwe.

the time that the reception committee took to inspect shipments and record deliveries in the PPM's warehouse management system after the delivery of shipments by 50 percent.

Also, the project installed a regional warehouse in Mopti with the PPM and their subcontractor. By the end of Q4 FY 2021, the subcontractor replaced the damaged equipment of the air conditioning system and nearly completed the installation of a new generator. The project scheduled a handover of the Mopti regional prefabricated warehouse to PPM in Q1 FY 2022.

Malawi

In Malawi, the project delivered malaria commodities funded by PMI and Global Fund in a parallel system. Aiming to provide greater efficiency in the supply chain management of malaria commodities, GHSC-PSM, the Global Fund, PMI, and Malawi's NMCP piloted a program from Q3 to Q4 FY 2021 to consolidate distribution. GHSC-PSM through a 3PL provider, managed delivery of Global Fund-procured malaria commodities including mRDTs, artesunate injectables, ACTs, SP, and LLINs. Similarly, within the period, the Global Fund–contracted 3PL provider managed delivery of PMI-procured malaria commodities including ACTs, SP, and Global Fund–procured ACTs and mRDTs.

Integrated distribution reduced the number of trucks delivering to facilities by half, from two to one, increasing efficiency. This also reduced the workload for health facility staff who now manage one receipt instead of two. Rather than receiving and processing delivery from two separate vehicles over a two-hour period or more, this has since been reduced to handling one vehicle within a one-hour period, thereby freeing time to attend to other supply chain logistical issues. Integrated distribution can save money on fuel and truck maintenance and it promotes organized operations. GHSC-PSM and the Global Fund-Project Implementation Unit (PIU)/MOH will finalize and sign off the memorandum of understanding (MOU) for the integrated malaria commodities distribution.

LLIN Distribution

In FY 2021, several countries launched large-scale LLIN campaigns as a key prevention strategy. These massive initiatives provide communities, particularly in high-burden areas, with the nets they need before the rainy season. Actual distributions can last a few weeks, while logistics, supply planning, procurement, and pre-positioning of the nets can take months. Other countries provided transportation support to deliver LLINs from the central level to the district or health facility levels for continuous distribution.

In FY 2021, the project delivered over 47 million LLINs to protect nearly 95 million people in 24 countries) (Exhibit 15).

Exhibit 15. LLIN deliveries in FY 2021

Country	Number of LLINs delivered	Country	Number of LLINs delivered
Angola	600,000	Madagascar	3,677,000
Burkina Faso	551,300	Malawi	1,900,000

Burundi	1,560,947	Mali	1,846,000
Cambodia	336,000	Myanmar	350,000
Cameroon	642,957	Nigeria	7,301,917
Congo DRC	28,000	Senegal	723,632
Côte d'Ivoire	3,613,720	Sierra Leone	627,631
Ethiopia	3,348,538	Tanzania	4,716,854
Ghana	4,531,839	Thailand	130,873
Kenya	4,742,348	Uganda	1,942,413
Laos	70,000	Zambia	2,498,000
Liberia	200,000	Zimbabwe	1,330,000

Grand Total **47,269,969**

LLINs require large storage space with controlled temperature to maintain quality. At the country level, the project worked to improve LLIN warehouses through planning, and improving storage conditions. The project also supported LLIN distribution, including transporting LLINs to various levels and facilitating mass distribution to households.

Cambodia

GHSC-PSM supported LLIN distribution in Preah Vihear province at the request of the National Centre for Parasitology, Entomology and Malaria Control (CNM). The project trained and oversaw local distribution teams to register households and distribute the LLINs in 102 targeted villages. The project subcontracted a 3PL to deliver 79,675 LLINs from the central warehouse in Phnom Penh to a provincial warehouse in Preah Vihear for repacking with other LLINs already stored there and then distributed to 24 health facilities. Household distribution took place from Q3-Q4. Due to Covid-19 restrictions, the nets were distributed house-to-house, rather than having beneficiaries gather at one location to collect the nets. As a result, a total of 78,812 nets, including 52,311 bed nets (LLINs) and 26,501 long-lasting insecticide-treated hammock nets were distributed, benefiting 131,123 people in 102 targeted villages.

In addition, GHSC-PSM procured 336,000 LLINs for CNM's future mass distribution campaigns. The project provided financial support to alleviate a space shortage at the central warehouse and outsourced storage to a third-party logistics (3PL) company.

Ethiopia

In FY 2021, the project distributed 3,324,476 LLINs in nine regions (Afar, Amhara, Benishangul-Gumuz, Dire Dawa, Harrari, Oromia, Somali, and SNNPR). These LLINs include 2,937,697 nets procured in FY 2021 and 386,779 nets that were part of the FY 2020 procurement. The project distributed most of the LLINs (nearly two million) to the Somali region, where GHSC-PSM faced challenges, including poor road conditions and a shortage of transportation services. The distribution in FY 2021 included 111,969 LLINs to flood-affected and internally displaced people in Afar, Amhara, Oromia, and SNNPR.

Highlights of GHSC-PSM support include:

- Organizing woreda (district-level) microplanning workshops to prepare distribution and transport plans for the lower level.
- Training campaign actors in implementing activities, including logistics, registration, documenting, and reporting LLINs distributed.
- Printing and distributing household registration and reporting tools at distribution point health posts.
- Availing transportation services from private vendors to deliver LLINs to last-mile distribution site health posts.
- Supervising campaign progress with government campaign supervisors (national, regional, and woreda-level supervisors) and training health extension workers at the distribution points.
- Procuring and distributing alcohol-based hand sanitizers and face masks to ensure the protection of campaign actors and beneficiaries against COVID-19.
- Organizing post-campaign review meeting workshops to evaluate the achievements and lessons learned from the campaign. Distribution of LLINs in FY 2021 benefited an estimated 6.7 million people living in malaria risk areas in the nine regions.

LLIN distribution in Adadile village, Shabelle Zone Somali Region, Ethiopia (Photo credit: GHSC-PSM)

LLIN distribution in Adadile village, Shabelle Zone Somali Region, Ethiopia (Photo credit: GHSC-PSM)

Liberia

In FY 2021, GHSC-PSM supported the NMCP in implementing the following activities:

- Data visibility: GHSC-PSM worked with county supply chain coordinators to report the total number of LLINs available at the county level. This helps the NMCP to make decisions about country-level LLIN stock status related to emergency resupply of products to health facilities.

- Support of the 2021 mass LLIN distribution campaign: The project and the NMCP launched the campaign in Q3, assisting the NMCP in training 20 national-level trainers who cascaded microplanning working sessions to include officers-in-charge of health facilities and district health teams. GHSC-PSM, the NMCP, and Plan International Liberia trained 20 national-level trainers on household registration (HHR). They cascaded this training to the county level with remote project support to clarify issues related to household registration and COVID-19 prevention protocols. The project collaborated with the NMCP in training 75 national monitors on the HHR process. Through partners' support, NMCP distributed 2,557,369 LLINs to households by August 2021, which benefited 1,157,038 registered households, representing 90 percent of household coverage.

Nigeria

GHSC-PSM supports micro-planning for the LLIN mass distribution campaign across the 11 PMI focus states. In Q2, the project worked with the governments of Kebbi, Nasarawa, and Sokoto States on micro-planning exercises for the LLIN mass replacement campaign. The activity was a preparatory exercise for distributing LLINs to approximately 15 million people in the three states. The project trained 57 state facilitators in micro-planning data collection and storage assessment for state and LGA warehouses. GHSC-PSM procured 5,000,033 LLINs with PMI funding for the Oyo LLIN campaign. In Q3, the project developed and deployed a web and mobile application to facilitate FY 2021 micro-planning exercise implementation in Akwa Ibom State. This application uses the information and communication technology for development (ICT4D) concept. ICT4D transitioned the planning and implementation of the campaign from a traditional paper-based to a technology-driven model that improves accountability and efficiency and mitigates fraud. In Q4, the project began full transition from paper-based processes to digital management of LLIN campaigns with a pilot in the LGA of Oyo State. Also, in Q4, GHSC-PSM worked with Kebbi and Sokoto States to adopt the technology in micro-planning and trained 186 government officials to use the technology.

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

GHSC-PSM transfers skills, knowledge, and technology through technical assistance 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 approaches to workforce development, improving countries' independence and ability to sustain programs. Interventions include in-service and pre-service training, supportive supervision or mentoring, leadership, and change management competencies.

LMIS and Inventory Management Training for a Self-Reliant Workforce

GHSC-PSM provided training using PMI funding to:

- 314 health facility staff members in Sierra Leone, to bolster inventory management and data quality
- 319 health facility staff (81 percent women) in Nigeria, focused on malaria commodity management
- 204 pharmacy attendants in Cameroon, to build and maintain skills in malaria product management

In Q3 FY 2021, GHSC-PSM conducted the first virtual introduction to supply chain management course. A total of 34 USAID staff, with the majority from USAID missions, and one GHSC-PSM staff member attended. The approach was necessary due to limited face-to-face training opportunities caused by COVID-19. The training recorded a 94.1 percent response to assignments and homework completion.

Additional country examples of workforce development activities follow.

Angola

The project supported the postgraduate specialization course in the Integrated Management of Health Supply Chain at the National School of Public Health in FY 2021. A total 28 students (78 percent) from the first cohort that started in 2019 successfully graduated in Q1 and received certificates in Q3 of FY 2021. The MOH committed to allocate these graduates to various health supply chain areas to use their knowledge and skills. In Q2, the project worked with the Escola Nacional de Saude Publica (ENSP) and submitted a proposal for the second cohort to the MOH for approval.

Burkina Faso

The *Direction de la Chaîne d'Approvisionnement des Produits de Santé (*DCAPS) identified inadequate collection and use of logistics data in the National Health Data Repository (ENDOS-BF) as a critical challenge impacting the availability of health products at SDPs. In collaboration with the Directorate of Sectoral Statistics and GHSC-PSM, DCAPS organized four training sessions on data extraction and data analysis from ENDOS-BF for 102 supply chain managers in Q1, partially funded by PMI. With DCAPS, GHSC-PSM trained supply chain managers from all 13 health regions and all 70 health districts on data collection, data extraction, and data analysis from ENDOS-BF to improve the timeliness and completeness of the logistics reports and data for decision making.

