Promoting the
QUALITY OF MEDICINES Plus

PQM+ Quarterly Report – Program Year 4, Quarter 2

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About PQM+

The Promoting the Quality of Medicines Plus (PQM+) Program is a five-year cooperative agreement (No. AID-7200AA19CA00025) between the U.S. Agency for International Development (USAID) and the U.S. Pharmacopeial Convention (USP) to sustainably strengthen medical product quality assurance systems in low- and middle-income countries (LMICs). PQM+ works to improve medical product quality through cross-sectoral and systems strengthening approaches and the application of international quality assurance standards across the pharmaceutical system. By sharing scientific expertise and providing technical support and leadership, PQM+ helps to create resilient and sustainable local health systems that ensure access to quality-assured essential medical products for HIV/AIDS, tuberculosis, malaria, neglected tropical diseases, and other infectious diseases as well as for reproductive, maternal, newborn, and child health.

USP establishes quality standards for medicines the United States Food and Drug Administration (U.S. FDA) is legally mandated to enforce. USP is an independent, scientific nonprofit public health organization and is not a part of the U.S. FDA or any other U.S. Government agency. PQM+ is unaffiliated with, and has not been evaluated by, FDA. References to FDA or to FDA publications do not constitute FDA endorsement of the PQM+ program or of the information provided by it.

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Contents

Acronyms

2FDC	two-drug, fixed-dose combination
4FDC	four-drug, fixed-dose combination
ADR	adverse drug reaction
AEFI	adverse events following immunization
AMA	African Medicines Agency
AMR	antimicrobial resistance
AMQF	African Medicines Quality Forum
AMRH	African Medicines Regulatory Harmonization
ANAB	American National Standards Society National Accreditation Board
ANCL-RN	African National Control Laboratory - Reliance Network
API	active pharmaceutical ingredient
CAPA	corrective and preventive action
CIP	Coalition of Interested Parties
COVID-19	novel coronavirus of 2019
CPD	continuing professional development
CRO	contract research organization
CRP	collaborative registration procedure
CSV	computerized systems validation
CTD / eCTD	Common Technical Document / electronic Common Technical Document
DMF	Drug Master File
DT	dispersible tablets (amoxicillin)
EAC	East African Community
EMP TC	Evaluation of Medicinal Products Technical Committee
EPI	Expanded Program on Immunization
EUA	emergency use authorization
FP	family planning
FPP	finished pharmaceutical product
GBT	WHO Global Benchmarking Tool to evaluate national regulatory systems
GMP	good manufacturing practice
HPLC	high-performance liquid chromatography
HR	human resources

IDP	institutional development plan
IGAD	Intergovernmental Authority on Development (Africa)
IQC	internal quality control
ISO/IEC	International Organization for Standardization/ International Electrotechnical Commission
KPI	key performance indicator
LIF	laboratory information file
LMIC	low- and middle-income countries
MedRS	Medicines Risk-based Surveillance
MNCH	maternal, newborn, and child health
MOH	ministry of health
MQCL	medicines quality control laboratory
MRA	medicines regulatory authority
MTaPS	Medicines, Technologies, and Pharmaceutical Systems program
NCL	National Control Laboratory
NTD	neglected tropical disease
OHS	Office of Health Systems (USAID)
OpERA	Optimizing Efficiencies in Regulatory Agencies
PIC/S	Pharmaceutical Inspection Co-operation Scheme
PIR	product information report
PIRIMS	Pakistan Integrated Regulatory Information Management System
PMI	U.S. President's Malaria Initiative
PMS	post-marketing surveillance
PPE	personal protective equipment
PQM+	Promoting the Quality of Medicines Plus
QA	quality assurance
QC	quality control
QMS	quality management system
RBI	risk-based inspection
RB-PMS	risk-based post-marketing surveillance
RIMS	regulatory information management system
RSS	regulatory system strengthening
RUTF	ready-to-use therapeutic food

SATTA	Stepwise Assessment Tool Towards Accreditation
SF	substandard or falsified
SOP	standard operating procedure
T2T	Test-to-Treat
TB	tuberculosis
TRIPS	Trade-Related Aspects of Intellectual Property Rights
TWG	technical working group
USAID	U.S. Agency for International Development
USP	U.S. Pharmacopeia
WHO	World Health Organization
WHO PQ	World Health Organization Prequalification

Letter from the Director

This quarter provided the Promoting the Quality of Medicines Plus (PQM+) program an opportunity to reflect and assess the current state of our implementation through internal audits—a best practice acquired through the years to ensure we are technically and programmatically armed to deliver quality results on time and on budget.

As PQM+ enters the third quarter of Program Year 4 (fiscal year 2023), we are implementing activities in 25 countries. Performance goals obtained from the audits revealed that 70 percent of total activities across field support projects were in-progress, with 92 percent of our portfolios having at least 50 percent of their PY4 activities complete or in-progress. 90 percent of our portfolios are equipped with staffing and technical resources required to achieve high quality deliverables by the end of Program Year (PY) 4 on September 30. To maintain this positive trajectory and possibly surpass it in PY5, we strengthened the PQM+ technical team towards greater performance and continuous delivery of technical excellence. Specifically, we welcomed the following leaders to their new roles:

- Dr. Souly Phanouvong is now PQM+ Technical Director following his previous role of Director, Regulatory Systems Strengthening for PQM+. Having worked in various capacities for organizations including WHO/Geneva and in countries spanning Hungary, Laos, Australia, Singapore, and the U.S., he brings more than 35 years of international experience in medical products regulation and quality assurance. As Technical Director, Dr. Phanouvong will provide leadership and technical direction to staff, consultants, and partners who contribute to the implementation of PQM+ work plan activities.
- Dr. Archil Salakaia became our Director, Technical Core Programs, and will oversee our Workforce Development (WFD) and Strategic Planning teams, ensuring that they have tools in place to standardize their work and expand it to more field buy-ins.
- Dr. Zlatka Kostova Lenard serves as the head of the newly created CMC & Vaccines unit, which consolidates the Product Supply and CMC team with the Vaccine team. The CMC & Vaccines unit leads all PQM+ technical assistance to manufacturers of medical products, including vaccines.

This Quarter 2 report further explains the program's progress during PY4, with highlights such as identifying priority countries in the Asia Region for increasing domestic pharmaceutical product manufacturing capability to meet local and global needs and supporting Liberia's medicines regulatory authority (MRA) to remove more than $56,000 USD worth of substandard and unregistered antimalarials and maternal health medicines from circulation.

Strengthening our engagement with partners is equally paramount. This quarter we worked with our PQM+ CoreFlex partners the Centre for Drug Discovery Development and Production (CDDDP), Muhimbili University of Health and Allied Sciences (MUHAS), and Mahidol University to conduct a technical exchange webinar on best practices in regulatory science curriculum reform. This webinar highlighted critical components for successful curricula reform and its importance in ensuring the sustainability of medicines quality assurance programs. Specifically, the webinar featured PQM+ efforts in advancing USAID localization strategies by developing regulatory workforce capacity in multiple regions through training programs, helping academia develop relevant curricula, creating platforms for knowledge management, and creating tools for cross-cutting capacity building programs within the regulatory field. This exchange served as a platform for information sharing and advocacy for more resources to be invested in this space.

Please continue following our progress toward ensuring that quality-assured medicines are available to those who need them most.

Jude I. Nwokike
PQM+ Director

Executive Summary

During the second quarter of Program Year 4, the USAID-funded Promoting the Quality of Medicines Plus (PQM+) program worked in 25 countries[1] and four regional portfolios and implemented 50 work plans.[2] The breakdown of active work plans is as follows:

- 24 Mission field-support buy-ins,[3]
- Three core-funded activities supporting the USAID Bureau for Global Health's Office of Infectious Disease for neglected tropical diseases (NTDs) and tuberculosis (TB) and the Office of Maternal and Child Health and Nutrition;
- Four regional buy-ins from USAID's Africa, Asia, and Latin America and Caribbean (LAC) bureaus, and East Africa region;
- One "cross-bureau" funding stream supporting the Office of Health Systems;
- Six buy-ins funded by the U.S. Government's Initiative for Global Vaccine Access (Global VAX);
- Seven other active COVID-19 buy-ins;[4] and
- One buy-in funded by USAID's COVID-19 test-to-treat initiative to promote access to safe and effective oral COVID-19 therapeutics in low- and middle-income countries (LMICs).

The goal of all the activities is to sustainably strengthen medical product quality assurance (QA) systems in low- and middle-income countries (LMICs). As such, PQM+ helps ensure access to quality-assured medical products, including those needed for HIV/AIDS, TB, malaria, NTDs, COVID-19, other infectious diseases, reproductive health, and maternal, newborn, and child health (MNCH).

This report summarizes activities conducted during the second quarter of Program Year 4 (January 1 to March 31, 2023). These activities are delineated by objective and funding source (USAID country Missions and USAID/Washington). All activities align with at least one of PQM+'s five program objectives, as detailed in the Results Framework (Figure 1).

PQM+ reports on its performance monitoring indicators twice a year. The PQM+ Monitoring Results Table in Annex 1 presents results for the first half of FY 2023 for PQM+ country, regional, and core buy-ins. Results are organized by PQM+ objectives and sub-objectives. Country, regional, and core buy-ins select indicators from the overall list of PQM+ indicators that reflect the focus of their activities and report on those indicators.

[1] Bangladesh, Benin, Burkina Faso, Burma, DRC, Ethiopia, Ghana, Guinea, Kazakhstan, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mozambique, Nepal, Nigeria, Pakistan, Panama, Rwanda, Senegal, South Africa, Tajikistan, Uzbekistan

[2] A few countries are implementing more than one work plan, such as a Global VAX country work plan.

[3] The 24 countries include the list of buy-ins in Footnote 1 minus South Africa, which is a Global VAX buy-in.

[4] One each from Bangladesh, Burkina Faso, Ethiopia, Ghana, and Uzbekistan, and two from Mozambique.

Figure 1. PQM+ Results Framework

GOAL: SUSTAINABLY STRENGTHEN MEDICAL PRODUCT QUALITY ASSURANCE SYSTEMS IN LMICs				
Objective 1: Governance for medical product quality assurance systems improved	**Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved**	**Objective 3: Financial resources for medical product quality assurance optimized and increased**	**Objective 4: Supply of quality assured essential medical products of public health importance increased**	**Objective 5: Global medical product quality assurance learning and operational agenda advanced**
1.1 – Evidence-based medical product quality assurance legislation, policies, and regulations developed/ updated and/or implemented 1.2 – Systems that facilitate transparency and accountability promoted 1.3 – Fragmentation addressed and coordination across entities (public and private) with medical product quality assurance responsibilities promoted 1.4 – Links among the medical product quality assurance systems and other sectors developed and fortified	2.1 – Sustainable systems for market authorization/ registration, inspection, and licensing functions of medical product regulatory agencies improved 2.2 – Sustainable post-marketing surveillance systems and medical product quality control laboratory capacity strengthened 2.3 – Regional harmonization to strengthen medical product quality assurance regulatory capacity and networks supported 2.4 – Adoption of data standards and integrated information systems to support regulatory medical product quality assurance functions supported 2.5 – Competence, efficiency, and expansion of the medical product quality assurance workforce improved	3.1 – Allocation and use of investments for medical product quality assurance systems strengthening optimized 3.2 – Sustainable resources mobilized	4.1 – Pharmaceutical manufacturers for Good Manufacturing Practices (GMP) and medical product regulatory submissions/ dossiers supported 4.2 – Capacity to conduct bioequivalence studies for dossier submissions strengthened 4.3 – Capacity for market intelligence and analytics of public health pharmaceutical markets increased 4.4 – Health coverage schemes that incorporate medical product quality requirements supported 4.5 – Monograph development and use supported	5.1 – Evidence-based approaches and tools developed and/or applied 5.2 – Research and analysis to support medical product quality assurance systems strengthening conducted 5.3 – Advocacy on the importance of medical product quality assurance for public health, including the link between medical product quality and antimicrobial resistance, supported

Technical Areas

Governance

Improving regulatory governance requires the effective and efficient establishment and implementation of quality assurance systems for medical products. PQM+ supports national pharmaceutical QA systems by facilitating the adoption of sound policies and aiding in the development of strategic plans. The program aims to help establish adequate coordination mechanisms that promote sound governance as well as efficiency, accountability, transparency, and partners' alignment. Through PQM+ support, stakeholders are becoming more effective in ensuring the quality and safety of medical products, increasing public trust, and freeing up valuable resources that can be used to expand health service coverage to their populations. PQM+'s objective in supporting countries to develop strategic plans is to enable public institutions to define their strategic goals, identify necessary interventions to reach those goals, allocate adequate resources to execute a plan, and implement a monitoring and evaluation system to measure progress of regulatory oversight that ensures timely access to essential medicines and protection from substandard and falsified (SF) products. Key highlights from PY4Q2 governance activities follow.

Uzbekistan. In December 2022, Uzbekistan split its regulatory body for medicines and pharmaceutical industry development into two separate organizations, the State Center and the Agency, respectively. PQM+ recommended this action to eliminate a conflict of interest wherein the Agency was responsible for both industry development and regulatory work. The State Center will handle regulatory functions, while the Agency will focus on industry development. PQM+ will work with both organizations, as their responsibilities overlap with PQM+ PY4 activities. In PY4 Q2, PQM+ initiated the development of a national pharmaceutical

manufacturing development strategy with the support of the head of the Agency. PQM+ also launched regular meetings with Agency staff to assess the current situation in the country and review recent governmental decrees.

Malawi. After the USAID Mission granted PQM+ concurrence to proceed with its work plan in Malawi, PQM+ immediately hired a consultant with strategic planning expertise to update the Pharmacy and Medicines Regulatory Authority (PMRA) strategic plan of 2018–2023. The consultant will work closely with the PMRA board of directors, management, staff, and other key stakeholders to gather inputs, consider recommendations, and create a comprehensive plan. At the close of Q2, PQM+ had finalized the implementation plan and arranged travel for an in-country kick-off meeting in early Q3.

Nepal. PQM+ conducted a review of Nepal's current Guidelines on Safe Disposal of Unwanted Pharmaceuticals in response to a WHO Global Benchmarking Tool (GBT) assessment highlighting the need for such guidelines. The review identified gaps in relation to regulatory authority requirements, and PQM+ is collaborating with Nepal's Department of Drug Administration (DDA) to address these gaps (e.g., manufacturing waste management, procedures to manage return of unwanted product to manufacturers). In addition, PQM+ started to support the DDA in creating the Nepal Pharmaceutical Manufacturing Strategy, which establishes a 10-year roadmap for the development of the local pharmaceutical industry to meet national needs and support export of essential medicines . PQM+ will continue to provide technical support for this strategy in close consultation with stakeholders.

Regulatory Systems Strengthening (RSS)

A strong regulatory system helps to ensure access to safe, effective, and quality-assured medical products. Robust regulatory systems are needed to ensure timely access to essential medicines and protect the public health of populations by preventing the distribution of SF medical products. SF medical products can cause serious health problems and undermine trust in a health system. PQM+ provided support in various RSS areas. Highlights include:

Asia Bureau. PQM+'s technical assistance funded by the Asia Bureau aims to contribute to regional regulatory convergence and reliance efforts in part by building regulatory capacity on product dossier evaluation of complex active pharmaceutical ingredients (APIs), biologicals, and bioavailability and bioequivalence (BA/BE). PQM+ works with regional health networks that include the Association of Southeast Asian Nations (ASEAN) Pharmaceutical Product Working Group and the South-East Asia Regulatory Network to strengthen regulatory and quality assurance systems. This quarter, 24 regulatory assessors responsible for medical product registration and market authorization from nine ASEAN member states attended a training of trainers (ToT) course on BA/BE studies with a focus on bioanalytical method validation and BE studies of oral and non-oral solid dosage forms.

Enforcement Action in Liberia. PQM+'s work—anchored in collaborative development of a five-year strategic plan in line with the institutional development plan (IDP) for the Liberia Medicines and Health Products Regulatory Authority (LMHRA) and establishment of a technical working group (TWG) on post-marketing surveillance (PMS)—supports the strengthening of six of the eight LMHRA regulatory functions per the WHO GBT. This quarter, after reviewing the PMS results, the TWG recommended the LMHRA remove from circulation more than $56,000 USD worth of substandard and unregistered antimalarials (artemether lumefantrine, artemether injections) and MNCH (oxytocin). The LMHRA subsequently acted on this recommendation.

Improving Inspections through Risk-based Approaches. PQM+ facilitated a training for Ghana Food and Drug Authority (GFDA), Senegal's *l'Agence Sénégalaise de Réglementation pharmaceutique* (ARP), and the South African Health Products Regulatory Authority (SAHPRA) on how to use the risk-based inspection (RBI) tool developed by PQM+ to improve their regulatory inspection practices. The PQM+ RBI tool strengthens the inspection process of MRAs by helping them better manage the inspection process by applying a consistent risk-based inspection approach. It also helps facilitate their adoption of international standards and best practices in the conduct of their regulatory inspections. The hands-on training on the use of the RBI good storage and distribution (GSDP) tool helps ensure that the regulatory bodies can effectively implement it.

Financial Resources to Improve Medical Product Quality Assurance

Since PY1, PQM+ has gradually ramped up its work on integrating cost-saving and financing mechanisms in MRAs and laboratories. Early PQM+ work generally encompassed various risk-based approaches as well as such efforts as reliance. More recent work, directed mainly at, but not exclusively, unaccredited national quality control laboratories (NQCLs),[5] includes developing/validating five-year strategic plans (in Burkina Faso and Kenya in PY3 and Mali PY4), analyzing testing costs and operational budgets given new quality management system (QMS) and accreditation efforts, drafting sustainability frameworks or resource mobilization plans, and advocating to governments and donors to fund new strategic initiatives (Burkina Faso in PY4 Q1 and Mali planned for PY4 Q4). PQM+ is also (1) building in cost-sharing arrangements in PMS TWGs—Kenya's TWG now has a three-year costed work plan, and South Africa's MRA [SAHPRA] has paid for one of the three TWG meetings held since September 2022; (2) developing costed, multi-stakeholder strategic plans with which to seek more substantial financing for activities (PQM+ began work with Burkina Faso's *L'Agence Nationale de Régulation Pharmaceutique* [ANRP] on a Quality Medicines Strategic Plan in Q2); and, in Q2, (3) drafted a Strategic Investment Plan for Bangladesh's Fifth Health, Population and Nutrition Sector Program.

Chemistry, Manufacturing, and Control (CMC)

CMC involves the development, production, and quality control of pharmaceutical products and devices that meet current good manufacturing practice (GMP) and international quality standards. The CMC process plays a crucial role in ensuring that these products are safe, effective, and of consistent quality. CMC processes are important because they help ensure that medical products are of consistent quality and meet required regulatory standards. This is essential for the products' safety and effectiveness.

The PQM+ CMC team's recent work has focused on technical assistance to 37 pharmaceutical manufacturers in 12 countries (Bangladesh, Ghana, India, Kenya, Liberia, Nepal, Nigeria, Pakistan, South Africa, Myanmar, Burkina Faso, and Uzbekistan) working on 61 product approvals. Highlights from Quarter 2 follow.

Bangladesh. PQM+ is continuing technical support to Bangladesh Manufacturer 2[6] toward the prequalification of first-line TB medicines. During this quarter, the company received a pilot BE

[5] PQM+ works with 36 NQCLs in 19 countries.

[6] For public reporting, PQM+ uses aliases for manufacturers to protect the confidentiality of their data and this program's work with them.

study report from ACDIMA BioCenter for Bioequivalence and Pharmaceutical Studies in Jordan and received WHO consent on the final BE protocol.

PQM+ is providing technical support to Essential Drugs Company Limited (EDCL) to conduct good practices (GxP) training for technical staff based on a training needs assessment. On March 20 to 22, PQM+ organized an advanced training on GxP in pharmaceuticals at the Gopalganj plant of EDCL to enhance knowledge and understanding of the current global regulatory requirements of basic good manufacturing practice (GMP), QMS, and data integrity.

PQM+ is also providing TA to build the capacity of selected local contract research organizations (CROs) to support BE study in the country. In February, PQM+ staff completed a gap assessment visit to three CROs—Khwaja Yunus Ali Medical College and Hospital, Bio-Research Services (KYAMCH-BS), Institute for Developing Science and Health Initiatives (ideSHi), and Novas Clinical Research Services Ltd. (NCRSL)—in Bangladesh to evaluate their general, clinical, and analytical functioning based on international standards.

Burkina Faso. PQM+ conducted a QMS and GMP assessment of Burkina Faso Manufacturer 1, the first generic drug manufacturing facility in that country. It is expected to help improve the country's self-sufficiency in medicine production and expand the supply of quality medicines. The manufacturer plans to provide production capacity capable of meeting the local needs and help to solve possible stockouts in the country. The manufacturer's pipeline currently includes the production of paracetamol to reduce fever of malaria patients.

Liberia. PQM+ supported Liberia Manufacturer 1 toward attaining a manufacturing license and GMP certificate from the LMHRA. PQM+ also supported the process that allowed the LMHRA to test 11 products manufactured by Liberia Manufacturer 1 at the USP Ghana Lab. The test results from USP Ghana enabled the LMHRA to issue marketing authorization of 11 products to Liberia Manufacturer 1 to commence local manufacturing of medicinal products in Liberia.

Nigeria. WHO PQ accepted and published the WHO Public Inspection Report (WHOPIR) for Nigeria Manufacturer 4 for two products pursuing prequalification (sulfadoxine + pyrimethamine (SP) and zinc sulfate ($ZnSO_4$).

Ghana. PQM+ continues to support manufacturers in Ghana. In Q2, PQM+ provided training on four key GMP topics identified in the roadmaps of the local manufacturers it is supporting, in three different training sessions held from January to March 2023. The three sessions covered (1) analytical method validation, (2) comparative dissolution studies and (3) stability studies.

Laboratory System Strengthening (LSS)

To ensure quality, accuracy, and reliability of medicines quality test data, laboratories must employ robust systems for medical product analysis and evaluation. Implementation of robust systems, based on proven standards of quality management and medicines testing, ensure laboratories are operating under conditions and following procedures that promote good practices. This can aid in preventing errors and contamination, which can compromise the validity and reliability of results. Overall, well-functioning quality management systems are essential for maintaining the integrity and quality of the work conducted in laboratories, and for ensuring that the results of this work are reliable.

PQM+ is supporting 45 work plans with laboratory activities (31 of which include NQCL-related activities). During the second quarter, PQM+ supported laboratory activities (e.g., trainings,

assessments, and procedure writing) in 13 countries.[7] An LSS highlight of this quarter was support of Drug Testing Laboratory (DTL) Multan for development and submission of corrective and preventive action (CAPA) plan to the WHO team, to address gaps as identified in the final audit report by the WHO inspection team. After thorough evaluation and multiple queries, the WHO team accepted the CAPA of DTL Multan and issued the CAPA acceptance letter. DTL Multan has achieved WHO prequalification status.

Global VAX

During this reporting period, the Global Vax program is collaborating with USP's regional USP-India team to organize a joint study visit in India for Vaccine Regulation Capacity Building to support African regulators achieve their goal of attaining and/or maintaining WHO GBT Maturity Level 3 for vaccines. The joint study visit is planned for four working days in May 2023. The participants will arrive in Hyderabad, India where they will visit and participate in discussions with two commercial vaccine manufacturers and USP-India.

Test-to-Treat Project

The PQM+ program is providing technical assistance to introduce a COVID-19 Test to Treat (T2T) service delivery model using antiviral medications, nirmatrelvir/ ritonavir (Paxlovid) and molnupiravir, in 10 countries. This work includes facilitation of registration/market authorization of two COVID-19 antivirals, branded (Paxlovid and Lagevrio) and the WHO-prequalified generic version. During the second quarter, the program established a non-disclosure agreement with India Manufacturer 4, which produces the first prequalified generic versions of nirmatrelvir/ritonavir and molnupiravir capsules, to coordinate registration of their products and liaise with regulatory authorities to expedite review processes. The program is also supporting registration or waiver applications for the products in two remaining countries, Lesotho and Bangladesh, by coordinating between regulatory authorities, India Manufacturer 4, and implementing partners.

Learning, Advocacy, and Awareness

Learning: PQM+ continues to collect and analyze data to inform our technical assistance and counterpart decisions. This quarter, PQM+:

- Collected **data on online sales** of health products in Burkina Faso. This will increase understanding of the processes and the prevalence of online pharmacies in the country, which will inform the development of regulation and guidelines for online pharmacy practices.
- Supported **rapid assessment of SF anti-TB medicines in the private sector** using visual inspection and field-based screening. In Q2, enumerators conducted fieldwork in 12 districts. The assessment will increase understanding of the current availability and use of anti-TB medicines, define the burden of SF anti-TB medicines, and inform strategic guidance for handling product-related issues.
- Developed **questionnaires on regulation and supply of MNCH medical devices and tranexamic acid**. PQM+ also started a literature search to understand current global availability, regulatory issues around sourcing and quality assurance, and where there are evidence gaps that country level data could help fill.

[7] PQM+ is strengthening quality control laboratories in all 24 countries with PQM+ buy-ins except Lesotho.

- Developed a questionnaire for FP wholesalers in Guinea. This questionnaire will be used to **collect data on the warehousing systems** available and how wholesalers manage environmental conditions to ensure they meet the required storage conditions.
- In collaboration with the Ghana Health Service (GHS) and FDA Ghana, **disseminated results** of the zone of influence (ZOI) study. Attendees of the dissemination meeting discussed and agreed on comprehensive recommendations that emerged from the study.

Advocacy and Awareness: Examples of work done by PQM+ this quarter to help counterparts raise awareness of medical product quality issues and processes and to advocate for improved medical product quality include:

- Co-authored, with Busia County, a **conference poster** for the Kenya National Malaria Forum on ***Laying the Foundation for Quality Assurance of Antimalarial Medicines in Busia County***. It enumerated how to optimize existing county structures to assure medicine quality.
- Distributed 150 **job aids/posters** to PPMVs in Bauchi state, Nigeria. To be used by shopkeepers and customers, they provide good visual aids for identifying quality medical products.
- Supported Rwanda FDA in raising public awareness on the quality and safety of medicines through **radio and TV talk shows**.
- Supported the Bangladesh DGDA to organize divisional workshops to build awareness about quality-assured medical products in line with the **National Quality Assurance Guidelines** (NQAG). Participants learned about **roles and responsibilities** of various stakeholders to ensure quality-assured medical products.

Cross-Bureau Activities and Progress

PQM+'s Cross-Bureau activities focus primarily on raising awareness of the importance of medical product quality and developing new approaches to strengthen medicine regulatory functions.

Office of Health Systems

These activities, funded by the Office of Health Systems (OHS), fall under program objectives 2, 3, and 5.

Progress This Quarter

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

MRAs Guidance Document. PQM+ is developing a guidance document for MRAs on how to grant emergency use authorization (EUA) for medicines, with PQM+ partner the University of Washington leading the work. PQM+ and the University of Washington discussed the methodology for developing the documents, a rapid assessment tool for understanding country needs, a list of PQM+ country offices to survey, and a timeline for milestones leading to the final EUA guidance document. Key achievements include:

- Finalized the task order.
- Reviewed the methodology, survey tool, Gantt chart, and list of PQM+ country offices.
- Scheduled kickoff meetings with Africa and Asia PQM+ country offices to initiate discussions and dissemination of the questionnaire.

PQM+ developed an inception report, disseminated the questionnaire, and began analysis of responses from the 13 countries.

African Lab Network. PQM+ is supporting AUDA-NEPAD and the AMRH to develop an African continental lot release lab network, initially assessing the capacity of NQCLs to assess biological products. PQM+ developed a draft of the African National Control Laboratory - Reliance Network (ANCL-RN) framework, a review and draft report of country national regulatory authority (NRA) legislative frameworks relative to the African Union Model Law, identifying gaps and recommendations and provided regular updates on progress to the African Medicines Regulatory Harmonization (AMRH) initiative. PQM+ also held discussions on ways to support further expansion of the ANCL-RN framework content and incorporate additional strategic thinking. PQM+ began a flow chart of country guidelines on lot release for harmonization with continental guidelines for the NCL reliance network. Highlights of this work include:

- Identified subject matter experts and implemented weekly discussions to ensure alignment of interrelated activities.
- Developed an inception report, a draft report on the review and findings of country legislative frameworks, and a draft of ANCL-RN framework content.

- Participated in AMRH consultants' meeting on February 22 to discuss consultancy scope/major deliverables, progress since inception, challenges, lessons learned, and support required from the AMRH Secretariat.
- Began preparations for PQM+ representation at the AMRH meeting in Rwanda in Q3. PQM+ will present the strategic vision for the Reliance Framework to discuss and validate with stakeholders its vision for conserving resources by avoiding duplication, increasing efficiency, and distributing or sharing responsibilities, among others.

Digitalized RIMS for AMA. PQM+ consulted with USAID's Medicines, Technologies, and Pharmaceutical Systems (MTaPS) program on next steps for discussions with the AMRH IMC TC on developing a roadmap to digitalize a regulatory information management system (RIMS) for the African Medicines Agency (AMA). PQM+ provided comments to MTaPS on a scope of work (SOW) for a consultant to drive stakeholder engagement. PQM+ also requested the status of desk review and draft roadmap milestones from MTaPS to ensure an opportunity for review and comment.

Objective 4: Supply of quality assured essential medical products of health importance increased

PQM+ continued developing a model local production strategy for countries and regions, including how countries can decide whether to invest in expanding local production, with the expectation that the latest draft will be ready for USAID review in early Q3. PQM+ shared an overview of the strategy as part of outreach to WHO and plans to share the final document after approval by USAID.

Objective 5: Global medical product quality assurance learning agenda and operational agenda advanced

AMR Module of PSS101 Course. PQM+ started collaborating with MTaPS on the new antimicrobial resistance (AMR) module 11 of the Pharmaceutical Systems Strengthening 101 (PSS101) course and will provide comment and technical input on the MTaPS storyboard for this module. PQM+ will provide technical inputs in Q3 and the two programs will deliver the module in June.

Social and Behavior Change Communication. PQM+ conducted a literature search to identify social and behavior change communication strategies and approaches for increasing the demand for quality medical products, with a focus at the community level. PQM+ developed and shared a draft of findings with Breakthrough ACTION and consulted with them on how to incorporate findings and evidence gaps into recommendations. PQM+ anticipates finalizing the current draft in late Q3/early Q4 to share with USAID.

High-Performing Health Care System Tool. PQM+ is helping the USAID Office of Health Systems survey health care facilities using the new High-Performing Health Care System tool in two countries, Kenya and Mozambique. PQM+ received Mission concurrence and developed initial lists of organizations for survey dissemination. The lists identify stakeholders at the national and subnational levels across public, private, and nongovernmental organization (NGO) sectors. PQM+ staff have reached out to the respective country Missions for support with the ministries of health (MOHs) to continue building the contact lists and to disseminate the questionnaire. PQM+ is having the tool translated into Portuguese for use in Mozambique.

Priority Activities for Next Quarter

Next quarter, the Cross-Bureau activity plans to:

- Progress development of the continental guidelines, standards and accreditation, and NCL reliance framework to validate in Rwanda with stakeholders to draft the five-year costed strategy.
- Disseminate questionnaire for EUA guidance document, complete desk review, and begin expanded outline of the guidance document.
- Continue collaborating with MTaPS and engage AMRH stakeholders in the development of the adapted roadmap for adoption of data standards and minimum common standards.
- Provide technical inputs on the AMR module for PSS101 course and deliver the module with MTaPS in June.

Africa Bureau to Support African Medicines Agency (AMA)

With funding from USAID's Africa Bureau, PQM+ is supporting the operationalization of the AMA and sustainably strengthening the AMA's medical product QA systems. This funding will complement USAID's OHS investments for PY4 to support the AMA.

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

MedRS Training Workshop. PQM+ is supporting Africa's Intergovernmental Authority on Development (IGAD) and the East African Community (EAC) in regional RB-PMS. PQM+ consulted with both communities to understand their RB-PMS needs and to plan for a Medicines Risk-based Surveillance (MedRS) tool training workshop. Given a similar activity for MedRS training in the EAC work plan, PQM+ proposed leveraging this planned workshop and to sponsor identified IGAD national MRAs and Secretariate members to attend this RB-PMS workshop training. PQM+ will continue to work with colleagues in Kenya to plan the workshop, pending USAID approval.

RB-PMS Testing. PQM+ proposed facilitating partial funding of the second round of RB-PMS[8] testing in IGAD and to develop a report of the findings and coordinate a dissemination and validation meeting of the findings with a subset of the IGAD secretariate and national MRAs.

BA/BE Subcommittee. PQM+ met with the African Medicines Quality Forum Evaluation of Medicinal Products Technical Committee (AMQF EMP TC) chair to discuss establishing a bioavailability and bioequivalence (BA/BE) subcommittee within an existing TC of the AMRH and development of technical operational guidelines to help support market authorization, EUA, reliance, and other pathways. Following these discussions, PQM+ developed a concept note for a BA/BE subcommittee under the EMP TC. PQM+ will share the concept note with the EMP TC chair in early Q3 and seek concurrence to establish the operational guidelines of the subcommittee.

[8] Unless specified, RB-PMS results are not necessarily nationally or regionally representative.

API Database. PQM+ worked with a Bill and Melinda Gates Foundation (BMGF) consultant and the IMS TC contacts to understand the overall plans and timelines for the current active pharmaceutical ingredient (API) database project that BMGF is leading. This will inform how PQM+ plans for activities beyond the current plan's scope. PQM+ reviewed and gave input on documents shared by BMGF, which include the use case, user requirements, and costing options report. PQM+ has also requested information from BMGF on initial costing work and will participate in the next EMP TC meeting planned for April. PQM+ has drafted a concept note of additional activities to support the API work and will share this with USAID in April.