Ethiopia

In FY 2021, the project developed the New Staff Induction and Skill Transfer Guide for Pharmaceutical Supply Chain and Pharmacy Services at Health Facilities in Ethiopia, targeting human resources and pharmacy personnel. The guide has three parts:

1. The first part introduces new staff to the organization and to their role. It also provides an overview of government civil service rules.
2. The task-tool checklist guides transfer of technical skills from the outgoing employee to a new employee within a defined timeline.
3. The final section assists leaders in creating opportunities for junior staff and potential managers or leaders in their department.

In Q4, the project supported the MOH in conducting a popularization and orientation workshop on the guide for 45 professionals (37 male and eight female) including pharmacy directors and heads from 11 regional health bureaus (RHBs) and selected federal hospitals and MOH staff. The workshop familiarized participants with the guideline, advocated for its implementation in health facilities, and built local health facility capacity. The orientation guides the RHBs to advocate for the guideline through different platforms such as review meetings, technical working group (TWG) meetings, and supervisions to the health facilities under their jurisdiction. The guide establishes a mechanism for onboarding new staff in an organized and consistent manner so that employees can be introduced into a new position and work environment quickly and contribute as soon as possible. Also, the guide assists in knowledge transfer and creating a supportive working environment that ensures continuity of health services, including improvement of supply chain management and availability of antimalarials. The guideline alleviates inefficiencies in supply chain human resource practices, including the lack of standard skill transfer and new staff induction system and absence of job handover guidelines, documents, and tools to their colleagues at health facilities. This effort is expected to standardize staff orientation programs on various technical areas of supply chain and pharmacy services and would decrease dependence on off-site training.

Zambia

In Q3–Q4 FY 2021, GHSC-PSM and the MOH's nursing school developed a virtual learning platform for health supply chain management to complement the school's in-person teaching program. The project converted the curriculum from in-person to online and used a learning management system to enroll four students in two sessions to solicit feedback and refine the approach. Once completed, the platform will provide training at a minimal cost to hundreds of nursing students from all 102 nursing institutions.

Number of Trainees

In FY 2021, GHSC-PSM trained in-country specialists on the full range of supply chain health systems strengthening areas. A total of 16 PMI-supported countries received training from GHSC-PSM.
In total, the project trained 2,618 people, either exclusively funded by the malaria task order or co-funded by the malaria task order and other health areas. Women comprised 40 percent of the trainees, and men comprised 60 percent. The countries with the most malaria task order–funded training recipients were Sierra Leone (632 individuals), Cameroon (380 individuals), and Ethiopia (372 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 improve 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 are provided below.

Burkina Faso

One of the interventions in the Burkina Faso NMCP five-year strategic plan (2021–2025) is to improve the availability of subsidized malaria commodities in private sector health facilities. To support this initiative, in Q3, GHSC-PSM, in collaboration with the NMCP, organized a workshop with private sector health facility associations in Ouagadougou. The workshop resulted in an Memorandum of Understanding (MOU) between the MOH and the private sector health clinic board. Prior to the MOU, the malaria commodities procured by the government and partners were used in the public sector only and patients visiting these health facilities receive free service for RDT tests, and pay a subsidized price for malaria medicines. Once signed by the MOH and private sector board, this MOU will make rapid diagnostic tests available free of charge for patients, and ACTs at subsidized price at private sector health facilities.

Ethiopia

GHSC-PSM supported the scale-up of the Auditable Pharmaceutical Transactions and Services (APTS/eAPTS) system to 30 health facilities through trainings and on-site support. MOH and Pharmaceutical and Medical Equipment Directorate, in collaboration with GHSC-PSM, conducted APTS training for 737 participants in six regions: Addis Ababa, Amhara, Oromia, Sidama. Somali, and Southern Nations, Nationalities, and Peoples' Region (SNNPR). The implementation of APTS improves commodity availability, reduces waste, and creates transparent and accountable systems for pharmaceutical transactions, including antimalarials, within the health facilities.

In a related activity, GHSC-PSM, the MOH, and Sidama RHB developed a resource-sharing directive legalizing and standardizing resource sharing, including exchange, share, transfer, and borrowing of medicines among health facilities in the region. Resource sharing reduces shortages, stockout, and expiries of pharmaceuticals, including malaria products. The project and the MOH are developing the requirements for linking the eAPTS with electronic medical records.

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. In FY 2021, the project did not assist with any NSCA field-level implementations due to ongoing COVID-19 restrictions. However, the project advised countries in preparation for implementation in FY 2022. Specifically, GHSC-PSM assisted the IMPACT project in Madagascar with the technical planning and conceptualization of an NSCA planned for FY 2022. Additionally, the project provided technical guidance to the Francophone Task Order of the GHSC-TA project in the planning of their NSCA in the Democratic Republic of Congo, which was set to be implemented in Q1 of FY 2022 with direct support from GHSC-PSM in field activities. The project has also worked on minor enhancements to the NSCA toolkit based on consultations with other

organizations about their experiences in using the tool. The toolkit update is slated for release in early FY 2022.

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, share supply chain information with other donors and collaborators as a global good, ensure that the project's supply chain stays current with emerging requirements, and effectively manage and share 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

At PMI's request, GHSC-PSM has participated in three malaria global task forces since the onset of COVID-19, the Malaria Pharmaceutical (Pharma) Global Task Force, Malaria Rapid Diagnostic Test (mRDT) Global Task Force, and the Vector Control Access (the former "Insecticide Treated Nets/Indoor Residual Spraying (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 Bill and Melinda Gates Foundation and Medicines for Malaria Venture.

GHSC-PSM provides market intelligence, informs discussions around market health and supply chain risk, and contributes to risk mitigation strategies and interventions in these forums. The project takes a leading role in smaller working groups as well. GHSC-PSM initiated and co-chairs a sub-working group of the Pharma Task Force that focuses on upstream supply chain challenges in the KSM and API markets. (See section C2 **"Commodity Risk Mitigation"** for more information.) Also, the team leads monthly meetings with the Global Fund and United Nations Children's Fund (UNICEF) to collaborate on strategic and operational topics related to mRDTs, including supplier/market updates, country updates, review orders, country stock status, prioritizing country orders, and any other issues that need to be addressed related to mitigating impact on the supply of mRDTs.

GHSC-PSM works closely with major procurers to coordinate activities in strategic pharmaceutical markets. In Q2, GHSC-PSM worked with the Global Fund, UNICEF, and the Malaria Consortium to share demand information and coordinate procurement planning for SPAQ for the FY 2022 SMC campaigns. In Q3, the project initiated a collaborative deep-dive assessment of artesunate suppositories in response to persistent market challenges. These efforts enable GHSC-PSM to engage with stakeholders on practices to stabilize and shape commodity markets, share market intelligence up and down the supply chain, and ensure responsible distribution of constrained supply based on urgency and country needs.

Global Collaboration for QA Activities

In FY 2021, GHSC-PSM kicked off a working group on LLIN quality and the QMS of manufacturers and initiated a monthly meeting with the Global Fund and UNICEF to gather information and brainstorm processes to improve quality and QMS for LLINs. The working group invited WHO PQ as a critical stakeholder to acquire updates on past, current, and upcoming quality assurance activities for the LLIN industry.

In Q4, GHSC-PSM chaired the global LQAG, which provides a forum for monitoring and communicating LLINs' quality-related concerns and trends to facilitate and implement activities to mitigate quality issues and potential risks.

GHSC-PSM reviewed the draft East African Standards for LLINs and solicited comments from LQAG members to provide feedback to EAS governing bodies.

GHSC-PSM led the collaboration with a receiving country and an LLINs supplier to generate a quality agreement on the QC activities for execution prior to and following LLIN shipments LLINs. The agreement proactively outlines the requirements that govern the quality control inspection activities, determines criteria for outcomes of the inspection as well as identifies responsible parties.

The project and Global Fund continued the monthly collaboration meetings. PMI and Global Fund engage the same manufacturers, use WHO guidance, and often experience similar supplier challenges. Representatives from both teams discussed QA/QC activities to mitigate COVID-19 restrictions, out-of-specification investigations, and other shared experiences.

Global Collaboration for Global Standards and Traceability

In FY 2021, the project collaborated with strategic partners to adopt GS1 healthcare standards in procurement. The project met with the IDA Foundation biweekly to advance the TraceNet working group co-convened by USAID and Global Fund to develop recommendations for identifying and labeling LLINs. This group aligned on GSI compliance messaging to LLIN suppliers. The upcoming GS1 phase three deadline for LLINs in June 2022 requires serialization of the individual nets and GS1 labels on the bales. The project reached out to suppliers with the requirements for compliance. Most suppliers began the necessary processes, and the project looks forward to collaborating with suppliers as they make progress towards compliance for the upcoming deadline.

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, more sustainable markets in the long run.

Updates to COVID-19 Procurement Strategies

GHSC-PSM executed new sourcing strategies for all priority commodities in FY 2021. As the public-sector mRDT market continued to experience competition for COVID-19 diagnostics and containers—exclusively used to ship LLINs—remained in short supply, the project employed an ordinal ranking strategy for both commodities, aligning country needs with the most appropriate supplier.

To mitigate production and shipping backlog risks exacerbated by COVID-19, GHSC-PSM leveraged the emergency loan fund and sequenced proactive procurement sourcing strategies for ACTs, SP, SPAQ, and severe malaria medications. In combination, these actions enabled GHSC-PSM to capitalize on available capacity and secure supply amidst the evolving dynamics of COVID-19.

Commodity Risk Mitigation

As COVID-19 lockdowns interrupted manufacturing operations and a cascade of events perpetuated container shortages and delays in the global freight industry, understanding the end-to-end supply chains in which the project operates remained a key strategic initiative throughout FY 2021.

The project reinforced measures built into its business to understand the upstream landscape of the finished product manufacturers from whom it directly procures. GHSC-PSM requested solicitations for component materials, including KSMs to produce APIs, packaging, and other product components. This information probed suppliers' mitigation strategies, safety stock levels, and redundancy efforts, which the team built into all supplier business review meetings. The project emphasized the importance of a diversified supply base through tenders and in business review meetings throughout the year.

Delays in the upstream piperonyl butoxide (PBO) market led to the legacy supplier's announcement of force majeure early in FY 2021, impacting numerous GHSC-PSM LLIN manufacturers. With only two prequalified sources of the synergist on the market, the disruption prompted GHSC-PSM to establish direct communication with both PBO companies, given the active ingredient's importance as entomological profiles of mosquitoes in PMI countries continue to evolve. While the legacy supplier lifted the force majeure by the end of FY 2021, the project now has a direct line of communication to both upstream companies.

The KSM/API working group met regularly, sharing information to increase visibility and identify and mitigate risks related to the upstream supply chains of KSM and API for finished malaria pharmaceutical products. The project led the development of a tool for collective data capture. GHSC-PSM presented the tool to PMI and made it available to all working group members. Comparing publicly available data on the WHO website with information received directly from suppliers through strategic tenders, the project is prototyping a tool that turns data scripts into a shareable web application to facilitate conversations and drive analysis and investigation into specific drugs, molecules, and associated risks with stakeholders.

The malaria pharma category saw evolving developments in the sulfadoxine KSM market. Used in the manufacture of the project's most high-priority drug (SPAQ) for malaria prevention in children and by pregnant women through IPTp programming, the KSM experienced ongoing economic constraints impacting production. Geopolitical and production disruptions in China related to the rising cost of coal and crude oil and the country's carbon-neutral policy became more apparent toward the end of FY 2021. Together with existing COVID-19 constraints, these dynamics magnified challenges in securing certain starting materials for finished product suppliers, as many of the ingredients are energy-intensive and subject to known offline periods during the summer months. To secure more primary information, GHSC-PSM brokered an introduction with one of the main suppliers of sulfadoxine KSM, which enabled communication on challenges and opportunities in the market toward supply chain resiliency.

Other Global Innovations

At the central and country levels, GHSC-PSM tests and promotes new approaches to ensure the availability of lifesaving commodities for the people who need them. Illustrative innovations from FY 2021 include:

- **Initiated outreach and communication with critical API and LLIN ingredient manufacturers,** orienting to the project, sharing notional demand figures for the respective finished product, and receiving an overview of each company's business, toward greater transparency and collaboration.
- Presented monthly **commodity risk assessments** to PMI throughout the year, analyzing geographical sourcing of commodities, market updates, and supplier-specific ability to meet goods availability dates, reflecting the most up-to-date information.
- Maintained a pulse on **malaria commodity product developments** to advance market health objectives. Hosted and participated in preliminary calls addressing insecticide resistance, HRP2 gene deletion, and product innovations in key LLIN, mRDT, and pharma markets.

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

International Meetings and Conferences

GHSC-PSM participated in the virtual **American Society of Tropical Medicine and Hygiene Annual Meeting** in Q1. At the meeting, the project presented four posters,[14] three focused on malaria activities:

- Angola: Building Supply Chain Expertise in the Angolan Ministry of Health to Improve Malaria and other Health Programs
- Cross-cutting: New Technologies and Global Standards for Improved Health Outcomes
- Kenya (TO5): Use of Routine Supply Chain Data to Improve Rollout of Community Case Management for Malaria in Siaya County, Kenya

The project participated in the virtual **Global Health Supply Chain Summit** in Q1, leading one oral presentation from Angola on activities co-funded by the malaria task order, "Angola: Supply Chain Preparedness and Response through Approach Redesign and Partnership – GHSC-PSM Angola COVID-19 Pandemic Experience."

GHSC-PSM participated in the **Global Digital Health Forum** as a presenter to introduce the QAT, a modernized FASP solution that is replacing legacy FASP software and aims to improve country-led supply planning, global data visibility, and thus availability of commodities across health programs.

Other Malaria Meetings and Events

Alliance for Malaria Prevention Partners Meeting: GHSC-PSM attended this annual partners' meeting, held virtually in Q2, focused on the malaria-burden country perspective. Main themes included 1)

[14] https://www.ghsupplychain.org/news/american-society-tropical-medicine-hygiene-annual-meeting-2020

lessons learned during COVID-19 regarding LLIN distribution, 2) multi-product campaigns, and 3) equity in vector control.

Global FY 2022 SMC Campaign Planning: GHSC-PSM worked with the Global Fund, UNICEF, and Malaria Consortium to share demand information and coordinate planning of procurement of SPAQ for FY 2022 SMC campaigns.

World Malaria Day celebration: In Burkina Faso, to improve health commodity logistics management performance at the peripheral level and to recognize the high performers, GHSC-PSM through the World Malaria Day event (April 25, 2021), awarded prizes, trophies, and certificates to the health districts and hospitals with the best performance in logistics management of malaria commodities and malaria cases management throughout the year 2020. The U.S. Ambassador in Burkina Faso and Government authorities (Minister of Health, Vice President of National Assembly) presented the awards to the recipients. Five trophies were awarded to four districts and one hospital (photo 1). As part of the World Malaria Day celebration event, the U.S. Ambassador also visited the public health supply chain facilities to understand how malaria commodities are distributed from the central warehouses (CAMEG central) to the district stores and down to the health facilities.

The U.S. Ambassador with representatives of three of the five districts that received trophies and the certificates from the Ambassador's hands. (Photo credit: GHSC-PSM)

The CAMEG Director General (left) presented the central warehouse and USAID support through GHSC-PSM for warehouse reconfiguration (product location), which significantly reduced product destocking time, and the temperature monitoring system to the U.S. Ambassador (middle) in the presence of the NMCP coordinator (right). (Photo credit: GHSC-PSM)

The Bogodogo district store's manager explained to the U.S. Ambassador how the distribution of malaria commodities to the health facilities is documented on the stock cards. (Photo credit: GHSC-PSM)

The U.S. Ambassador visited a health facility store in Ouagadougou. The health facility's head nurse (left) presented the stores and commodity management. (Photo credit: GHSC-PSM)

C.4 Coordination and Collaboration within GHSC-PSM

Coordination across Health Areas within the IDIQ

GHSC-PSM promotes collaboration across the four health areas and with other GHSC-funded activities. The project uses the scale of its work across multiple health areas to benefit all task orders. Due to the project's economies of scale, significant cost savings related to infrastructure (e.g., through 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 a new requisition order, purchase order, and inventory order reports, developing a toolbox to estimate lead time and freight costs and designing integration with other tools. (See Section A.4.) ARTMIS integrates with partner systems like the Global Family Planning Visibility and Analytics Network, PMI's M-DIVE, and OHA's Data Development Commons (in progress currently). Shared funding allows for specialized support, such as market dynamics, knowledge management and communications, and monitoring and evaluation (M&E).

The project's four primary health areas co-fund important innovations such as GS1. In FY 2021, the project saw progress in supplier compliance with GTIN, GLN, and GDSN requirements for malaria products, enabling the use of this data in global and national supply chain processes and systems. GHSC-PSM supports the adoption of global standards in supply chain processes through technical assistance within country programs. For full details on GS1 activities in FY 2021, see Section A.4.

The project advanced the forecasting and supply planning tool from Pipeline to QAT in FY 2021, co-funding all four health areas. The module for supply planning has been implemented in 13 countries in FY 2021, with four additional countries ready to implement in Q1 FY 2022. Six countries advocated and trained ministries' staff in the use of QAT by their government counterparts. GHSC-PSM initiated the development of the second QAT module for forecasting. The project will pilot this module in Q2 FY 2022, see Section B.1.

Numerous health programs observed the utility of PMI's long-standing EUV survey and requested GHSC-PSM adapt the survey to meet their needs, such as reproductive health and maternal, newborn and child health programs. 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. For full details on EUV activities in FY 2021, see Section B4.

GHSC-PSM maximizes synergies across health programs. The project develops approaches and systems in one health area that diffuse to other areas. Multiple health areas fund most of GHSC-PSM country offices. This provides enormous benefits for country offices, which share the cost of office space, infrastructure, and staff. The health areas 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 forecasting and supply planning, warehousing, distribution, inventory management, and LMISs. For example, the project installed temperature and humidity sensors in warehouses to monitor the storage environment for commodities from all health areas. The project implemented this tool in Burkina Faso, Cameroon, Ghana, Guinea, Mozambique and Zimbabwe.

Coordination with Other USAID GHSC-funded Activities

Separate GHSC contracts—e.g., a bilateral contract known as Task Order 5 under GHSC-PSM, or Afya Ugavi, in Kenya; and a multi-award GHSC-TA contract—provide technical assistance through field offices in several countries, including in PMI-supported countries Benin, DRC, Senegal, and Tanzania, and through 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 in 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 and efficiently 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 memorandums of understanding 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 on global supply chains and TO2 commodities and provides 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 M&E plan with performance indicators that reflect the project's 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.

GHSC-PSM's M&E plan includes quarterly, semiannual, and annual indicators. The project collects and cleans performance monitoring data and calculates relevant indicator values for each reporting period; these are reported in the project's contractual quarterly and annual reports. GHSC-PSM performs extensive quality assurance of on-time delivery data and works continually with project staff to ensure the quality of other indicator data. Headquarters-based M&E specialists carefully 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 also support the relevant teams in reflecting on progress and prioritizing areas for improvement.