Priority Activities for Next Quarter

Next quarter, the Cross-Bureau activity plans to:

- Advance discussion with Kenya colleagues on synergies with the EAC work plan to leverage activities that align, and obtain USAID feedback and concurrence for revised activities.
- Seek USAID feedback on payment facilitation of partial payment to IGAD for second round of RB-PMS tests and initiate payment if approved.
- Continue toward completion of a concept note for a BA/BE subcommittee, validate with the EMP TC and develop a TOR/operational guidelines.
- Continue discussions with BMGF and the EMP TC about collaboration on an API Database and share with USAID for concurrence.

Activities and Progress by Country and Regional Buy-Ins

Africa Region

Benin

PQM+ works with the Beninois Agency for Pharmaceutical Regulation, *l'Agence Béninoise de Régulation Pharmaceutique* (ABRP), Benin's main regulatory body. ABRP develops and implements national pharmaceutical policy and regulations, registers medicines, approves licenses, inspects pharmaceutical establishments, and controls the advertisement and promotion of medicines, including herbal and traditional medicines. The national quality control laboratory, *l'Agence Nationale de Contrôle de la Qualité des Produits de Santé et de l'Eau* (ANCQ), collects and tests medicines at points of entry into the country (land, sea, and air) or at the request of any national institution. PQM+ is helping ANCQ strengthen its quality management system (QMS) to achieve international recognition (ISO/IEC 17025 or WHO prequalification). This would assure the reliability of testing and increase public confidence in ANCQ test results.

Progress by PQM+ Objective

Objective 1: Governance for medical product quality assurance systems improved

In preparation to support ANCQ and ABRP to develop a collaborative framework, PQM+ completed a situational analysis on the state of collaboration between these two agencies. Currently ABRP requests ANCQ to conduct quality testing for registration and PMS products. In addition, ABRP invites ANCQ to participate in product dossier evaluation committees. With regard to the quality testing, no official timelines have been agreed on, so ABRP is not satisfied with the turnaround time for test results in many instances.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

RB-PMS of Antimalarials. In January, PQM+ coached the post-marketing surveillance technical working group (PMS-TWG) to draft its second risk-based PMS protocol for antimalaria medicines which was finalized in February 2023. At the end of the quarter, PQM+ supervised a training of the samplers conducted by members of the PMS-TWG. The members provided the terms of reference, materials, delivery, and reporting of the training. The 13 samplers (three women and 10 men) received training on storage, transportation of the samples, on the RB-PMS protocol for 2023, the RB-PMS guidelines and the use of the sampling tools.

In Q2, PQM+ supported dissemination of the results of the 2022 RB-PMS of antimalaria medicines.[9] Of the 202 samples collected from four regions (13 health zones), 4.5 percent did not comply with quality standards. Further, 18 percent of the products sampled did not have marketing authorization. Of the 82 percent that were registered, 10 percent had expired marketing authorization. When ABRP received the results of the QC tests, they issued alerts

[9] These results are not necessarily nationally representative.

and recalled the failed samples. Manufacturers that had expired marketing authorizations have been advised of the need to renew this.

ISO 17025 Accreditation. As part of the implementation of its roadmap toward ISO 17025 accreditation, PQM+ trained 10 analysts (seven men, three women) from ANCQ on Karl Fischer and UV-visible spectrophotometry. A second training covered high-performance liquid chromatography (HPLC) and gas chromatography (GC). PQM+ trained nine analysts (eight men, one woman) on the use of these two chromatographic techniques for testing medicines. The first three techniques are part of ANCQ's proposed accreditation scope and as a result PQM+ seeks to systematically build the capacity of the bench analysts on these techniques until they are able to demonstrate proficiency. Proficiency is required for successful accreditation. PQM+ also provided introductory theoretical training on GC to start preparing ANCQ to conduct GC tests, such as what is required to detect diethylene glycol poison in pediatric cough syrups. ANCQ recently acquired a new GC for installation in the coming months.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Conduct a training on GMP to prepare for the piloting of the risk-based inspections tool.
- Support ANCQ and ABRP to develop a collaborative framework.
- Supervise the sampling of antimalarials for the second RB-PMS.

Burkina Faso

A 2018 decree created the national pharmaceutical regulatory authority, *L'Agence Nationale de Régulation Pharmaceutique* (ANRP), to strengthen the regulatory framework for the pharmaceutical sector in Burkina Faso. The Directorate of Market Surveillance and Quality Control of Health Products at ANRP is the technical body in charge of QA/QC. ANRP collaborated with the Directorate for the Control of Drugs and Non-Food Products (DCM/PNA) within the *Laboratoire National de Santé Publique* (LNSP), which is now *l'Agence nationale pour la sécurité sanitaire de l'environnement, de l'alimentation, du travail et des produits de santé* (ANSSEAT) to conduct sampling of medical products. In 2021, with PQM+ support, LNSP and ANRP established an official collaborative framework.

PQM+ works with the PMS-TWG to strengthen ANRP's market surveillance function. The program is also improving LNSP's QMS to conform with ISO/IEC 17025 standards and strengthening the capacity of technical analysts to conduct quality testing.

Objective 1: Governance for medical product quality assurance systems improved

Online Health Products Sales. PQM+ designed and deployed a questionnaire to conduct a situational analysis of online sales of health products in Burkina Faso. Responses to this questionnaire will help PQM+ understand the processes as well as the prevalence of online pharmacies in the country.

Medical Products QA Strategic Plan. In preparation to develop a five-year medical products quality assurance strategic plan, PQM+ met with ANRP to plan the development and collect key documents such as (1) ANRP's three-year quality control plan and (2) ANRP's 2022 annual report.

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

GMP Audit and ISO 9001 Assessment of Burkina Faso Manufacturer 1. In Q2, PQM+ conducted a baseline GMP audit of Burkina Faso Manufacturer 1 using WHO GMP guidelines. The audit included inspection of the manufacturer's facility and review of its documentation. While the manufacturer has quality systems in place, many documents need revision to meet GMP requirements. The manufacturer is currently compressing imported paracetamol granules and is producing oral rehydration salts, with little actual manufacturing taking place at this stage. The assessment report will outline the gaps identified during the audit.

In addition to the GMP audit, PQM+ conducted an ISO 9001 baseline assessment of Burkina Faso Manufacturer 1. The manufacturer does not yet have an ISO 9001 system in place. A strong quality management system that meets the requirements of the ISO 9001 standard can complement its implementation of GMP and further strengthen its quality infrastructure. PQM+ also conducted an ISO 9001 awareness training for all staff. This training sensitized 13 of the manufacturer's personnel (nine men, four women) on the requirements of the standard and increased their awareness of the company's drive toward ISO 9001:2015 certification.

DCM/PNA Mock Audit. In preparation for an ISO 17025 assessment audit in 2023, PQM+ conducted a mock audit of the DCM/PNA at ANSSEAT (formerly LNSP). An overall score of 76 percent indicated that the DCM/PNA has progressed in the implementation of its quality management systems. This boosted the confidence of DCM/PNA staff toward success in the pending accreditation assessment. The audit report is under development and in the coming months PQM+ will support DCM/PNA to close the remaining gap and guide its application for ISO/IEC 17025 accreditation. To further build capacity in areas where the DCM/PNA still has gaps, PQM+ coached the quality assurance team on preparing for its imminent accreditation assessment.

RB-PMS Samples. In Q2, PQM+ also supervised the confirmatory testing of the samples collected in October and November 2022 as part of PY3 RB-PMS.[10] The testing is expected to be completed in April 2023.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Complete the situational analysis of online medical products sales in Burkina Faso.
- Conduct a stakeholder workshop to draft ANRP's five-year medicines QA strategic plan.
- Support development of the 2022 RB-PMS report and dissemination of its results.
- Conduct training on uniformity of dosage units (UDU) and Karl Fischer (KF) titration.

[10] These results will not necessarily be nationally representative.

Democratic Republic of Congo (DRC)

The widespread availability and distribution of non-quality-assured artemisinin combination therapies and non-artemisinin therapies[11] in DRC underscore the need for strong medicines regulatory systems, including PMS. In PY2, PQM+ began working with the Congolese Pharmaceutical Regulatory Authority (*Autorité Congolaise de Réglementation Pharmaceutique,* or ACOREP) and its NQCL – Pharmaceutical Laboratory of Kinshasa (*Laboratoire National de Contrôle de Qualité – Laboratoire Pharmaceutique de Kinshasa,* or LNCQ-LAPHAKI).

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

PQM+ resumed implementation of its activities in DRC with a virtual refresher training in preparation for sampling for the 2022 RB-PMS.[12] The training addressed 23 samplers (14 men, nine women) from ACOREP's staff and covered sampling techniques, sampling procedures, accurate recording of samples, sampling instructions, and precautions and the risk-based testing approach.

Sampling of antimalarials as planned in the 2022 RB-PMS protocol began at the end of March from nine USAID focus provinces—Bukavu (Sud-Kivu), Kabinda (Lomami), kalemie (Tanganyika), Kamina (Haut-Lomami), Kananga (Kassai-Central), Kolwezi (Lualaba), Lubumbashi (Haut-Katanga) and Mbuji-mayi (Kassai-Oriental) in DRC. This was five more than were sampled in 2021.

To help LNCQ-LAPHAKI continue to implement its roadmap toward ISO/IEC 17025 accreditation, PQM+ conducted a training on uniformity of dosage units (UDU) and quality risk management (QRM).

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Supervise sampling and testing of samples for the 2022 RB-PMS.
- Conduct a training on costing of QC samples and provide technical assistance to adopt a new methodology for costing QC samples.
- Conduct an ISO 9001 baseline assessment of ACOREP.
- Conduct an ISO 9001 awareness training for staff of ACOREP.

Ethiopia

The Ethiopian Food and Drug Authority (EFDA) registers all medical products; licenses and regulates the production, import, storage, and distribution of transregional medical products; and conducts quality-control testing and post-marketing surveillance of products circulating in the local market. All other regulatory activities that are not mandated to EFDA fall under the

[11] ACTwatch Group., Mpanya, G., Tshefu, A. et al. The malaria testing and treatment market in Kinshasa, Democratic Republic of the Congo, 2013. Malar J 16, 94 (2017). https://doi.org/10.1186/s12936-016-1659-x.
[12] These results are not necessarily nationally representative.

jurisdiction of regional government and city administration regulatory bodies. But the lack of clarity in mandates between EFDA and the regional regulatory bodies (RRBs), the absence of a formal reporting relationship between EFDA and those regulators, and the latter's poor capacity compromise proper regulatory oversight of medical products circulating in Ethiopia.

PQM+ works with EFDA and the RRBs to build capacity to monitor medical product quality across the supply chain and strengthen their collaborative working relationship. PQM+ also helps build local manufacturers' capacity to meet international standards, ensuring that locally produced medical products are of good quality and not harmful to end users.

Progress by PQM+ Objective

Objective 1: Governance for medical product quality assurance systems improved

An effective medicines regulatory system is a central, albeit often invisible, part of reliable, good-quality health care services and high-performing medical product supply chain systems. Strong medical product regulation promotes and protects public health by ensuring that medical products are of the required quality, safety, and efficacy and thereby cause more benefit than harm. Regulation also ensures that medical products are appropriately manufactured, stored, distributed, and dispensed; that illegal/illicit manufacturing and trade practices are detected and adequately sanctioned; and that health professionals and patients have the required information to enable them to use medical products appropriately. Finally, regulations ensure that promotion and advertising are fair, balanced, and aimed at rational use and that access to medical products is not hindered by unjustified regulatory processes or regulatory hurdles.

This quarter, PQM+:

- Participated in the Malaria Program Thematic Desk Review workshop prepared by MOH to provide relevant technical support.
- Contributed/recommended vital inputs (especially on QA and QMS for malaria products) of PQM+ through EFDA to the Ethiopian Malaria Elimination Strategic Plan (2021-2025).
- Suggested the importance of a QA system to the procurement and supply management system for antimalarial products (drugs and insecticide-treated nets).
- Coordinated an experience sharing visit of the MRA team from Madagascar.

Objective 2. Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

Activity 2.1. Support EFDA in addressing WHO's GBT assessment findings and prepare it for WHO Maturity Level 3 (ML3): PQM+ provided technical support for implementation of the IDPs established by EFDA based on identified noncompliance gaps of self-benchmarking for WHO ML3. Per the IDP, PQM+ has supported drafting and performing a technical workshop on the stringent regulatory authorities listing guideline and drafted a guideline for regulation of advertisement and promotion of medicines.

Aiming to address gaps identified during WHO's GBT assessment, PQM+ supported EFDA in drafting a clinical trial directive. The directive is based on clinical trial authorization and good clinical practice experiences from other countries and own-country experiences and policy documents. This quarter, PQM+ continued working with EFDA to get input from relevant

stakeholders on the draft clinical trial directive. A validation workshop took place in Adama in February for clinical trial stakeholders from research institutes, universities, advisory board members, trial participants, and implementation partners, with 35 people (13 women, 22 men) attending. Participants reviewed the draft directive and provided comments and input. The directive enables standardization and harmonization of clinical trial applications and protocols; provides public assurance that trial subjects' rights, safety, and well-being are protected; and emphasizes the principles of good clinical practice. It will be an instrument for EFDA to outline requirements under each activity of the clinical trial process. Other key benefits are improving information sharing and increasing transparency and information on clinical trials. The directive's availability and implementation are part of EFDA's IDP.

This quarter, PQM+ also provided technical assistance to EFDA in updating the national pharmacovigilance guideline. The draft document addresses GBT requirements with regard to guidance for pharmacovigilance inspection activities and other best practices on pharmacovigilance.

Activity 2.2. Build capacity of branch EFDA laboratories toward ISO/IEC 17025:2017 accreditation and of the main lab to maintain its accreditation: EFDA has five branch laboratories whose geographical locations are strategically based on the level of risk of infiltration of SF products in the country. These laboratories are closer to the end user, and their role is to assess the quality of medical products circulating in their catchment areas. They are also actively involved in the PMS programs. The labs' locations enable them to the fight the circulation of SF products, thereby protecting public safety. Currently, none of these laboratories is ISO/IEC 17025:2017 accredited or WHO-prequalified, meaning they may generate questionable test results that may not withstand legal scrutiny. During PY3, PQM+ supported implementation of the branch-specific roadmap toward ISO/IEC 17025:2017 accreditation along with EFDA's central lab experts.

This quarter, PQM+:

- Helped build capacity of the main EFDA Laboratory through support in revising QMS documents such as quality manuals and SOPs for maintenance of ISO/IEC 17025:2017 accreditation.
- Followed up with the procurement process for water softener at EFDA's Diredawa Branch Lab.
- Followed up with the Ethiopian National Metrology Institute for equipment calibration of EFDA's Diredawa Branch Lab.
- Supported the Diredawa Branch Lab to address items in the corrective and preventive actions (CAPA) plan generated during Q1.
- Procured and supported testing and reporting of proficiency testing (PT) samples for both the main lab (18 physico-chemical and 10 medical device samples) and Diredawa Branch Lab.

Table 1. Status of Lab Accreditation in Ethiopia

Laboratory	Accreditation	QMS	Initial Gap Assessment	CAPA	PT	Official Inspection/ Pre-assessment
DMQCD (EFDA), Ethiopia	IS/IEC 17025:2017 (Testing)	Completed	Completed	Ongoing	Submitted to the PT provider; awaiting the PT report	Planned for Q4

Objective 4. Increase supply of quality-assured essential medical products of public health importance

Activity 4.2: Build capacity of selected local pharmaceutical industries for achieving WHO PQ and local GMP certification: Ethiopia has few Giemsa stain manufacturers that supply products to the public procurement agency. In PY4 PQM+ planned to identify those manufacturers, conduct rapid gas assessment, and provide relevant technical support for some of the identified once so that they will be able to manufacture quality assured stains to be used for testing of malaria.

This quarter, PQM+ collaborated with EFDA and MOH to conduct a quality gap assessment on six local Giemsa manufacturers to evaluate their current good manufacturing practice (cGMP) status and provide technical support based on the outcome of the assessment. The report is drafted and PQM+ will discuss it with the manufacturers to finalize it. PQM+ will also develop an action plan to address the findings in Q3.

Priority Activities for Next Quarter

- Prepare for reaccreditation of the main EFDA laboratory and expansion of its scope to add three glove testing methods.
- Support the Diredawa Branch Lab toward final ISO accreditation.
- Develop an RB-PMS protocol and start collecting samples.
- Support EFDA toward ML3 by addressing gaps to be identified through the WHO official inspection in early June 2023.
- Conduct a gap assessment of selected local manufacturers toward WHOPQ of their selected products.
- Support addressing gaps identified on local Giemsa stain manufacturers.

Ghana

The Food and Drugs Authority of Ghana (FDA Ghana) is the national regulatory body responsible for the regulation of food, drugs, clinical trial protocols, and other products. FDA Ghana carries out key regulatory functions through its divisions: Drug Registration and Inspections; Safety Monitoring and Clinical Trials; Medical Devices and Cosmetics; Monitoring and Evaluation (M&E); and Household Chemicals Substances. FDA Ghana is ISO 9001-certified and, in 2020, attained WHO ML3. Its Center for Laboratory Services and Research (CLSR) is also ISO/IEC 17025 accredited and WHO prequalified. At the time of its June 2021 audit by the American National Accreditation Board, it had the largest accreditation scope in Africa.

PQM+ is helping Ghana improve the supply of quality assured medicines by providing technical assistance to select local manufacturers of artemisinin-based combination therapies and MCH commodities such as oxytocin.

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

FDA Ghana completed the sampling of 2022 RB-PMS antimalaria samples.[13] A total of 143 antimalaria and MCH samples were collected from seven regions (Central, Ashanti, Greater Accra, Volta Region, Upper West, Upper East, and Western Region). This total number of samples was less than the target (349) because most of the facilities visited either did not have the targeted products or the quantities of the products in-stock were not enough to allow sampling. FDA Ghana has already issued a national alert on 19 samples (11 brands including Beltocin labeled for room temperature storage) of oxytocin injection that were unregistered and initiated a recall.

In Q2, PQM+ collaborated with the Ghana Health Service (GHS) and FDA Ghana to disseminate the results of the zone of influence (ZOI) study. The study covered four regions in Northern Ghana: Upper West, Upper East, Northeast, and Northern Region. Eight hundred respondents (nurses, midwives, doctors, pharmacists, pharmacy technicians) from 298 facilities completed the questionnaire that PQM+ developed with approval from the Ghana Health Services Ethics Review Committee.

The dissemination workshop included 33 participants representing FDA Ghana, the family health division of the GHS, health care providers from the four regions, and other key stakeholders (Global Health Supply Chain-Procurement and Supply Management/GHSC-PSM, World Vision, Advancing Nutrition). Key recommendations include:

- Ensure all oxytocin is labeled for storage at 2℃ to 8℃.
- Include the storage requirement of 2℃ to 8℃ in the framework contracting criteria.
- Improve collaboration between Ghana FDA, Ministry of Health, Ghana Health Service, and partners on improving quality uterotonics to clients.
- Need for widespread dissemination of the Ghana Standard Treatment Guidelines for Postpartum Hemorrhaging (PPH) 2021 and training of health care providers to ensure strict adherence to standards.
- Provide continuous pre- and in-service training to providers of maternal health care services on the appropriate use and storage of uterotonics, including around the quality of medicines.
- Make available data loggers for verification of the actual storage temperature and humidity unveiled that significant proportions were not within the recommended limits.

[13] These results are not necessarily nationally representative.

Objective 4: Supply of quality-assured essential medical products of health importance increased

In Q2, PQM+ provided three training sessions on four key GMP topics identified in the roadmaps of the local manufacturers it is supporting. The sessions covered (1) analytical method validation, (2) comparative dissolution studies, and (3) stability studies, process development/validation, and annual product quality review.

Thirteen laboratory analysts (11 men, two women) from six manufacturers attended the training on analytical method validation; 19 participants (16 men, three women) attended the training on comparative dissolution studies; and 21 participants (11 men, 10 women) attended the training on stability studies, process development/validation, and annual product quality review.

These training sessions are required to help build the necessary capacity of the manufacturers as they prepare for either local registration of their products or WHO prequalification. Manufacturers will need to submit the data for method verification/validation as part of their dossier for local registration/WHO prequalification. Comparative dissolution studies are required for generic products; when produced, these need to be compared to the innovator products to ensure their release performance is comparable. This study is required, in addition to bioequivalence studies for the products being developed for local registration and WHO prequalification. The manufacturers need to include data on the stability of their products as part of the submission to the regulatory. This study also helps the manufacturer determine the shelf life of the products they manufacture.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Conduct training for local manufacturers of both antimalarials and MCH products on impurities testing and dossier compilation, as per the roadmaps towards local registration or WHO PQ.
- Supervise the testing of samples collected from the 2022 RB-PMS.

Guinea

Guinea's National Directorate of Pharmacy and Medicines (DNPM) is implementing regulatory provisions related to its mandate while strengthening its technical capacity to carry out regulatory functions. The NQCL, *Laboratoire national de contrôle qualité des medicaments* (LNCQM), conducts quality testing of medical products to facilitate decision-making by DNPM. PQM+ works with DNPM to strengthen its market surveillance function by operationalizing a TWG to implement RB-PMS. Additionally, PQM+ has assisted LNCQM in improving its QMS to conform with ISO/IEC 17025 standards and is strengthening its technical analysts' capacity to conduct quality testing per the ISO accreditation roadmap developed in PY2.

Progress by PQM+ Objective

Objective 1: Governance for medical product quality assurance systems improved

In PY3, PQM+ helped LNCQM and DNPM develop the collaborative framework between the institutions. To ensure implementation of the framework, which sought to delineate agreed-on areas of the institutions' collaboration and their individual responsibilities, PQM+ supported both to draft terms of reference for establishing a committee of DNPM and LNCQM management to

oversee implementation of the collaborative framework. PQM+ also assisted both institutions to with designating members to serve on the committee.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

Antimalaria Samples Screening: In Q2, LNCQM completed the screening of the antimalaria samples collected in December 2022. MCH products are not screened and proceed directly to confirmation testing. In addition, the PMS-TWG completed the draft of its 2021 RB-PMS report[14] and submitted it to PQM+ for review before official submission to the DNPM. While PQM+ has been following up to ensure this report is finalized, progress has been slow due; challenges in country are resulting in salary delays, reducing the motivation of staff to respond in a timely manner.

Family Planning RB-PMS: In March, PQM+ developed an RB-PMS protocol of family planning (FP) medicines using the MedRS tool.[15] PQM+ plans to collect 204 FP samples (medroxyprogesterone acetate 150mg/ml, ethynylestradiol/levonorgestrel 0,05 mg / 0,25 mg and ethinyestradil/northistérone 0,05 mg/1mg) from eight regions in Guinea. In addition, PQM+ drafted the scope of work to start the process to recruit university students who will serve as samplers for the FP RB-PMS, given that the Government of Guinea cannot be the direct beneficiary of FP funds.[16]

ISO 17025 Trainings: As part of building its capacity toward international recognition (ISO/IEC 17025), PQM+ trained LNCQM technical staff on QRM, measurement uncertainty (MU), and UDU, reaching 17 participants (14 men, three women). The training covered theoretical topics, as well as hands-on sessions to ensure the participants gained the practical skills to implement these areas in their laboratory. Key next steps include the revision/finalization of SOPs related to MU and UDU, which PQM+ help them draft, to facilitate their implementation in LNCQM.

Mapping Wholesalers: In Q2, PQM+ developed a questionnaire to map the wholesalers in Guinea to the procurement and distribution of FP medicines in the country. This questionnaire seeks to understand the warehousing systems available at the wholesalers' premises and how they manage environmental conditions to ensure they are meeting the storage conditions of manufacturers of the medicines they store.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Deploy the questionnaire designed to map wholesalers in Guinea to FP commodities.
- Conduct training on good receiving, storage, and distribution practices for FP wholesalers/distributors.
- Supervise the confirmatory testing of 2022 RB-PMS samples.

[14] These results are not necessarily nationally representative.

[15] These results will not necessarily be nationally representative.

[16] PQM+ is directly implementing this activity (2.5 in the PY4 work plan) due to restrictions on FP funds as a result of the September 2021 coup d'etat in Guinea.

Kenya

PQM+ delivers technical assistance to Kenya's Pharmacy and Poisons Board (PPB), National Quality Control Laboratory (NQCL), Ministry of Health's Division of National Malaria Program (DNMP), Department of Family Health (DFH), Division of Health Products and Technologies (DHPT), and the counties to strengthen in-country stakeholders' capacity in ensuring access to quality-assured medical products in the country.

Progress by PQM+ Objective

Objective 1: Governance for medical product quality assurance systems improved

PQM+ supported the Q2 Pharmacovigilance (PV) /PMS TWG workshop to continue with the oversight work of strengthening the QA of medical products. Representatives from NQCL, PPB, Mission for Essential Drugs and Supplies (MEDS), and DHPT (chair of the TWG) participated. The workshop achieved the following:

- Reviewed the draft PMS strategy.
- Reviewed the status of implementation of the TWG workplan.
- Reviewed the SOP on handling market complaint and reports of poor-quality medical products. This included incorporating recommendations from the WHO GBT assessment and experience from handling complaints in the past. The reviewed procedure will strengthen the investigations of quality complaints of antimalarials in the country.
- Initiated preliminary discussions on the development of a protocol for conducting RB-PMS of malaria rapid diagnostic test kits (mRDTs).[17]

The program participated in the review of strategies to prevent and manage malaria in Kenya. The review workshop, organized by the DNMP, incorporated recommendations from WHO after a previous assessment of the strategy. The strategy also included surveillance of the malaria commodities to assure their quality, safety, performance, and efficacy.

PQM+ is supporting the PPB to recruit and onboard 25 new regulatory staff. In Q2, the program supported this by:

- Developing a job vacancy announcement and placing an ad in Kenya's largest circulation daily newspaper on March 3. PPB placed the same ad in another daily newspaper.
- Developing of an online portal for applications.
- Shortlisting 125 qualified candidates from 314 applications received.
- Preparation of induction and onboarding materials for the new staff is ongoing.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

PQM+ is working with the DHPT and Busia County to support implementation of QA strategies in handling malaria medicines and other health products and technologies (HPTs). In Q2, the

[17] These results will not necessarily be nationally representative.

program helped review four SOPs related to assuring the quality of commodities during procurement, transportation, and storage. Once completed and approved, the SOPs will be implemented at the county, subcounty, and lower-level health facilities.

The program worked with PPB to review the licensing and inspection guidelines and procedures to strengthen its regulatory oversight toward achievement of WHO GBT ML3. This is in line with addressing the recommendations from the June 2022 WHO GBT ML3 assessment.

Objective 5: Global medical product quality assurance learning agenda and operational agenda advanced

PQM+ and Busia County coauthored an abstract and conference poster for the Kenya National Malaria Forum. The local forum was attended by Malaria stakeholders including the U.S. President's Malaria Initiative (PMI), implementing partners, research institutions, academic institutions, national and county governments, and public and private institutions. The poster, titled *Laying the Foundation for Quality Assurance of Antimalarial Medicines in Busia County,* enumerated the approach PQM+ is taking to help optimize existing county structures to strengthen systems for assuring the quality of antimalarials and related medicines.

Priority Activities for Next Quarter

Next quarter, PQM+ in Kenya plans to:

- Complement ongoing Global VAX work and continue working with PPB to revise guidelines and procedures as recommended by WHO GBT assessors.
- Work with the Pharmaceutical Society of Kenya (PSK) to finalize and validate the developed technical content on QA and pharmaceutical regulation to build the technical capability of the pharmaceutical workforce.
- Support the PV/PMS TWG to develop a PMS protocol, using the risk-based approach, for malaria rapid diagnostic tests and other medical devices.
- Collaborate with DHPT and DNMP to conduct supportive supervision activities in Busia County to monitor progress in implementing action plans and develop/revise SOPs on QA of antimalarial medicines and other essential HPTs.
- Participate in new staffing interviews and support onboarding.

Lesotho

With USAID funding from the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), PQM+ is helping Lesotho develop appropriate regulations and support good governance. The national medicines system in Lesotho plays a crucial role in protecting and improving public health by ensuring that essential medical products, such as antiretroviral (ARV) medicines, that are available and used in Lesotho are of good quality, efficacious, and safe for human use. Currently, the Ministry of Health (MOH) is performing some basic medical product regulatory functions through its Directorate of Pharmacy, but the country is moving toward an independent regulatory authority as recommended by WHO and the soon-to-be enacted Lesotho Medicines and Medical Devices Control Authority (LMMDCA) Bill, 2019.

Progress by PQM+ Objective

Objective 1: Governance for medical product quality assurance systems improved

Held an in-country project kickoff meeting with key stakeholders including the Ministry of Health, Directorate of Pharmacy, USAID/PEPFAR, National University of Lesotho, and Ministry of Health Programs responsible for HIV, MCH, and family planning and reproductive health.

PQM+ worked collaboratively with the Directorate of Pharmacy to establish key contacts for workplan activities.

- PQM+ assisted with drafting of terms of reference for a technical working group comprising multiple stakeholders to craft and implement the roadmap toward establishing a national medicines regulatory authority.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

PQM+ facilitated training for two pharmacy directorate inspectors on good storage and distribution practices (GSDP) and RBI tool use in Johannesburg, South Africa, in collaboration with the South African Health Products Regulatory Authority (SAHPRA) and PQM+ work on the Global VAX program. Inspectors were certified as trainers to provide further training and capacitation of regulatory inspectors in Lesotho.

- Built Directorate of Pharmacy staff's capacity to conduct inspections to detect risks to medical products, especially vaccines at different stages in the supply chain, including purchasing, storage, repackaging, relabeling, transportation, and distribution.
- Supported the Directorate of Pharmacy in mitigating the risks of SF medicines, including vaccines, by providing training of trainers in the use of the RBI methodology for the downstream pharmaceutical distribution chains and use of an RBI tool to allow the pharmacy directorate to prioritize the selection and inspection of distribution facilities.

Priority Activities for Next Quarter

Next quarter (Q3), PQM+ in Lesotho plans to:

- Conduct a regulatory functions gap analysis workshop.
- Assist the Pharmacy Directorate to draft priority regulations, guidelines, and procedures.
- Implement the RBI tool in Lesotho.
- Assist the Pharmacy Directorate with adapting regional regulatory harmonization guidelines, tools, and documents.
- Finalize the draft of the mutual recognition agreement with other MRAs.
- Finalize the draft memorandum of understanding for laboratory testing with the National University of Lesotho.
- Draft guidelines for RB-PMS on antiretrovirals and related medicines[18] in Lesotho.

[18] These results will not necessarily be nationally representative.

Liberia

In Liberia, PQM+ is strengthening the country's regulatory system, specifically supporting the Liberia Medicines and Health Products Regulatory Authority (LMHRA) in six of the eight regulatory functions per the WHO GBT.

PQM+ supported the LMHRA to develop appropriate regulatory tools for its efficient operations and to remove substandard antimalarial and MCH medicines from circulation. PQM+ supported the LMHRA quality control lab in developing a laboratory quality management system.

Also this quarter, PQM+ supported Liberia Manufacturer 1 toward attaining a manufacturing license and GMP certificate from the LMHRA.

Progress by PQM+ Objective

Objective 1: Improve governance for medical product quality assurance systems.

This quarter, PQM+ supported the LMHRA to develop appropriate regulatory tools for the efficient operations of LMHRA. PQM+ supported drafting 12 SOPs in fulfillment of requirements in the LMHRA institutional development plan that resulted from the 2021 WHO GBT assessment. The SOPs cover regulations on marketing surveillance and control, registration and marketing authorization, and regulatory inspection.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

This quarter, LMHRA removed from circulation more than $56,000 USD worth of substandard and unregistered antimalaria and MCH medicines. The medicines included artemether lumefantrine, artemether injections, and oxytocin. This enforcement action resulted from the second and third rounds of PMS. Dissemination of the PMS results is expected to take place in April. In preparation for a new round of PMS, PMQ+ facilitated the training of 24 members of the PMS-TWG on the online MedRS tool.[19]

PQM+ also supported the lab with the following components in developing a laboratory quality management system:

- Drafting required SOPs.
- Developing ILT/PT, equipment calibration, and internal audit plans.
- Performing one internal audit.
- Forming a lab management review committee.

Objective 4: Supply of quality-assured essential medical products of health importance increased

PQM+ supported Liberia Manufacturer 1 toward attaining a manufacturing license and GMP certificate from the LMHRA. In 2022, PQM+ provided technical support to the manufacturer by conducting a GMP gap assessment, generating a CAPA report and closing it, providing guidance on the local manufacturing of medicines, and training LMHRA staff in GMP inspection.

[19] These results are not necessarily nationally representative.

PQM+ also supported the process allowing the LMHRA to test 11 products manufactured by Liberia Manufacturer 1 at USP's Ghana Lab. The test results from USP Ghana enabled the LMHRA to issue the marketing authorization of 11 products to Liberia Manufacturer 1, enabling the company to commence local manufacturing of medicinal products in Liberia.

Left to right: Health Minister Wilhelmina Jallah, Liberia Vice President Jewel Taylor, and Professor Nelson Oniyama.

Priority Activities for the Next Quarter

Next quarter, PQM+ plans to:

- Conduct one round of sample collection.
- Start and complete MiniLab™ screening.
- Finish developing course material for the medical product short course.
- Continue supporting the lab to develop a laboratory quality management system.