D.2 TO2 Regular Meetings and Review

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

- A weekly malaria task order management team meeting to discuss issues specific to malaria task order activities
- Daily Global Supply Chain meetings to review all pending orders and determine priority actions for appropriate malaria order management
- Weekly GHSC-PSM program management meetings to discuss cross-cutting project issues that impact project health areas, including the malaria task order

GHSC-PSM also has several standing meetings with the USAID/PMI team, including:

- Weekly GHSC-PSM malaria task order and PMI team meetings to review the status of pending malaria orders, provide updates on progress in systems strengthening activities, and present and discuss new sourcing strategies and innovations for PMI approval before implementation.
- Biweekly GHSC-PSM malaria task order QA and PMI meetings to review and discuss progress and issues related to TO2 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 issues related to technical assistance in evaluation that has cross-country applicability.
- Biweekly Logistics TWG meetings to review Deliver/Return and 3PL metrics, RDC metrics, and current logistical challenges and issues; participants also present and discuss customized logistics solutions that are developed to improve project performance.
- Monthly ARTMIS Change Control Board meetings hosted by the Management Information System (MIS) team with the USAID technical backstops to review proposed ARTMIS changes such as corrections to defects or new functionalities.
- Bi-weekly 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 all task orders; track funding streams and sources for procurement transactions and in-country activities; financial reporting; and update or discuss any topic related to finance across Task Orders.
- Bi-monthly GHSC-PSM and USAID Development Data Library TWG meetings to review and discuss 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), the project implements the GHSC-PSM Initial Environmental Examination (IEE) and the Environmental Mitigation and Monitoring Plan (EMMP). This includes providing multi-faceted services to staff globally, including reviewing solicitation and contractual documents to ensure appropriate integration of IEE and EMMP requirements, as well as reviewing technical documents pertaining to USAID's 22 CFR 216 Agency Environmental Procedures, technical guidance, and direct technical assistance.

GHSC-PSM monitors all environmental mitigation activities against the activity-level mitigation requirements, representing a flow down of project-wide environmental safeguarding requirements described in the IEE and EMMP. The project shares this information with the home office environmental compliance team, which analyzes the data, identifies trends (e.g., challenges, lessons learned, success stories), and compiles the information into the annual Environmental Mitigation and Monitoring Report (EMMR).

In Q2, GHSC-PSM submitted the FY 2020 EMMR. The project will conduct the FY 2021 EMMR in Q1 FY 2022 and submit it to USAID by January 1, 2022, per an approved extension from USAID.

The COVAX technical assistance support that increased during Q3 resulted in rising levels of waste generated by mass COVID-19 vaccination campaigns. GHSC-PSM prepared a COVAX Waste Management technical brief to answer frequently asked questions and clarify the type of waste management technical support the project offers partner governments.

In Q4, GHSC-PSM clarified waste management support to partner governments to manage increased waste production due to mass COVID-19 vaccination campaigns. GHSC-PSM also provided technical guidance to country-based teams and partner governments on health care waste management operations and compliance in preparation for project closeout. After a request from USAID in Q4, GHSC-PSM began the collection and destruction of one million expired COVID-19 RDTs at Travis Air Force Base in California. The project facilitated the collection and transport of 196 pallets into temporary storage where waste segregation and handling occurred to sort recyclable items into separate waste streams. The project will complete this work in Q1 FY 2022.

GLOBAL HEALTH SUPPLY CHAIN PROGRAM

Procurement and Supply Management

GHSC-PSM Task Order 2 (Malaria)

Annual Report External Annex FY2021

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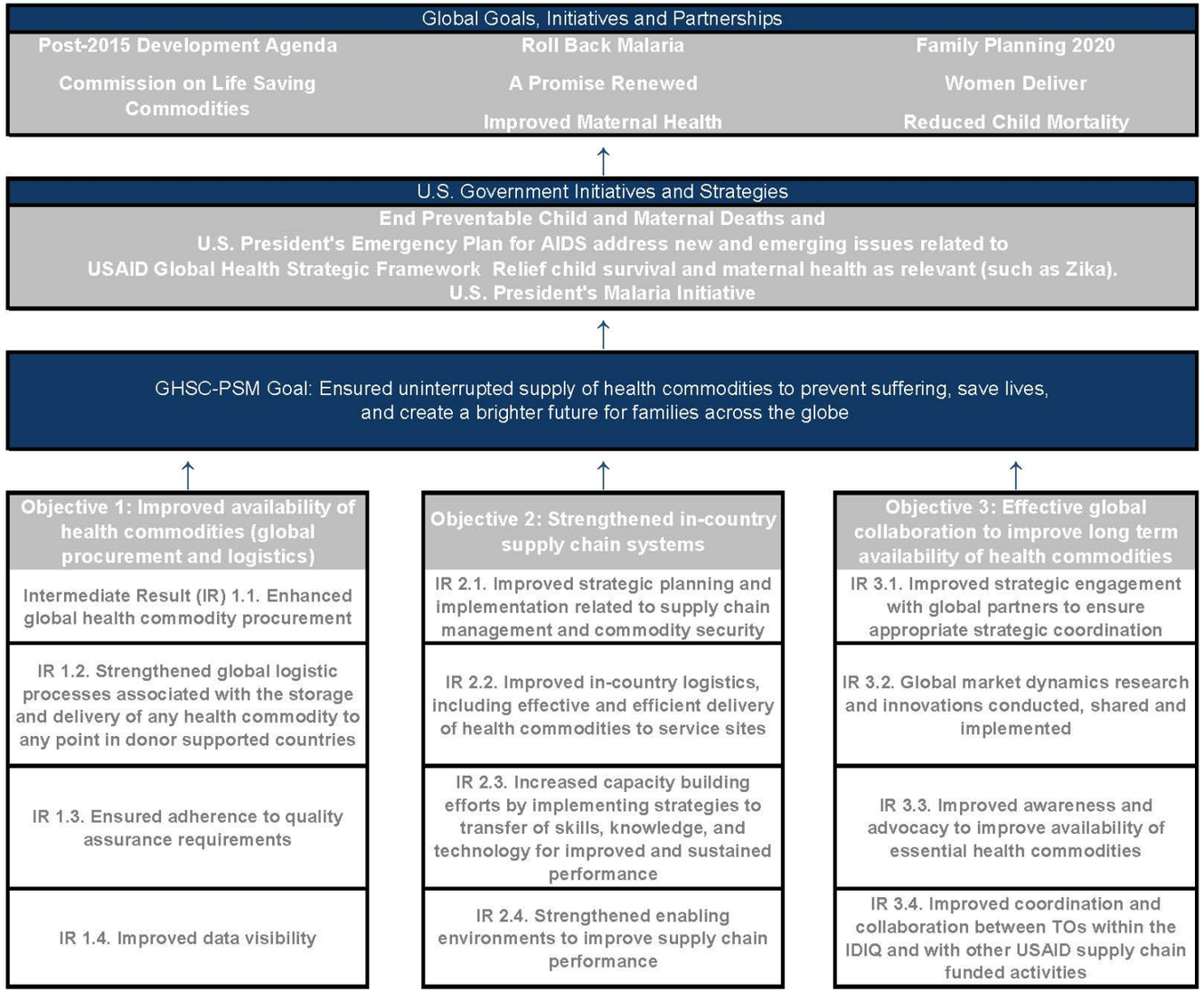
Annex A. GHSC-PSM Results Framework



Annex B. Indicator Details

Check out the GHSC-PSM IDIQ M&E Plan for complete details on all our indicators.

GHSC-PSM Global Supply Chain Indicators

Indicator Code	Name	Numerator	Denominator	Data Source(s)	Reporting frequency	Other Info
A01a	On Time, In Full Delivery (OTIF) - Percentage of line items delivered on time and in full, within the minimum delivery window (within -14/+7 calendar days of the agreed delivery date (ADD))	Number of line items delivered to the recipient on time and in full during the quarter	Total number of line items delivered to the recipient during the quarter	ARTMIS	Quarterly	Lines items are considered on-time and in-full if the full ordered quantity of the line item is delivered to the recipient within the -14/+7 day delivery window. If the line item is partially delivered within the window, it may be considered on-time but not in-full.
A01b	On Time Delivery (OTD) — Percentage of line items delivered on time, within the minimum delivery window (within -14/+7 calendar days of the agreed delivery date (ADD))	Number of line items with an ADD during the quarter that were delivered to the recipient on time	Total number of line items with an ADD during the quarter	ARTMIS	Quarterly	
A02	Percentage of QA processes completed within the total estimated QA lead times (on-time completion rate for QA processes)	Number of consignments complying with the pre-established QA lead times during the quarter	Total number of consignments requiring QA processes that were cleared for shipment during the quarter	QA Database	Quarterly	Consignment is defined as a shipment of commodities, including one or more line items. QA process transactions are managed at the consignment level, regardless of the number of line items in the consignment.
A03	Cycle time (average)	Sum of cycle time for all line items delivered during the quarter	Count of all line items delivered during the quarter	ARTMIS	Quarterly	Overall cycle time is defined as the number of days between when a customer order is submitted to when the shipment is actually delivered to the customer, inclusive of the start/end days and all holds or other dwell times. The project is implementing new dwell tracking procedures, with the intent of reporting dwell-adjusted cycle time by FY2021.
A04	Inventory turns (average number of times inventory cycles through GHSC-PSM controlled global facilities)	Total ex-works cost of goods distributed from GHSC-PSM-controlled global inventory stocks (in USD) within the fiscal year	Average monthly inventory balance (in USD)	Inventory extract	Annual	
A05	Total Landed Cost (as a percentage of total value of commodities delivered to recipients)	Sum of all freight and logistics costs (in USD) paid by GHSC-PSM during the reporting period	Sum of the value of all commodities delivered to recipients during the	ARTMIS, Monthly Financial Statement	Semiannual	The project will also report a variant of this indicator that includes all HQ supply chain operations costs in the numerator. Quality assurance costs will be excluded from all task orders, as QA costs are not paid by GHSC-PSM for all task orders. A version of the

Annex B. Indicator Details

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GHSC-PSM Global Supply Chain Indicators

Indicator Code	Name	Numerator	Denominator	Data Source(s)	Reporting frequency	Other Info
A06a	Absolute percent supply plan error, with variants annual absolute percent error and supply plan bias	Absolute value of the differences between the actual quantities with requested delivery dates during the quarter minus the quantities planned for delivery according to country supply plans	Sum of the actual quantities with requested delivery dates during the quarter	ARTMIS, Country Supply Plans	Quarterly	Supply plan error is currently calculated for adult and pediatric ARVs, HIV lab products, ACTs, and malaria rapid diagnostic tests. Planned quantities are drawn from an aggregation of country supply plans submitted in the prior quarter, including only the quantities that are forecasted to be procured through GHSC-PSM. Actual quantities are derived based on the requested delivery dates for products included in customer ROs submitted to ARTMIS.
A07	Percentage of line items imported using a temporary registration waiver (temporary waiver percentage)	Number of line items that were imported using a temporary registration waiver	Total number of line items delivered to the recipient during the quarter	Supplier registration bidding documentation	Quarterly	
A08	Average percentage of shelf life remaining for warehoused commodities, weighted by the value of each commodity's stock (product at risk percentage)	Percentage of shelf life remaining at the end of the quarter, weighted by value of commodities, summed across all products	Total value of commodities, summed across all products, at the end of the quarter	Inventory extract	Quarterly	Shelf life requirements vary by country and by product.
A10	Percentage of product procured using a framework contract (framework contract percentage)	Value of product purchased through framework contracts during the quarter	Total value of commodities purchased during the quarter	ARTMIS	Quarterly	
A13	Percentage of batches of product for which the final result is showing nonconformity (out of specification percentage)	Total number of batches of product showing nonconformity during the quarter	Total number of batches tested during the quarter	QA Database	Quarterly	

Annex B. Indicator Details

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GHSC-PSM Global Supply Chain Indicators

Indicator Code	Name	Numerator	Denominator	Data Source(s)	Reporting frequency	Other Info
A14a	Average vendor rating score - Commodity suppliers	Sum of all key vendor ratings	Number of key vendors from whom GHSC-PSM procured products/commodities during the quarter	ARTMIS	Quarterly	Scorecards are compiled on one-month lag, i.e. Q1 data represents vendor performance from Sept-Nov. Supplier OTIF is currently reported for high value and/or high risk suppliers. Only suppliers for which one or more order line items were fulfilled in this reporting period were included. All vendors are equally weighted in the overall score, regardless of procurement volume from each vendor.
A14b	Average vendor rating score - QA lab services	Sum of all key vendor ratings.	Number of key vendors from whom GHSC-PSM procured lab testing services during the quarter	QA scorecard	Quarterly	All vendors are equally weighted in the overall score, regardless of procurement volume from each vendor.
A14c	Average vendor rating score - Freight forwarders	Sum of all key vendor ratings	Number of key vendors from whom GHSC-PSM procured freight forwarding services during the quarter	3PL scorecard	Quarterly	To allow complete data collection, freight forwarder scorecards are conducted on a one-month lag (i.e. Q1 data represents performance from Sept-Nov, rather than Oct-Dec). Overall score is weighted by delivery volume, such that vendors who deliver a greater number of shipments will have a relatively greater impact on the result.
A15	Percentage of quality assurance Investigation reports submitted within 30 calendar days of outcome determination (QA investigation report submission)	Number of QA investigation reports submitted to PMI within 30 days of outcome determination	Total number of QA investigation reports due during the reporting period	QA Database, email submissions	Semiannual	
A16	Percentage of backlogged line items	Number of line items with an ADD on or before the reporting period end date, within a rolling 12-month period, that have not been cancelled or put on hold and that are currently undelivered and late	Total number of line items with an ADD on or before the reporting period end date, within a rolling 12-month period, that have not been cancelled or put on hold	ARTMIS	Quarterly	

Annex B. Indicator Details

Check out the GHSC-PSM IDIQ M&E Plan for complete details on all our indicators.

GHSC-PSM Country Level Indicators

Indicator Code	Name	Numerator	Denominator	Data Source(s)	Reporting frequency	Other Info
B01	Stockout rate at SDPs	Number of SDPs that were stocked out of a specific tracer product according to the ending balance of the most recent logistics report (or on the day of site visit)	Total number of SDPs that reported/were visited in GHSC-PSM-supported countries that offer the tracer product	LMIS reports, End User Verification surveys, other country-specific stock data sources	Quarterly	Stockout rates are provide for all tracer products for which data is available, regardless of whether GHSC-PSM procures or delivers the product. Data is provided for the ending balance of the middle month of each quarter for most countries. "Composite stockouts" are presented for select malaria and family planning commodities, indicating where SDPs are stocked out of all products they offer within the same product type or contraceptive method. At the task order level, aggregated stockout rates are calculated based on all SDP stock observations summed across all tracer products for that TO. TO-level denominators will therefore be greater than the number of SDPs that reported in that health area.
B02	Percentage of stock status observations in storage sites, where commodities are stocked according to plan, by level in supply system	Number of stock status observations for a tracer product that are within the designated minimum and maximum quantities at storage sites	Total number of stock status observations for a tracer product at storage sites	Warehouse management information systems, partner stock reports	Quarterly	Stocked according to plan rates are provided for all tracer products for which data is available, regardless of whether GHSC-PSM procures, delivers, or manages inventory for the product. Stock "observations" are typically based on inventory reports and will include as many observations (monthly, quarterly) from as many storage locations as are available at the time of reporting.
B03	SDP reporting rate to the LMIS	Number of SDPs whose LMIS report(s) or order form(s) were received at the central level within 30 days of the specified in-country deadline	The total number of SDPs in country that are required to report	LMIS reports, other country-specific stock data sources	Quarterly	All sites that have submitted reports within 30 days of the country-specified deadline are considered "reporting" for this indicator. Some countries have limited access to SDP-level data and are reporting rates from a small number of sites. Number of sites reporting for each country is listed on the "Complete Results" page for each country.
B04	Average rating of in-country data confidence at the central, subnational, and SDP levels (data availability, accuracy and timeliness)	Sum of all rating scores (0-9 points each) for all sites reporting	Total number of sites reporting	Data quality assessments	Annual	GHSC-PSM collects data for this indicator via data quality assessments conducted at health facilities and warehouses. Sites are scored based on the availablity, accuracy, and timeliness of relevant supply chain data points. The selection methodology and number of sites visited varies between countries depending on available resources and other country-specific factors.
B05	Percentage of required annual forecasts conducted	Number of required annual forecasts conducted	Total number of required annual forecasts	Annual forecast documents	Annual	Annual forecast requirements for each country mirror their supply plan requirements.
B06	Percentage of required supply plans submitted to GHSC-PSM during the quarter	Number of required supply plans that were submitted to GHSC-PSM in the quarter	Total number of required supply plans	Country supply plans, FASP tracker	Quarterly	Supply plan submission expectations are determined in consultation with USAID, headquarters FASP team, and field office technical leads. Submission rates are only calculated for prioritized submissions. Additional supply plans beyond the requirements are often submitted to GHSC-PSM headquarters.

Annex B. Indicator Details

Check out the GHSC-PSM IDIQ M&E Plan for complete details on all our indicators.

GHSC-PSM Country Level Indicators

Indicator Code	Name	Numerator	Denominator	Data Source(s)	Reporting frequency	Other Info
B07	Percentage of total spent or budgeted on procurement of commodities for public sector services by the government, USG, the Global Fund, or other sources	Total budgeted/spent on health care commodities by a specific stakeholder in a country	Total budgeted/spent on health care commodities in a specific country	Supply plans, budgets, warehouse receipts, etc.	Annual	Data for this indicator may represent actual spending or budgeted amounts, depending on data availability. Data may represent U.S. government fiscal year, host government fiscal year, or other relevant annual period depending on data availabilitiy.
B08	Percentage of targeted supply chain activities in which the host country entity has achieved technical independence with GHSC-PSM technical assistance.	Total number of targeted supply chain activities for which the relevant host country entity has achieved technical independence with GHSC-PSM technical assistance.	Total number of targeted supply chain activities	GHSC Supply Chain Technical Independence Scorecard; document reviews; key informant interviews	Annual (reported Q3)	This indicator is measured for a defined set of targeted supply chain activities within each country that are expected to become technically independent by the end of the project, with GHSC-PSM technical assistance. The targeted activities are selected jointly between the USAID mission and the GHSC-PSM field office. The host country entities responsible for carrying out the targeted activities are then assessed on key capacity elements and their role in the implementation of the activity.
B09	Supply chain technical staff turnover rate	Number of supply chain technical staff who left the active health labor force in the last year	Total number of supply chain technical staff at the beginning of last year	Supply chain agency HR data	Annual	Data collection for this indicator focuses on technical employees of the primary supply chain agency in each country. It includes mainly central-level staff, with some countries including subnational levels if relevant and if data is available. It does not include all members of the health workforce who do supply chain tasks, such as SDP staff who keep and report consumption and stock records.
B10	Percentage of GHSC-PSM-supported countries that have a functional logistics coordination mechanism in place	Total number of countries with a functional logistics coordination mechanism in place as determined by a qualitative assessment	Total number of countries supported by GHSC-PSM for technical assistance	Key informant interviews	Annual	Logistics coordination mechanisms are scored against six criteria, each with a point value. The maximum score is 11. Any mechanism that scores 8 or more is considered functional. More detail is available in the project M&E plan.
B11	Percentage of leadership positions in supply chain management that are held by women (in countries where GHSC-PSM is providing technical assistance related to workforce development)	Number of leadership positions in supply chain management that were held by women in a specified time in countries where GHSC-PSM is providing technical assistance related to workforce development	Total number of leadership positions held in a specified time, in countries where GHSC-PSM is providing technical assistance related to workforce development	Supply chain agency HR data	Annual	
B12	Absolute percent consumption forecast error, with forecast bias variant	Absolute value of the difference between the actual quantities of products consumed at service delivery points during the year minus the forecasted consumption for the year	Sum of the actual quantities of products consumed during the year	Annual forecasts; Comsumption or issues data from LMIS or WMS	Annual	

Annex B. Indicator Details

Check out the GHSC-PSM IDIQ M&E Plan for complete details on all our indicators.