Madagascar

PQM+ collaborates with Madagascar's medicines regulatory authority, *Agence du Médicament de Madagascar* (AMM), to strengthen its capacity to assure medicines and medical product quality throughout the country. AMM performs all regulatory functions through four technical departments: pharmaceutical inspection, registration, pharmacovigilance, and quality control. The National Pharmaceutical Quality Control Laboratory (*Laboratoire National de Contrôle de Qualité des Médicaments*/LNCQM*)* is part of the AMM's QC department. PQM+ is helping AMM strengthen the LNCQM's capacity to prepare for ISO/IEC 17025:2017 accreditation and WHO prequalification.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

Activity 2.1: Strengthen PMS of medicines quality in Madagascar using a risk-based approach

- PQM+ continued assisting AMM to implement its RB-PMS protocol for reproductive health and antimalarial medicines, completing sampling of medicines in 12 regions and obtaining chemicals needed to test these medicines in the laboratory.[20]
- PQM+ conducted a workshop with AMM and the PMS TWG to develop a guideline on reporting, investigating, recall, storage, and disposal of SF medical products and a document on monitoring and evaluation framework for RB-PMS.

Activity 2.2: Strengthen the capacity of Madagascar LNCQM

- PQM + conducted an on-site visit of the laboratory's new location on February 1 and 2, confirming observations from the preliminary remote assessment and prioritizing recommendations for improvement.
- PQM and LNCQM reviewed five laboratory procedures this quarter, including one describing the risk-based testing process, as required by the WHO GBT.
- PQM+ trained two new laboratory analysts on QMS/ISO 17025:2017 standards on March 1 and 2.

Table 2: Status of Labs Accreditation in Madagascar

Laboratory	Accreditation Sought	QMS	Initial Gap Assessment	CAPA	LIF	Official Inspection/ Pre-assessment
LNCQM	ISO 17025 : 2017	Review ongoing	Done	Yes	No	Laboratory is waiting to move to another location

Activity 2.3: Strengthen the capacity of AMM in pharmaceutical regulatory inspection. PQM+ collected countrywide information related to AMM inspection sites. The information has been incorporated into the RBI tool and will be used during the RBI training.

Objective 5: Global medical product quality assurance learning agenda and operational agenda advanced

Activity 5.1: Develop and implement a short course on RB-PMS in collaboration with FOP-UOA and AMM. PQM+ held an initial planning meeting on 30th of January with the head of the Faculty of Pharmacy (FOP) and two other professors to jointly review and compare the content of the University of Antananarivo's pre-service quality control and assurance course; and the content of the PQM+'s in-service RB-PMS course.

Activity 5.2: Facilitate AMM's experiential learning at Ethiopian Food and Drug Authority. PQM+ organized a site visit of the EFDA in Addis Ababa, Ethiopia for the AMM Director and the Head

[20] These results are not necessarily nationally representative.

of LNCQM from the 6th to the 9th of February. The objective was to observe and share knowledge on MRA and accredited National Quality Control laboratory practices.

Left to Right: Head of LNCQM Rivo Tantely Raminosoa, AMM Director Dr. Hoby Sitraka Ravelomampianina, PQM+ Ethiopia Chief of Party Zelalem Sahile, and two laboratory analysts from EFDA discuss analytical techniques. Photo credit: PQM+

Priority Activities for Next Quarter

Next quarter (Q3), PQM+ in Madagascar plans to:

- Train AMM-designated pharmacist on RBI.
- Finalize the assessment report of LNCQM's new location.
- Conduct a workshop with the PMS TWG to present the results of the PMS samples testing, finalize the guideline on reporting, investigating, recall, storage, and disposal of substandard and falsified medical products, and finalize the monitoring and evaluation framework for RB-PMS.
- Conduct a short course on RB-PMS in collaboration with Faculty of Pharmacy – University of Antananarivo and AMM.

Malawi

PQM+ collaborates with Malawi's Pharmacy and Medicines Regulatory Authority (PMRA) to revise and update the PMRA strategic plan of 2018 – 2023 with the aim of aligning the plan with current developments in the pharmaceutical sector in Malawi and in the region and globally. Strategic plans for medicines regulatory authorities are a crucial tool for improving governance of medical product quality assurance systems. If well implemented, the new strategic plan for

PMRA will guarantee sustainable access to quality-assured safe and effective medical products that address the local health needs in Malawi.

Progress by PQM+ Objective

Objective 1: Governance for medical product quality assurance systems improved

PQM+ received concurrence from the USAID Mission and subsequently the agreement officer's representative team's approval of the PQM+/Malawi work plan, allowing activities to commence. Immediately following the work plan approval and obligation of funds, PQM+ hired and onboarded a consultant with expertise in strategic planning to revise and update the PMRA strategic plan of 2018 – 2023. This will involve a consultative process that will gather, consider, and incorporate guidance, input, and recommendations from PMRA's board of directors, management, and staff, as well as other key stakeholders. At the close of Q2, PQM+ had finalized the implementation plan and proposed travel arrangements to Malawi for an in-country kickoff meeting in early Q3.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Hold an in-country project kickoff/inception meeting with key stakeholders, including PMRA, and key implementing partners in country.
- Perform a desktop review of strategic documents.
- Conduct an in-country workshop to draft a strategic planning framework,
- Finalize the draft PMRA strategic plan.
- Finalize the strategic plan revision report.

Mali

In Mali, the Directorate of Pharmacy and Medicines (DPM) and the National Health Laboratory (*Laboratoire National de la Santé,* LNS) oversee medicines regulation. The DPM is an ML1 agency. The LNS tests the quality of medical products, food, beverages, or any substance imported or produced in the country that is intended for therapeutic or dietary purposes. In January 2023, LNS achieved ISO/IEC 17025 accreditation for four quality control techniques, for its medicines quality control laboratory (LCQM) with direct support from PQM+ which started in 2020.

PQM+ works with the DPM to strengthen its market surveillance function through establishing and operationalizing a PMS-TWG to implement RB-PMS and improve the capacity for medicine registration.

In addition, PQM+ is providing tailored technical assistance to the Medicines Quality Control Laboratory within LNS to attain ISO/IEC 17025 accreditation to expand their accreditation scope and to include pharmaceutical microbiology testing.

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

In Q2, the LNS completed the confirmatory testing of the 2022 RB-PMS antimalaria and MCH samples. In addition, the PMS-TWG finalized their 2022 RB-PMS report[21] with minimal support from PQM+ - the report was drafted and revised by the PMS-TWG with revision inputs from PQM+. In February, PQM+ supported the dissemination of these PMS results. More than 50 medical products quality assurance stakeholders attended. 341 samples were collected from 9 regions in Mali. Out of the 341 samples (190 antimalarials and 151 MCH medicines) collected, 4 antimalarial samples and 15 MCH samples did not meet quality specifications and therefore failed their quality analysis. The recommendations from this 2022 survey, formulated at the dissemination workshop included: Updating the list of pharmaceutical facilities, scrupulously respect the Master Plan for the Supply and Distribution of Essential Medicines (SDADME), place minilabs at the regional level and training of regional staff on sampling, quickly recall falsified and substandard medicines, take regulatory action for unregistered drugs, continue the supervisory missions of the PMS-TWG in order to monitor the implementation of the regulatory actions of the DPM regarding the recall of products from circulation, share the results of the 2022 PMS with the Ministry of Health and develop a technical note on what is required for effective regulatory actions to be taken and be more effective and finally to ensure PMS is included in the annual workplans of the regional health directorates. Prior to the dissemination workshop the DPM had issued product recalls and visited the affected regions to confirm that the products had been recalled and were not available at the facilities where they were found.

Building on the work completed in PY3 and supporting the microbiology laboratory to implement its roadmap toward ISO/IEC 17025 accreditation, PQM+ provided QMS training on risk management and good practices for microbiological laboratories. Additionally, PQM+ provided a refresher training for both physiochemistry and microbiology laboratory on Measurement Uncertainty estimation, internal quality control checks and implementation of analytical method verification. This will help ensure the LNS technical staff gain the needed competence to maintain their newly attained accreditation.

In Q2, LNS demonstrated their commitment to maintaining their newly achieved accreditation by conducting their management review meeting, developing their 2023 training plan (to be executed by staff capacitated by PQM+) and internal audit plan for 2023 without support from PQM+. PQM+ will take part to LNS monthly quality meetings to observe monitor the implementation the critical QMS functions.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Conduct hands-on training for microbiology testing.
- Supervise Mali's PMS-TWG as it develops its fourth RB-PMS protocol using the MedRS tool.
- Complete the baseline assessment of regulatory inspections in Mali (a role shared by Inspection de la Santé and DPM).

[21] These results are not necessarily nationally representative.

Mozambique

Mozambique recently established an autonomous medicines regulatory authority (MRA), ANARME, IP (*Autoridade Nacional Reguladora de Medicamentos, Instituto Publico)*, which encompasses the *Laboratório Nacional de Comprovação da Qualidade* (LNCQ) as a division within ANARME, IP. PQM+ has been providing technical assistance in the transition to an autonomous national MRA and assistance moving ANARME, IP toward attaining WHO GBT ML3 and achieving ISO 9001:2015 certification. Additionally, PQM+ has been assisting LNCQ to identify and bridge gaps toward attaining ISO 17025:2017 accreditation, including developing the necessary QMS documents, manuals, and processes.

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

Sub-Objective: Provide technical assistance to ANARME, IP to conduct RB-PMS surveillance for antiretroviral medicines in health care facilities. Poor-quality ARV medicines pose a risk to patient safety, compromise treatment and prevention outcomes, and affect the willingness of patients to start and remain on long-term treatment. Concerns about the continued quality of ARVs at the lower levels of the supply chain stem from challenges around commodity storage. PQM+ is working with ANARME, IP as part of support toward attaining WHO GBT ML3 to conduct RB-PMS of ARVs used in the national HIV program.[22]

In Q2, PQM+:

- Engaged ANARME, IP management and technical personnel to discuss and plan for the ARV PMS activities and synchronize with other routine ANARME, IP regulatory activities.
- Identified key ARVs used in the national HIV program in preparation for risk assessment and development of the PMS protocol and identification of appropriate quality tests for samples to be collected.
- Commenced the process of identifying potential external laboratories to support testing of samples in techniques that the LNCQ does not have the capacity to test.

Sub-Objective: Support ANARME, IP to conduct RB-PMS for long-acting contraceptive implants. Poor-quality contraceptive implants threaten the success of family planning efforts and potentially compromise the reproductive health of women in Mozambique. PQM+ is supporting ANARME, IP to assess the quality of contraceptive implants through RB-PMS to provide the necessary evidence to support programmatic decisions.

During Q2, PQM+:

- Consulted with ANARME, IP on the modalities of the PMS activity and potential synergy with other planned PMS activities.

[22] These results will not necessarily be nationally representative.

- Engaged with ANARME, IP to identify the contraceptive implants registered in the country and worked with supply chain partners to identify contraceptive implants circulating in the country.
- Held internal discussions with PQM+ technical experts to identify potential quality testing methods for contraceptive implants.

Sub-Objective: Support LNCQ to strengthen its reliability testing capacity for PMS of family planning and reproductive health products. ANARME, IP is pursuing WHO GBT ML3 and ISO 17025:2017 accreditation for the LNCQ. PQM+ is providing technical assistance to LNCQ in supporting the PMS activities as well as in addressing the gaps identified in the roadmap toward ISO 17025:2017 accreditation.

During Q2, PQM+:

- Engaged the LNCQ to review capacity for testing PMS samples.
- Worked with the LNCQ to identify and quantify reagents and reference standard needed to support sample quality testing.
- Identified potential suppliers for reagents/reference standards, water purification system, and equipment calibration and maintenance services.

Table 3: Status of Labs Accreditation in Mozambique

Laboratory	Accreditation Sought	QMS	Initial Gap Assessment	CAPA	LIF	Official Inspection/ Pre-assessment
LNCQ	ISO 17025:2017 (Calibration)	Develop and review most QMS documentation (completed, pending some required in-person PQM+ subject matter expert support)	Initial gap assessment by PQM+ complete	Mock audit to be conducted after closure of the gaps identified in the initial gap assessment. Previous CAPAs from the failed proficiency tests have been investigated and closed.	N/A	Not done

Priority Activities for Next Quarter

Next quarter, PQM+ in Mozambique plans to:

- Work with ANARME, IP to commence planned PMS activities targeting ARVs and long-acting contraceptive implants. This will include training of the PMS TWG on the MedRS tool, development of the protocols, sample collection, and testing.
- Provide training for selected ANARME, IP staff in the use of the TruScan analyzer technology procured through PQM+ assistance.
- Train the LNCQ team on compendial testing as part of laboratory capacity strengthening and in preparation for ISO 17025:2017 accreditation.
- Procure the reagents and reference standards, water purification system, and equipment calibration and verification services.

Nigeria

PQM+ is focused on helping ensure the quality of medicines and other medical products in Nigeria, with an emphasis on malaria and MNCH medicines and family planning commodities. PQM+ collaborates with stakeholders in the public and private sectors to increase local pharmaceutical manufacturing capacity and sustainably strengthen regulatory systems at the national and state levels. PQM+ also strengthens QMS and builds laboratory capacity in QC testing in compliance with international standards.

Progress by PQM+ Objective

Objective 1: Governance for medical product quality assurance systems improved

PQM+ developed a draft of the proposed Nigeria Pharmaceutical Manufacturing Sector Strategy. Plans are ongoing to convene a TWG meeting to finalize the draft in Q3.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

PQM+ supported the National Agency for Drug Administration and Control (NAFDAC) Central Drug Quality Control Laboratory (CDCL) to address issues from the last inspection for WHO PQ. Support included:

- Closing CAPA items from the WHO-PQ that have been pending since a 2019 inspection during a one-week workshop in January.
- Conducting a training on the Stepwise Assessment Tool Towards Accreditation (SATTA) to aid internal auditing of NAFDAC's CDCL in January for 19 staff (nine women, 10 men).
- Performing a mock audit of CDCL in January and February to prepare for the 2023 WHO PQ inspection, and subsequently observing the WHO PQ inspection in mid-February.

NIPRID Mock Audit: Reassessment of the National Institute for Pharmaceutical Research and Development (NIPRD) QCL in preparation for its ISO 17025 reaccreditation and extension of scopes to three microbiological parameters:

- PQM+ conducted a mock audit of the laboratories between March 21 and 24.
- Nigeria National Accreditation System (NiNAS), NIPRD's evaluators for the ISO 17025 accreditation of its QCL, scheduled a recertification inspection of the lab for late April.

Capacity Building of CPs and PPMVs: Liaised with the Pharmacy Council of Nigeria (PCN) to conduct capacity building workshops for community pharmacists (CPs) and patent and proprietary medicines vendors (PPMVs) in Benue state on QA on medicines, sourcing and identification of quality medicines, and supply chain management, as well as sensitizing them on procedures to register retail medicines outlets with the PCN.

Visual Aids for PPMVs and Patients: PQM+ distributed 150 job aids/posters to PPMVs in Bauchi state. The job aids provide information for PPMVs and their patients on identifying quality medical products.

Objective 4: Supply of quality assured essential medical products of health importance increased (MNCH and Nutrition)

WHO PQ accepted and published the WHO Public Inspection Report (WHOPIR) for Nigeria Manufacturer 4 for two products pursuing prequalification: sulfadoxine + pyrimethamine (SP) and zinc sulfate ($ZnSO_4$). Measures included:

- Conducting WHOPIR for palatability studies on zinc sulfate dispersible tablets.
- Conducting WHOPIR for BE studies for SP.
- Inspection by the WHO PQ team of Nigeria Manufacturer 3's facility in Sagamu to produce SP.
    - This follows Nigeria Manufacturer 3's earlier submission of its Common Technical Document (CTD) product dossier to the WHO PQ in Q3 of FY 2022.
- Providing technical assistance to Nigeria Manufacturer 8, on request from USAID/Nigeria, to prepare for the United Nations Children's Fund (UNICEF) pre-procurement inspection for ready-to-use therapeutic foods (RUTF) products.

Priority Activities for Next Quarter

Regulatory Systems Strengthening

- Assist NAFDAC on CAPA plans from the WHO PQ inspection report.
- Assist NIPRD on CAPA closure from NiNAS findings.
- Support PCN to train the Lagos Zonal Office on ISO 9001:2018
- Support NAFDAC to conduct RB-PMS on FP commodities (male and female condoms).[23]
- Conduct SATTA training for other NAFDAC laboratories (Agulu Lab, Kaduna Lab, Oshodi Food Lab and Vaccine, Biologics and Medical Device Lab, Yaba).

Technical Support to Pharmaceutical Manufactures:

- Conduct Module 2 QRM training on the risk-based approach to inspection and dossier assessment.
- Build capacity on product quality reviews for Industry and CDDDP.
- Follow up visit to Nigeria Manufacturer 6 on the progress with turnaround maintenance and WHO PQ inspection preparedness.

[23] These results will not necessarily be nationally representative.

Table 4: Status of Quality Control Labs Accreditation in Nigeria

Laboratory	Accreditation Sought	QMS	Initial Gap Assessment	CAPA	LIF	Official Inspection/ Pre-assessment
NAFDAC Central Drug Control Laboratory, Yaba, Lagos	ISO 1025:2017 (Testing)	Complete	Completed	Nil	N/A	Completed
NAFDAC Central _	WHO PQ	Complete	Completed	Expecting official WHO inspection report.*		Inspection occurred February 15 – 17, 2023; inspection report to come.*
NAFDAC Vaccine, Biologicals and Medical Devices Lab, Yaba, Lagos	ISO 17025:2017 (Testing)	Complete	Completed	Nil	N/A	Completed
	ISO 17025:2017 (Testing)	Complete	Completed	Nil	N/A	Completed
NAFDAC Agulu Laboratory Service	ISO 17025:2017 (Testing)	Complete	Completed	Nil	N/A	Completed
	ISO 17025:2017 (Testing)	Complete	PQM+ completed a gap assessment of the Microbiology and Biotechnology Department.*	Completed	N/A	Reaccreditation of physico-chemical tests and scope extension for microbiological testing are scheduled for Q3.*

Changes for Q2 are in red and marked with an asterisk.

Rwanda

PQM+ is building the capacity of the Government of Rwanda (GOR) to manage the country's pharmaceutical system, focusing on product quality assurance, to meet its public health needs. The primary focus is strengthening the medicines regulatory system in quality assurance areas, including those outside the mandate of other USAID programs (e.g., RB-PMS and drug quality control laboratory strengthening). This will contribute significantly to improving the Rwanda Food and Drug Authority (Rwanda FDA) regulatory system as an essential public health function and advancing implementation of the government's National Pharmaceutical Sector Strategic Plan in collaboration with other organizations such as Rwanda Medical Supply Limited and Regional Center of Excellence for Vaccines, Immunization, and Health Supply Chain Management.

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

- Trained 25 multisectoral participants of RB-PMS TWG on sample collection of MCH and family planning and reproductive health (FP/RH) medical products
- Conducted theoretical and practical training of 13 Rwanda FDA staff on detecting, preventing, and responding to SF medical products, including the use of Minilab™ kits.
- Provided technical support to Rwanda FDA on revision of PMS regulatory documents including guidelines, protocol, and SOPs on RB-PMS.
- Provided technical support to Rwanda FDA to conduct the first RB-PMS TWG meeting.
- Provided technical assistance to Rwanda FDA on raising public awareness on the quality and safety of medicines through radio and TV talk shows.
- Trained Rwanda FDA quality control laboratory staff on methods development, verification, and validation.
- Supported Rwanda FDA QCL to acquire and install equipment to enhance laboratory security (cameras).
- Supported Rwanda FDA QCL to acquire and install prioritized occupational health and safety equipment (fire alarm, extinguishers, and smoke detectors).

Priority Activities for Next Quarter

Next quarter, Rwanda PQM+ plans to:

- Support Rwanda FDA to subscribe to select scientific journals on the quality and safety of medical products,
- Provide technical support to Rwanda FDA to conduct the second RB-PMS TWG meeting.
- Train QCL staff on methods development, verification and validation, measurement uncertainty and equipment suitability, equipment performance, qualification, and preventive and corrective maintenance especially for dissolution, HPLC, GC, atomic absorption spectroscopy (AAS), and liquid chromatography with tandem mass spectrometry (LC-MSMS, mainly Agilent).
- Conduct a mock audit and support QCL staff to initiate ISO 17025:2017 accreditation and WHO PQ process and conducting a training on internal auditing of laboratory management system.
- Provide technical support in PT of 10 samples and facilitate inter-laboratory comparisons of HPLC, UV, dissolution, pH, limit of detection (LOD), Fourier transom infrared (FTIR), titration, UDU, and KF test results between NQCL and one of the three approved PT providers (Sigma Aldrich, LGC-UK, NCI-USA).
- Guide Rwanda FDA QCL on how to perform compendial tests of sampled medicines and facilitate testing of samples outside Rwanda, where NQCL cannot test.

- Supporting Rwanda FDA QCL to acquire and install equipment and devices to enhance laboratory security (cameras, temperature/humidity monitoring).
- Support Rwanda FDA QCL to acquire and install prioritized occupational health and safety equipment (laboratory stools).
- Train QCL staff on laboratory waste management (products flow control).

Senegal

PQM+ works with the new *Agence Sénégalaise de Regulation Pharmaceutique du Senegal* (ARP), a fusion of the former *Direction de la Pharmacie et du Médicament* (DPM) and *Laboratoire National de Contrôle des Médicaments* (LNCM), to strengthen its market surveillance function through a PMS Unit to implement RB-PMS and to improve the capacity for medicine registration. In addition, PQM+ provides support to ARP's National Medicines Control Laboratory (*Direction de Contrôle Qualité*/DICQ) to improve its capacity to test medicines.

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

DICQ completed confirmatory testing of the 2022 RB-PMS antimalaria samples.[24] After the screening, all samples that failed or had inconclusive results, together with 20 percent of samples that passed the screening, were tested in DICQ's laboratory. The PMS Unit drafted the report independently, requiring no support from PQM+. The report is currently under review by PQM+ experts that support Senegal's PMS Unit to implement the 2022 RB-PMS.

In January, PQM+ supported the PMS-Unit to draft its third RB-PMS protocol for antimalarials. In 2023, the PMS Unit plans to sample 249 antimalarials (artemether injection, artesunate powder for injection, artesunate/amodiaquine tablets, artemether/lumefantrine tablets, and sulfadoxine/pyrimethamine tablets) from eight regions in Senegal, two more than the 2022 surveillance. During this workshop, PQM+ learned that ARP plans to use the MedRS tool to plan a PMS for antidiabetics and antihypertensives and the program guided the PMS Unit to conduct the risk analysis for these therapeutic classes that would help them develop the protocol for these products.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Support dissemination of the 2022 RB-PMS results.
- Conduct a baseline assessment of ARP, per the ISO 9001 standard.
- Conduct an ISO 9001 awareness training.
- Conduct a training on internal quality checks (IQCs) and out-of-specification (OOS) results.

[24] These results are not necessarily nationally representative.

Asia Region

Asia Bureau

PQM+'s technical assistance funded by USAID's Asia Bureau aims to promote regional regulatory convergence and reliance. PQM+ works with regional health networks that include the Association of Southeast Asian Nations (ASEAN) Pharmaceutical Product Working Group (PPWG) and the South-East Asia Regulatory Network (SEARN) to strengthen regulatory and quality assurance systems. This work leverages the current PQM+ work in Southeast and Central Asia.

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

From January 30 to February 2, in collaboration with the ASEAN Secretariat, PQM+ conducted a four-day virtual training of trainer (ToT) course on BA/BE studies with a focus on bioanalytical method validation and bioequivalence studies of oral and non-oral solid dosage forms. The objective of the training was to enhance the ability of assessors to understand and apply current global requirements applicable to the evaluation of clinical and analytical aspects of BA/BE studies. A total of 24 regulatory accessors responsible for medical product registration and market authorization (17 women, seven men) from nine ASEAN member states attended.

The team is awaiting ASEAN PPWG's final consent for the implementation of several activities. Next quarter's activities will depend on ASEAN PPWG response.

Objective 4: Supply of quality assured essential medical products of health importance increased

PQM+ designed and used a multi-stage selection methodology to identify priority LMICs in the Asian region for increasing domestic pharmaceutical product manufacturing capability to meet local pharmaceutical needs. The methodology included a comprehensive framework for evaluating eligible countries' capability to increase the local production of health products and a scoring criterion for shortlisting countries for further qualitative research.

In Q2, PQM+ submitted to USAID a preliminary analysis report that documented the entire process from the development of the methodology to the assessment of selected countries on the agreed framework. The report offers a comprehensive analysis of the five selected countries (Indonesia, Kazakhstan, the Philippines, Uzbekistan, and Vietnam), including market size, share of local production vs. imports, local industry's manufacturing capability and maturity to expand production, and various other policy and regulatory dimensions. The team also developed and shared with USAID a prioritization framework and scoring rational to use in selecting one priority country from the five shortlisted countries. The framework will rely on interviews with key informants in the shortlisted countries. To date, the team has conducted interviews with key informants in the Philippines, Vietnam, and Uzbekistan. However, due to challenges identifying key informants in other countries, interviews will continue into Q3.

Priority Activities for Next Quarter

Next quarter, PQM+ Asia Bureau plans to:

- Complete interviews in remaining shortlisted countries with subject matter experts and stakeholders to select one country for an in-depth market feasibility study using the proposed prioritization framework.

Bangladesh

In Bangladesh, PQM+ works with the Directorate General of Drug Administration (DGDA). DGDA oversees medical product quality in the country and develops and implements national pharmaceutical policy and regulations. The authority also registers medicines, approves licenses, inspects pharmaceutical establishments, and controls the advertisement and promotion of herbal and traditional medicines. One of DGDA's key functions is PMS of medical products, including vaccines and medical devices.

PQM+ is helping the DGDA achieve WHO ML3 in vaccine regulation; providing TA to the National Control Laboratory (NCL) to strengthen its medicines quality monitoring systems, particularly as they pertain to vaccines; and supporting manufacturers in boosting production of quality-assured first-line TB medicines and GMP.

For PY4, PQM+ expanded activities to support the Directorate General of Livestock (DLS) in strengthening regulation of animal health products in collaboration with DGDA to prevent AMR and providing technical assistance to the Institute of Epidemiology Disease Control and Research (IEDCR) for accreditation of its Public Health Laboratory.

Progress by PQM+ Objective

Objective 1: Governance for medical product quality assurance systems improved

PQM+ is supporting DGDA to finalize and disseminate a five-year strategic plan for the National Control Laboratory (NCL). On February 13, a PQM+ home office expert facilitated a meeting with the TWG to get feedback from team members. On February 14, PQM+ shared the draft five-year strategic plan for NCL 2022-2026 with officials of DGDA (including the Director General and senior officials, who provided feedback) and NCL. The home office expert is working to finalize the strategic plan by addressing the feedback. DGDA's five-year strategic plan 2022-2026 is in the final stage of printing and the NCL strategic plan will align with and complement DGDA's plan. NCL's plan will address issues of sustainability and future expansion of testing services in compliance with achieved international standards.

PQM+ team members share the draft five-year strategic plan for NCL (2022-2026) with DGDA and NCL high officials.

PQM+ supported the Ministry of Health and Family Welfare (MoHFW) of Bangladesh to develop the Fifth Health, Population, and Nutrition Sector Program (HPNSP 2024-2029). In the thematic area "Quality and Affordable Drugs," PQM+ provided technical assistance to prepare the sector investment plan (SIP). The SIP submitted to MoHFW will help development of the HPNSP.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved.

Sub-Objective 2.1. Support DGDA to make improvements across seven regulatory functions toward sustainable systems development for DGDA. Progress includes:

- Updated SOPs on SOP creation, complaint handling and measuring customer satisfaction, job management of employees to ensure traceability of actions, and Rapid an alert system to control SF medical products.
- Updated DGDA's CAPA plan.

PQM+ has been supporting DGDA in RB-PMS system development. Notable developments include:

- In January, PQM+ and DGDA organized a protocol review meeting on RB-PMS of anti-TB medicines. DGDA Director General Mohammad Yousuf chaired the meeting and provided an opening speech. Participants at the meeting were the RB-PMS committee and TWG members, line director and program manager of the National Tuberculosis Program (NTP), USAID representatives- Dr. Samina Choudhury, Liza Talukder, and Dr. Farzana Begum, along with PQM+ Chief of Party Dr. Syed Umar Khyyam and the program team.
    - They reviewed the RB-PMS sampling and testing protocol to reach consensus on performing surveillance of TB medicines throughout the NTP distribution chain.
    - The NTP line director and program manager said they appreciated the initiative of DGDA and consented to help DGDA to perform RB-PMS of TB medicines by collecting samples from their distribution centers.
    - DGDA assured NTP that they will share the results with them if the surveillance finds any quality issues that require taking action.
    - The review comments and inputs from the attendees were addressed in the protocol and it was submitted to the RB-PMS committee to finalize prior to starting surveillance of first-line anti-TB medicines. This is the first time DGDA has expanded RB-PMS support to programmatic medicine and had collaboration from the NTP.
- On January 29, DGDA's Market Surveillance and Control (MC) department organized a training on PMS online database development facilitated by WHO. Shaiful Khan, the PQM+ technical lead for regulatory systems strengthening, attended the program as a resource person. He conducted training on RB-PMS sampling and testing techniques and discussed the basic requirements of the PMS database. This database will help the MC department take the necessary evidence-based regulatory measures.
- On March 6, the PQM+ team attended an introductory meeting with new Line Director Dr. Md Mahfuzur Rahman and Program Manager Dr. Afzalur Rahman of NTP. The chief of party presented all PY4 TB-related activities and reported the progress to the NTP

leadership. PQM+ shared the RB-PMS sampling and testing protocol of anti-TB medicines[25] with the new line director and informed him of the progress in starting surveillance. NTP will issue a notification so DGDA inspectors can take samples from the NTP's field outlets. PQM+ assured its continued technical assistance to DGDA's MC department and NTP to successfully implement RB-PMS of anti-TB medicines.

- From July to December 2022, a total of 610 medicines samples were tested through nine Minilabs. Among them, two samples (one albendazole and one levofloxacin) failed thin-layer chromatography testing, and samples were sent to NCL in December for confirmation testing.

PQM+ is supporting DGDA to assess the agency's current registration practices for manufacturing APIs in the country. On January 4, the activity lead organized an online consultation with a home office expert to clarify the scope and way forward of the activity. The PQM+ Bangladesh COP attended. On February 28, PQM+ met with two Bangladeshi API experts and collected information about the process they follow and the list of required documents to submit for registration of API products for manufacturing. They noted that DGDA's existing guidelines for the registration of bulk and intermediate product of medicine, from 2017, it is not mandatory to submit whole or partial Drug Master Files (DMFs) for registering APIs.

PQM+ is supporting rapid assessment of SF anti-TB medicines in the private sector. On January 24, the program organized a meeting with the principal investigator of the study to review the protocol. The USAID Activity Manager and TB, Communicable Disease, and Urban Health Specialist attended the meeting and provided feedback. From January 28 to February 2, the principal investigator organized data enumerator training for collecting available samples from private facilities and medicines outlets. The participants learned the requirements for sample collection, how to complete the visual inspection checklist, and how to conduct screening tests on collected samples using Minilabs. From February 7 to March 7, the data enumerators conducted fieldwork at 12 districts in eight administrative divisions.

Sub-Objective 2.2. Medical product QCL capacity strengthening to support sustainable PMS programs. PQM+ is providing technical assistance to enhance capacity of NCL's vaccine laboratory to achieve and sustain WHO ML3

In Q2, PQM+ provided technical support to NCL to prepare 23 new SOPs for operation, cleaning, and calibration,[26] and assistance to set up calibration parameters for and supported calibration of 90 expired pieces of equipment from three third-party service providers (CS Lab Ltd., Calibration Technology Pvt. Ltd., and ESCO).[27]

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[25] These results will not necessarily be nationally representative.

[26] 1) Operation and maintenance of carbon dioxide incubator (Sanyo, Model: MCO-19AIC), 2) cleaning and calibration of quant studio-5 DX real-time PCR, 3) mini spin centrifuge, 4) high-speed mini centrifuge, 5) refrigerator, 6) inverted microscope, 7) hemocytometer, 8) biosafety cabinet, 9) ultra freezer (-80°C), 10) deep freezer (-20°C), 11) orbital shaker (operation, cleaning, and maintenance) 12) automatic colony counter, 13) ELISA microplate reader, 14) microplate washer, 15) Karl Fischer coulometer, 16) liquid-borne particle counter, 17) ion chromatography, 18) digital telethermometer, 19) Puris Evo-CB water system, 20) Stierisart® universal pump 16420, 21) bioburden unit (Biostar 50), 22) dry heat sterilizer, and operation and cleaning, and 23) handling and filling procedure of liquid nitrogen in cryotank and reservoir tank.

[27] The types of equipment, including numbers of each, were: pass boxes (7), pressure gauges (5), thermo hygrometers (15), refrigerators (10), micropipettes (8), incubators (5), biosafety cabinets (5), UV spectrophotometer (1), centrifuges (3), freezers (3), auto pipette fillers (3), water baths (2), cold room (1), thermocouple (1), moisture balance (1), isolator (1), anaerobic chamber

On February 1, PQM+ provided theoretical online training on GDP to 25 NCL Vaccine Wing staff (20 men, five women). Participants learned uniform documentation procedures.

PQM+ is helping build the capacity of the Central Drug Testing Laboratory (CDTL) in Chattogram to test medicine quality and continue technical assistance to the NCL physicochemical lab. The PQM+ COP supported DGDA and NCL to organize an exclusive meeting with DGDA/NCL/CDTL staff and management, which provided an opportunity to make several management decisions in support of NCL accomplishing its functions.

On January 31, PQM+ chaired a technical meeting in collaboration with the DG of DGDA to discuss relocation of existing and new spaces for the lab, progress and challenges of CDTL roadmap implementation, and filling critical vacancies in CDTL. Meeting notes have been prepared and signed by DGDA. A committee has been formed to suggest a relocation plan for the DG's approval.

On March 21, the PQM+ QA/QC team lead visited CDTL and conducted hands-on training on how to prepare an SOP with pre- and post-evaluation. Three people participated (all men). The QA/QC lead also assisted CDTL staff to prepare the equipment database.

PQM+ is providing technical support to IEDCR toward accreditation (ISO 15189 & 15190). On January 23, in collaboration with PQM+, the Institute of Epidemiology, Disease Control, and Research (IEDCR) organized an inaugural ceremony for the inception of USAID's PQM+ support toward ISO 15189 and ISO 15190 accreditation for IEDCR's laboratories . Representatives from the Directorate General of Health Services (DGHS), the Drug Administration (DGDA), USAID, the Centers for Disease Control and Prevention (CDC), WHO, IEDCR, and USP attended. IEDCR Director Prof. Dr. Tahmina Shirin discussed the institute's role in research and public health and emphasized the importance of achieving ISO accreditation for IEDCR. She thanked USAID's PQM+ program for extending support to IEDCR laboratories to achieve ISO accreditation.

Participants of the IEDCR inaugural ceremony.

Objective 4: Supply of quality assured essential medical products of health importance increased

PQM+ is continuing technical support to Bangladesh Manufacturer #2 toward the prequalification of first-line TB medicines. During this quarter, the manufacturer received a pilot

(1), flocculation water bath (1), ELISA washer (1), ELISA reader (1), glass thermometer (1), microscope (1), heating block (1), filtered storage cabinet (1), autoclave (3), liquid-borne particle (1), air particle counter (1), electrophoresis system (1), Gel DOC system (1), digital thermometer, 0-50°C (1), fume hood (1), conductivity meter (1), and colony counter (1).

BE study report from ACDIMA BioCenter in Jordan, and received WHO consent on the final BE protocol. Based on the pilot BE report and accepted protocol, Bangladesh Manufacturer #2 started producing the pivotal BE batch of four-drug, fixed-dose combination (4FDC) with the same quantitative and qualitative composition and manufacturing process of the pilot BE batch from February 23. The manufacturing process is ongoing and on schedule for completion in March. After confirming all quality compliance checks, AHL will be able to send the sample to ACDIMA to start the final BE study in the first week of April. AHL is also working to address CAPAs from the PQM+ inspection in September 2022, gathering suggestions and advocacy from PQM+ experts.

PQM+ is providing technical support to Essential Drugs Company Limited (EDCL) to conduct good practices (GxP) training for technical staff based on a training needs assessment. In March, PQM+ organized an advanced training on GxP in pharmaceuticals at the manufacturer's Gopalganj plant to enhance knowledge and understanding of the current global regulatory requirements of basic GMP, QMS, and data integrity. The training reached 24 technical staff (23 men, one woman) who learned how to assess pharmaceutical products, relevant guidelines used by the regulatory authorities for evaluation, cGMP, QMS, and data integrity, which ultimately will help them during product evaluation, licensing, and continuous monitoring.

Participants of the training on GxP in pharmaceuticals

PQM+ is providing technical assistance to build the capacity of a select local contract research organization (CRO) to support a BE study in the country. From January 22 to February 6, PQM+ experts completed gap assessment visits to three CROs [Khwaja Yunus Ali Medical College and Hospital, Bio-Research Services (KYAMCH-BS), Institute for Developing Science and Health Initiatives (ideSHi), and Novas Clinical Research Services Ltd. (NCRSL)] in Bangladesh.

On January 23, PQM+ expert Amanda Lewin (center, in black) conducted a CRO assessment at Khwaja Yunus Ali Medical College Hospital Bio Research Services.

After the assessment, PQM+ organized a two-day training on BE study of medicines for 55 representatives of registered CROs and DGDA staff. In closing remarks, Director General Major General Mohammad Yousuf emphasized the need for more training from PQM+ experts to enhance knowledge and competency on BE study. PQM+ is working to prepare the gap assessment report for the three CROs. The report will advise the CROs of gaps that need to be addressed to achieve international standards of practice during the BE study of medicines. PQM+ will continue to provide technical assistance to address those gaps through a CAPA plan, advocacy, suggestions, and development and review of guidelines, SOPs, and more.

DGDA Director General Mohammed Yousuf delivers the closing speech on the BE study of medicines in Dhaka.

PQM+ is supporting the Bangladesh Association of Pharmaceutical Industries (BAPI) to develop a pool of trainers on pharmaceuticals. In January, PQM+ developed a concept note for the dissemination workshop on promoting the local production of APIs in Bangladesh, then met USP regional officials on a training for master trainers in Bangladesh to promote a sustainable competency enhancement system for the local production of APIs. Later in January, PQM+ updated a concept note for API training and an industry visit to Hyderabad, India. The proposal is under consideration at the World Trade Organization (WTO) Cell of the Ministry of Commerce.

Objective 5: Global medical product quality assurance learning agenda and operational agenda advanced

PQM+ is supporting DGDA to organize divisional workshops to build awareness about quality-assured medical products in line with National Quality Assurance Guidelines (NQAG). On January 16, in collaboration with PQM+, DGDA organized a divisional-level seminar on the NQAG for Medical Products in Rajshahi to promote awareness about medical product quality among health care professionals, policymakers, administration, law enforcement agencies, local government officials, and academics. DGDA Director General Yousuf presided over the seminar, delivering the inaugural speech and closing remarks and leading a question-and-answer session. In the opening remarks, he acknowledged support from PQM+ to strengthen the NRA toward ML 3 and move the NCL toward WHO-PQ and ISO achievement. He also highlighted USAID's support with Minilabs and introducing the RB-PMS system across the country. The workshop raised participants' awareness about different perspectives on the quality of medical products and the roles and responsibilities of stakeholders to ensure quality-assured medical products.

DGDA Director General Yousuf presided over the divisional-level seminar on the NQAG for Medical Products in January..

PQM+ is providing technical assistance to DGDA for situational analysis and planning of strengthening regulation capacity, marketing surveillance, control, and quality testing of antimicrobial veterinary medicines at the national and subnational levels. On January 26, in collaboration with PQM+, the Department of Livestock (DLS) organized an inception meeting at Krishibid Institution, Bangladesh (KIB). Senior officials from DLS, Fleming Fund, International Centre for Diarrheal Disease Research, Bangladesh (icddr,b), the Food and Agriculture Organization of the United Nations (FAO), Bangladesh Agricultural University (BAU), DGDA, USAID, and PQM+ attended the meeting. Topics included governance issues, rules and regulations, SOPs, mindset of leadership, and DGDA regulatory system strengthening.

PQM+ is providing technical support to DGDA and the Ministry of Fisheries and Livestock to develop and finalize national formularies for animal health, and to DLS in developing a Bangladesh National Veterinary Formulary (BDNVF). On January 20, PQM+ supported DGDA to review and revise three committees (19-member working committee, 12-member advisory committee, and eight-member editorial committee). On February 5, PQM+ facilitated a technical working committee meeting to review the first draft of the BDNVF.

On March 15, two USP representatives, Senior Vice President Dr. Emily Kaine and Partnership Growth Asia Director Gary Dahl, attended a debrief meeting with Dr. Samina Choudhury, Infectious Disease Team Lead; and Liza Talukder, Activity Manager for USAID's PQM+ Program. The PQM+ COP and deputy COP also attended. The participants discussed ongoing progress toward advancing the supply of quality-assured medicines in Bangladesh and USAID's ongoing TB activities.

Table 5: Status of Labs Accreditation in Bangladesh

Laboratory	Accreditation Sought	Initial Gap Assessment	CAPA	QMS	PT/LT	LIF	Official Inspection/ Pre-assessment
National Control Lab (Physicochemical Lab)	ISO: IEC 17025/2017 (reaccreditation) by ANAB	Completed	Completed	Completed	Completed	Submitted and approved	Reassessment completed (August 30 to September 1). Certificate renewed

Laboratory	Accreditation Sought	Initial Gap Assessment	CAPA	QMS	PT/LT	LIF	Official Inspection/ Pre-assessment
National Control Lab (Microbiology Lab)	ISO: IEC 17025/2017 (reaccreditation) by Bangladesh Accreditation Board (BAB)	Completed	Completed	Completed	Completed	Submitted and approved	Reassessment completed 2020. Certificate renewed

Laboratory	Accreditation Sought	QMS	Initial Gap Assessment	CAPA	LIF	Official Inspection/ Pre-assessment
National Control Lab (Physicochemical Lab)	WHO PQ	Completed	Completed	CAPA closed	Submitted and approved	Achieved WHO PQ in March 2020.
National Control Lab (Microbiology Lab)	WHO PQ	Completed	Completed	CAPA closed	Submitted and approved	Achieved WHO PQ in March 2020.
National Control Lab (Microbiology Lab +Vaccine Chemical lab)	WHO ML3	Completed	Completed	CAPA closed	-	Reassessment by WHO is pending; ML3 not yet achieved

Priority Activities for Next Quarter

- Finalize the DGDA regulatory framework document.
- Finalize the NCL five-year strategic plan.
- Conduct a divisional workshop on NQAG.
- Prepare a proposal to rationalize the NCL testing fee.
- Complete the assessment of DGDA's API DMF practices and approve the API manufacturing facility.

Burma

PQM+ in Burma is working to build the capacity of Burma's Department of Food and Drug Administration (DFDA) toward a resilient medical product quality monitoring system. At the same time, PQM+ is working with private manufacturers to achieve WHO PQ for locally manufactured antimalarials. PQM+ aims to assure the quality of medicines in the country, with a focus on antimalarials, and thereby contribute to the National Malaria Control Program's effort to eliminate malaria by 2030.

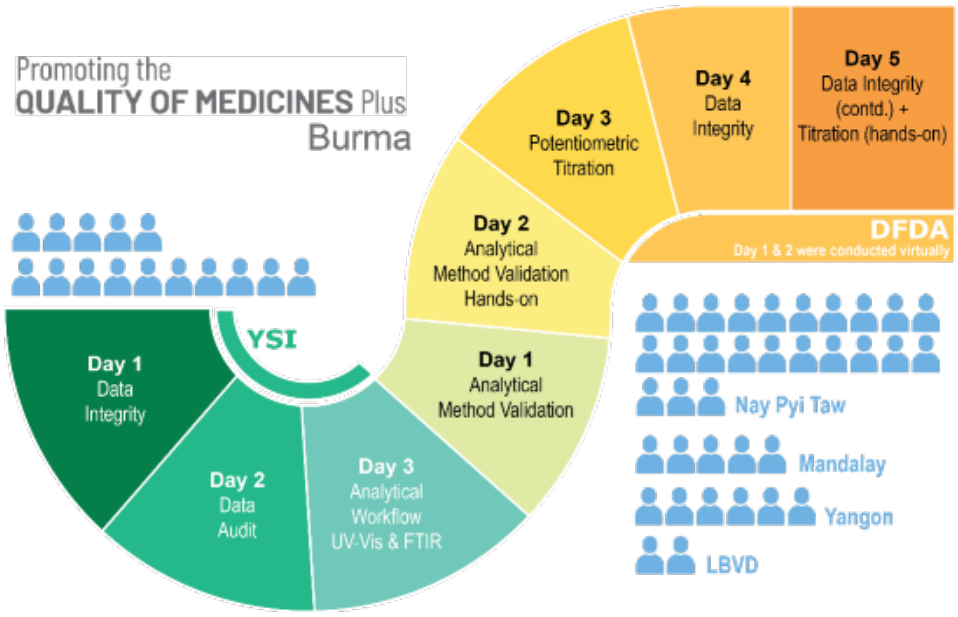
Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

PQM+ delivered an in-person training on data integrity, analytical method validation and verification, and potentiometric titration at DFDA Nay Pyi Taw Pharmaceutical Chemistry Laboratory.

- The 37 participants included 34 women and three men from DFDA laboratories in Nay Pyi Taw, Yangon, Mandalay, and Livestock Breeding and Veterinary Department Laboratory.
- The data integrity training built the capacity of DFDA Nay Pyi Taw laboratory to improve its data management system as it prepares for WHO PQ.
- PQM+ collaborated with the WHO Malaria Unit in this training. WHO supported expenses related to DFDA participants' travel.

PQM+ delivered an in-person training on data Integrity and analytical workflow of UV-vis spectrophotometer and FTIR at YSI Pharmaceuticals QC Laboratory.

- Fifteen participants from YSI Pharmaceuticals QC Laboratory participated.
- This training built on the underway preparation toward ISO 17025:2017 accreditation at YSI Pharmaceuticals QC Laboratory.



Summary of PQM+ training for DFDA and YSI Pharmaceuticals QC Laboratories

PQM+ organized a technical webinar on ISO 13485:2016, Medical Devices Quality Management System.

- Fifteen participants from DFDA Medical Devices Control Section, DFDA Medical Devices Laboratory, and a private medical devices import company attended.

- The webinar covered the international standard that ensures quality in the lifecycle of a medical device.
- The knowledge from this webinar is applicable to DFDA regulators who control medical devices in the country, as well as to importers who supply products to the market.

Group photo session during the opening ceremony of the QMS workshop. DFDA Director General Dr. Khin Zaw (front row, center) opened the QMS workshop.

PQM+ and DFDA organized a QMS workshop to prepare DFDA Yangon Laboratory for ISO 17025:2017 accreditation.

- PQM+ and the WHO Malaria Unit collaborated in organizing the workshop. WHO supported DFDA-related expenses (e.g., travel, accommodations, and per diem) and PQM+ provided technical lectures and coordination of the workshop.
- The 30 participants were from DFDA laboratories in Nay Pyi Taw, Yangon, and Mandalay.
- The quality assurance team from DFDA Nay Pyi Taw Pharmaceutical Chemistry Laboratory shared their experience in achieving ISO 17025:2017 accreditation.
- Representatives from the Myanmar National Institute of Metrology and Myanmar National Accreditation Board presented on available metrology services and the national accreditation process respectively.

Priority Activities for Next Quarter

Next quarter, PQM+ Burma plans to:

- Organize a training on analytical workflow of HPLC and dissolution at DFDA Yangon Laboratory.
- Organize a training on measurement uncertainty and inter-laboratory comparison at DFDA Nay Pyi Taw Laboratory.
- Organize a training on analytical method validation and verification at YSI Pharmaceuticals QC Laboratory.

- Organize a training on measurement uncertainty and quality risk management at YSI Pharmaceuticals QC Laboratory.
- Conduct an on-site cGMP assessment at YSI Pharmaceuticals manufacturing facility.
- Organize a technical webinar on medical devices regulation.

Nepal

PQM+ provides technical assistance to Nepal's Department of Drug Administration (DDA) to strengthen medical product quality assurance (QA) and quality control (QC) systems and is enhancing the testing capacity of National Medicines Laboratory (NML) to complement the regulatory activities of DDA. PQM+ is also working with local public and private manufacturers to increase the domestic supply of quality-assured medicines.

Objective 1: Governance for medical product quality assurance systems improved

Development of Technical Annexes to the Updated GMP Code: Previously, PQM+ coordinated with DDA's TWG to facilitate updating the GMP code, which the Ministry of Health and Population approved. This quarter, PQM+ worked with the TWG to finalize a remaining annex on compressed air, in addition to four technical annexes approved previously.

Drug Advisory Group Meeting: In Q2, PQM+ will provide technical support to DDA to organize another policy dialog meeting to generate discussion on the pressing issues that are challenging to the pharmaceutical sector. DDA has proposed several topics, but has not decided on the topic or the timing of the event.

Guidelines on Safe Disposal of Unwanted Pharmaceuticals: The WHO GBT assessment showed the need for national guidelines on safe disposal of unwanted pharmaceuticals. In the reporting quarter, PQM+ reviewed current available national guidelines on disposal of unwanted pharmaceuticals, as well as assessed the gaps in relation to the regulatory authority requirements. PQM+ collaborated with DDA to review those gaps.

Assist the Development of the Nepal Pharmaceutical Manufacturing Strategy: PQM+ has initiated support to DDA in developing a Nepal Pharmaceutical Manufacturing Strategy. The strategy aims to address increasing domestic production for self-sufficiency and self-reliance regarding essential medicines in the country.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

Strengthen RBI of DDA: In Q2, PQM+ supported DDA to create databases for 67 of 80 local allopathic manufacturers that have received marketing authorization in Nepal. The remaining 13 manufacturers were excluded in the risk ranking as they have less than two years of manufacturing history and do not require inspection for certification purposes. PQM+ facilitated DDA in risk ranking of the manufacturers following the RBI framework and in preparing an RBI plan. PQM+ and DDA reviewed the RBI plan in a TWG meeting, and DDA plans to conduct an inspection of the high-risk manufacturers identified by the RBI framework. The TWG further discussed the finalization of RBI-related guidelines, SOPs, and next steps for their approval.

Strengthen Product Registration and Market Authorization Functions of DDA: PQM+ is assisting DDA to facilitate the medicines registration and authorization process in line with international practices. In Q2, PQM+ collaborated with DDA to identify five SOPs required per GBT recommendations and facilitated drafting them. PQM+ developed a roadmap for DDA to support adoption of the Common Technical Document (CTD) format and initiated a gap assessment of the medicine registration guidelines, followed by amending the guidelines to include provisions required for adoption of CTD format for dossier submission. PQM+ facilitated a training on risk-based inspection and adoption of the CTD format for dossier submission to 30 regulatory personnel from DDA, NML, and regional offices.

RB-PMS field sampling (left) and sample of collected medicine (right)

Strengthen RB-PMS of DDA: PQM+ is working with DDA's Management Division and branch offices to scale up RB-PMS at a national level. Following preparatory work for RB-PMS such as protocol development workshops, training, and field sampling at Birgunj office in the previous quarter, PQM+ supported DDA's branch office in Nepalgunj to conduct field sampling in six districts per the RB-PMS protocol.[28] This part of RB-PMS fieldwork observed a collection of 73 random samples from about 46 brands of eight medicines from different outlets, including government-owned health facilities. PQM+ also facilitated an RB-PMS TWG meeting at DDA for reviewing RB-PMS guidelines in Nepali (the TWG previously endorsed the English version), and two SOPs drafted previously.

Presentation of findings of mid-program SATTA at NML

[28] These results will not be nationally representative.

Support NML Toward ISO 17025 Accreditation: PQM+ conducted a mid-program assessment of NML using the SATTA to review the progress of the laboratory toward ISO 17025 accreditation. The assessment result showed that NML progressed to 55 percent from 37 percent as achieved in the baseline SATTA assessment conducted in 2021. With PQM+ advocacy, NML has completed its first internal audit of all its sections and planned to disseminate the audit findings at the end of the quarter. PQM+ is planning to procure essential laboratory equipment to enhance NML's testing capacity.

Assist NML in the Selection of Private Laboratories for Outsourcing Testing Activities: PQM+ conducted a baseline assessment of a private drug testing laboratory to support NRAs in their effort to improve the quality assurance of medicine. The baseline assessment revealed that the assessed laboratory is 30 percent in compliance with the ISO/IEC 17025:2017 standard. A desk review of documents for the second laboratory is ongoing.

Strengthen Management Information System (MIS) of Regulatory Bodies: With the onboarding of its MIS advisor, PQM+ in Nepal accomplished the following activities:

- Conducted a feasibility study to integrate the RBI module with the DDA's current MIS.
- Coordinated with the PQM+ home office to optimize DDA's PMS system through the integration or interoperability of the MedRS tool.
- Assessed system requirements to implement the electronic data integrity management system at NML and in the process of releasing a request for quotations for software procurement.

Objective 3: Financial resources for medical product quality assurance optimized and increased

Development of a Five-Year Laboratory Optimization Strategy: PQM+ provided technical assistance to NML to develop a concept note for the development of NML's five-year strategy, which the was forwarded along with a memo to the Ministry of Health and Population (MoHP) for approval. In Q2, the MoHP approved the memo and directed NML to initiate development of the strategy. NML has formally requested PQM+ to facilitate the activity.

Objective 4: Supply of quality-assured essential medical products of health importance increased

To improve the local supply of quality-assured essential medicines, PQM+ is working with private and public pharmaceutical manufacturers.

Private Manufacturers: PQM+ and three private manufacturers are working on CAPA plans to build a roadmap to obtain WHO PQ for selected medicines. In Q2, PQM+ conducted CAPA follow-up. The manufacturers initiated the process of sourcing WHO-prequalified APIs for product development, to be followed by stability studies and continual testing. PQM+ facilitated training on advanced GMP topics to 126 technical personnel from 54 manufacturers.

Public Manufacturer: PQM+ is working with Nepal's only public pharmaceutical company, Nepal Ausadhi Limited (NAL), to achieve compliance toward national GMP certification. PQM+ conducted a reassessment of NAL for GMP compliance to cover entire areas, per national GMP code. The reassessment identified some gaps related to air-handling units, along with

previously identified areas of calibration, qualification, and validation of equipment that need to be addressed before application submission for GMP to DDA.

Strengthening Local HTP Manufacturers: PQM+ had conducted an assessment of a health technology product (HTP) manufacturers of disposable syringes and blood collection tubes for technical assistance to attain ISO 13485. The manufacturer calibrated one remaining piece of equipment. PQM+ will conduct a CAPA follow-up with the manufacturer in Q3.

Assessment of the BE Center at Kathmandu University (left) and a meeting to share assessment findings (right).

Support Establishment and Upgrade of Bioequivalence Laboratory: Since BA/BE studies are at the rudimentary phase in Nepal, PQM+ had a discussion with stakeholders to understand the status and initial feasible steps each stakeholder can take. Prior to that, PQM+ assessed two potential BE laboratories at Tribhuwan University's Institute of Medicine and Kathmandu University to identify gaps in functioning as CROs. Detailed reports for the assessed institutions will be developed next quarter. PQM+ organized an orientation session for DDA, National Ethical Review Board of the Nepal Health Research Council (NHRC), and two CROs on their respective requirements.

Improve Quality Assurance in the Supply Chain of Medicines in Local Government Units: The new federal structure of Nepal devolved responsibility for the procurement of medical products to local and provincial governments. PQM+ assessed quality assurance in the procurement process at one of the local government units (LGUs) during PY3 and developed a guidance document for the same. Following the guidance document, this LGU was oriented in PY4 on the quality-assurance process and advised to form a quality-assured medicines procurement committee led by the deputy chairperson of the local government as a part of a leadership, management, and governance (LMG) approach. PQM+ assessed a second LGU concerning its quality-assurance process in the procurement of medical products in Q2.

Left: LGU assessment; right: orientation program on quality assurance in the procurement process.

Objective 5: Global medical product quality assurance learning and operational agenda advanced

Increasing Public Awareness on SF Medicines. PQM+ is working with DDA to finalize informative infographic stickers to display in pharmacies. Two forms of stickers—one for the dispensary and one for the consumer—are in the finalization phase. They will contain information relating to medicines quality assurance for pharmacists and customers.

Training Health Professionals on Visual Identification of SF medicines: PQM+ is developing a training curriculum in coordination with professional councils to reach their members, including pharmacists, medical doctors, nurses, and paramedics, on visual identification of SF medicines.

Support the Nepal Pharmacy Council on Establishing a Continuing Professional Development (CPD) Course: To initiate CPD courses for Nepal Pharmacy Council members, the council and PQM+ held formal and informal discussions on developing course requirements. In Q2, the council decided to formally request assistance from PQM+ to develop the course, which users can take online through the council's website. The council formed a three-member committee to collaborate with PQM+ on the development of CPD courses.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Advocate with DDA for approval of the technical guidelines to the updated GMP code and work with DDA to disseminate the updated code and guidelines.
- Work with the in-house expert to initiate consultation among individual stakeholder groups to identify their priorities and get their suggestions for developing a National Pharmaceutical Manufacturing Strategy.
- Collaborate with the NML to develop an initial draft of the five-year strategy after holding a series of consultations.
- Support NML to implement an electronic data management system by procuring software and training to their staff. For DDA, PQM+ will technically facilitate the piloting of the RBI MIS tool developed by the PQM+ home office. PQM+ Nepal will start integrating the MedRS tool into its system.
- Continue to strengthen the QMS through development of procedures and technical training and support NML to put in place an internal calibration and verification program.
- Assess a private sector drug testing laboratory's compliance with ISO 17025.

- Work with a manufacturer to finalize a roadmap for WHO PQ for selected medicines. PQM+ will continue to support the public manufacturer to strive toward national GMP standards, focusing on the validation of its manufacturing units to meet the standards.
- To improve quality assurance in medical products procurement at LGUs, PQM+ will share the assessment report and facilitate formation of a committee. PQM+ will deliver training to the LGUs with support from DDA and the provincial ministry.
- Collaborate with stakeholders such as the Nepal Health Research Council on awareness of SF medicines, as well as coordinate with professional councils to develop a training course on SF medicines.

The PQM+ team meets with the director general of Drug Control.

Pakistan

In Pakistan, PQM+ is addressing challenges around the provision of and access to quality health services through four areas: improving governance of medical product QA systems; strengthening medical product regulations; enhancing private sector engagement; and reducing the availability of SF medical products. PQM+ works closely with the Drug Regulatory Authority of Pakistan (DRAP).

The PQM+ Pakistan work plan focuses on advancing medicines quality assurance elements to enhance Global Health Security Agenda initiatives; curbing antimicrobial resistance; promoting maternal, neonatal, and child health; addressing communicable diseases; and engaging the private sector in achieving better health outcomes and contributing to economic development.

Objective 1: Governance for medical product quality assurance systems improved

PQM+ is working in coordination with Ministry of National Health Services Regulations and Coordination (MoNHSRC) to establish an efficient medical product quality assurance system through strengthening of the national regulatory system and strengthening the national quality control laboratory network. PQM+ achievements include:

- Conducted a program orientation meeting with the Director General for Health and shared program activities in Pakistan as well as highlighting key achievements. PQM+ discussed the status of the revised national medicine policy and aims to develop a comprehensive national medicine policy implementation plan in collaboration with key stakeholders under the supervision of MoNHSRC.
- Completed a gap assessment of the safety surveillance system of Punjab Province to establish a medicine safety surveillance system in the country and apprised the Director General for Drug Control on observations and recommendations to fill the gaps. This is part of continuing support to strengthen national regulatory system through achieving a high maturity level rating on the WHO GBT.

- Trained 71 staff (22 women, 49 men) in Punjab on building the capacity and strengthening the medical product safety surveillance system in the province. The training aimed to prepare participants for the upcoming WHO GBT final audit in May. Punjab has established the first medicine safety monitoring center in Pakistan and this training focused on the staff who report medical and quality errors in tertiary care hospitals as well as advanced facilities.
- Trained senior-level officers, including directors and district drug inspectors, of Punjab health department on the MedRS tool. The program also conducted performance evaluation and monitoring of District Quality Control Boards (DQCBs) and drug control activities.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

To strengthen the national regulatory system. PQM+ continued supporting DRAP for accession of Pharmaceutical Inspection Cooperation Scheme (PIC/S). PQM+ trained DRAP inspectors on GMP inspection procedures followed by the PIC/S. GMP guidelines of PIC/S and a brief comparison of (GMP) standards between WHO guidelines and PIC/S were also on the training agenda. The training was attended by 33 (Male 26, Female 09) Inspectors of DRAP**.** These trainings are mandatory for regulatory authorities for harmonization and coordination between regulatory authorities. GMP guidelines of PIC/S and a brief comparison of (GMP) standards between WHO guidelines and PIC/S were also on the training agenda. PIC/S approach to the classification of GMP deficiencies, with some examples given of the more common GMP deficiencies found by PIC/S inspectors was also the part of this training session. Trainer shared the *"Inspection Do's and Don'ts"* was essentially a discussion of the different approaches and techniques that GMP inspectors could use to enhance their skills as inspectors.

Objective 3: Financial resources for medical product quality assurance optimized and increased

PIRIMS Finalization: PQM+ supported DRAP to finalize development of the Pakistan Integrated Regulatory Information Management System (PIRIMS) interface for national quality control laboratories to share regulatory information for harmonization of testing standards and optimization or regulatory resources by avoiding repeat testing in multiple NQCLs. After finalization of interface development DRAP has issued the notification to manufacturers to submit finished product specifications and validated testing methods for their approved pharmaceutical products within 30 days.

DTL Lahore Achieves WHO PQ: PQM+ supported Drug Testing Lab (DTL) Lahore to submit the second version of a CAPA plan against major observations, including on data integrity, QRM, analytical method validations, computer system validation, and good documentation practices. The WHO PQ inspection team accepted the CAPA response and issued an inspection closing letter on February 22. The letter notes that DTL Lahore successfully achieved WHO PQ status in February 2023.

WHO's inspection team at DTL Lahore

Training of DRAP inspectors on PIC/s.

DTL Multan Achieves WHO PQ Status: PQM+ supported DTL Multan to develop and submit its CAPA plan to the WHO team, addressing gaps identified in the final audit report by WHO's inspection team. After thorough evaluation and multiple queries, the WHO team has accepted the CAPA of DTL Multan and issued the CAPA acceptance letter. DTL Multan has achieved WHO PQ status.

Objective 4: Supply of quality assured essential medical products of health importance increased

DRAP BE Studies of Generic Medicines: PQM+ supported DRAP to revise the rules for smooth and stepwise implementation of bioequivalence studies for generic medicines in Pakistan. During Q2, DRAP secured approval from the Federal Cabinet to revise the biostudy rules, removing unnecessary documentation requirements that were inconsistent with international best practices.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Review the SOP on good safety surveillance practices in Punjab.
- Review DRAP guidelines and SOPs on GBT.
- Support DRAP during the WHO final assessment on GBT.
- Implement a CAPA plan for the PIC/S DRAP gap assessment.
- Review preparation for the WHO final audit of DRAP regarding IDPs.
- Train DTLs on the PIRIMS interface.
- Produce a gap assessment report of NCLB.
- Train DRAP staff on good clinical practices (GCP) and good laboratory practices (GLP).
- Support submission of DRAP's application for accession of PIC/s.
- Conduct training of BE centers on GCP/GLP and review the draft study protocol.
- Train NCLB staff on ISO 17025 QMS standards.
- Conduct a consultative workshop on the draft national medicine implementation plan.

Europe and Eurasia Region

Central Asia/Kazakhstan

PQM+ is strengthening the medicines regulatory system in Kazakhstan by providing technical assistance to the National Center for Expertise of Medicines and Medical Devices (NCEM). The main objectives are to support medicines quality control laboratories (MQCLs) so they can test the quality of medicines reliably and accurately according to international standards; strengthen the GMP inspectorate; and prepare the country for accession to the PIC/S, as well as to support the NCEM in establishing an RB-PMS. system

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved.

Laboratory strengthening. In PY4 Q2, PQM+ continued technical assistance to the Almaty and Karaganda MQCLs to work toward and maintain WHO PQ.

- The Almaty MQCL, with PQM+ technical assistance, worked on the WHO PQ CAPA plan as a follow-up to the WHO PQ inspection in July 2022. On January 4, PQM+ met with Almaty MQCL to discuss issues related to the implementation of the CAPA plan for the WHO PQ.

  PQM+ is now preparing the lab for the WHO follow-up audit and working with both Almaty and Karaganda MQCLs to prepare a letter to WHO that requests postponing the audit until July, allowing more time for audit preparation. The Karaganda MQCL's WHO PQ expires in March and will require an audit from WHO to maintain the PQ status.

- PQM+ held an onsite two-week intensive training for 39 laboratory staff from February 6 to 17 on QMS, covering risk management, trend analysis, process continuity, and method validation/ verification. Participants were staff from Almaty, Karaganda, Taras, and the Management System Assurance Department. The training helped the labs comply with WHO PQ requirements. PQM+ is preparing for additional in-person training in April and a mock audit.
- A PQM+ computerized systems validation (CSV) expert visited Almaty MQCL from January 16 to 24 and Karaganda MQCL on January 25 and 26. During the visit, the CSV expert provided technical assistance on implementing CAPA measures to prepare for the WHO follow-up audit. The CSV expert conducted audits of Computerized Laboratory Systems and the data integrity system; analysis of documentation and computerized systems; and the backup and recovery process. The expert also conducted review, reconfiguration, and organization of the IT infrastructure qualification process; and worked on site with validation documentation, mentoring laboratory staff on CSV. The CSV audit, interventions, and mentoring will help the labs comply with the WHO PQ requirements.

GMP Inspection: PQM+ is supporting Kazakhstan to strengthen the inspectorate and prepare for ascension to PIC/S membership, which will facilitate reliance and open access to the GMP inspection mechanism with other PIC/S member countries; resources for capacity development;

and access to quality-assured medicines in the country. PQM+ continued technical assistance toward advancing on the roadmap to PIC/S ascension. In PY4 Q1, PQM+ helped GMP inspectorate in preparation for the launch of their newly developed QMS.

In January and February, PQM+ held two teleconferences with the PIC/S working group. The team discussed updates from the inspectorate, the licensing unit and liaison to the inspectorate, quality defect handling, legislation, the matrix of inspectors, training inspectors, QMS, and the inspection approach. It was agreed that the working group will focus on legislative changes in March. As a result of PQM+ advocacy, the Committee is working to amend the Public Health Code and other regulatory documents to bring them in line with PIC/S requirements for licensing manufacturers and handling quality defects.