GHSC-PSM C-Level Indicators

Indicator Code	Name	Numerator	Denominator	Data Source(s)	Reporting frequency	Other Info
C01	Number of innovations (including operations research studies) that were developed, implemented, or introduced and are related to the health commodity market or supply chain best practices	Number of innovations (including operations research studies) that were developed, implemented, or introduced and are related to the health commodity market or supply chain best practices	NA	Field office reports, work plans	Quarterly	Innovations are reported in the quarter in which they are launched. Activities are considered innovations if they represent a significant advancement for the country. Similar activities may be reported from multiple countries.
C02	Number of people trained	Number of people trained. "People trained" refers to any type of participant, student, or learner in a training event, regardless of its duration	NA	Registration forms, attendance sheets	Quarterly	Training of USAID and GHSC-PSM personnel is excluded from this indicator. Participants may be counted more than once if they attend multiple discrete training activities.
C07a	Percentage of product lost due to expiry while under GHSC-PSM control (product loss percentage)	Total value of product lost due to expiry during the quarter	Average inventory balance (in USD) during the quarter	Inventory reports	Quarterly	Expiries from the Regional Distribution Centers (RDCS) are presented in the GSC section of this report. Expiries that occur in warehouses that GHSC-PSM manages in countries are reported in the country-specific sections of this report.
C07b	Percentage of product lost due to theft, damage, or other causes, while under GHSC-PSM control (product loss percentage)	Total value of product lost due to theft, damage, or other causes during the quarter	For losses in transit: Total value (in USD) of product delivered during the quarter For losses in storage: Average inventory balance (in USD) during the quarter	GHSC-PSM Continual Improvement system reports	Quarterly	Product losses due to incidents are reported only after the actual value of the loss has been determined, which may be later than the quarter in which the incident took place or was first reported to GHSC-PSM Continual Improvement.

ANNEX C. COMMODITY SOURCES

Eligible RDT Manufacturers			
Manufacturer	**Test Name**	**Target Antigen**	**Species**
Abbott Diagnostics Korea, Inc.	Malaria Rapid Diagnostic test (RDT) HRP2 (Pf) Cassette, 25 tests (Bulk + POCT)	HRP2	Pf
	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf) Cassette, 25 Tests (Bulk + POCT)	HRP2/pLDH	Pf
	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf/PAN) Cassette, 25 Tests (Bulk + POCT)	HRP2/pLDH	Pf/PAN
	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf/Pv) Cassette, 25 Tests (Bulk + POCT)	HRP2/pLDH	Pf/Pv
Access Bio, Inc.	Malaria Rapid Diagnostic test (RDT) HRP2 (Pf) Cassette, 25 test (Bulk + POCT)	HRP2	Pf
	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf) Cassette, 25 Tests (Bulk)	HRP2/pLDH	Pf
	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf/PAN) Cassette, 25 Tests (Bulk)	HRP2/pLDH	Pf/PAN
	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf/Pv) Cassette, 25 Tests (Bulk)	HRP2/pLDH	Pf/PV
Advy Chemical Pvt. LTD.	Malaria Rapid Diagnostic test (RDT) HRP2 (Pf) Cassette, 25 test (Bulk)	HRP2	Pf
Arkray Healthcare Pvt. Ltd.	Malaria Rapid Diagnostic test (RDT) HRP2 (Pf) Cassette, 25 test (Bulk)	HRP2	Pf
Meril Diagnostics Pvt. Ltd.	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf/Pv) Cassette, 25 Tests (Bulk + POCT)	HRP2/pLDH	Pf/Pv
Premier Medical Corporation Ltd.	Malaria Rapid Diagnostic test (RDT) HRP2 (Pf) Cassette, 25 tests (Bulk + POCT)	HRP2	Pf

	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf/PAN) Cassette, 25 Tests (Bulk + POCT)	HRP2/pLDH	Pf/PAN
	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf/Pv) Cassette, 25 Tests (Bulk + POCT)	HRP2/pLDH	Pf/Pv
SD Biosensor, Inc	Malaria Rapid Diagnostic test (RDT) HRP2 (Pf) Cassette, 25 tests (Bulk)	HRP2	Pf
	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf/PAN) Cassette, 25 Tests (Bulk)	HRP2/pLDH	Pf/PAN
	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf/Pv) Cassette, 25 Tests (Bulk)	HRP2/pLDH	Pf/Pv
Tulip Diagnostics [P] Ltd.	Malaria Rapid Diagnostic test (RDT) HRP2 (Pf) Cassette, 25 tests (Bulk + POCT)	HRP2	Pf
	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf/PAN) Cassette, 25 Tests (Bulk + POCT)	HRP2/pLDH	Pf/PAN
	Malaria Rapid Diagnostic Test (RDT) HRP2/pLDH (Pf/Pv) Cassette, 25 Tests, 10 Tests (Bulk + POCT)	HRP2/pLDH	Pf/Pv

Eligible LLIN Manufacturers

Manufacturer	Brand	Material	Pesticide
A to Z Textile Mills Ltd.	Olyset®	Polyethylene	Permethrin
A to Z Textile Mills Ltd.	Olyset Plus®	Polyethylene	Permethrin + PBO
BASF	Interceptor®	Polyester	Alpha-cypermethrin
BASF	Interceptor G2®	Polyester	Alpha-cypermethrin + Chlorfenapyr
Disease Control Technologies	Royal Sentry 2.0®	Polyethylene	Alpha-cypermethrin
Disease Control Technologies	Royal Guard®	Polyethylene	Alpha-cypermethrin + Pyriproxyfen
Fujian Yamei Industry & Trade Co.	Yahe®	Polyester	Deltamethrin
Mainpol GmbH	SafeNet®	Polyester	Alpha-cypermethrin
Shobikaa Impex Private Ltd.	DuraNet®	Polyethylene	Alpha-cypermethrin

Shobikaa Impex Private Ltd.	DuranNet Plus®	Polyethylene	Alpha-cypermethrin + PBO
Sumitomo Chemical Co. Ltd.	Olyset®	Polyethylene	Permethrin
Sumitomo Chemical Co. Ltd.	Olyset Plus®	Polyethylene	Permethrin + PBO
Vestergaard SA	PermaNet 2.0®	Polyester	Deltamethrin
Vestergaard SA	PermaNet 3.0®	Polyester	Deltamethrin + PBO
V.K.A. Polymers Pvt. Ltd.	MagNet®	Polyethylene	Alpha-cypermethrin
V.K.A. Polymers Pvt. Ltd.	Veeralin®	Polyethylene	Alpha-cypermethrin + PBO

Eligible ACT Manufacturers		
Manufacturer	**Product**	**Details**
Ajanta	ALU	20 mg artemether/120 mg lumefantrine 6x1 DT, 6x2 DT, 6x1, 6x2, 6x3, 6x4
		80 mg artemether/480 mg lumefantrine 6x1
	ASAQ	25 mg artesunate/67.5 mg amodiaquine 1x3
		50 mg artesunate/135 mg amodiaqune 1x3
		100 mg artesunate/270 mg amodiaqune 1x3, 1x6
Alfasigma	DHA-PPQ	20 mg Dihydroartemisinin/160 mg Piperaquine
		40 mg Dihydroartemisinin/320 mg Piperaquine
Cipla	ALU	20 mg artemether/120 mg lumefantrine 6x1 DT, 6x2 DT, 6x1, 6x2, 6x3, 6x4
	ASAQ	25 mg artesunate/67.5 mg amodiaquine 1x3
		50 mg artesunate/135 mg amodiaqune 1x3
		100 mg artesunate/270 mg amodiaqune 1x3, 1x6
Cipla Quality Chemical Industries Limited	ALU	20 mg artemether/120 mg lumefantrine 6x1, 6x2, 6x3, 6x4
Ipca	ALU	20 mg artemether/120 mg lumefantrine 6x1 DT, 6x2 DT, 6x1, 6x2, 6x3, 6x4
	ASAQ	25 mg artesunate/67.5 mg amodiaquine 1x3
		50 mg artesunate/135 mg amodiaqune 1x3

		100 mg artesunate/270 mg amodiaqune 1x3, 1x6
Novartis	ALU	20 mg artemether/120 mg lumefantrine 6x1 DT, 6x2 DT, 6x1, 6x2, 6x3, 6x4
		80 mg artemether/480 mg lumefantrine 6x1
Macleods	ALU	20 mg artemether/120 mg lumefantrine 6x1 DT, 6x2 DT, 6x1, 6x2, 6x3, 6x4
	ASAQ	25 mg artesunate/67.5 mg amodiaquine 1x3
		50 mg artesunate/135 mg amodiaqune 1x3
		100 mg artesunate/270 mg amodiaqune 1x3, 1x6
Guilin	ASAQ	25 mg artesunate/67.5 mg amodiaquine 1x3
		50 mg artesunate/135 mg amodiaqune 1x3
		100 mg artesunate/270 mg amodiaqune 1x3, 1x6
	DHA-PPQ	20 mg Dihydroartemisinin/160 mg Piperaquine DT
		40 mg Dihydroartemisinin/320 mg Piperaquine DT
		40 mg Dihydroartemisinin/320 mg Piperaquine
		80 mg Dihydroartemisinin/640 mg Piperaquine
Sanofi	ASAQ	25 mg artesunate/67.5 mg amodiaquine 1x3
		50 mg artesunate/135 mg amodiaqune 1x3
		100 mg artesunate/270 mg amodiaqune 1x3, 1x6
Shin Poong	Artesunate/Pyronaridine	20 mg Artesunate / 60 mg Pyronaridine granules
		60 mg Artesunate / 180 mg Pyronaridine tablets
Strides	ALU	20 mg artemether/120 mg lumefantrine 6x1 DT, 6x2 DT, 6x1, 6x2, 6x3, 6x4
Eligible Severe Malaria Medication Manufacturers		