Post-Marketing Surveillance: PQM+ continued technical assistance to NCEM in strengthening the PMS system by building on work conducted in the previous quarters.

NCEM faced challenges in implementing RB-PMS, as it requires changes to national legislation and needs resources for sample purchasing. PQM+ was asked to prepare slides for top management of the Committee and NCEM to explain the benefits of introducing RB-PMS and how to implement it. PQM+ prepared the slides and provided them to the NCEM in January. NCEM and the Committee are working to introduce changes to legislative documents that will allow them to implement RB-PMS appropriately. In the meantime, PQM+ will continue to work with the NCEM in help prepare for the WHO GBT assessment for PMS.

SEC Capacity Building: PQM+ continued work with the NCEM's scientific-educational center (SEC). The center is important to ensure the sustainability of PQM+'s efforts to build the capacity of the medicine's regulatory workforce in Kazakhstan.

PQM+ and NCEM discussed appointing five GMP experts as part of the TWG that will work with SEC and PQM+ to draft GMP modules for manufacturer capacity building. NCEM has appointed these experts. PQM+ will organize a meeting with the experts to initiate this activity.

Medical Devices Inspection: PQM+ is providing technical assistance to NCEM on medical device inspections and registration. In Q2, PQM+ reviewed documents from NCEM on these topics and held a kickoff meeting with the head of medical device inspection and registration to understand their needs. PQM+ is planning on-site technical assistance in April to train the Medical Device Unit on the medical device manufacturing audit and to update and collaborate on creating inspection documents.

QMS 9001: A gap identified during the WHO GBT assessment was that the Committee needs to establish a QMS according to ISO 9001 because they are involved in a regulatory function. In Q2, PQM+ provided technical assistance to the Committee on this. PQM+ has identified a local QMS expert to collaborate with the Committee to establish the QMS. The local expert will work closely with the regional expert and the Committee.

Lot release and Vaccine Testing: PQM+ is providing technical assistance to the NCEM on lot release and vaccine quality testing. In Q1, PQM+ provided technical assistance to NCEM and is in the process of implementing IDPs on lot release and vaccine testing. In Q2, PQM+ met with the NCEM to review the progress on IDPs to date. PQM+ also reviewed existing laboratory SOPs and provided feedback to align with the WHO GBT requirements for the laboratory testing and lot release function. PQM+ also prepared for a training on the bacterial endotoxin testing method. Training took place March 29. The bacterial endotoxin test is a main component of the quality control of vaccines and is used in the testing of QazVac.

The timeline for the QazVac vaccine manufacturer facilities construction is delayed and it is unclear if the facilities will be ready and equipped by the time of the WHO assessment in February 2024. PQM+ and NCEM are discussing the center's plans for WHO GBT if the manufacturing site is ready by the next WHO assessment.

Objective 4: Supply of quality-assured essential medical products of public health importance increased.

Foundations of GMP: As a crosscutting activity in Q2, in collaboration with IntraHealth International, PQM+ initiated updating and repackaging the "Foundation of Good Manufacturing Practices" e-learning modules into Russian for the Central Asia region. PQM+ has started translation and review of the GMP modules.

Priority Activities for Next Quarter

- Continue technical assistance to the NCEM in preparation for the next WHO GBT assessment, with tentative plans for a virtual audit in May.
- Provide face-to-face trainings for Almaty and Karaganda MQCLs in April and May and conduct a mock audit in preparation for the WHO PQ audit.
- Meet regularly with top management of NCEM to discuss progress in joint activities.
- Continue technical assistance to the NCEM on developing approaches and procedures for RB-PMS.
- Assist the Committee in establishing ISO 9001 QMS by onboarding and introducing the new technical expert.
- Conduct training on the medical device manufacturing audit for the Medical Device Unit and update and collaboratively create inspection documents.
- Initiate development of GMP training modules with the NCEM appointees.
- Continue translation and repackaging of the Foundations of GMP modules into Russian.

Tajikistan

PQM+ is supporting Tajikistan in strengthening the medicines regulatory system by providing technical assistance to the State Surveillance Service over health care and social protection of population (State service). The main objectives are to improve the medicines registration system and to support the MQCL to ensure access to quality-assured medicines in the country.

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved.

Medicines Registration System: PQM+ is providing technical assistance to the State service to strengthen its medicines registration system. In PY3, PQM+ supported the MRA to establish a TWG on the medicines registration function to work with PQM+ on improving the system. PQM+ developed a registration assessment questionnaire using the WHO GBT questionnaire as a reference. The assessment found that legal provisions, rules, and guidelines exist to support

registration/market authorization and an organization and management structure support registration activities, but there is a need to improve the regulatory process and to improve communication for greater efficiency in the registration system. There is need to develop and implement SOPs and guidance for good review practices; special medical product registration requirements and procedures for national emergencies, epidemics, and pandemics; and dissemination of product information. Based on the PQM+ assessment findings, PQM+ and the TWG developed two SOPs: one on the screening application and another on evaluation of the assessment. These SOPs are with the State service management for review.

One gap identified during the PQM+ facilitated assessment of the registration function was that the State service has only hard copies of the product dossier submitted for registration, with no backup. These hard copies can be vulnerable to physical damage and loss. The State service expressed interest in digitization and electronic organization with backup for the submitted dossiers. In PY4, PQM+ is providing technical assistance to the State service in establishing a registration module of the RIMS, which would include digitization and electronic organization with proper backup of submitted dossiers. In Q1, PQM+ initiated discussions with the State service on RIMS. In Q2, PQM+ onboarded a RIMS expert who started adapting the RIMS software to the Tajikistan context. Once the adaptation is complete, PQM+ will conduct a demonstration of the RIMS module to the MRA. In addition, specifications for IT hardware for the central server system and networking devices procurement and installation were developed.

Registering TB Medicines: PQM+ is supporting registration of quality-assured first- and second-line TB medicines in Tajikistan through existing a national registration procedure to ensure that the medicines are available in the country for domestic procurement by the National TB Program (NTP). PQM+ coordinated closely with the Global Drug Facility (GDF) to identify the manufacturers of WHO PQ TB medicine and encouraged them to work toward submission of their TB medicines dossier for registration in Tajikistan. To motivate the manufacturers of quality-assured TB medicines (e.g., WHO PQ, Stringent Regulatory Authority/SRA-approved, or reviewed by the Global Fund's Expert Panel/ERP), PQM+ in PY3 used a competitive selection process to identify and contract a local company experienced in registration of medicines in Tajikistan to compile and submit dossiers on behalf of the manufacturers. In PY3, nine dossiers of quality-assured first-line TB medicines from two manufacturers were submitted and accepted by the MRA for registration. In PY4 Q2, all nine medicines[29] were registered by the MRA in Tajikistan. This is the first time WHO PQ TB medicines have been registered in Tajikistan. PQM+ worked with GDF and the NTP to identify and approach additional manufacturers of pediatric first-line and second-line medicines to support registration and subsequent availability of those quality-assured medicines in the country. Three additional manufacturers were engaged and dossiers have been compiled for six additional TB medicines for submission for registration in Tajikistan.[30]

PQM+ is also engaging with WHO, NTP, and GDF to advocate to the Government of Tajikistan for procurement of WHO PQ medicines. Specifically, PQM+ is contributing to developing the specifications for procuring TB medicines, which the NTP will submit to the MOH.

In Q2, PQM+ organized a kickoff meeting with Avicenna Tajik State Medical University (ATSMU), a public university in Tajikistan and technical assistance lead Purdue University.

[29] The medicines are: rifampicin 150mg/isoniazid 75mg, rifampicin 150mg/isoniazid 75mg/ethambutol HCL 275mg, rifampicin 150mg/isoniazid 75mg/ethambutol HCL 275mg/pyrazinamide 400mg, ethambutol 400mg, rifapentine and isoniazid 300mg/300mg, rifampicin 150mg and isoniazid 75mg, rifampicin and isoniazid 75/50mg, rifapentine 300mg, rifampicin 150mg, isoniazid 75mg, pyrazinamide 400mg and ethambutol hydrochloride 275mg.

[30] Isoniazid H100, ethambutol E100, RHZ 75/50/150, isoniazid H300, moxifloxacin 400mg, and linezolid 600mg.

PQM+ provided a list of courses with short descriptions for ATSMU's consideration as well as a questionnaire to identify areas of need. ATSMU completed the questionnaire. PQM+ is reviewing the response with Purdue.

In Q2, PQM+ engaged with the State service to understand the current status of and plans for developing the GMP inspection capacity. It not yet clear if the State service will have a GMP inspection team soon; one person is currently working on GMP. PQM+ is discussing internally, as well as with the State service, the best way forward on the capacity development work.

As a crosscutting activity in Q2, in collaboration with IntraHealth International, PQM+ initiated update and repackage of the "foundation of good manufacturing practices" e-learning modules into Russian for the Central Asia region. PQM+ has started translation and review of the GMP modules into Russian.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Submit three first-line pediatric dossiers and three second-line dossiers to the State service.
- Implement activities with MQCL according to the CAPA plan.
- Purchase a dissolution tester.
- Finalize and demonstrate the RIMS.
- Initiate training on an identified area with the ATSMU.
- Initiate GMP with the State service.
- Continue repackaging of the Foundations of GMP modules.

Uzbekistan

In recent years, the Government of Uzbekistan introduced several initiatives to strengthen the local production of quality-assured medicines in the country. In support of this strategy, and generally to ensure the quality of medicines on the local market, PQM+ is assisting the Agency on Development of the Pharmaceutical Industry ("the Agency") around medicines regulatory systems strengthening. This includes improving the medicines review and registration system, supporting MQCLs to test the quality of medicines reliably and accurately, preparing the GMP inspectorate for PIC/S accession, and introducing RB-PMS to detect sub-standard and falsified medicines. The program also focuses on increasing the supply of locally manufactured, quality-assured TB medicines by providing technical assistance to pharmaceutical manufacturers.

Progress by PQM+ Objective

Objective 1: Governance for medical product quality assurance system improved.

New Governance Structure: In December 2022, the Government of Uzbekistan announced the decision to split the Agency and establish two organizations: the State Center for Expertise and Standardization of Medicines, Medical Devices, and Medical Equipment (the State Center) under the Ministry of Health and the Agency for Development of the Pharmaceutical Industry (the Agency) under the Ministry of Investments, Industry, and Trade. The State Center will be responsible for the regulatory functions and the Agency will be responsible for development of

the pharmaceutical industry. This move eliminates a conflict of interest stemming from one organization (the Agency) being responsible for both industry development and regulatory work. But the final structure and responsibilities of both new organizations still are being defined. PQM+ will continue working with both organizations, as some PQM+ PY4 activities fall under the Agency's responsibility and some are under the State Center's responsibility.

Restructuring of the Agency and the State Center is still unfolding. The Government of Uzbekistan appointed the head for the Agency and later the head of the State Center. PQM+ met with the head of the Agency and laid out the need and plan for PQM+ technical assistance. The head of the Agency is supportive and welcomed PQM+ support. After the head of the State Center was appointed in early March, PQM+ met with the deputy minister of health to reintroduce the program. The deputy minister was supportive of PQM+'s technical assistance and instructed the head of the State Center to work with PQM+. The State Center is not fully staffed and decisions around where departments, such as the GxP center responsible for GMP inspection, will be housed is still unclear.

Cough Syrup Tragedy: Also in December 2022, the government of Uzbekistan reported deaths of children in Uzbekistan due to the consumption of imported contaminated cough syrup. WHO issued a warning stemming from this tragedy. In response to the incident, the Government of Uzbekistan is investigating. Several people, including former staff of the Agency and State Center, were arrested (including the senior managers) and/or fired.

The governance restructuring and staffing changes after the cough syrup tragedy have impacted most PQM+ activities, especially those related to the regulatory strengthening activities through the State Center.

National Pharmaceutical Manufacturing Development Strategy: In Q2, PQM+ initiated the development of the national pharmaceutical manufacturing development strategy. This activity falls within the Agency, whose head is supportive of the activity. He has provided a point of contact from the Agency to work with PQM+ for this activity. PQM+ completed detailed plans for this activity in collaboration with the Agency. PQM+ is also preparing for a technical assistance visit in April to kick off this activity in country and conduct interviews with stakeholders as part of the assessment for the strategy document. During the reporting period, PQM+ launched regular meetings with Agency staff, interviewing them on the current situation in the country as well as reviewing recent governmental decrees and the status of its implementation.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved.

Global Benchmarking Tool (GBT). In the aftermath of the cough syrup incident, the Government of Uzbekistan initiated an investigation to examine mitigation measures it can take to avoid this type of situation in the future. As such, the State Center representative in Uzbekistan developed a roadmap to further improve the regulation on the circulation of medicines. This roadmap lists a series of activities, methods of implementation, deadline, and person responsible to further improve legislation, system, capacity building, and awareness. PQM+ reviewed and provided feedback on this roadmap. One of the strategic directions in the draft document is working toward WHO GBT ML3.

Registration System Strengthening. PQM+ prepared a training for the registration working group on how to write SOPs and implement documents and record control. The training will focus on the importance of documentation; key requirements for writing an effective SOP; and good

documentation practices. The training was planned for January 2023. However, because of the restructuring, this activity is now postponed until staff have been identified in the State Center to work on this.

Registration of WHO PQ TB Medicines. To date, PQM+ has facilitated the registration of six WHO prequalified TB medicines through WHO CRP. Application for one more medicine was submitted to the State Center for WHO CRP Registration: clofazimine (South Korea Manufacturer 1) that is under review. In PY4 Q1, with no technical assistance from PQM+, the Agency used the WHO CRP process to register three vaccines: tetanus toxoid, ROTASIL (liquid), and the Bacille Calmette-Guérin (BCG) vaccine to combat tuberculosis. This signals that the WHO CRP process is sustainable and working for products beyond TB medicines. In Q2, PQM+ followed up with the NTP and GDF to finalize a dossier for WHO PQ TB medicine from India Manufacturer 2.

GMP Inspection. It is unclear where the GxP Center, which is responsible for GMP inspections, will be located. PQM+ is discussing this with local counterparts to learn of any developments.

Laboratory Strengthening. MQCLs will stay within the State Center. Currently, only two laboratories, Tashkent and Andijan (both of which PQM+ supports), were accredited and functioning. Three other regional labs were not able to go through the accreditation process and are not functioning at this point, leaving Tashkent and Andijan laboratories to provide services for the entire country. Because of the recent restructuring at the State Center and increased workload at Tashkent and Andijan laboratories, no active work occurred on implementation of the CAPA plan developed earlier. Based on recent discussions with representatives of the laboratories, it is expected that they will continue working on implementation of the CAPA plan starting in April, when PQM+ will resume corresponding technical assistance.

QMS 9001. In PY3, PQM+ initiated support on QMS for ISO 9001 accreditation and on a management model that will help the State Center improve its administrative and management processes. This activity was also on pause because of the restructuring. However, at a recent meeting between PQM+ and the head of the State Department, he expressed interest in continuing this work, so PQM+ introduced the program contact responsible for ISO 9001 work to him. Plans to restart this activity are underway.

Post-Marketing Surveillance (PMS). PMS will be under the purview of the State Center. However, it is not clear who the point of contact will be. Issues with funding the pilot, especially for the cost of testing medicines, are looming. The Agency had offered to fund this, but given the structural changes, it is unclear where the funding for testing will come from. When meeting with PQM+, the new director of the State Center was skeptical about implementing RB-PMS in the near future, referring to the absence of funding. PQM+ will follow up to identify possible solutions.

Pharmaceutical Technology University. The university is a public private entity and will stay with the Agency. The main point of contact for the university also remains the same. PQM+ finalized the task order for Purdue University for PY4. PQM+ is also preparing to continue training of the faculty, who previously received training by PQM+ on foundations and “regulatory” and “quality’ areas. This will be an online training with discussion sessions to be held in person. PQM+ plans to kick off this online training in April.

Manufacturer Assistance: In PY3, PQM+ provided technical assistance to Uzbekistan Manufacturer 2 on the prequalification of its TB drug levofloxacin. In Q1, the manufacturer finalized two documents, Protocol for Biowaiver Lot and Batch Manufacturing Report for 100,000 tablets. Uzbekistan Manufacturer #2 also manufactured a biowaiver lot and is working toward finalizing the lot for stability investigations. This stage is important because the product development work is being completed. In Q2, a PQM+ expert traveled to Tashkent and provided onsite technical assistance on compiling a dossier for WHO PQ submission. PQM+ also discussed CAPA and conducted follow-up on the GMP assessment from July 2022. Uzbekistan Manufacturer #2 is on track to submit the dossier to WHO for levofloxacin in three to four months.

GMP Compliance Training: Because the Uzbekistan pharmaceutical industry must be GMP-compliant before accession to PIC/S, training will assist the local industry in understanding of GMP requirements and facilitate achievement of GMP compliance. To address this, PQM+ issued a procurement notice to hire a company to deliver GMP training to the country's pharmaceutical industry. In Q1, PQM+ completed the procurement and finalized the vendor to provide GMP trainings for manufacturers. In Q2, the vendor submitted the first draft of the training materials, which PQM+ reviewed and provided feedback. The vendor is updating the materials based on that feedback.

Foundations of GMP eLearning: As a crosscutting activity, in collaboration with IntraHealth International, PQM+ initiated update and repackage of the "Foundation of GMP" eLearning modules into Russian for the Central Asia region. PQM+ has started translation and review of the GMP modules into Russian.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Continue following up with the State Center on points of contact for regulatory strengthening activities.
- Kick off the national pharmaceutical manufacturing strategy.
- Restart technical assistance to the State Center on QMS compliance to 90001:2015
- Kick off the online module for the pharma university.
- Continue assistance to Uzbekistan Manufacturer #2 on product development and dossier preparation.
- Initiate GMP training for Uzbekistan pharmaceutical manufacturers.

Latin America and the Caribbean Region

Panama

PQM+ has been tasked with strengthening Panama's laboratory and testing capacity to improve its ability to ensure medical product quality, as well as developing or revising curricula for relevant University of Panama departments to institutionalize and standardize information and requirements. This will enable them to sustainably ensure and prepare the regulatory workforce.

To achieve this, PQM+ collaborates with key stakeholders, including the National Secretariat of Science, Technology, and Innovation (SENACYT), the main stakeholder coordinating the implementation of the action plan for local pharmaceutical development and manufacturing; the scientific research body under SENACYT (*Instituto de Investigaciones Científicas y Servicios de Alta Tecnología de Panamá,* INDICASAT); Panama's national MRA (*Dirección Nacional de Farmacia y Drogas,* DNFyD); the national quality control laboratory (*Instituto Especializado de Analisis,* IEA); and the University of Panama's Faculty of Pharmacy, among others.

Progress by PQM+ Objective

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

From March 13 to 17, PMQ+ conducted a country scoping visit to build relationships with key stakeholders receiving PQM+ technical assistance, conduct or follow up on technical kickoff orientation meetings, and collate information on the status of and reach consensus on planned activities. Specifically, PQM+ met with representatives from the U.S. Embassy in Panama, SENACYT, DNFyD, IEA, University of Panama's Faculty of Pharmacy, INDICASAT, and the Social Security Administration, which is planning the development of a medicines quality control laboratory.

PQM+ is creating a scoping report that will incorporate detailed findings and recommendations for stakeholders. Findings from the scoping visit will also support the development of a detailed implementation plan for PQM+ activities through September 2023.

Priority Activities for Next Quarter

Next quarter, PQM+ Panama plans to:

- Train IEA and DNFyD on good practices for pharmaceutical quality control laboratories (GPPQCL) and ISO 17025:2017 general requirements for the competence of testing and calibration laboratories.
- Assess DNFyD's marketing authorization and post-marketing surveillance regulatory functions using the WHO GBT tool.
- Identify potential resources within USP for enriching the University of Panama Faculty of Pharmacy's selected curricula. PQM+ is collaborating with the faculty dean to identify specific needs.

COVID-19

Bangladesh

Coordination and Operations for COVID-19 Vaccines

In Bangladesh, PQM+ is working to establish and strengthen the relationship among key stakeholders monitoring the roll-out of COVID-19 vaccines. As part of this activity, PQM+ is providing technical support to the DGDA to implement RB-PMS of vaccines,[31] including COVID-19 vaccines. In January, PQM+ supported DGDA's Market Control (MC) department to organize a second meeting of the Vaccine Quality Assurance Committee. The Director General of DGDA chaired the meeting. The purpose of the meeting was to inform the committee about the progress of the NCL's vaccine lab toward performing quality testing of samples from RB-PMS of vaccines. Discussions at the meeting also helped finalize roles and responsibilities for key stakeholders (DGDA, the Expanded Program on Immunization (EPI), Institute of Epidemiology Disease Control and Research (IEDCR), Bangladesh Medical Research Council (BMRC), WHO, and UNICEF) to implement RB-PMS of vaccines. The Directorate General of Health Services (DGHS)'s EPI representative agreed to provide training on cold chain management to DGDA's inspectors in partnership with the PQM+ program. PQM+ will continue its technical assistance to DGDA's MC department and NCL for the successful implementation of RB-PMS of vaccines and establishment of a cold chain management system.

PQM+ also supported NCL and DGDA in the revision and standardization of the registration of human vaccine guidelines. This quarter, the guideline document was technically reviewed, edited, and submitted to DGDA for adoption. PQM+ assisted in the overall restructuring of the guidelines, helped define the appropriate process for registering any vaccine intended for full registration, and included several sections for vaccines testing and evaluation. PQM+ also supported DGDA to prepare medical oxygen guidelines to strengthen the regulation of medical oxygen. This quarter, PQM+ submitted the finalized regulation of medical oxygen guidelines to DGDA and they adopted it. The guidelines will support DGDA and NCL to strengthen the regulation of medical oxygen and ensure enhanced quality with compliance to regulatory standards benefiting the manufacturers and end users.

Laboratory Systems

In Bangladesh, PQM+ is working with the NCL to build its capacity in personal protective equipment (PPE) testing at its newly established medical device testing laboratory. PQM+ procured four pieces of equipment (mask and respirator breathing resistance tester, medical gloves hole detector, universal tensile strength tester, and paramagnetic oxygen analyzer) to strengthen PPE testing at the medical device testing laboratory. Among the four pieces of equipment, two equipment (i.e., mask and respiratory breathing resistance tester and universal tensile strength tester) were delivered to NCL in March. The remaining two pieces of equipment (i.e., medical gloves hole detector and the paramagnetic oxygen analyzer) will be supplied in May/June 2023. PQM+ submitted a no-cost extension request to finalize activities related to the arrival of the equipment, including the development of SOPs and training on developed SOPs. During this quarter, PQM+ supported NCL and the DGDA to prepare 11 SOPs for potency and identity test-related equipment of COVISHIELD vaccines. PQM+ also supported NCL to calibrate 22 pieces of equipment through a third party. In addition to creating SOPs for the lab, in collaboration with private sector partner ITS Labtest Limited, PQM+ trained NCL staff on six

[31] These results will not necessarily be nationally representative.

medical devices testing equipment, including PPE testing and Oxygen testing equipment. On March 14-16, ITS Labtest Limited facilitated a practical training (functional and operational) on six pieces of equipment (Particulate Filtration Efficiency [PFE] Tester; Mask Pressure Difference Tester; Mask and respirator breathing resistance tester; Universal tensile Strength tester; Medical Glove hole detector; Paramagnetic Oxygen Analyzer) to NCL analysts, supervisors, and management including three PQM+ staff. A total of 13 participants (F-5, M-8) attended. The trainees learned how to use the equipment by themselves and gained the ability to provide training to other new staff.

On March 13, DGDA organized an inauguration event at the NCL's newly established medical devices testing laboratory. More than 80 people participated, representing MoHFW, DGDA, NCL, USAID and its implementing partners, WHO, Better Health Bangladesh (BHB), nongovernmental agencies, and local journalism outlets. The Honorable Secretary Dr. Md. Anwar Hossain Howlader from the Health Services Division of the MoHFW spoke at the ceremony. Other guests included DGDA Director General Major General Mohammad Yousuf; special guest Enamul Haque, Additional Secretary at the Health Services Division of MoHFW; Dr. Emily Kaine, Senior Vice President for Global Health and Manufacturing Services, USP; and Ms. Liza Talukder, USAID's Bangladesh activity manager for PQM+. All delivered speeches for the occasion.

PQM+ delivered nine cold boxes (12 liters capacity each) to DGDA to use for carrying vaccines during the implementation of RB-PMS of the COVID-19 vaccine.

PQM+ is also supporting DGDA to build NCL's capacity in vaccines testing. This quarter, PQM+ provided four sessions of hands-on training on vaccine testing equipment to NCL staff. On January 11, PQM+ trained staff on master cell bank preparation protocol of human embryonic kidney (HEK)-293 cell line. This training included cell revival, subculture, and cryopreservation the cell line used in the method validation of COVIDSHIELD vaccines. This training was important as NCL is introducing a cell line facility for the first time; it must be part of vaccine quality control testing per international standards. Fifteen NCL staff (two women, 13 men) participated. On February 22, PQM+ trained 11 staff (three women, eight men) on the operation of a hemocytometer and bio-safety cabinet. This equipment is used in cell line testing, enabling staff to perform identity and potency tests of COVISHIELD vaccines, confirming that its preparation is accurate and precise. On February 26, PQM+ trained 14 staff (two women, 12 men) on newly implemented SOPs:1) Operation, Calibration, and Maintenance of the inverted microscope, ultra freezer (-80°C freezer), and liquid nitrogen cryotank. Through this training, NCL staff learned how to count cell line by using an inverted microscope and how to preserve a cell line with the help of the ultra freezer (-80°C freezer) and Liquid Nitrogen Cryotank for a long period of time, ensuring the quality of vaccines tested at the lab. By gaining this skill, NCL staff can operate, calibrate, and maintain the equipment, and can also train other staff. On February 28, PQM+ trained 17 staff (two women, 15 men) on newly introduced SOPs on operation and maintenance of CO_2 incubator [Sanyo, Model: MCO-19AIC] and Quant Studio-5 DX Real-time PCR. The ability to operate a CO_2 incubator will help staff to maintain the proper growth of cell lines of the COVISHIELD vaccine. For identification of the COVISHIELD vaccines and other COVID-19 vaccines, it is mandatory to know the operating procedure of real-time (RT) polymerase chain reaction (PCR). As a result of the training, NCL staff know how to operate a RT-PCR machine. Now NCL analysts can easily identify and assess the quality of any vaccines with these new standards, methods, and training available to them through PQM+ support.

Burkina Faso

Immunization Readiness and Implementation

PQM+ is working to support Burkina Faso's medicines regulatory authority, ANRP, to strengthen its adverse events following immunization (AEFI) surveillance system and build its capacity to grant regulatory approval for COVID-19 vaccines in alignment with international norms (e.g., WHO COVID-19 vaccine safety monitoring guidelines) and the country's National Vaccine Deployment Plan. Previously, PQM+ conducted a training of trainers on AEFI reporting for health care workers from the national immunization program from 13 regions in Burkina Faso. With PQM+ support, this training was then cascaded to vaccination staff in two regions (Central and South Central). In this reporting period, PQM+ supported ANRP to convene all relevant stakeholders (USAID implementing partners, the vaccination program, the university hospital centers, etc.) to validate the report, which compiled and collated AEFI data from June 2021 to October 2022. The report has been successfully validated and shared with all relevant stakeholders, including UNICEF and WHO regional health directorates. Nineteen people (six women, 13 men) participated in this validation workshop. The report highlights the significant discrepancy (90%) between the AEFI notifications declared by the vaccination program (DPV) and those notified to ANRP. Of the 960 AEFI cases, 1.9% (20) were serious adverse events. However, no death was recorded. Of the 20 serious cases notified, 12 cases were investigated and submitted to the Technical Committee for the Vigilance of Medicines, Vaccines, and Immunological Serums for causality assessment to the WHO vaccine imputability method. Of the 12 cases analyzed, 10 involved the AstraZeneca vaccine and two the Johnson & Johnson vaccine. Six investigated cases of serious AEFIs were found to be associated with vaccines or vaccination. Four cases required further investigation to finalize the causality analysis. PQM+ subsequently supported ANRP to draft a report based on the information compiled. With the validated report, ANRP will record the AEFIs in VigiBase, WHO's pharmacovigilance database. This report also provides ANRP with the necessary safety information about the COVID-19 vaccines imported into the country for its population and will guide regulatory decisions on full approval of these vaccines. In addition, ANRP can use this report as an advocacy tool to make a case to the regulatory authority for improved AEFI notifications. As of the end of Q2, all Burkina Faso COVID-19 ARP activities are completed per the approved work plan.

Laboratory Systems

PQM+ is working to build the capacity of the national quality control lab, LNSP, to test COVID-19 vaccines. PQM+'s work with LNSP will help the lab support ANRP with its lot release function as the six vaccines that have been granted EUA in the country transition to full approval and future post-marketing surveillance of the vaccines registered and deployed in Burkina Faso. By March, all equipment and consumables that PQM+ procured for LNSP for testing vaccines/biologics were successfully delivered to the laboratory. PQM+ has verified the arrival of these equipment and consumables and the vendor has scheduled the installation and training of the laboratory analysts on their use, already paid for by PQM+. As of the end of Q2, all Burkina Faso COVID-19 ARP activities are completed per the approved work plan.

COVID-19 Therapeutics

Policy, Planning, and Coordination

PQM+ is providing technical assistance across several countries to introduce and refine a COVID-19 Test to Treat service delivery model using the currently authorized antiviral medications (nirmatrelvir/ ritonavir [Paxlovid] and molnupiravir). Manufacturing constraints and a

complex regulatory pathway from licensing to market authorization/prequalification result in a protracted timeframe for availability of generic medicines, including these oral antivirals. PQM+, in coordination with relevant partners such as Reaching Impact, Saturation and Epidemic Control (RISE), is working to provide support to regulatory authorities in the 10 Test-to-Treat (T2T) countries to facilitate registration/market authorization of two COVID-19 antivirals, both the branded (Paxlovid and Lagevrio) as well as the WHO-prequalified generic (nirmatrelvir/ritonavir co-packaged and molnupiravir capsules) versions. PQM+ is also supporting implementing partners in obtaining the necessary authorizations for importation of these donated products. In Q2, PQM+ established a confidential non-disclosure agreement with India Manufacturer #4, which produced the first prequalified generic versions of nirmatrelvir/ritonavir and molnupiravir capsules. PQM+ is working with India Manufacturer #4 representatives in eight of the 10 countries to coordinate registration of their products, including document compilation and liaising with regulatory authorities to expedite review processes. In the two remaining countries, Lesotho and Bangladesh, PQM+ is also supporting registration or waiver applications for the products by coordinating between the regulatory authorities, India Manufacturer #4, and implementing partners to facilitate necessary document submissions.

Ethiopia

Cold Chain and Supply Logistics

In Ethiopia, PQM+ is supporting the EFDA to build capacity in cold chain regulation for vaccines. Under its previous American Rescue Plan project, PQM+ Ethiopia conducted a cold chain regulatory inspection, which highlighted gaps in terms of compliance to international regulatory requirements and best practices. The findings showed non-conformities in staff technical capacity in good distribution practice (GDP), good storage practice (GSP), good documentation practice (GDP) and QMS implementation. In Q2, PQM+, in collaboration with EFDA, regional health Bureaus, and the Expanded Program on Immunization provided a training on these topics for 353 experts (190 women, 163 men), mostly nurses, or other health care workers that are involved in management of vaccines. This training supported the health workers to implement good distribution practice, good storage practice, good documentation practice, and an overall QMS in their immunization health facilities, to ensure the quality, safety, and efficacy of vaccines. PQM+ plans to assess the impact of this training in the future after health facilities have established a QMS and implemented good practices. This assessment will be conducted after facilities have had some time to fill gaps identified during the first cold chain assessment and its purpose is to measure how PQM+ support, including the training, has helped these facilities to improve the GDP/GSP regulatory requirements. PQM+ also plans to provide support to the immunization facilities on equipment calibration/verification and general metrology related topics based on the first gap assessment.

Policy, Planning, and Coordination

In Ethiopia, PQM+ is supporting the EFDA to build the technical capability of its Market Surveillance and Relevance Directorate so it will be able to detect SF COVID-19 vaccines and related commodities through its market surveillance work. In Q2, PQM+ facilitated a training for regional regulatory inspectors and EFDA branch office inspectors about the methodology for detecting substandard and falsified medicines, including COVID-19 vaccines, and the illegal activities related to such SF products. The training was provided by Ethiopia's National Intelligence and Security Service experts in partnership with PQM+ for 45 participants (seven women, 38 men). PQM+ is supporting EFDA to map the overall circulation of COVID-19 products in the supply chain system to promote more evidence-based decision-making. EFDA,

with PQM+ technical support, conducted the mapping (identification and detection) of areas for presence of SF medicines including COVID-19 vaccines and the illegal trade of such products, and submitted the report to management for regulatory measures.

Pharmacovigilance and Safety Monitoring

In Ethiopia, PQM+ is working to strengthen product quality defect reporting through adverse drug reaction (ADR) reporting. Ethiopia has a passive ADR monitoring system where health care providers voluntarily send ADR data and product defect reports, so medicines/vaccines quality issues, often caused by cold-chain storage problems, can be captured and reported real-time. The system is not widely used, but can be a valuable source of information for the National Pharmacovigilance Center if it becomes regularly used. More than 15,000 AEFI reports have been collected using both the active and passive reporting systems. However, these reports have not been entered into WHO's global database for proper capture and analysis.

During this quarter, PQM+ supported the National Safety Advisory Committee (NSAC) to conduct a performance review of the national causality assessment process from February 28 to March 1 in Bishoftu, Ethiopia, with 29 NSAC participants (seven women, 22 men). The NSAC was able to review and classify two serious adverse event reports on the Astra Zeneca COVID-19 vaccine. Both cases were classified as coincidental, using the WHO online causality assessment tool. The NSAC and the pharmacovigilance team at EFDA also reviewed the performance of its causality assessment process to date by evaluating the activities conducted using this process. NSAC and the EFDA pharmacovigilance team discussed the challenges they have encountered throughout the causality assessment process, and proposed recommendations to address these challenges and a way forward. As of February, 54,353,183 doses of COVID-19 vaccine have been administered in Ethiopia. The number of AEFI reports received from both active and spontaneous reporting are around 50,000, and causality classification was completed for 51 serious AEFIs. Establishing a causality assessment system of AEFI cases will help to monitor the safety of the COVID-19 vaccines and enable the provision of recommendations on individual cases and the immunization program as a whole. This will improve the public's confidence in and support of the immunization program, helping improve vaccination uptake.

Laboratory Systems

PQM+ is supporting the EFDA to increase the capacity of its quality control laboratories. The EFDA has a medical devices testing laboratory aimed at testing the quality of medical devices before and after marketing authorization as part of its quality assurance process. Since 2014, the laboratory has been ISO/IEC 17025:2017 accredited for its male condom testing system based on support from PQM+'s predecessor program, PQM. The laboratory is just starting to test other medical devices like gloves, syringes, and rapid diagnostic tests, and there is a need to build the quality management system in these areas so that the test results will be accurate, traceable, internationally recognized, and help to better protect the public from diseases like COVID-19 through evidence-based decision making from accurate test results generated from the laboratory. PQM+ is supporting this activity through both COVID-19 and field support funding. In Q2, under its other funding streams, PQM+ Ethiopia provided technical support to the Medical Device Testing Laboratory of EFDA on Laboratory Quality Managements System (LQMS) to maintain ISO 17025:2017 accreditation and to expand the scope of ISO/IEC 17025:2017. With its COVID-19 American Rescue Plan funding, PQM+ provided a five-day, hands-on training to nine (three women, six men) lab staff on glove testing, operational procedures, and interpretation of related standards. PQM+ also reviewed and revised five medical device testing SOPs. Finally, PQM+ procured standards and PT samples for the lab

and supported the lab to complete and evaluate test results. PQM+ support is enabling the medical device testing laboratory to maintain ISO 17025 accreditation of its existing scope and expand its scope to other products.

Ghana

Policy, Planning, and Coordination

In Ghana, PQM+ Global VAX funding to support the FDA Ghana to strengthen its lot release function, to enable the production of vaccines in Ghana. In the past, FDA Ghana's lot release function was not assessed as part of the WHO GBT assessment. Given that plans for local production of vaccines in Ghana are unfolding, FDA Ghana seeks to operationalize and achieve ML3 for its lot release function. As a result, PQM+ is providing technical assistance to ensure FDA Ghana has the legal provisions, regulations and guidelines required to define the regulatory framework of independent lot release. In Q2, PQM+ reviewed and amended five additional regulatory documents to help FDA Ghana operationalize its lot release function: (1) SOP for conducting lot release, (2) Application for lot release, (3) Job descriptions for first and second reviewers for the lot summary protocols, (4) Reliance lot release assessment and (5) Lot release database template. In addition to the guidelines developed in Q1, with support from PQM+, these additional lot release documents will be key for FDA Ghana to fully operationalize this regulatory function as per best practices and to facilitate independent lot release for the planned production of vaccines in the country.

Beyond the support for strengthening systems to conduct lot release at FDA Ghana, PQM+ conducted a hands-on training session for FDA Ghana personnel on reviewing summary protocols received from manufacturers for independent lot release. The 27 regulatory staff who received training included 11 women and 16 men. The training prepared the regulatory officers from FDA Ghana for a follow-on working session where they would use real lot summary protocols to model the process for releasing lots of selected vaccines, including COVID-19 vaccines. This training will contribute to FDA Ghana meeting the GBT indicator LR03, by ensuring they have a workforce capable of performing independent lot release. PQM+ then provided the follow-on supportive supervision to the regulatory staff involved in lot release to 'mock release' COVID-19 and other vaccines in a training/workshop setting. Participants were provided real but redacted lot summary protocols for (1) Two lots of ChAdOx1 nCoV-19 adenovirus non-replicative vaccine from two different manufacturers, (2) one lot of DTP vaccine (3) one lot of measles vaccine and (4) one lot of SARS-CoV-2 RS (COVID-19) recombinant spike protein nanoparticle vaccine to review using the checklists that were developed during the same workshop. The participants were able to successfully apply the processes for documentary review required to release vaccine lots. The process and findings during the review were discussed in plenary and PQM+ coached the participants on key elements they should look out for while doing future reviews.

PQM+ is also working with FDA Ghana to acquire and operationalize a complete regulatory management system, such as the Integrated Regulatory Information Management System (IRIMS), which improves and streamlines regulatory processes. With an operational IRIMS, Ghana FDA can offer electronic services to its clients, increasing the consistency, transparency, and efficiency of their regulatory process and operations with which they manage client requests while also improving their quality management systems. Implementation of IRIMS will help Ghana FDA meet the GBT indicator (RS09.08 - The national regulatory authority uses computerized systems to process information, manage records, and analyze data). IRIMS will help to improve the regulatory oversight for all medical products, including COVID-19 vaccines,

by increasing the standardization of regulatory processes. An improved regulatory system will provide the necessary confidence among stakeholders that regulation of COVID-19 vaccines is done effectively. This quarter, PQM+ developed a list of potential vendors that could be considered for the IRIMS to be procured for Ghana FDA. In addition, PQM+ reviewed the data collected through the completed questionnaire submitted by Ghana FDA and developed the feasibility study report. This report was finalized in Q2 and concluded that implementation of a set of minimum common standards (MCS) and IRIMS will ensure the fluidity and quality of information/data exchanges between the Ghana FDA regulatory departments and/or third parties, as well as to continue to improve its performance to comply with medicines laws and regulations in terms of the quality, safety, and efficacy of medicines and health products. The report also recommends a phased-out process for the implementation of the IRIMS: (1) planning and set-up, (2) selection, (3) implementation,(4) maintenance. With the list of potential vendors and the feasibility report, PQM+ can now work with Ghana FDA to identify the best IRIMS that will be procured.

Cold Chain and Supply Logistics

In Ghana, PQM+ received Global VAX funding to support the FDA Ghana and to provide a ToT for FDA Ghana inspectors on good storage and distribution practices (GSDP). According to WHO, medical products are subject to various risks at different points in the supply chain, including storage and distribution. As a result, the medicines regulatory authority needs to have adequate capacity to conduct inspections that would detect issues at any of these stages. This quarter, to help FDA Ghana strengthen the capacity of its inspectors, PQM+ completed the development of the training curriculum and delivered the ToT, building upon an orientation on the RBI tool, created by PQM+ for GSDP inspections which was attended by seven regulatory inspectors from FDA Ghana. Twenty-five (F-6, M-19) regulatory staff attended the ToT which emphasized the application of risk-based inspection approaches in regulatory practices. It offered the opportunity to identify and prevent infiltration of substandard and falsified pharmaceutical products into the market. A large part of the training covered cold-chain inspection, which is essential to ensure vaccines, such as those for COVID-19, that require cold storage are being stored and supplied at the required temperatures. This ToT has capacitated FDA Ghana to conduct cold chain inspections by applying best practices and an efficient approach. In addition, this group of trainers can cascade the training to other regulatory staff to ensure they have an adequate pool of inspectors with the capability to inspect cold chain storage facilities.

Laboratory Systems

PQM+ received Global VAX funding to support FDA Ghana to strengthen the capacity of its lab to complete independent lot release of COVID-19 mRNA vaccines. QC testing laboratories that meet international requirements for best laboratory practices enable the regulatory authority to assess the quality of medical products. The regulatory authority needs this critical service to review applications for marketing authorization and variations to existing marketing authorizations, post-marketing surveillance, and lot release. Ghana's QC testing laboratory is ISO/IEC 17025 accredited for several parameters. This laboratory also has capacity to test some vaccine quality attributes, such as appearance, pH, sterility, and bacterial endotoxins. In 2021, through COVID-19 technical assistance funds, PQM+ procured laboratory equipment and supplies to enable the FDA Ghana QC laboratory to test the viral vector platform COVID-19 vaccines. However, the QC laboratory requires additional equipment, accessories, and consumables required for the QC testing of mRNA COVID-19 vaccines. In addition, additional capacity building is needed to enable the QC analysts to test the COVID-19 vaccines per the manufacturers' methods. This quarter, PQM+ completed the bid evaluation for six pieces of

equipment requested by FDA Ghana and selected two pieces of equipment (Capillary Gel Electrophoresis system and Cell-based Flow Cytometry System) in alignment with the approved budget. A third piece of equipment (SDS-PAGE Western blot system) is also being considered if PQM+ can identify savings in the budget after the analysis of the spend in March.

Kenya

Policy, Planning, and Coordination

In Kenya, PQM+ is strengthening the PPB and the NQCL to provide the regulatory oversight required to assure the quality, safety, and efficacy of COVID-19 vaccines and other biologics throughout their production, storage, distribution, and use in Kenya. In addition, PQM+ interventions are supporting PPB and NQCL toward the achievement of WHO GBT ML3 for medicines regulatory authorities. In the previous reporting period, PQM+ supported PPB to update and develop guidelines for licensing and inspections of vaccine manufacturing facilities. In Q2, PQM+ continued to work with PPB to finalize the guidelines and planned for a final training in April on the developed guidelines and SOPs.

PQM+ is also supporting PPB to establish and institutionalize a vaccines lot release function. Lot release is a new function for PPB and is critical to ensure that Kenya can support the production and release of vaccines both for internal use and for export use. Developing lot release guidelines and SOPs will enable the regulator to develop a real-time system that continuously monitors vaccine quality through review and testing. This quarter, PQM+ conducted two workshops to help finalize the drafted lot release guideline. Both workshops were conducted in January, with attendees from both PPB and the NQCL. The first workshop focused on building the capacity of eight (F-2, M-6) participants on the principles of biomanufacturing and vaccine platforms. With PQM+ guidance, participants reviewed lot release guidelines from stringent regulatory authorities and other ML3/4 authorities. These guidelines helped to inform inputs into PPB's own guidelines. The second workshop allowed the nine (9) (F-2, M-6) participants to review and validate the guidelines developed for lot release. These guidelines are now with PPB management for final approval, and PQM+ will train PPB staff and manufacturers on these guidelines in May.

Continuous monitoring of the quality of medicines including vaccines is important for any medicine's regulatory authority. To support this, PQM+ developed a tool for RB-PMS. This quarter, PQM+ continued to tailor its MedRS tool for vaccines. The updated tool will be completed in April, and PQM+ will train PPB staff on its use.

Laboratory Systems

PQM+ is strengthening the PPB and the NQCL to provide the regulatory oversight required to assure the quality, safety, and efficacy of COVID-19 vaccines and other biologics throughout their production, storage, distribution, and use in Kenya. As part of this project, PQM+ plans to assess the NQCL's capacity to support lot release and testing of COVID-19 vaccines. The NQCL needs to develop its capacity for testing of vaccines to support Kenya to produce quality assured vaccines. In Q2, the NQCL, with the support of PQM+, carried out a self-assessment of their capacity to carry out vaccine testing using a checklist developed by PQM+. To ensure effectiveness in the use of the assessment tool, two PQM+ technical staff had an instruction session with three NQCL staff (one woman, two men). PQM+ will review the results of the assessment in a workshop in April and generate recommendations for capacity building.

In February, PQM+ conducted a two-day workshop for document review for 12 NQCL staff (five women, seven men). The team helped NQCL review 12 SOPs dealing with medicine and vaccine related equipment, lab procedures, and human resources. These SOPs are now going through finalization and approval and will ensure that the lab has quality management system documents in place for vaccines testing.

Mozambique

Policy, Planning, and Coordination

PQM+ received ARP funding to work with the Mozambique national medicines regulatory authority, ANARME-IP to conduct a RB-PMS for COVID-19 vaccines and therapeutics in Mozambique,[32] as well as train ANARME staff on COVID-19 vaccine dossier review, quality control testing, and emergency use authorization. Poor storage and transportation conditions potentially influence the quality of medical products available to patients and clients, compromise outcomes of treatment, and increase the risk of long-term morbidity and mortality from COVID-19. Additionally, the inadequate institutional and laboratory capacity of ANARME limits its capacity to effectively monitor the quality of COVID-19 medical products in the health system. PQM+ will provide technical support to ANARME and its PMS TWG to develop an RB-PMS protocol for COVID-19 vaccines and therapeutic medical products, conduct samples collection, and utilize existing LNCQ capacity for QC testing to support quality assurance of COVID-19 medical products. During Q2, PQM+ engaged with ANARME management and technical teams to discuss and plan for the PMS activities as well as synchronize with other PMS activities as part of the ANARME routine regulatory activities. PQM+ and ANARME agreed on methodology and training dates for the MedRS and PMS protocol development, as well as schedules for sample collection and testing. As part of the preparatory work, PQM+ is working with ANARME to identify the COVID-19 vaccines and therapeutic products currently in circulation and use in the country. Considering the inability of the LNCQ to conduct vaccines testing and the unavailability of in-country vaccines testing facilities, PQM+ also explored external laboratories and held preliminary discussions with the South Africa National Control Laboratory for Biological Products in this respect.

PQM+ is also supporting ANARME to develop a pool of competent staff in the evaluation of vaccine dossiers and the emergency use authorization process as part of the IDP toward WHO GBT ML3. To ensure the training responds to the needs of ANARME, in Q2, PQM+ engaged the Division of Evaluation of Medicines, Health and Biological Products (*Divisão de Avaliação de Medicamentos, Produtos Biológicos e de Saúde*) to discuss the training expectations, needs, and structure. Following this, PQM+ will work with ANARME to determine any skills gaps and training needs. This will support the development of new or adaption existing training material and subsequent training sessions.

Laboratory Systems

PQM+ is working with the LNCQ to effectively support PMS activities for COVID-19 therapeutics. LNCQ requires the necessary testing capacity that ensures generation of valid and reliable results. PQM+ has been supporting the LNCQ in strengthening its capacity for compendial testing and in closing the gaps identified in the roadmap towards ISO 17025:2017 accreditation as part of the laboratory systems strengthening assistance. In Q2, PQM+ engaged the LNCQ in needs identification for equipment calibration and maintenance, quantification of reagents and reference standards required for testing PMS samples, performance of mandatory

[32] These results will not necessarily be nationally representative.

PT, as well as identifying potential providers to support this. The procurement process is underway and expected to be completed in Q3 in time for sample testing. To strengthen regional collaboration and facilitate sharing of available resources, PQM+ is supporting LNCQ in identifying regional laboratories to support PMS sample testing in cases where the LNCQ lacks the necessary capacity.

Nigeria

Policy, Planning, and Coordination

In Nigeria, PQM+ received Global VAX funding to support the NAFDAC to update its existing guidelines for imported COVID-19 vaccine regulation, laboratory testing, vaccine manufacturing site inspections, and post-approval changes of COVID-19 vaccines. As part of this work, PQM+ is conducting an assessment to identify the gaps in regulatory documentation that exist and need to be addressed. This quarter, as part of the gap assessment, PQM+ reviewed a total of 62 legal, policy, and guideline documents that NAFDAC uses for vaccine and biologics related regulation and registration. PQM+ drafted the gap assessment report, including recommendations, which is currently under internal review.

PQM+ is also working with NAFDAC to increase its capacity to inspect vaccine manufacturers. In Q2, PQM+ conducted a ToT for 21 (F-8, 13-M) NAFDAC staff from February 7-11, 2023 on the evaluation of biological products, including vaccines. At the training, PQM+ provided technical support to NAFDAC for the development of a checklist for vaccine manufacturing site inspection, covering chemistry, manufacturing, and control (CMC), corrective action and preventive actions (CAPA), final product specifications, and good manufacturing practice (GMP). PQM+ also provided knowledge and technical support on the understanding of lot release pathways, the risk-based approach for pathway selection, lot release procedures, submission of application, summary protocol review, laboratory testing, and investigation of non-compliance results. During the training, PQM+ also worked with participants to develop procedures and guidelines for post-approval changes as part of NAFDAC's registration function.

Laboratory Systems

PQM+ is working to strengthen the NAFDAC's laboratory testing function for vaccines. PQM+ is supporting the lab to develop, review, and revise new and existing laboratory procedures focused on vaccines. This quarter, the osmometer with a particulate analyzer, which PQM+ procured for the lab in the previous quarter, was delivered, calibrated, and handed over to NAFDAC. PQM+ also finalized an order for consumables for the hands-on training of COVID-19 specific (potency, mRNA identity, Adenovirus particles quantity etc.) and non-specific (osmolality, bacterial endotoxins, sterility, etc.) quality control testing to the selected vendors. These consumables will be delivered in time for the second phase of quality control laboratory training for NAFDAC's analysts scheduled for May.

As part of its first phase of QC training, PQM+ conducted a training in January to build NAFDAC analysts' capacity in PCR equipment, principles, materials, primer design, procedures, and applications to COVID-19 vaccine testing. PQM+ also provided knowledge and technical support on data analysis using the GraphPad Prism application for testing and verification of key attributes of adenovirus and mRNA-based COVID-19 vaccines. The training reached 21 participants (nine women, 12 men). Finally, PQM+ started developing the training manual that it will hand over to the lab following the training. PQM+ also visited the Vaccine, Other Biologicals, and Medical Devices Laboratory (VBM-LSD) at the end of March to assess its functional readiness of the qPCR instrument for the May training workshop.

Rwanda

Policy, Planning, and Coordination

In Rwanda, PQM+ received Global VAX funding to provide technical assistance to the Rwanda FDA to strengthen its capacity to provide regulatory oversight of COVID-19 vaccines imported into the country and expected to be manufactured locally in the near future. This will help assure the efficacy, quality, and safety of COVID-19 vaccines and biological products used in Rwanda. In the previous quarter, PQM+ supported Rwanda FDA to revise the terms of reference of its existing RB-PMS technical committee to include responsibilities of identified new members responsible for the implementation of COVID-19 vaccine related PMS activities. In the same quarter, PQM+ also supported Rwanda FDA to kick start the revision of RB-PMS protocol, SOPs, and guidelines to incorporate vaccines related aspects. In Q2, as a continuation of these activities, the PQM+ program organized a one-day technical committee meeting focusing on the inauguration of the new members, election of the vice-chairperson, and amendment of the revised terms of reference. Fifteen people (seven women, eight men) from the Rwanda FDA, King Faisal Referral Hospital, Rwanda National Police, Rwanda Investigation Bureau, Rwanda Medical Supply, Private Sector Federation, University of Rwanda, and National Pharmacy Council attended. PQM+ collaborated with Rwanda FDA to organize a workshop to revise the RB-PMS protocol, guidelines, and SOPs. The 25 participants (11 women, 14 men) represented the Rwanda FDA, King Faisal Referral Hospital, Rwanda National Police, Rwanda Investigation Bureau, Rwanda Medical Supply, Private Sector Federation, University of Rwanda, and National Pharmacy Council.

Senegal

Policy, Planning, and Coordination

In Senegal, PQM+ received Global VAX funding to support the medicines regulatory authority ARP to reach ML3. Specifically, PQM+ is working to strengthen the systems for registration and marketing authorization (MA) for biologics such as COVID-19 vaccines. Previously, PQM+ conducted a desk review of current regulatory documents to outline the gaps/inadequacies in these documents. The gaps in each document were shared with the ARP task force responsible for MA related documents. In Q2, as a follow-up to the feedback provided on ARP's regulatory documents, PQM+ convened a series of virtual meetings to discuss the feedback with ARP to help finalize these documents. Subsequently, on their own, ARP validated these documents reviewed by PQM+ ahead of their February WHO GBT monitoring visit. These documents are:

- *Checklist d'évaluation d'un dossier* (Checklist on document evaluation)
- *Arrêté portant dérogations à l'Autorisation de Mise sur le Marché* (Ministerial decision on exceptions for market authorization holders)
- *Procedure d'enregistrement de vaccin* (Procedure to register vaccines)
- *Arrêté relatif à l'Autorisation d'Utilisation d'urgence* (Ministerial decision for emergency use authorization)

A fifth document, *Guidelines for reviewing common technical documents (CTD) dossiers*, has not yet been finalized. These documents address specific recommendations from ARP's WHO GBT assessment and will help them improve their maturity level for their registration and marketing authorization regulatory function.

PQM+ is also working to strengthen ARP's vaccine lot release function to enable production of vaccines in Senegal. The lot release of vaccines by regulatory authorities involves the independent assessment of each lot of a licensed vaccine before its release to the market. The goal of this regulatory function is to ensure the quality, safety, and efficacy of biological products through a regulatory release system. Lot release accounts for the nature and inherent variability of these products and therefore is done on a lot-by-lot basis. The assessment includes reviewing the manufacturer's summary protocol and, as necessary, testing the vaccine independent of the manufacturer's quality control testing. For vaccines imported from countries with mature regulatory authorities, lot release entails reviewing the lot release certificate issued by the producing-country's regulatory authority. Senegal, as a vaccine producing country, already routinely conducts independent lot release. However, in the recent GBT assessment, WHO indicated that the ARP's procedure for lot release needs to be updated, its staff needs training on lot release, and the quality control laboratory responsible for testing the vaccine lots requires specific procedures for implementing this regulatory function. In Q2, ARP validated the lot release regulatory documents that were reviewed by PQM+ in Q1. The documents validated are: (1) *Arrête sur Libération de Lot* (Decree for Lot Release) and (2) *Procedure de Libération de lot (standard operating procedure (SOP) for Lot Release)*. In addition to these documents, PQM+ also provided inputs on a third lot release document, Guidelines for Lot Release.

To guide ARP through the implementation of the lot release process it is establishing, PQM+ provided an in-person training on Lot Release and lot summary protocol review for 27 participants (11 women, 16 men) from ARP and the Institut Pasteur de Dakar (IPD). The training prepared the regulatory officers from ARP for a follow-on working session to use real lot summary protocols to model the process for releasing lots of selected vaccines, including COVID-19 vaccines. This training will contribute to ARP meeting the *GBT indicator LR03*, by ensuring they have a workforce capable of performing independent lot release. Later in the quarter, PQM+ provided the follow-on supportive supervision to the regulatory staff involved in lot release to 'mock release' COVID-19 and other vaccines in a training/workshop setting. Participants were provided real but redacted Lot Summary protocols for (1) one lot of ChAdOx1nCoV-19 adenovirus non-replicative vaccine from one manufacturer, (2) one lot of BCG vaccine, (3) one lot of yellow fever vaccine and (4) one lot of SARS-CoV-2rS (COVID-19) recombinant vaccine to review using the checklists that were developed by ARP prior to the workshop. This training gave ARP regulatory staff the opportunity to simulate the documentation review process to release vaccines manufactured locally or imported into the country.

PQM+ is also working to strengthen ARP's capacity to conduct RB-PMS for vaccines. PQM+ has supported Senegal to establish a national multisectoral PMS unit that includes members from all disease programs and other medicines quality assurance stakeholders. The PMS unit operates under a terms of reference (TOR) developed and validated by the unit with assistance from PQM+. In Q2, PQM+ worked with ARP to convene this PMS unit to revisit its TOR, guidelines, and SOPs for RB-PMS to ensure that they also include biologics and vaccines in their scope. The guidelines were revised to include biological products; in adherence with its TOR, which has a provision to invite specialized experts as needed, the PMS unit decided to defer inviting representatives from Senegal's vaccines program until the agency needs to develop RB-PMS protocols for vaccines. As part of this workshop, the PMS unit was oriented on the principles for RB-PMS for vaccines and also sensitized on the MedRS tool which PQM+ is upgrading to cover vaccines. Twenty-seven people (13 women, 14 men) attended.

Pharmacovigilance and Safety Monitoring

In Senegal, PQM+ received Global VAX funding from ARP to strengthen its pharmacovigilance (PV) systems. While ARP has the mandate to conduct PV activities, it requires a legal

framework for reliance on PV data from regional and international organizations. It also must implement the necessary procedures to conduct PV activities and to communicate and collaborate with other stakeholders, such as the expanded program on immunization, to take appropriate joint actions whenever required. AEFI data can be collected through passive surveillance systems of routine reporting. To gather more specific information on AEFIs, ARP can also implement an active surveillance program whereby it enrolls vaccinated candidates and follows them post information on any adverse events they experience. In Q2, PQM+ reviewed and revised several PV documents shared by ARP. These documents were:

- *Projet de décret sur les Vigilances fixant les régles portant organisation du systéme et fonctionnement des Vigilance* (Decree on the organization and operations of the vigilance system)
- *Arrêté portant organisation et fonctionnement du système national d'hémovigilance* (Ministerial decision on the organization and operations of the haemovigilance system)
- *Arrêté n° PV_V02d02 portant composition, fonctionnement et missions des instances de Vigilances* (Ministerial decision on the composition, operations, and mission of the vigilance department)
- *Bonnes pratiques de pharmacovigilance* (Good pharmacovigilance practices)
- *Guide de gestion Programme Elargi de la Vaccination* (Management guide for the Expanded Program on Immunization)

In addition to these, PQM+ initiated new drafts of documents required by ARP:

- *Des procedures por l'approche basé les risques PV* (SOP on a risk-based approach to pharmacovigilance)
- *Des procédures pour garantir l'implication, la coordination et la communication entre les parties prenantes concernées par les activités de vigilance* (SOPs to ensure involvement, coordination, and communication between parties relevant to vigilance activities)
- *Des procédures pour les investigations, l'interprétation et les réponses aux EIM et évènements indésirables* (Procedures for investigations, analysis and response to adverse events).

In March, in collaboration with other PV experts in country, PQM+ organized a two-day virtual training on PV to help participants improve their understanding of using national data to improve medicine safety. The training covered vaccine and AEFI concepts and definitions, AEFI monitoring methods, process for reporting AEFI cases, principles/methods of investigating AEFI cases, different methodologies for AEFI causal analysis, and analysis of health product safety data. This training improved the practical skills of stakeholders in the active surveillance and management of AEFI and on how to communicate effectively on vaccine safety and ensure coordination between stakeholders involved in vigilance activities. More than 80 participants from ARP, the national vaccines program, the central medical stores, the pharmacovigilance unit of the anti-poison center, and academia attended this training. It will prepare ARP for the development of its active surveillance protocol, which it plans to implement with PQM+ support.

Laboratory Systems

PQM+ is also working to strengthen the laboratory testing function and equip and build capacity for testing of biologics. Senegal has a NQCL with some capacity to test biologics in country,

specifically the yellow fever vaccines that IPD produces. This laboratory, however, requires new equipment, accessories, and consumables to test COVID-19 vaccines. In Q2, PQM+ started the bid evaluation (financial review completed, technical review ongoing) for ten pieces of equipment requested by ARP. Out of this equipment list, PQM+ will be able to purchase four pieces of equipment (Osmometer, UV-Vis Spectrophotometer SoloVPE, qPCR – Real-Time PCR System, and Molecular Devices SpectraMax M5 Multi-Mode Microplate Reader) in alignment with the approved budget. Per its approved work plan, PQM+ also planned to support the NQCL to establish reliance mechanisms for testing COVID-19 vaccines. However, with work currently ongoing towards the establishment of a continental lot release laboratory network for testing of vaccines (performed by the African Medicines Regulatory Harmonization Program and African Medicines Quality Forum with support from PQM+) and the fact that ARP plans to have its vaccines testing laboratory ready by the time the first lot of vaccines manufactured in the Manufacturing in Africa for Disease Immunization and Building Autonomy project (MADIBA) facility is ready for release, this activity is no longer a priority for ARP and has been discontinued.

South Africa

Policy, Planning, and Coordination

PQM+ received Global VAX funding to strengthen the South African Health Products Regulatory Authority (SAHPRA)'s capacity to provide regulatory oversight to assure the efficacy, quality, and safety of vaccines, including COVID-19 vaccines and biologics, throughout their production, storage, distribution, and use in country. In the previous reporting period, PQM+ adapted WHO's regulatory competency framework for regulators of medical products to conduct a competency needs assessment of SAHPRA's capacity to oversee vaccine production and biomanufacturing in South Africa. This approach supports the strengthening of SAHPRA's competency to build an adequate regulatory system and regulatory environment to ensure that vaccine production and biomanufacturing is compliant with national and international standards. PQM+ shared the final competency report with SAHPRA in January 2023. Key findings from the competency needs assessment were spread across the six divisions of SAHPRA, including the contracted external quality control laboratories and can be condensed into the following recommendations:

- Establishment of integrated electronic systems for management of applications, inspections, and laboratory results
- Building of internal staff capacity and resources to 1) balance staff capacity with the current and expected workload and 2) limit reliance on external experts, specifically for pharmaceutical evaluation, inspectorate activities, and clinical evaluation
- Integration and alignment of different processes to create synergy and facilitate decision making [For example: Pharmacovigilance (reporting of adverse drug reactions and medicine quality issues) and Regulatory Compliance activities (aligning inspections and evaluations with pharmacovigilance data)]

These results will be used to inform the development of a training program with a clear and practical implementation plan for strengthening staff skills and expertise. PQM+ plans to support the implementation of training on market authorization and licensing of COVID-19 vaccines in May/June.

Related to this activity, PQM+ is tasked with developing a biomanufacturing competency framework and database for SAHPRA. Vaccine manufacturing is an advanced industry,

requiring a workforce with specialized and diverse technical knowledge, skills, and abilities (i.e., competencies) obtained through education, training, and experience. Recognizing the common need for biomanufacturing and regulatory capacity development across the African region, PQM+, in collaboration with Purdue University Biotechnology Innovation and Regulatory Science (BIRS) Center, is in the process of developing a competency framework with focus on vaccines and biologics-specific regulatory job functions to support the broader continental workforce development activities. As of Q2, the outline of the framework has been established, using the WHO draft guidelines as reference for the Key Core Activities required for the regulation of products that are common to all regulatory functions.

In Q2, as a follow-on to the regional workshop on vaccine manufacturing that PQM+ hosted in Cape Town, South Africa in December, the team is in process of putting together an article to report on the proceedings of the workshop in a peer-reviewed journal relevant to the field. This workshop enabled PQM+ to effectively and efficiently engage with the relevant African continental agencies and multilateral technical organizations to mobilize technical resources in support of the Global VAX program and the participating African countries.

Pharmacovigilance and Safety Monitoring

PQM+ received Global VAX funding to support the SAHPRA to develop a national guideline for RB-PMS for medicines and vaccines. In November 2022, PQM+ conducted a workshop with SAHPRA to introduce RB-PMS and to review current PMS activities. As part of this workshop, SAHPRA's current PMS guideline was reviewed. As of January 2023, a final version of this guideline for internal comment was drafted. Once internally approved, the guideline will be disseminated for public comment before adoption. In Q2, PQM+ also worked with SAHPRA to establish a PMS technical working group. The terms of reference for this TWG were finalized and adopted in January 2023. This multi-sectoral group which includes SAHPRA, the quality control laboratories and ad hoc experts has expertise that allows objective risk assessments and decision-making for PMS activities for efficient use of limited resources.

In Q2, PQM+ also continued working to update its MedRS tool, which allows countries to estimate risks related to medicines, geographical areas, and facilities within the pharmaceutical supply chain and then make informed decisions, on which medicines to focus on, how many samples are statistically representative, and where to sample from. Currently this tool is designed for RB-PMS of medicines and is in the process of being adapted with additional modules to allow this tool to be used for the design of a COVID-19 vaccine quality surveillance protocol. The updated tool will be finished and expected to be ready in April 2023. While updating the MedRS tool for vaccines, in February, PQM+ worked with the SAHPRA PMS TWG to pilot the RB-PMS approach using medicines of public health interest, which included the COVID-19 therapeutic dexamethasone. This initial pilot will allow SAHPRA and the TWG to have hands-on experience implementing the RB-PMS approach, which can then be applied to vaccines. PQM+ conducted a workshop with 11 participants (five women, six men) from the PMS TWG focused on the risk-based development of a PMS protocol including the development of a sampling plan. The protocol is being finalized for sign-off and execution.

Cold Chain and Supply Logistics

PQM+ received Global VAX funding to support SAHPRA to develop guidelines and procedures for special handling requirements, quality assurance in cold-chain storage, and GDPs for vaccines. The quality and safety of perishable drug products like COVID-19 vaccines heavily relies on the availability and proper functioning of relevant cold-chain facilities and distribution systems. As a result, regulatory oversight is critical to ensure appropriate handling and storage

practices across the supply chain. In this regard, inspection of selected cold chain or COVID-19 vaccine storage facilities or warehouses for compliance with good storage and distribution practices (GSDP) by SAHPRA provides information on potential gaps within the supply chain and informs program managers about timely actions needed to avoid affecting the end user. PQM+ provided training and technical support to SAHPRA between March 27-31, 2023 to conduct inspections using an existing cold-chain inspection checklist tool (based on WHO GDP and GSDP guidelines) to help identify gaps in the system and resolve issues in time, helping ensure the safety of end users. The training included 11 participants (F-5, M-6) from the Inspectorate and Licensing departments at SAHPRA and covered the principles of GSDP and the use of the risk-based inspection tool, developed by PQM+ as well as in-field inspection sessions to pilot the inspection tool.