Manufacturer	Product	Details
Bliss	Artesunate Suppositories	50mg artesunate suppository, 2 pack
		200mg artesunate suppository, 2 pack
Cipla	Artesunate Suppositories	100mg artesunate suppository, 2 pack
Guilin	Injectable Artesunate	Artesunate (w/ 1 Amp NaHCO3 5% + 1 Amp NaCl 09%) 60 mg Vial, 1 Set
		Artesunate (w/ 1 Amp NaHCO3 5% + 1 Amp NaCl 09% + 2 x 10 mL Syringe) 60 mg Vial, 1 Set
		Artesunate (w/ 1 Amp NaHCO3 5% + 1 Amp NaCl 09%) 30 mg Vial, 1 Set
Ipca	Injectable Artesunate	Artesunate (w/ 1 Amp NaHCO3 5% + 1 Amp NaCl 09%) 60 mg Vial, 1 Set
Strides	Artesunate Suppositories	100mg artesunate suppository, 2 pack
Eligible SPAQ Manufacturers		
Manufacturer	**Product**	**Details**
Guilin	SPAQ	Amodiaquine 76.5 mg + Sulfadoxine/Pyrimethamine 250/12.5 mg Dispersible Tablets, 50 x 1 SP + 3 AQ Co-Blister Tablets
		Amodiaquine 153 mg + Sulfadoxine/Pyrimethamine 500/25 mg Dispersible Tablets, 50 x 1 SP + 3 AQ Co-Blister Tablets
S Kant	SPAQ	Amodiaquine 75 mg + Sulfadoxine/Pyrimethamine 250/12.5 mg Dispersible Tablets, 50 x 1 SP + 3 AQ Co-Blister Tablets
		Amodiaquine 150 mg + Sulfadoxine/Pyrimethamine 500/25 mg Dispersible Tablets, 50 x 1 SP + 3 AQ Co-Blister Tablets
Eligible SP Manufacturers		
Manufacturer	**Product**	**Details**
Emzor	SP	500 mg Sulfadoxine/25mg Pyrimethamine, 10x3, 25x3, 50x3, 100, 1000
Guilin	SP	500 mg Sulfadoxine/25mg Pyrimethamine, 10x3, 25x3, 50x3, 100, 1000
Jiangsu Pengyao	SP	500 mg Sulfadoxine/25mg Pyrimethamine, 10x3, 25x3, 50x3, 100, 1000
Medopharm	SP	500 mg Sulfadoxine/25mg Pyrimethamine, 10x3, 25x3, 50x3, 100, 1000
Micro Labs	SP	500 mg Sulfadoxine/25mg Pyrimethamine, 10x3, 25x3, 50x3, 100, 1000

Annex D. Malaria Commodities Procured and Delivered

Total Number of Commodities Procured

Country	ACTs (blister strips)	Laboratory	LLINs (nets)	mRDTs (tests)	Other Pharma	Severe Malaria Meds	SMC	SP (treatments)
Angola	3,317,700		4,053,800	1,317,600		1,326,917		2,500,000
Benin	2,367,630		550,000	4,000,000		307,600	1,160,000	1,300,000
Burkina Faso	6,000,090		1,243,977	7,000,000		9,500	8,380,400	
Burma	10,020		150,000	400,000	170,000			
Burundi	2,802,120		1,047,171	4,942,875		132,626		
Cambodia			336,000	183,200				
Cameroon	1,611,660	10	609,999	1,719,700		1,520,580	15,485,550	747,050
Congo DRC	18,078,550		1,169,683	20,506,075		358,794		8,067,250
Côte d'Ivoire	2,361,660	120	1,144,559	3,189,275		167,720		
Ethiopia	537,300	2,500,074	2,810,219			692,619		
Ghana			1,048,825	2,500,000		545,000	4,673,800	1,940,000
Guinea		3,464,478	234,900		252,000	1,279,406		
Kenya	3,090,000		1,663,576	1,000,000		653,500		
Liberia	2,396,700		479,000	3,200,000	1,000,000	210,047		253,333
Madagascar	4,275,600	4,494,479		7,876,125		545,540		1,150,000
Malawi	8,310,000		1,200,000	4,575,000		25,074		1,733,333
Mali	3,089,250	204,424	1,846,000	3,784,575		460,000	13,556,000	2,126,667
Mozambique	8,282,880			24,450,425		540,000		
Niger	1,859,550		100,000	4,260,625		487,000	9,263,900	1,000,000
Nigeria	25,086,240	83	13,153,400	31,215,675		349,744	5,614,400	
RDMA	2,000	7,600	471,187	12,500	35,000	3,000		
Rwanda	2,600,610		1,142,263			107,688		
Senegal	1,100,030		2,556,477	6,763,125	20,000	270,440	8,451,950	
Sierra Leone	1,267,070	5	327,631	1,715,000		302,000		
Tanzania	3,061,170	6	3,634,695	4,700		555,906		
Uganda	973,530		1,304,413	1,250,000		350,000		
Zambia	4,831,020		600,000	13,478,850		537,400		1,833,333
Zimbabwe	628,370		1,925,000	1,408,000				300,000
Total	**107,940,750**	**10,671,279**	**44,802,775**	**150,753,325**	**1,477,000**	**11,738,101**	**66,586,000**	**22,950,967**

Total Number of Commodities Delivered

Country	ACTs (blister strips)	Laboratory	LLINs (nets)	mRDTs (tests)	Other Pharma	Severe Malaria Meds	SMC	SP (treatments)
Angola	4,207,450		600,000	6,592,150		580,000		2,500,000
Benin	1,999,530			2,000,000		307,600	580,000	650,000
Burkina Faso	8,501,043		551,300	11,250,000		609,500	4,126,250	
Burma	27,000		350,000	400,000				
Burundi	2,802,120		1,560,947	4,942,875		585,228		
Cambodia			336,000					
Cameroon	1,906,020	10	642,957	1,064,250		1,360,856	7,844,600	105,000
Congo DRC	12,043,075	3,213,805	28,000	12,601,625		1,359,522		2,000,000
Cote d'Ivoire	2,946,600	120	3,613,720	2,920,750		111,800		
Ethiopia		1,977,195	3,348,538			477,643		
Ghana		120	4,531,839	2,000,000		330,000	1,878,500	970,000
Guinea	1,144,110	782,000		1,759,725	1,008,000	1,334,572		
Kenya	2,670,000		4,742,348	5,990,800				
Liberia	2,377,080	3,931,490	200,000	4,420,275	1,400,000	145,620		337,500
Madagascar	3,275,600	4,120,000	3,677,000	2,000,000		411,000		500,000
Malawi	8,289,990	4,020,000	1,900,000	6,250,000		25,074		1,633,333
Mali	1,600,020	134,056	1,846,000	6,125,000		320,000	6,780,000	2,000,000
Mozambique	15,495,150			31,026,700		24,000		
Niger	2,300,400			2,800,000		1,181,602	3,249,650	1,424,700
Nigeria	28,896,408	33	7,301,917	28,579,000		211,163	5,614,400	
RDMA	16,070		200,873	450,000	200,000	3,000		
Rwanda	1,186,590					22,095		
Senegal	839,991		723,632	3,813,125	50,200	185,440	3,936,500	
Sierra Leone	1,307,370	5	627,631	1,715,000		302,000		
Tanzania	2,053,710	85,082	4,716,854	4,700		345,906		2,250,000
Uganda	1,216,770		1,942,413			550,000		
Zambia	8,804,160		2,498,000	20,144,925		690,624		1,833,333
Zimbabwe	520,370		1,330,000	1,408,000				
Total	**116,426,627**	**18,263,916**	**47,269,969**	**160,258,900**	**2,658,200**	**11,474,245**	**34,009,900**	**16,203,867**

Notes: Tables above include commodities procured for and delivered to countries. Orders for the emergency stockpile and regional distribution center are excluded. The laboratory category includes a mix of reagents, consumables, and other products, which have varying units. Severe malaria medicines units may be either vials or suppositories depending on the product. Commodities "procured" includes all line items with a purchase order or distribution order released during the fiscal year. Commodities "delivered" includes all line items fully delivered in the fiscal year. Line items partially delivered this year are excluded and will be reported in the year the deliveries are completed.

Annex E. GHSC-PSM Procurement Indicators

A10. Percentage of product procured using a framework contract (framework contract percentage)

Reporting Period	2021-Q1			2021-Q2			2021-Q3			2021-Q4		
Product Category	Procurement total	Framework contract percentage	Framework contract target	Procurement total	Framework contract percentage	Framework contract target	Procurement total	Framework contract percentage	Framework contract target	Procurement total	Framework contract percentage	Framework contract target
ACTs	$18,143,700	100%		$17,680,393	100%		$6,870,446	100%		$3,733,942	100%	
Laboratory	$223,827	100%		$248,177	99%		$179,533	100%		$255,969	100%	
LLINs	$21,339,110	90%		$56,974,631	81%		$5,258,320	62%		$15,634,784	70%	
mRDTs	$8,347,913	93%		$19,312,767	95%		$6,857,276	92%		$8,870,621	100%	
Other Non-Pharma	$62,970	100%		$804,258	100%		$16,478	100%		$13,712	100%	
Other Pharma	$42,500	100%		$13,125	100%		$13,272	100%		$1,400	100%	
Severe Malaria Meds	$5,670,693	100%		$3,676,812	100%		$3,317,311	100%		$3,701,413	100%	
SMC	$977,200	100%		$1,295,932	100%		$286,452	100%		$8,712,559	100%	
SP	$805,850	100%		$2,563,253	100%		$719,696	100%		$1,257,297	100%	
Total	**$55,613,763**	**95%**	**85%**	**$102,569,348**	**88%**	**85%**	**$23,518,783**	**89%**	**85%**	**$42,181,696**	**89%**	**85%**

A1a. Percentage of line items delivered on time and in full, within the minimum delivery window (OTIF)