Laboratory Systems

PQM+ received Global VAX funding to strengthen the SAHPRA's capacity to provide regulatory oversight to assure the efficacy, quality, and safety of vaccines, including COVID-19 vaccines and biologics, including through quality testing. At the moment, SAHPRA outsources its testing of medicines and biological products, but it is imperative that it maintain its governance and authority to receive timely testing results from its identified testing laboratories. SAHPRA currently uses two external laboratories affiliated with academic institutions for QC testing: NWU's Research Institute for Industrial Pharmacy (RIIP) incorporating the Centre for Quality Assurance of Medicines (RIIP®/CENQAM®) for small molecules and University of the Free State (UFS) - South African National Control Laboratory for Biological Products (SANCLBP) for biologics. As part of this activity, in March, PQM+ facilitated a general TWG meeting with SAHPRA to discuss the creation of a core task force to plan activities related to the Quality Control Laboratory network. The task force will aid in developing individual tasks associated with implementing a road map to a laboratory network and assist in the identification of challenges, brainstorming proposals, decision-making, resource mobilization, and validation of best solutions for planning and deployment. SAHPRA has identified the members for this initial task force and PQM+ will facilitate in formalizing the terms of reference.

Uzbekistan

Policy, Planning, and Coordination

In December 2022, two things happened that impacted PQM+ work in Uzbekistan. First, the Government of Uzbekistan announced the decision to split Uzbekistan's medicines regulatory authority, the Agency, and establish two organizations: the State Center for Expertise and Standardization of medicines, Medical Devices and Medical Equipment (the State Center) under the Ministry of Health and The Agency for Development of the Pharmaceutical Industry (the Agency) under the Ministry of Investments, Industry and Trade. The State Center will be responsible for the regulatory functions and the Agency will be responsible for development of the pharmaceutical industry. This decision is a step in the right direction as it eliminates conflict of interests which existed when the same organization (the Agency) was responsible for the industry development and regulatory work. However, the final structure and responsibilities of both newly established organizations are still being defined. PQM+ will need to continue working with both organizations as some of the PQM+ COVID-19 activities fall under the Agency's responsibility and some of them under the State Center's responsibility. Second, the government of Uzbekistan reported deaths of children in Uzbekistan due to the consumption of imported contaminated cough syrup. WHO issued a warning citing this tragic event. Following this tragic incident, the government of Uzbekistan is still investigating. Several people, including

former staff of the Agency and State Center were arrested (including the senior managers) and fired. All these developments caused significant disruption to the regulatory work in Uzbekistan.

To date, PQM+ worked with the National Immunization Program (NIP) and the PV department at the Agency to initiate collaboration between the two and develop their capacity. PQM+ reviewed national documents on vaccine safety surveillance and PV, introduced WHO recommended approaches, and provided training to the PV department and NIP counterparts. PQM+ also organized educational visits for representatives from the NIP and the PV department to WHO Collaborating Center in Morocco (RCC) to learn from their best practices in PV and vaccine safety surveillance. PQM+ also facilitated a workshop between the PV department and the NIP that resulted in a draft roadmap to strengthen PV in Uzbekistan. However, the work with the PV department within the Agency came to a pause in December 2022 because of the above-described restructuring. At the end of Q2, the restructuring of the Agency and the State Center is still unfolding. The head for the State Center was finally appointed in early March, and PQM+ met with the deputy minister of health to re-introduce the program. The deputy minister of health was supportive of PQM+'s technical assistance and instructed the head of the State Center to work with PQM+. PQM+ then met with the State Center head, however, the State Center is not fully staffed, and a final structure still is not defined, including the department responsible for PV. The registration department that falls under the State Center has also been equally impacted. Prior to December 2022, PQM+ was working with the department to establish a regulatory framework on EUA, and this work has now stalled. Yet, a provision on EUA, drafted with PQM+ support as part of the updated Resolution of Cabinet of Ministers regulating the registration of the pharmaceutical products, vaccines, and medical devices is in the final stage of its approval. It is expected that in Q3, the President of the country will sign a decree which will approve the regulation with the EUA provision in it. This would allow PQM+ to work with the State Center on operationalization of EUA, including developing the corresponding SOPs and training the staff.

While things are still settling at the State Center, the NIP that falls within the MoH, has not been impacted. PQM+ is continuing to provide technical assistance to the NIP to strengthen their vaccine safety surveillance capacity. In Q2, PQM+ has developed and agreed with the NIP on a plan of action for technical assistance, which includes drafting the AEFIs surveillance guideline; training of trainers who will subsequently provide basic training on the identification and reporting of AEFIs; and training of committee members on the investigation and causality assessment of severe AEFIs. In Q3, PQM+ will work with NIP on implementation of these activities. It is expected that by that time, the structure at the State Center will be defined and the corresponding people responsible for PV will be appointed, so the State Center staff also will be involved in this work.

Progress by Health Elements

Maternal and Child Health (MCH)

PQM+'s Core MCH work focuses on helping MRAs and manufacturers improve their systems. PQM+ also supports global leadership efforts in advancing USAID's, global, and country MCH agendas and increasing access to QA life-saving medicines for women and children in LMICs.

Objective 2: Country and regional regulatory systems to assure the quality of medical products in the public and private sectors improved

PQM+ finalized the gentamicin PIR and will begin dissemination in early Q3. PQM+ developed two job aides to support inspection and registration of gentamicin for national MRAs. These job aides will be shared for USAID review in early Q3 followed by dissemination to country MRAs.

PQM+ initiated discussions with MTaPS and GHSC-PSM on opportunities for dissemination of the Call-to-Action paper including a webinar/call with USAID missions to orient them to the paper. The paper has been added to each partner's website, to the CHTF website, and disseminated via social media posts on Twitter and LinkedIn. Next steps are to disseminate to MOH MCH counterparts and USAID missions.

PQM+ refined the questionnaire for MNCH medical devices and developed a questionnaire for tranexamic acid – both focused on regulation and supply and has shared both with USAID. Based on the pilot experiences of conducting the MNCH survey in Ghana and Bangladesh in PY3, PQM+ recommends focusing on 5 PQM+ countries for this data in PY4 – expand Ghana and Bangladesh, add Nepal, Ethiopia, and Mali or Senegal. PQM+ has begun a literature search to identify the current global situation for these commodities in terms of general availability, and regulatory issues around sourcing and quality assurance and how country level data could inform evidence gaps for further investments.

Objective 5: Global medical product quality assurance learning agenda and operational agenda advanced

PQM+ participated in meetings with RHSC/MHSC and a presentation of the call-to-action paper for amoxicillin and gentamicin to the CHTF. PQM+ has disseminated the paper via its website and social media. PQM+ intends to further disseminate the paper via a webinar – possibly via the MHSC platform and/or USAID missions.

PQM+ provided SME review to Quality Assurance Practices for Medical Oxygen Systems – a Technical Resource Document developed by MTaPS for applying quality assurance practices to health-facility medical oxygen. The technical resource aims to cover quality assurance practices as they relate to sourcing and/or producing medical oxygen on-site, and its storage and distribution so that patients receive oxygen that is safe, reliable, continuous, and of acceptable quality.

Neglected Tropical Diseases (NTDs)

The November 2020 WHO NTD global roadmap, Ending the Neglect to Attain the Sustainable Development Goals: A Roadmap for Neglected Tropical Diseases 2021-2030, sets goals for an integrated approach across all NTD diseases as well as targets to reduce the number of people requiring NTD treatment by 90 percent. WHO has been instrumental in coordinating NTD medicine donations from manufacturers for use in affected populations globally. However, shortfalls remain compared to the demand for some medicines. The USAID NTD program targets the most prevalent NTDs that also have proven, cost-effective health interventions: lymphatic filariasis, blinding trachoma, onchocerciasis, schistosomiasis, and soil-transmitted helminths. The overall goal of PQM+'s NTD work is to ensure the availability of affordable, quality assured NTD medicines for patients in need.

Objective 4: Supply of quality assured essential medical products of health importance increased

PQM+ is continuing to work with existing and newly identified manufacturers of NTD medical products to ensure that enough sources of quality-assured medicines are available on the market.

- The GMP CAPA response submitted to WHO for was reviewed and closed satisfactorily for India Manufacturer 1 on CAPA deficiencies for albendazole 400 mg tablets. Discussion on further production of the company's experimental batches of mebendazole 500 mg tablet in progress. A subaward is being initiated for the cost share on the BE study of mebendazole.
- WHO PQ responded to the bioequivalence report of India Manufacturer 3 on praziquantel 600mg tablets and concluded that the safety and efficacy of the product has not been established as it is not bioequivalent to the accepted comparator product, Biltricide. The product was removed from the prequalified list.
- The CDA for India Manufacturer 2 (albendazole and ivermectin) has been reviewed and activated. For albendazole 400mg tablets, the project status has been discussed with the regulatory and RD team. The pilot batch production is completed, and the dissolution profile study and product development report compilation are in progress. For ivermectin 3mg tablets, the first pilot batch production is scheduled for April.
- Nigeria Manufacturer 1 (mebendazole) was unresponsive and this manufacturer has been dropped.
- Completed a dossier review for Bangladesh Manufacturer 1 for azithromycin 500 mg. (waiting for product shipment to U.S. market for submission for WHO PQ). A meeting took place with both Bangladesh Manufacturer 1 and Kenya Manufacturer 1 to update the project timeline.
- Completed 508 compliance testing and remediation for the NTD Dashboard. PQM+ has drafted a two-page overview of the dashboard.
- Developed a concept note for two new eLearning courses: 1.) Pharmaceutical quality management system: elements and quality review practice and 2.) GMP in QC laboratory and analytical method validation. Progressing a task order with Purdue for the content. Developed implementation plan and secured instructional designer.

Priority Activities for Next Quarter

Next quarter, PQM+ plans to:

- Conduct site visits with Kenya Manufacturers 1 and Bangladesh Manufacturer 1.
- Continue working with India Manufacturers 1 and 2 and Bangladesh Manufacturer 2.
- Finalize subaward with India Manufacturer 1.
- Disseminate the NTD landscape analysis.
- Finalize long term hosting for the NTD dashboard and launch the tool publicly.
- Disseminate updated GMP course guideline documents.
- Develop instructional design for new eLearning modules on advanced GMP topics.

Tuberculosis (TB)

PQM+ seeks to ensure an uninterrupted supply of lifesaving quality-assured TB medicines by providing direct support to manufacturers of priority TB products. It also explores innovative manufacturing processes for priority TB medicines, develops technical documents such as product information reports, and works with partners to ensure that medicines registration processes do not create hurdles for introducing and scaling-up new TB medicines.

Objective 4: Supply of quality-assured essential medical products of public health importance increased.

In Q2, PQM+ continued supporting two pharmaceutical manufacturers of first line and four manufacturers of fixed-dose combination (4FDC) TB medicines in Pakistan. To date, PQM+'s technical assistance to Pakistan Manufacturer 4 resulted in the compilation of a dossier, including reports on the stability and bioequivalence studies. This was an important milestone toward prequalification of the product, thereby ensuring that TB patients in Pakistan have access to locally produced quality-assured TB medicines. As a result, the manufacturer submitted the 4FDC dossier to WHO. WHO accepted the dossier for full assessment. PQM+ helped the manufacturer respond to the additional data and comments requested by WHO. As part of full prequalification, WHO conducted an onsite inspection from September 19-23, 2022. Although the inspection report showed no critical observations, it outlined several deficiencies. PQM+ worked with the manufacturer to develop and submit CAPA to WHO to address those deficiencies. In Q2, PQM+ worked closely with Pakistan Manufacturer 4 to address the gaps identified in the CAPA; this included training and SOP updates. For example, PQM+ conducted an on-site visit and provided training on the change control SOP and template to the manufacturer's technical team and provided suggestions to their technical team per guideline requirements and the WHO inspector's remarks in the CAPA report.

PQM+ is also providing technical assistance to Pakistan Manufacturer 4 for two-drug fixed-dose combination (2FDC) TB medicines. The manufacturer will produce the 2FDC in the same production line as 4FDC. PQM+ technical assistance will focus on compiling the dossier, conducting a BE study, and developing the product. In Q1, PQM+ helped identify suppliers for a reference product for 2 FDC; procurement of the reference product is complete. In Q2, Pakistan Manufacturer 4 completed milestone two of the agreement with PQM+. The manufacturer selected Jordan's ACDIMA Center for Bioequivalence and Pharmaceutical Studies as the CRO. ACDIMA, Pakistan Manufacturer 4, and PQM+ completed a bioequivalence protocol for the

2FDC, which the WHO assessment team reviewed. ACDIMA, Pakistan Manufacturer 4, and PQM+ addressed WHO's comments on the protocol. The protocol was approved by WHO. The 2FDC bioequivalence study was completed in March. The next step is data analysis and report development.

Pakistan Manufacturer 1 received PQM+ technical assistance to update the dossier along with stability studies of the 4FDC product. That manufacturer is addressing the challenges identified by WHO during the BE and stability study to update its dossier for submission for WHO PQ.

In PY3, PQM+ and USP completed the validation of methods to test for nitrosamines impurities in rifapentine TB medicine. USP finalized the laboratory report for the liquid chromatography-mass spectrometry method development/validation for the rifapentine API and tablets. In Q1, USP completed the validation of methods to test for nitrosamine impurities in rifapentine and rifampin TB medicine. The team also completed the first draft of the training slide deck for analyzing nitrosamine impurities in rifapentine and rifampin TB medicines. In Q2, USP finalized the training slide deck for analyzing nitrosamine impurities in rifapentine and rifampin TB medicines. This finalized the PQM+ deliverables for PY4 for the validation of methods to test for nitrosamines impurities in rifapentine and rifampin TB medicines.

Also, in PY4 Q2, PQM+ finalized work with Virginia Commonwealth University (VCU) on phase 2 optimization, scale up, and integration of the synthesis process for developing an alternative route for producing API for a priority TB product. The teams successfully identified a synthesis route and demonstrated each step of the continuous manufacturing process. In Q2 of this program year, with USAID's guidance, PQM+ identified a potential manufacturer to receive the technology transfer. PQM+ also extended VCU agreement to include the technology transfer phase. USAID facilitated a kick off meeting with VCU and the potential technology transfer recipient. Separately, VCU also filed a global provisional patent for the new technology. In PY4 Q2, PQM+ also finalized the scope of work for the optimization of rifamycin-S.

In PY3, PQM+ signed a non-disclosure agreement with South African Manufacturer 1, a manufacturer based in Africa that currently produces two TB API. PQM+ is providing technical assistance to South Africa Manufacturer 1 for WHO PQ of isoniazid API, one of the two TB APIs that the manufacturer produces. During the visit, PQM+ conducted an onsite GMP assessment of the manufacturer's facility and helped with preparation of the isoniazid DMF. In Q2, PQM+ continued to work remotely with the manufacturer to improve GMP compliance and to prepare the DMF. PQM+ prepared for an onsite technical assistance visit to the South African Manufacturer 1 and identified an expert to conduct a landscape analysis for manufacturers in South Africa. The work will start in Q3.

In PY3, PQM+ initiated technical assistance to the Regional Bioequivalence Centre Sh. Co. (RBEC) in Ethiopia, which is a public-private partnership established in 2012 to serve as a CRO for East African pharmaceutical manufacturers to improve the quality and effectiveness of essential medicines. Through the clinical and bio-analytical laboratory services provided by RBEC, the center will play a fundamental role in fulfilling Africa's unmet needs for the supply of safe, effective, and quality assured medicines for its people. As such PQM+ is working with RBEC through a TWG to identify the bottlenecks hindering RBEC from delivering BE studies for Ethiopia and the African continent. The TWG includes members from WHO, Armour Hansen Research Institute, Ministry of Health, Ethiopia Food and Drug Administration, RBEC, and PQM+. In PY3, PQM+ facilitated TWG meetings and, with RBEC, laid out a plan of action for assessing, identifying, and addressing gaps. In Q1, the TWG was finalizing a concept note for a stakeholders' workshop that, along with the desk review conducted by the TWG, will inform the

technical report that will serve as a foundation to build the capacity of RBEC. In Q2, the TWG finalized the concept note for the stakeholders' workshop and prepared for the April workshop.

Priority Activities for Next Quarter

Next quarter, PQM+ will:

- Follow up with Pakistan Manufacturer 1 to review the updated dossier and stability data prior to submission to WHO.
- Continue to work with Pakistan Manufacturer 4 to address the gaps identified in the WHO audit for 4FDC and product development and BE for 2 FDC.
- Continue to provide technical assistance to the selected manufacturer for technology transfer of the API for an important TB medicine.
- Continue to provide technical assistance to South Africa Manufacturer 1 on GMP compliance and preparation of DMF for isoniazid API.
- Conduct the stakeholders' workshop to develop the technical report.
- Issue a procurement to conduct optimization for rifamycin-S.
- Initiate a landscape analysis of South African manufacturers.

Program Support

Communications

Social media: To highlight PQM+ activities and amplify our work, this quarter PQM+ shared 57 posts on Twitter and LinkedIn, earning more than 700 reactions and engagements. The top posts were:

- NQCL video (14,416 views).
- Ghana vaccine lot release training.
- PQM+ Director's visit to Nepal (Nepal Aushadhi Ltd., National Medicines Lab, etc.).

Success stories: We published three success stories on the PQM+ website this quarter:

- WHO prequalifies West Africa's first national medicines quality control laboratory.
- Strengthening Pakistan's public diagnostics lab to respond to COVID-19.
- Story Map: Tackling Drug-Resistant TB in Central Asia .

Newsletter: PQM+ shared its 10th newsletter, which had a 52 percent open rate—our highest to date. This issue spotlighted:

- Nepal updates GMP code for manufacturers
- Uzbekistan streamlines TB medicines
- Nigeria's medicines vendors and community pharmacists
- Video: Staff insights from Burma's NQCL lab

Website: We continued to add new content to the PQM+ website, including the three success stories and bios for the new Technical Team leads. We are developing expanded country pages, which we plan to roll out next quarter.

Staff: Kait Markley joined PQM+ on March 27 as our new Communications Specialist. Kait previously worked on USAID's GHSC-PSM project at Chemonics. She holds a master's degree in public health from the University of Colorado.

Annex 1: Monitoring, Evaluation, and Learning Update

PQM+ reports on its performance monitoring indicators twice a year. The PQM+ Monitoring Results Table (below) presents results for the first half of FY2023 for PQM+ country, regional, and core buy-ins. Results are organized by PQM+ objectives and sub-objectives. Country, regional, and core buy-ins select indicators from the overall list of PQM+ indicators that reflect the focus of their activities and report on those indicators.

How to Read the M&E Results Table

The following provides background information on the M&E Results Table and specific indicators that warrant explanation.

Coordination and Cooperation (1.3a and 1.4a). PQM+ promotes collaboration among the various counterparts and sectors involved in medical product quality. Indicator 1.3a tracks coordination among *public* entities with responsibilities for medical product quality, while indicator 1.4a tracks collaboration among *public and private* stakeholders. Under 1.3a, PQM+ tracks whether public agencies have been identified, focal points named, a coordination mechanism defined, and information exchanged. Under 1.4a, the program ensures that multisector groups have (1) a coordination framework (terms of reference or TOR) and (2) chairperson; whether they (3) hold regular meetings per the TOR and (4) distribute meeting minutes; and whether (5) most members attend most meetings (per the quorum specified in the TOR). For indicators 1.3a and 1.4as, each of the components is scored "0" if it is absent, "1" if PQM+ is still assisting, and "2" if the component is established and documented. The total possible scores are 8 (100%) for 1.3a and 10 (100%) for 1.4a. Once these public and multisectoral coordination systems become fully functional (i.e., they score 100% on the components), PQM+ continues to monitor their operations.

Institutionalization indicators. PQM+ works to institutionalize medical product quality assurance approaches and tools so counterparts (MRAs and QC laboratories) can continue using them after the project ends. To determine institutionalization, PQM+ tracks whether the counterpart: (1) has adopted SOPs that require use of the approach/ tool or detail how to use it; (2) is able to train its own staff on the approach or tool; and (3) tracks use and/or outcomes of the approach/ tool. For each factor, a score of "0" is given if it is not yet being developed for adoption; "1" if work on it is underway but not yet finished; and "2" if it has been instituted. Thus, a total score of 6 (100%) means the tool/approach has been fully incorporated into counterpart practices. Once 100% has been achieved, PQM+ continues monitoring use of the tool/approach to monitor the likelihood of its sustainability.

Milestone indicators. Generally, it takes years for quality control laboratories to achieve ISO accreditation or WHO prequalification (PQ) (**2.2h**) or for manufacturers to achieve local market authorization or WHO PQ (**4.1c**). Each of these outcomes requires completion of a set of activities, as shown in the table below. To summarize and systematically report progress on these long-term efforts, PQM+ uses "milestone" indicators that correspond with each major stage. As laboratories and manufacturers make progress against each stage, PQM+ reports on the percentage of milestones met. Manufacturer milestones are reported for *each* medical product for which the manufacturer is seeking authorization with PQM+ support. For each of the milestones outlined below, a score of "0" is given if no work has begun, "1" if work is underway, and "2" if work is completed. As milestones vary in their complexity and the length of time they take to complete, some milestones are weighted more than others. For example, Laboratories'

QMS development and implementation is weighted four times that of the other laboratory activities.

Milestones toward ISO Accreditation, Market Authorization, and WHO Prequalification

Laboratory activities (ISO accreditation/WHO prequalification) – 2.2h	Manufacturer activities (market authorization/WHO prequalification) –4.1c
1. Gap assessment / roadmap toward accreditation / prequalification	1. GMP assessment and gap analysis
2. Institute a quality management system (QMS)	2. Product and dossier development
3. Lab equipment and facilities readiness	3. Close out GMP CAPAs
4. Analytical methods readiness	4. Dossier compilation
5. Proficiency testing	5. Dossier acceptance
6. PQM+ mock audit / interim assessment	6. PQM+ mock audit
7. Inspection/audit by the accreditation/inspection body	7. MRA or WHO audit
	8. MRA or WHO dossier review

Similarly, manufacturers' product/dossier development and CAPA close-out are weighted one and a half times, and dossier compilation two times more than the other manufacturing activities. Scores and weights are used to calculate the overall percentage of milestones achieved. The total possible score for each set of activities is 20 (100%). When a QC laboratory or manufacturer achieves a score of 100%, it has completed all milestones and is poised to receive accreditation, pre-qualification, or market authorization.

PMS. Details of the PMS activities concluded in the first half of PY4 and MRA enforcement actions are described in Annex 1A.

Other Performance Indicators.

PMS independence: PQM+ uses indicator **2.2m** to track the technical independence of country counterparts in conducting RB-PMS. Independence means the PQM+-supported TWG and/or MRA can (and do) use *on its/their own* the RB-PMS approach adopted from PQM+. The steps involved in carrying out an RB-PMS activity include: (1) developing the sampling plan using a risk-based approach, (2) developing the protocol, (3) training sample collectors on the new protocol, (4) managing sample collection, (5) assessing samples using the three-tiered assessment, (6) writing the report, and (7) disseminating the PMS results. For each PMS step, the TWG or MRA scores "2" if it followed the risk-based procedures outlined in the protocol, used the appropriate tool/approach, and did the work independently without PQM+ support; "1" if it followed all the correct procedures but still needed some technical assistance from PQM+; and "0" if it did not follow the RB protocol or best practices or if PQM+ provided substantial support. All countries that conduct RB-PMS report against this indicator at the conclusion of a PMS round.

Laboratory performance: PQM+ also tracks the performance of laboratories. To that end, the program uses the following indicators:

- **2.2n.** Number of core processes for which the NQCL has documentation. Typically, there are 28 or 29 core processes in addition to the Quality Manual that all laboratories should possess. These include:

1. Document control 2. Record control 3. Internal audit (program) 4. Management review 5. Training program 6. Environmental criteria & monitoring 7. Equipment handling, maintenance & calibration 8. Equipment operation (i.e., procedures for operating all lab equipment) 9. Measurement uncertainty/traceability 10. Service & product providers 11. Requests, tenders & contract review 12. Method selection, verification & validation 13. Sampling	14. Handling of samples (test items) 15. Validity of results confirmation 16. Report generation, review & distribution 17. Complaint /feedback handling 18. Nonconforming work 19. Risk & opportunity identification 20. Corrective actions & improvements 21. Confidentiality and impartiality 22. Change control 23. Reference standard handling 24. Reagent handling 25. Atypical & OOS results 26. Housekeeping 27. Information systems/data processing equipment 28. Safety procedures 29. Subcontracting *(not all laboratories)*

- **2.2o.** NQCL completed QMS management oversight tasks in the last year. An internal audit and management review are usually conducted by the laboratory's quality manager at least once a year.
- **2.2p.** Number of core methods in which at least two staff are competent, per the NQCL quality manager. There are ten core physicochemical and four microbiologic methods for physiochemical laboratories. NQCL staff should be competent in a relevant subset of these methods.

Training (2.5b). PQM+ buy-ins generally do not maintain databases of each trainee who participates in PQM+ training programs. Rather, buy-ins track the number of trainees (disaggregated by sex) in each major segment of the workforce who participate in each PQM+ training. So as not to duplicate the number of individuals trained in any given quarter, PQM+ counts trainees from each identifiable segment of the workforce (e.g., lab staff) only once each quarter, even though those staff may have benefited from multiple trainings that quarter. PQM+ does not aggregate trainee numbers across quarters since doing so increases the likelihood of duplication.

PQM+ PY2023 Q1 and Q2 Monitoring Results

Table Legend

n/a: Not applicable as indicator is new to PY4.

N/A: Data are not available.

No target: Target not set as results cannot be predicted.

Blank cell: No results achieved yet as activity is ongoing, or results have already been achieved for the year and no further results are expected.

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
OBJECTIVE 1: GOVERNANCE FOR MEDICAL PRODUCT QUALITY ASSURANCE SYSTEMS STRENGTHENED					
1a. Number of regulatory actions taken by MRA and other authorized entities to address substandard and falsified medical products, by quarter					
Benin ABRP	0	0	No target		2
Liberia LMHRA	0	2	No target		6
Mali DPM	0	1	No target		2
Nepal DDA	64*	2	No target	2	1

Government enforcement action in response to regulatory violations is a sign that the government is committed to keeping its citizens safe. PQM+ tracks the number and nature of MRA enforcement actions to address SF medical products. Below are the enforcement actions taken by MRAs in the first half of PY4.

MRA	Number of enforcement actions taken	Nature of enforcement action
Benin ABRP	2	In Q2, ABRP (1) recalled three substandard antimalarial products (quinine injection, quinine tablets, and artemether injection), and (2) informed manufacturers with expired product registrations to renew them.
Liberia LMHRA	6	Regarding manufacturers, LMHRA (1) removed 15 batches of SF medicines from circulation (currently being incinerated); (2) inspected facilities selling failed samples; (3) fined facilities with poor storage 500 USD. These facilities have three months to improve, or they will be shut down, per LMHRA and Pharmacy Board; (4) required importers to cover the costs of the recall procedure and incineration, (5) issued a warning to violators during a PMS stakeholder's meeting, and (6) is closing monitoring violators.
Mali DPM	2	In Q2, DPM (1) recalled 23 vials of a non-conforming batch of diazepam, and (2) quarantined failed magnesium sulfate.
Nepal DDA	3	DDA (1) revoked one market authorization in Q1, and (2) recalled 13 products in Q1, and 6 products in Q2. These actions were taken in response to DDA's conventional PMS.

For more information on the RB-PMS rounds (in Benin, Liberia, and Mali) on which these enforcement actions are based, please refer to Annex 1A.

*Nepal's baseline comes from the government's annual report. The 64 enforcement actions listed in the report include product recalls and the filing of legal cases due to violations of the Drug Act 2035. The baseline covers the period July 2019-July 2020, which overlaps with the start of PQM+. As the U.S./Nepal governments' fiscal years differ, there is an overlap or gap in the reporting periods for this baseline.

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
1.1. Evidence-based medical product quality assurance legislation, policies, and regulations developed, updated, and/or implemented					
1.1a. Number of policies, laws, regulations, and guidelines on medical product quality assurance developed or revised with PQM+ support, by quarter					
Bangladesh	0	4	3	0	1 new policy
Strategic investment plan for fifth HPNSP (PY4)					Drafted & submitted
Medical oxygen regulation guidelines (PY3)					Adopted
Registration of human vaccine (PY3)					Adopted
Ethiopia	0	8	6	1 new policy	4 new policies
Guideline for importation of active pharmaceutical ingredients (APIs) and raw materials (PY4)				Drafting	Drafting
Clinical trial directive (PY4)					Drafting
Stringent regulatory authorities listing guideline (PY4)					Drafting
Guideline for regulation of advertisement and promotion of medicines (PY4)					Drafting
National pharmacovigilance guideline (PY4)					Drafting
Ghana	0	1	1	2 new policies	0
Guideline for submission of lot summary protocol for Covid-19 vaccine (PY4)				Drafting	Drafting
Guideline for batch/ lot release for vaccines and plasma derived medicinal products (PY4)				Drafting	Drafting
Kenya	0	0	No target	4 new policies	0
Lot release guideline (PY4)				Drafting	Submitted
Guidelines for registration and licensing of premises (PY4)				Drafting	
Guidelines for internet pharmacy services in Kenya (PY4)				Drafting	
Guidelines for delivery of pharmaceutical services and care in Kenya (PY4)				Drafting	
Reliance guideline on regulatory decision-making (PY2)				Submitted	
Liberia	0	7	5	0	4 new policies
Regulations for medical device registration (PY4)					Drafted & submitted
Regulations on variation of medical products (PY4)					Drafted & submitted
Regulations on defects and quarantine of medicinal product (PY4)					Drafted & submitted
Regulations for sub-contracting of testing services (PY4)					Drafted & submitted
Madagascar	0	1	2	0	1 new policy
Product recall guidelines					Drafting

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Nepal	0	6	4	0	1 new policy
Guidelines, compressed air (Technical annex to updated GMP code) (PY4)					Drafting
Guideline, water for pharmaceutical use (PY3)					Submitted
Guideline, biological product manufacturing (PY3)					Submitted
Guideline, handling and manufacturing of hazardous substances (PY3)					Submitted
Guideline, heating, ventilation, and air-conditioning system (PY3)					Submitted
Order of Ministry of Health on the regulation of post-marketing surveillance (PY3)					Submitted
GMP code (revised) (PY3)				Adopted	
South Africa	0	n/a	4	1 new policy	0
PMS guideline (PY4)				Drafting	Submitted
Uzbekistan	0	6	2	1 new policy	0
Strategy for licensing process for manufacturers and wholesalers in Uzbekistan to fit with WHO and PIC/S requirements (revised)				Drafted & submitted	
Total 1.1a				**9 new policies**	**11 new policies**
A national policy and regulatory framework is essential to ensuring the quality of medical products in countries. PQM+ helps countries develop or revise and submit for adoption medical product quality assurance legislation, policies, and guidelines. The table notes when work on policies begin (i.e., when they are being drafted) and tracks when the policies are submitted and adopted by governments. "New" policies are those currently being drafted. Older policies are recorded only when they are submitted and/or adopted. Thus, during the first two quarters of PY4, PQM+ supported a total of 20 new regulations and guidelines. Fourteen policies – drafted in PY4 Q1 or Q2 or previously – were submitted for government approval. Three PY3 policies in Nepal and Bangladesh were adopted in the first half of PY4.					
1.2. Systems that facilitate transparency and accountability promoted					
1.2c. PQM+-supported MRA disseminated regulatory results, by quarter					
Benin (PMS)	No	No	Yes	No	Yes
Liberia (PMS)	No	Yes	Yes	No	Yes
Kazakhstan NCEM (PMS)	No	No	Yes	Yes	No
Kazakhstan NCEM (registration)	Yes	Yes	Yes	Yes	No
Mali (PMS)	Yes	Yes	Yes	No	Yes
Uzbekistan Agency (licensing)	Yes	Yes	Yes	Yes	No
Uzbekistan Agency (registration)	Yes	Yes	Yes	Yes	No
PQM+ promotes transparent and accountable systems in countries to increase public trust. The program encourages MRAs to disseminate (or continue disseminating) results of their regulatory activities (inspection, registration, licensing, and post-marketing surveillance). Kazakhstan and Uzbekistan continue to disseminate registration results (and					

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Uzbekistan, its licensing results). In Q1, Kazakhstan also disseminated the results of its conventional PMS activity. Following the conclusion of their PMS rounds (see Table, Annex 1A), MRAs and PMS TWGs in Benin, Liberia, and Mali disseminated results via multi-stakeholder workshops. These activities were reported by local media outlets and in social media posts.					
1.3. Fragmentation addressed and coordination across entities (public and private) with medical product quality assurance responsibilities promoted					
1.3a. Score of PQM+-supported MRA on coordination and communication with other authorities involved in medical product regulatory oversight, by quarter (results capture percentage of coordination components in place)					
Ethiopia (EFDA & regional regulatory bodies, RRBs)	0%	37.5%	No target	37.5%	87.5%
Pakistan (DRAP & customs authorities)	0%	n/a	No target	75%	75%
Pakistan (DRAP & provinces, market surveillance / RB-sampling)	0%	n/a	No target	100%	100%
Pakistan (DRAP & relevant authorities, including health departments of provincial governments)	0%	n/a	No target	12.5%	12.5%
Pakistan (DRAP & provincial governments), communication mechanism	0%	n/a	No target	50%	50%
PQM+ promotes regular coordination and information-sharing among public sector stakeholders involved in assuring the quality of medicines in countries. PQM+ tracks whether public agencies have been identified, focal points named, coordination mechanisms defined, and information exchanged. In Ethiopia, PQM+ has helped strengthen coordination between EFDA and RRBs to better monitor medical product quality across the supply chain. However, not all relevant RRBs have yet been identified. In Pakistan, DRAP is at various stages of coordinating with (a) custom authorities to implement GDPs at custom ports, (b) provinces to strengthen market surveillance and adopt risk-based sampling, and (c) relevant authorities [including the health departments of provincial governments] on regulatory inspections and implementation of drug laws. DRAP is also in the process of implementing a communication mechanism with provincial governments to share information on drug sale licenses.					
1.4. Links among the medical product quality assurance systems and other sectors developed and fortified					
1.4a. Percent of core functional components in place for a multisectoral group supported by PQM+ to advance medical product quality assurance, by quarter					
Technical Working Groups—Post-Marketing Surveillance					
Benin	0%	90%	90%	90%	90%
Burkina Faso	0%	90%	90%	90%	40%*
Ethiopia	0%	70%	90%	70%	70%
Ghana	0%	40%	90%	40%*	40%*
Guinea	0%	90%	100%	90%	40%*
Kenya	0%	90%	90%	80%	70%
Lesotho	0%	n/a	No target	0%	20%
Liberia	0%	90%	No target	40%*	100%
Madagascar	0%	90%	90%	90%	90%