Reporting Period	2021-Q1		2021-Q2		2021-Q3		2021-Q4	
Product Category	OTIF	Total # of Line Items Delivered	OTIF	Total # of Line Items Delivered	OTIF	Total # of Line Items Delivered	OTIF	Total # of Line Items Delivered
ACTs	93%	82	96%	110	93%	137	83%	103
Laboratory	100%	23	100%	21	96%	27	100%	6
LLINs	86%	36	91%	34	85%	40	97%	34
mRDTs	90%	29	88%	33	95%	19	77%	43
Other Non-Pharma	100%	6	75%	4	100%	6	100%	5
Other Pharma	100%	2	100%	2	100%	1	100%	1
Other RTK					100%	1		
Severe Malaria Meds	88%	24	100%	20	85%	34	93%	30
SMC		0		0	93%	29		
SP	100%	2	100%	14	100%	3	60%	5
Total	**92%**	**204**	**95%**	**238**	**92%**	**297**	**85%**	**227**

A1b. Percentage of line items delivered on time, within the minimum delivery window (OTD)

Reporting Period	2021-Q1		2021-Q2		2021-Q3		2021-Q4	
Product Category	OTD	Total # of Line Items with ADDs in the quarter	OTD	Total # of Line Items with ADDs in the quarter	OTD	Total # of Line Items with ADDs in the quarter	OTD	Total # of Line Items with ADDs in the quarter
ACTs	95%	86	99%	112	89%	146	94%	95
Laboratory	96%	24	100%	21	100%	26	86%	7
LLINs	84%	37	92%	36	92%	37	100%	34
mRDTs	100%	26	91%	33	83%	23	97%	37
Other Non-Pharma	86%	7	100%	3	100%	6	100%	5
Other Pharma	100%	2	100%	2	100%	1	100%	1
Other RTK					100%	1		
Severe Malaria Meds	91%	23	95%	21	88%	32	97%	30
SMC		0		0	93%	29		
SP	100%	2	100%	14	60%	5	100%	3
Total	**93%**	**207**	**97%**	**242**	**90%**	**306**	**96%**	**212**

Note: Blank or 0 values for a product category in the above OTIF and OTD tables indicate that there were no actual or agreed deliveries for that category in that period.

Annex F. Other GHSC-PSM Logistics Indicators

A16. Percentage of backlogged line items

Reporting Period	2021-Q1		2021-Q2		2021-Q3		2021-Q4	
Product Category	Backlog	Total # of line items with ADDs in the last 12 months	Backlog	Total # of line items with ADDs in the last 12 months	Backlog	Total # of line items with ADDs in the last 12 months	Backlog	Total # of line items with ADDs in the last 12 months
ACTs	2.1%	290	0.0%	316	2.3%	428	0.5%	441
Laboratory	0.5%	189	2.7%	150	0.0%	111	6.4%	94
LLINs	3.8%	131	3.1%	130	3.8%	160	1.3%	149
mRDTs	1.5%	68	0.0%	98	3.8%	105	0.0%	120
Other Non-Pharma	2.0%	50	0.0%	35	0.0%	33	7.4%	27
Other Pharma	0.0%	8	0.0%	7	0.0%	8	0.0%	6
Other RTK					0.0%	1	0.0%	1
Severe Malaria Meds	0.0%	56	1.4%	71	0.0%	91	0.9%	108
SMC	0.0%	38	0.0%	35	0.0%	38	0.0%	29
SP	0.0%	21	0.0%	30	3.1%	32	0.0%	24
Total	**1.6%**	**851**	**1.0%**	**872**	**2.1%**	**1,007**	**1.3%**	**999**

A6a. Absolute percent supply plan error

Product Category	Supply plan error	Supply plan bias	4-quarter error	4-quarter bias	4-quarter error target
ACTs					
2021-Q1	71%	-71%	90%	-90%	35%
2021-Q2	8%	-8%	69%	-69%	35%
2021-Q3	13%	-13%	53%	-53%	35%
2021-Q4	8%	-8%	23%	-23%	35%
mRDTs					
2021-Q1	28%	-28%	38%	-38%	35%
2021-Q2	24%	-24%	40%	-40%	35%
2021-Q3	14%	14%	16%	-16%	35%
2021-Q4	26%	-26%	13%	-13%	35%

A4. Total inventory turns (annual)

Reporting Period	Inventory turns	Inventory Turns Target
2021-Q4	1.2	3.0

A5. Total landed cost - excluding QA costs

Task Order	TO2 - Malaria	
Reporting Period	Total Landed Cost (Freight and Logistics)	Total Landed Cost (Freight, Logistics, and HQ Operations)
2021-Q2	17.8%	22.8%
2021-Q4	13.4%	16.8%

A5. Total landed cost - including QA costs

Task Order	TO2 - Malaria	
Reporting Period	Total Landed Cost (Freight and Logistics)	Total Landed Cost (Freight, Logistics, and HQ Operations)
2021-Q2	18.7%	24.2%
2021-Q4	14.2%	18.0%

A3. Cycle Time (Average)

Reporting Period	Average Cycle Time	Cycle time target	Average dwell-adjusted cycle time
2021-Q1	357	350	328
2021-Q2	386	350	362
2021-Q3	355	340	327
2021-Q4	357	340	303

A8. Average percentage of shelf life remaining for warehoused commodities, weighted by the value of each commodity's stock (product at risk percentage)

Reporting Period	% Shelf Life Remaining	Shelf life target
2021-Q1		70%
2021-Q2		70%
2021-Q3	81%	70%
2021-Q4	74%	70%

Note: For A8, there was no usable stock at the RDCs to report in Q1 and Q2 as all stockpile stores were distributed for emergency orders before the close of each quarter.

Annex F. Other GHSC-PSM Logistics Indicators

A2. Percentage of quality assurance (QA) processes completed within the total estimated QA lead times

Reporting Period	2021-Q1		2021-Q2		2021-Q3		2021-Q4	
Product Category	% QA Processes On Time	Total # of QA processes completed	% QA Processes On Time	Total # of QA processes completed	% QA Processes On Time	Total # of QA processes completed	% QA Processes On Time	Total # of QA processes completed
ACTs	98%	42	88%	56	100%	22	84%	31
LLINs	100%	33	84%	19	100%	28	100%	16
mRDTs	100%	20	100%	5	100%	21	75%	16
Other Pharma	100%	3		0	100%	1	100%	4
Severe Malaria Meds	100%	5	100%	10	100%	8	79%	14
SMC		0		0		0	100%	1
SP	100%	2	100%	3	83%	6	83%	6
Total	**99%**	**105**	**89%**	**93**	**99%**	**86**	**85%**	**88**

A15. Percentage of quality assurance investigation reports submitted within 30 calendar days of outcome determination (semiannual indicator)

Reporting Period	2021-Q2		2021-Q4	
Product Category	Report submissions	# of reports due	Report submissions	# of reports due
ACTs	100%	1		0
LLINs	100%	1	0%	1
mRDTs				0
Other Pharma				0
Severe Malaria Meds				0
SMC				0
SP			100%	1
Total	**100%**	**2**	**50%**	**2**

A13. Percentage of batches of product for which the final result is showing nonconformity (out-of-specification-percentage)

Reporting Period	2021-Q1		2021-Q2		2021-Q3		2021-Q4	
Product Category	% Out-of-spec	Total # of batches tested	% Out-of-spec	Total # of batches tested	% Out-of-spec	Total # of batches tested	% Out-of-spec	Total # of batches tested
ACTs	0.0%	131	2.8%	179	0.0%	139	0.0%	152
LLINs	0.0%	40	0.0%	39	0.0%	45	0.0%	19
mRDTs	0.0%	77	0.0%	78	0.0%	72	0.0%	69
Other Pharma	0.0%	2		0	0.0%	3	0.0%	2
Severe Malaria Meds	1.8%	113	0.0%	62	0.0%	65	0.0%	90
SMC	0.0%	29		0	3.3%	30	0.0%	18
SP	0.0%	7	0.0%	10	0.0%	12	0.0%	16
Total	**0.5%**	**399**	**1.4%**	**368**	**0.3%**	**366**	**0.0%**	**366**

A7. Percentage of Delivered Line Items that required Temporary Waiver Registration

Reporting Period	2021-Q1		2021-Q2		2021-Q3		2021-Q4	
Product Category	% using temp waiver	Total # of line items delivered	% using temp waiver	Total # of line items delivered	% using temp waiver	Total # of line items delivered	% using temp waiver	Total # of line items delivered
ACTs	9.8%	82	11.8%	110	5.8%	137	6.8%	103
Laboratory	0.0%	23	0.0%	21	0.0%	27	0.0%	6
LLINs	16.7%	36	0.0%	34	10.0%	40	8.8%	34
mRDTs	6.9%	29	6.1%	33	47.4%	19	18.6%	43
Other Non-Pharma	0.0%	6	0.0%	4	0.0%	6	0.0%	5
Other Pharma	50.0%	2	100.0%	2	0.0%	1	100.0%	1
Other RTK					100.0%	1		
Severe Malaria Meds	16.7%	24	0.0%	20	8.8%	34	23.3%	30
SMC		0		0	0.0%	29		
SP	100.0%	2	21.4%	14	0.0%	3	20.0%	5
Total	**11.3%**	**204**	**8.4%**	**238**	**8.4%**	**297**	**11.9%**	**227**

Annex G. Commodity Losses

C7a. Product loss due to expiry while in GHSC-PSM control

Reporting Period	Task Order	Country	Type of Loss	Product Group	Loss Value	Loss Denominator	% Loss
2021-Q1	TO2 - Malaria	RDC	Expiry	ACTs	$32	$182,729	0.02%

Note: There was no RDC expiry in Q2, Q3, or Q4.

C7b. Product loss due to theft, damage and other causes while in GHSC-PSM control

Reporting Period	Task Order	Country	Type of Loss	Product Group	Loss Value	Loss Denominator	% Loss
2021-Q1	TO2 - Malaria	RDC	Damage	SMC	$599	$6,878,194	0.01%
2021-Q1	TO2 - Malaria	DRC	Missing product	LLINs	$50,460	$4,295,844	1.17%
2021-Q2	TO2 - Malaria	Ethiopia	Other	Laboratory	$5,492	$1,373,807	0.40%
2021-Q2	TO2 - Malaria	Burundi	Missing product	ACTs	$8,127	$963,295	0.84%
2021-Q3	TO2 - Malaria	RDC	Damage	ACTs	$1,528	$623,994	0.24%