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Mali	0%	90%	90%	100%	90%
Mozambique	0%	70%	90%	70%	70%
Nepal	0%	80%	No target	80%	80%
Rwanda	0%	70%	90%	70%	80%
Senegal	0%	90%	90%	40%*	90%
South Africa	0%	n/a	70%	70%	80%
Other Multisector Groups					
Nepal Inspection TWG	0%	80%	No target	80%	80%
Nepal NML	0%	90%	No target	90%	90%
Uzbekistan Quality Club	0%	100%	100%	100%	40%*
PQM+ promotes coordination and collaboration among the various counterparts and sectors (e.g., health programs, regulatory agency, laboratories, industry, civil society) involved in medical product quality. To determine the extent of multisectoral coordination and collaboration, PQM+ tracks whether TWGs have: (1) a coordination framework (terms of reference or TOR), and (2) chairperson in place; whether they (3) hold regular meetings per the TOR (and pay for their own meetings), and (4) distribute meeting minutes; and whether (5) a quorum of TWG members attend most meetings. Each component is given a "0" if it is absent, a "1" if PQM+ is still assisting, and a "2" if the component is established and documented. The total possible score is 10 (or 100%). In many countries, PQM+ is supporting the development and functioning of technical working groups (TWGs) to establish priorities for, oversee, and report results of RB-PMS activities. TWGs also make recommendations for enforcement action to the MRA. While substantial progress has been made with most TWGs, a common shortcoming is that TWGs are not yet paying for their own meetings. For example, for PMS as well as the other multisectoral groups in Nepal, PQM+ still pays for most meetings and is usually the entity that calls meetings. There is progress on this front in several places. In Q1, PQM+ assisted PPB (Kenya) in developing a three-year costed workplan for the PV/PMS TWG; and South Africa's SAPHRA has paid for one of three meetings held since September 2022. Another issue among PMS TWGs is diminished private sector attendance at some non-PQM+-sponsored PMS meetings. PQM+ will help national chairpersons investigate why this is happening and try to reinvigorate participation. *Because of the postponement of Ghana's round 2 sampling due to a protracted delay in the arrival of minilabs, there were no PMS meetings for many months. In Uzbekistan, the Quality Club did not hold a meeting in Q2. Other countries also held no meetings. PQM+ will continue to investigate the operation of the TWGs.					
OBJECTIVE 2: COUNTRY AND REGIONAL REGULATORY SYSTEMS TO ASSURE THE QUALITY OF MEDICAL PRODUCTS IN THE PUBLIC AND PRIVATE SECTORS IMPROVED					
2a. Percent of medical products assessed by PQM+-supported MRA through post-marketing surveillance that failed, by quarter					
Benin round 1 RB-PMS	0%	n/a	No target		4%
Liberia round 2 RB-PMS	N/A	29%	No target		16%
Liberia round 3 RB-PMS	N/A	29%	No target		11%
Mali round 3 RB-PMS	N/A	4%	No target		6%

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
The various RB-PMS rounds shown above concluded in PY4 Q2. These were risk-based post-marketing surveillance surveys that focused on higher risk locations. **Unless otherwise noted, results are not nationally representative**. Still, the results signal problems with the quality of certain anti-malarial and MNCH medicines and the high prevalence of unregistered medicines in some African countries (18% unregistered in Benin and 68% in Mali in these rounds). Liberia completed two rounds of RB-PMS in PY4 Q2. In round 1, 13% of antimalarials and 22% of MNCH medicines failed, while 13% of antimalarials and 7% of MNCH medicines failed in round 2. In Benin's first-ever RB-PMS, 4.5% of anti-malarial samples were SF. Please refer to Annex 1A for more details on these rounds of RB-PMS and to indicator 1a for MRA enforcement actions.					
2.1. Sustainable systems for market authorization/registration, inspection, and licensing functions of medical product regulatory agencies improved					
2.1a Number of recommendations in the country's WHO GBT Institutional Development Plan addressed with PQM+ support					
Ethiopia	0	9	13	4 (31%)	4 (31%)
Kenya	0	14	58	14 (24%)	
South Africa	0	n/a	8		2 (25%)
The regulatory functions of many MRAs in LMICs have been benchmarked against global standards per the WHO Global Benchmarking Tool. Institutional development plans (IDPs) are developed with recommendations on how to improve each regulatory function (and its score). PQM+ is helping MRAs in several countries systematically address these recommendations. In the first two quarters, PQM+ addressed roughly a quarter of the agreed-upon recommendations in Kenya and South Africa and 31% in Ethiopia. The table records *when* (i.e., the quarter in which) recommendations are fully addressed (i.e., the end point).					
2.1b. Score on institutionalization of new approaches to authorizing use of medical products at PQM+-supported MRA, by quarter					
Uzbekistan Agency (fast-track registration)	0%	83.3%	100%	100%	100%
2.1d. Score on institutionalization of new approaches to inspecting facilities by PQM+-supported MRA, by quarter					
Lesotho (inspection checklist)	0%	n/a	50%	0%	33.3%
PQM+ helps countries institutionalize the new approaches and tools it uses to strengthen MRAs' regulatory functions. A score of 6 (or 100%) means the tool/approach has been fully incorporated into MRA practices (see scoring convention above). In Q2, Lesotho began developing SOPs and training to institutionalize PQM+'s inspection checklist. Uzbekistan continues to use the CRP (reliance) method to register medicines in country.					
2.1k. Number of standard operating procedures adopted by MRA as a result of PQM+ support, by quarter					
Bangladesh (5 regulatory systems)	0	21	No target	2	3
Burkina Faso (2 registration, 1 lot release, 2 other)	0	0	No target	5	0
Ethiopia EFDA (4 inspection, 1 PV, 1 clinical trials)	0	36	13	6	0
Kazakhstan NCEM (2 lot release, 5 lab testing)	0	6	5	6	1
Kenya (9 inspection)	0	0	1	9	0
Nigeria (2 registration, 1 other)	0	0	No target	3	0
Rwanda (1 PMS)	0	5	No target	0	1
Uzbekistan Agency (1 registration, 1 clinical trials)	0	7	10	2	0

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
			Total 2.1k	33	5
PQM+ helps MRAs develop or update and adopt SOPs to carry out regulatory functions, depending on their needs. SOPs help MRAs achieve efficiency, quality output, and uniformity of performance, while reducing miscommunication and noncompliance with regulations or requirements. In the first two quarters, MRAs in 8 countries adopted 38 SOPs (see above for types of procedures).					
2.2. Sustainable post-marketing surveillance systems and medical product quality control laboratory capacity strengthened					
2.2a. QC laboratory's score on SATTA, by quarter					
Burkina Faso ANSSEAT	29%	29%	No target	29%	76% (PQM+ mock audit)
Ethiopia (Diredawa branch lab)	15%	15%	No target	57%	
Nepal NML	37%	37%	No target	37%	55% (PQM+ midterm assessment)
Nigeria NAFDAC Vaccines, Biologicals, and Medical Devices Laboratory (PQM+ mock audit for reaccreditation of 14 scopes and expansion of 26 scopes for medical devices and IVDs)	N/A	n/a	No target	76%	
Nigeria NAFDAC Agulu Laboratory (PQM+ mock audit for reaccreditation of 16 scopes and expansion of 25 scopes for medical devices and food)	N/A	n/a	No target	68%	
PQM+ strengthens QC laboratories so they can generate accurate and consistent test results for medical products. The program usually commences support for a laboratory by conducting a detailed baseline assessment using the SATTA tool to identify areas that are not compliant with WHO prequalification or ISO 17025:2017 standards. Thereafter, PQM+ or the labs themselves may use SATTA for internal audits or interim assessments, and later as a mock audit in advance of a formal audit by the accrediting body. This is useful even for accredited labs that are seeking to extend the scope of their accreditation. Scores above are either PQM+ mock audits in preparation for accreditation, or PQM+ midterm assessments of the laboratories.					
2.2b. Number of PQM+-supported laboratories that achieved or maintained ISO accreditation or WHO prequalification, by quarter and number of methods					
Mali LNS	0	0	ISO 17025:2017 accred.	ISO 17025:2017 (4 methods) new	
Nigeria Central Drug Control Laboratory	ISO 17025:2017	ISO 17025 (17 methods)	ISO 17025:2017 reaccred.	ISO 17025:2017 (17 methods) reaccredited	
Nigeria NAFDAC Kaduna Laboratory	ISO 17025 (7 methods)	ISO 17025 (16 methods)	ISO 17025:2017 reaccred.	ISO 17025 (16 methods) reaccredited	
Nigeria NAFDAC Vaccine, Biologicals and Medical Devices Laboratory	ISO 17025 (10 methods)	ISO 17025: 14 methods	ISO 17025:2017 reaccred./scope expansion	ISO 17025: 14 methods reaccredited; 26 new scopes in medical devices & IVDs	
Nigeria NAFDAC Agulu Laboratory	ISO 17025 (7 methods)	ISO 17025: 16 methods	ISO 17025:2017 reaccred /scope expansion	ISO 17025: 16 methods reaccredited; 25 new	

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
				scopes in medical devices, food & water	
Pakistan PIMS Diagnostic Laboratory	N/A	N/A	ISO 15189 accred.	ISO 15189 new	
Pakistan DTL Rawalpindi	N/A	N/A	WHO PQ	WHO PQ new	
Pakistan DTL Lahore	N/A	N/A	WHO PQ		WHO PQ new
Pakistan DTL Multan	N/A	N/A	WHO PQ		WHO PQ new
Uzbekistan Andijan	ISO 17025:2017 (105 methods)	ISO 17025:2017 (118 methods)	ISO 17025:2017 reaccred.		ISO 17025:2017 reaccredited (118 methods)
PQM+ helps laboratories achieve international (or national) accreditation or WHO prequalification as evidence of their quality and competence. To renew accreditation means that laboratories must continue to meet the rigorous standards of the accrediting body. In the first two quarters of PY4, the four Nigerian laboratories listed above and Uzbekistan's Andijan were reaccredited; NAFDAC's Vaccine, Biologicals and Medical Devices and Agulu laboratories expanded their scopes. New accreditations were granted to Mali's LNS (ISO 17025 by SOAC for four methods) and to Pakistan's PIMS Diagnostic Laboratory (ISO 151289). A major achievement in the first half of FY2023 is the WHO prequalification of three labs in Pakistan: DTL Rawalpindi (Q1), DTL Lahore (Q2), and DTL Multan (Q2).					
2.2c. Score on institutionalization of new quality assurance approaches / tools at PQM+-supported QC laboratory, by quarter					
Liberia (training program)	0%	0%	No target	0%	100%
Liberia (QMS)	0%	N/A	No target	83.3%	83.3%
The sustainability of PQM+'s laboratory strengthening work depends, in part, on whether laboratories "own" the new quality programs and systems that PQM+ has introduced. Having the capability to continually evaluate operational procedures, staff, and equipment allows a more reliable laboratory environment capable of producing accurate results in the most efficient way. PQM+ tracks institutionalization of new approaches and programs using the scoring rubric outlined in the notes above. In Q2, Liberia's LMHRA NQCL fully institutionalized its training program.					
2.2g. Number of proficiency tests or inter-laboratory tests completed by the QC laboratory, by year					
Burma NPT	N/A	0	4	2	0
Kazakhstan Almaty and Karaganda	N/A	4 each	Karaganda: 8, Almaty:16	0	2
In the first two quarters of PY4, one or more staff at Burma's NPT participated in proficiency testing for two scopes: chromatography assay via HPLC and dissolution assay via UV/Vis spectroscopy. NPT staff passed both. In Kazakhstan, staff from Almaty and Karaganda engaged in two interlaboratory tests (pH and microbiological purity).					
2.2h. Percentage of milestones toward accreditation or PQ achieved by a PQM+-supported laboratory, by quarter					
Benin ANM Metrology Laboratory	0%	0%	No target	10%	10%
Burkina Faso (ISO 17025)	0%	45%	No target	45%	55%
Ethiopia Diredawa (ISO 17025)	0%	45%	No target	50%	50%
Kazakhstan Almaty (WHO PQ)	0%	95%	No target	95%	95%

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Madagascar LQCM (ISO 17025)	0%	40%	No target	45%	45%
Rwanda (ISO 17025)	0%	60%	90%	60%	65%
Pakistan CDL Karachi (WHO PQ)	0%	95%	No target	95%	95%
Pakistan DTL Bahawalpur (WHO PQ)	95%	95%	No target	95%	95%
Pakistan DTL Lahore (WHO PQ)	N/A	95%	No target	95%	100%
Pakistan DTL Multan (WHO PQ)	95%	85%	No target	95%	100%
International accreditation enhances a laboratory's technical competence and reputation and assures compliance with established standards. Achieving ISO accreditation/WHO PQ is a lengthy process (see Table A2 above). The closer a laboratory is to 100%, the more milestones it has completed. Of note, in the first half of PY4, PQM+ began providing TA to Benin's ANM Metrology by carrying out a gap assessment of the laboratory.					
2.2i. Number of standard operating procedures adopted by QC laboratory as a result of PQM+ support, by quarter					
Bangladesh	0	33	No target	2	23
Ethiopia	0	14	30	29	2
Ghana	0	33	No target	0	1
Kazakhstan	0	9	19	5	0
Madagascar	0	7	No target	3	5
Nepal NML	0	16	No target	4	2
Nigeria	0	0	No target	37	0
			Total 2.2i	**80**	**33**
SOPs help ensure that accepted procedures are followed consistently to ensure consistent performance and results. SOPs underpin many efforts to strengthen laboratories and are essential for accreditation. In the first half of PY4, laboratories in seven countries adopted 113 laboratory SOPs.					
2.2m. Score on technical independence of country in conducting risk-based post-marketing surveillance					
Benin (round 1)	71%	n/a	No target		71%
Liberia (rounds 2 and 3)	50%	50% (round 1)	No target		86%
Mali (round 3)	43%	86% (round 2)	No target		86%
After each round of RB-PMS, PQM+ scores the extent to which counterparts can (and do) use on their own the RB-PMS approach adopted from PQM+ (see notes above for scoring). The indicator tracks performance (not impact), so the baseline is informed by MRAs' previous experience conducting conventional PMS (i.e., some of the steps, from sample collection to reporting) are similar to those of RB-PMS (see description of PMS steps outlined above). In PY4 Q2, following dissemination of PMS results (indicator 1.2c), PQM+ scored the technical capacity of MRAs/TWGs in carrying out the completed rounds. As shown, technical independence is quite high for the three MRAs. PQM+ still is assisting the TWGs in properly using the MedRS tool to develop their sampling plans. Moreover, until the MRA pays the full cost of the RB-PMS, it will not score 100% for this indicator.					

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
2.2n. Percentage of core QC laboratory processes adopted by the laboratory, to date					
Ethiopia Diredawa	14.3%	100%	100%	100%	93.1%
Nepal NML	N/A	37.04%	No target	39.3%	57.1%
Rwanda QCL	100%	90%	100%	93.3%	93.3%
A laboratory's QMS consists of processes that must be followed to meet requirements on a consistent basis. There are at least 28-29 core procedures every laboratory should have documented (see notes above table). The QMS in NQCLs in Ethiopia (Diredawa) and Rwanda are nearly complete. The QMS in Nepal's NML is almost 60% complete.					
2.2o. Percentage of the management oversight tasks completed by the NQCL during the year					
Nepal NML	0	100%	No target	0%	100%
As part of regular management oversight of laboratories' quality management system, an internal audit and management review should be conducted every year. Nepal's NML has performed this annual activity for the year.					
2.2p. Percentage of core techniques for which the NQCL quality manager has confirmed at least two analysts are competent					
Ethiopia Diredawa	70%	N/A	80%	100%	90%
Madagascar LNCQM	40%	50%	No target	50%	50%
Mozambique DCQ	N/A	100%	100%	100%	100%
Nepal NML	N/A	100%	100%	100%	100%
Rwanda QCL	35.7%	N/A	71.4%	57.1%	57.1%
PQM+ tracks how well unaccredited national quality control laboratories can provide reliable, accurate results. One important measure of this is the extent to which NQCL staff are competent to conduct 10 core tests: dissolution, Fourier transform infrared spectrometry, HPLC, Karl Fischer titration, loss on drying, pH measurement, thin layer chromatography, UV spectroscopy, uniformity of dosage unit, and volumetric titrimetry. Before their capability is externally assessed, the NQCL's Quality Manager assesses whether at least two staff can perform these tests. (Two people must be competent so the lab is able to perform the test reliably even if one of the staff persons is absent or leaves.) Of the laboratories reporting scores for PY4 Q1 and Q2, Nepal's NML and Mozambique DCQ report that at least two staff members can perform all core tests. Note: this indicator is used only for scoring *unaccredited* laboratories.					
2.2r. Percentage of calibration requirements fulfilled, by quarter					
Nepal NML	N/A	n/a	No target	0%	50%
Rwanda QCL	0%	n/a	100%	50%	50%
This indicator reflects the laboratory's adherence to equipment calibration requirements. Routine calibration of laboratory instruments by ISO-accredited providers helps ensure the accuracy, quality, and validity of test results. NQCLs in Nepal and Rwanda report that they have conducted routine calibrations for half their equipment.					
GVX 2.2.2. A gap assessment of the PQM+ supported laboratory has been completed					
Ghana NQCL	No	n/a	Yes	Yes	
Nigeria NAFDAC Vaccines and Biologics Lab	No	n/a	Yes	Yes	

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Senegal ARP DICQ	No	n/a	Yes	Yes	
GVX 2.2.3. Number of analytical and microbiological tests for biological products for which the NQCL quality manager has confirmed at least two analysts are competent.					
Nigeria NAFDAC Vaccines and Biologics Lab	N/A	n/a	4	6	
GVX 2.2.4. Percent of milestones toward implementing RB-PMS of vaccines completed by the MRA					
Rwanda PMS TWG	0%	n/a	40%	10%	10%
South Africa Therapeutics RB-PMS	0%	n/a	60%	10%	40%
South Africa Vaccines RB-PMS	0%	n/a	60%	10%	10%
The above indicators, which mirror standard PQM+ indicators, are specific to Global VAX-funded activities. GVS 2.2.2 and 2.2.3 show progress in strengthening vaccines and biologics labs in those countries. PQM+ is adapting the MedRS tool for use with vaccines. GVX 2.2.4 tracks progress in completing each major phase of the process toward implementing RB-PMS of vaccines. South Africa and Rwanda are developing RB sampling plans for PMS of vaccines. South Africa has developed the sampling plan for therapeutics and is working on the protocol and training materials for data collectors.					
2.3. Regional harmonization to strengthen medical product quality assurance regulatory capacity and networks supported					
2.3a. Number of regulatory decisions informed by data from a regional harmonization body or other reliance mechanism, by quarter					
Uzbekistan	0	6	6	3	0
In PY4 Q1, with no TA from PQM+, the Agency in Uzbekistan used the WHO CRP process to register three vaccines—Tetanus Toxoid vaccine, ROTASIL (liquid), and the BCG vaccine. This signals that the Agency is fully independent in using WHO CRP, which can increase the speed and reduce the cost of registering WHO prequalified medicines, expanding the public's access to these essential medicines.					
2.4. Adoption of data standards and integrated information systems to support regulatory medical product quality assurance functions supported					
2.4d. Number of new regulatory functions for which data are now managed in regulatory information management system, by quarter					
Pakistan	N/A	0	No target	0	1
In PY4 Q2, the Drug Regulatory Authority of Pakistan completed the interface with QCLs in its regulatory information management system. Manufacturers were notified to upload their finished product specifications and validated testing methods for FPP within 30 days. These specifications and methods will now be readily available for QCLs when they need to test the medicines. Further, data on which medicines had been tested and results now will be available to all laboratories and other parts of DRAP to reduce duplication of testing and to inform regulatory planning and decisions.					
2.5a. Number of in-service training programs that address quality assurance/quality control topics delivered with PQM+ support, by quarter					
Asia Bureau	0	0	1	1	1
Bangladesh (w/ ARP)	0	21	No target	3	6
Benin	0	7	8	1	4
Burkina Faso (w/ ARP)	0	14	12	2	1

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Burma	0	8	13	0	3
DRC	0	12	5	0	2
Ethiopia (w/ ARP)	0	12	1	5	8
Ghana (w/ ARP)	0	7	9	0	8
Guinea	0	10	8	1	1
Kazakhstan (w/ ARP)	0	15	8	4	4
Liberia	0	11	No target	1	2
Madagascar	0	6	4	0	1
Mali	0	8	13	0	1
Mozambique	0	3	1	1	0
Nepal	0	19	No target	3	6
Nigeria	0	17	No target	2	4
Pakistan (w/ ARP)	0	21	No target	1	3
Rwanda	0	3	9	0	3
Senegal	0	4	4	3	5
South Africa	0	n/a	5	1	2
			Total 2.5a	**29**	**65**
2.5b. Number of individuals who successfully completed a PQM+-supported in-service training program, by quarter				**F / M / Unknown**	**F / M / Unknown**
Asia Bureau	0	n/a	No target	22 unknown	17 / 7
Bangladesh	0	At least 66	No target	11 / 25	35 / 73
Benin	0	At least 27	100	6 / 10	9 / 19
Burkina Faso	0	At least 101	120	6 / 3	9 / 11
Burma	0	At least 33	130	0	34 / 3 / 15
DRC	0	At least 49	110	0	23 / 29
Ethiopia	0	At least 234	30	37 / 104	154 / 258
Ghana	0	At least 51	100	0	25 / 47
Guinea	0	At least 35	80	5 / 7	4 / 14
Kazakhstan	0	At least 95	100	50 / 13	5 / 24

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Liberia	0	At least 60	No target	5 / 25	6 / 29
Madagascar	0	At least 37	17	0	2 / 0
Mali	0	At least 22	86	0	6 / 5
Mozambique	0	20	No target	7 / 3	0
Nepal	0	At least 144	No target	12 / 48	51 / 123
Nigeria	0	At least 1,235	1,500	385 / 512	26 / 35
Pakistan	0	At least 230	No target	0	80 / 104 / 16
Rwanda	0	At least 38	No target	0	17 / 31
Senegal	0	At least 19	50	13 / 19	53 / 42 / 94
South Africa	0	n/a	No target	11 / 6	5 / 6
			Total (disaggregated)	559 / 781 / 22	566 / 842 / 125
			Grand total 2.5b	**1,362**	**1,533**
PQM+ maintained a robust program of training for its various counterparts in all countries. The percentages of female trainees are as follows: Q1—41%; Q2—36.9%.					
2.5c. Number of training programs developed or revised to address quality assurance / quality control topics with PQM+ support, by quarter					
Ghana Global VAX	0	1	0	0	1
To help Ghana FDA strengthen the capacity of its inspectors, PQM+ developed a training curriculum on good storage and distribution practices (GSDP). PQM+ trained trainers who will cascade the training to other regulatory staff.					
2.5e. PQM+-supported laboratory instituted a workforce development intervention, by quarter					
Nepal (staffing program)	0	33.3%	No target	33.3%	50%
To improve the sustainability of its interventions, PQM+ promotes workforce development approaches that help counterparts (MRAs and laboratories) build, retain, support, and motivate their workforce. PQM+ begins by (1) assessing counterparts' human resources across one or more of four pathways: staffing, skills, working conditions, and staff motivation; then works with counterparts to (2) design interventions to strengthen areas prioritized for support, and (3) develop and utilize a central tracking system to monitor implementation of/or results from the workforce development intervention. PQM+ scores each of these components on the pathways selected for improvement to determine how much the counterpart has institutionalized the intervention. A score of 100% means the program has been fully incorporated into national and/or counterpart practices. Nepal's NML completed its staffing assessment in PY3. PQM+ is now helping the laboratory develop a five-year strategy. The concept for doing so has been approved by the Ministry of Health and Population.					
OBJECTIVE 3: FINANCIAL RESOURCES FOR MEDICAL PRODUCT QUALITY ASSURANCE OPTIMIZED AND INCREASED					
3.1. Allocation and use of investments for medical product quality assurance systems strengthening optimized					
3.1a. Score on institutionalization of risk-based approaches at PQM+-supported MRA, by quarter					
Rwanda (RB-inspection)	0%	n/a	83.3%	0%	33.3%

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Ethiopia (RB-PMS)	0%	50%	83.3%	50%	83.3%
Liberia (RB-PMS)	0%	33.3%	No target	33.3%	66.7%
Mozambique (RB-PMS)	0%	0%	50%	16.7%	16.7%
Rwanda (RB-PMS)	0%	66.7%	83.3%	66.7%	83.3%
PQM+ promotes use of risk-based approaches to the inspection, registration, and PMS functions of MRAs. The program also tracks institutionalization of the approaches to better facilitate their sustainability. In Q2, the Rwandan MRA began institutionalizing the RB inspection approach by developing SOPs and training. Institutionalization of RB-PMS continued in Ethiopia (SOPs and training in place), Liberia (training and tracker in place), and Rwanda (SOPs and tracker in place, SOPs being developed); and commenced in Mozambique (SOPs being developed).					
3.2. Sustainable resources mobilized					
3.2b. PQM+-supported MRA or NQCL shared analysis of its costs to support review of the fee structure or to improve budgeting & planning, by quarter					
Burkina Faso (Laboratory costs)	N/A	No	n/a	Yes	
PQM+ supports MRAs and NQCLs in analyzing and reporting their costs. MRAs and QC laboratories can then use these cost analyses to justify budget requests or changes in user fees. In PY4 Q1, PQM+, USAID Burkina Faso, and ANSSEAT convened a donors' roundtable to promote the new agency's strategic plan and to encourage financial and technical support from development partners. Various development partners expressed interest in areas of the plan. ANSSEAT has developed a roadmap for mobilizing resources and has mapped partners to specific activities in the strategic plan.					
OBJECTIVE 4: SUPPLY OF QUALITY-ASSURED ESSENTIAL MEDICAL PRODUCTS OF PUBLIC HEALTH IMPORTANCE INCREASED					
4c. Number of priority medical products supported by PQM+ that received market authorization, by quarter					
India Manu #3, Praziquantel	0		No target	0	0 (WHO PQ withdrawn)
Tajikistan	0	0	9	4	5
This indicator helps demonstrate the extent to which PQM+ is helping to diversify the supplier base of medicines. This will help ensure the availability of quality-assured medical products and a marketplace that promotes quality and competitive pricing. Tajikistan's MRA registered nine new WHO-PQ TB medicines manufactured by external companies (Lupin and Svizera) for the first time in that country. The WHO PQ program previously had provided conditional PQ for praziquantel produced by India Manufacturer #3. After that manufacturer was unable to establish the bioequivalence of its product to the comparator, in Q2, WHO PQ withdrew the prequalification.					
4.1. Pharmaceutical manufacturers for Good Manufacturing Practices (GMP) and medical product regulatory submissions/dossiers supported					
4.1b. Number of product dossiers submitted by PQM+-supported manufacturers for a USAID-priority medical product, by quarter					
India	N/A	0	No target	0	3
Pakistan Manu #4, 4FDC	N/A	0	No target	1	0
Tajikistan, TB medicines	0	9	5	0	4
4.1c. Percentage of milestones toward market authorization or WHO prequalification achieved by PQM+-supported manufacturer, by quarter					

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Bangladesh Manu #1, 4FDC	N/A	32.5%	No target	32.5%	47.5%
Core NTD, India Manu #1, albendazole chewable 400 mg	N/A	85%	85%	85%	90%
Core TB, South Africa Manu #1, Isoniazid API	N/A	n/a	No target	n/a	18%
Nepal Manu #1, Amoxicillin DT 125 mg	0%	42.5%	No target	35%	35%
Nepal Manu #2, Azithromycin 500 mg	0%	42.5%	No target	35%	35%
Nepal Manu #2, Zinc sulfate 20 mg	0%	42.5%	No target	35%	35%
Nepal Manu #3, Azithromycin 500 mg	0%	42.5%	No target	35%	35%
Nepal Manu #4, Zinc sulfate 20 mg	0%	42.5%	No target	35%	35%
Nepal Manu #5, Azithromycin 500 mg	0%	42.5%	No target	35%	35%
Nigeria Manu #3, SP 500+25	N/A	30%	No target	70%	75%
Nigeria Manu #4, ALu 20/120 mcg	N/A	42.5%	No target	42.5%	62.5%
Nigeria Manu #4, SP 500+25	N/A	70%	No target	85%	90%
Nigeria Manu #4, Zinc sulfate	N/A	70%	No target	70%	65%
Pakistan Manu #1, 4FDC	N/A	n/a	No target	n/a	18%
Pakistan Manu #2, Amoxicillin DT	N/A	35%	No target	43%	43%
Pakistan Manu #4, 4FDC	N/A	50%	No target	50%	90%
Pakistan Manu #4, 2FDC	N/A	n/a	No target	43%	50%
Pakistan Manu #5, Zinc sulfate	N/A	57.5%	No target	85%	85%
Pakistan Manu #6, Amoxicillin DT	N/A	35%	No target	35%	35%
Pakistan Manu #7, Zinc sulfate	N/A	52.5%	No target	35%	35%
Pakistan Manu #8, Zinc sulfate	N/A	57.5%	No target	48%	48%
Achievement of market authorization or WHO prequalification for a new medical product is a long process with many stages (see table above). Scores for Nepal's five manufacturers fell in Q1 since they were not yet sourcing their APIs from a qualified entity. While those manufacturers were not rescored in Q2, they have identified and started sourcing WHO prequalified APIs.					
4.1d. Number of manufacturers supported by PQM+ that completed GMP assessments, by quarter					
Ethiopia	0	0	3	0	6
This indicator reflects whether manufacturers have systematically reviewed their GMP compliance and understand gaps. This helps ensure the quality of their medical products. In Q2, six new PQM+-supported manufacturers in Ethiopia completed GMP gap assessments.					
4.5a. Monographs or product information reports					

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Core MNCH - PIR for gentamicin injection	0	n/a	1	0	1
Many medical products used in USAID's health programs lack monographs or PIRs, making it difficult for regulatory authorities, manufacturers, and QC laboratories to assure the quality of those medical products. This indicator measures the extent to which PQM+ is increasing the resource base of foundational documentation to support product quality for more USAID priority medical products. To that end, the Core MNCH program finalized a PIR for gentamicin injection in Q2.					
OBJECTIVE 5: GLOBAL MEDICAL PRODUCT QUALITY ASSURANCE LEARNING AND OPERATIONAL AGENDA ADVANCED					
5.1. Evidence-based approaches and tools developed and/or applied					
5.1a. Number of new medical product quality assurance or regulatory innovations with tested efficacy that were adopted, by quarter					
South Africa GLOVAX (competency needs assessment tool)	0	n/a	3	1	0
Core MNCH (Medical Devices eLearning course)	0	n/a	2	1	0
Core TB (training materials)	0	1	2	0	1
In South Africa, PQM+ developed a competency needs assessment tool adapted from the WHO regulatory competency framework for regulators of medical products. Using the tool, PQM+ conducted a needs assessment of South African Health Products Regulatory Authority (SAHPRA)'s ability to oversee vaccine production and biomanufacturing. The assessment covered six divisions and two laboratories. The assessment findings will inform training plans to strengthen staff skills. The Core MNCH Program launched a Medical Devices eLearning course in Q1, and the Core TB Program developed training materials for analyzing nitrosamine impurities in rifapentine and rifampin TB medicines in Q2.					
5.1b. Number of PQM+-supported entities that used a PQM+-promoted global tool, by quarter					
Benin MRA/PMS TWG	0	0	3	0	1-MedRS
Ethiopia MRA and NQCL	0	0	No target	2-SATTA	0
Nepal NML	0	0	1	0	1-SATTA
Uzbekistan State Center/MRA	0	0	1	1-MedRS	0
The MedRS tool is a critical part of PQM+'s RB-PMS approach. It helps MRAs and TWGs develop risk-based sampling strategies to support national PMS while maximizing available resources. In the first half of PY4, Benin's MRA/PMS TWG and Uzbekistan's State Center/MRA used the MedRS tool to design RB-PMS sampling plans. Ethiopia's MRA and NQCL and Nepal's NML utilized the SATTA tool to audit their laboratories.					
5.2. Research and analysis to support medical product quality assurance systems strengthening conducted					
5.2a. Number of technical publications or technical presentations supported by PQM+, by quarter					
Asia Bureau	0	2	No target	0	1 pub.
Core MNCH	0	4	5	3 pubs. (feedback), 1 pres.	1 (feedback on global document)
Burma	0	3	No target	1 pres.	1 pres.
Ethiopia	0	4	No target	0	1 pub.

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Ghana	0	0	No target	0	1 pres.
Kenya	0	6	2	0	1 pres.
Nigeria	0	1	No target	3 pub.	0
Pakistan	0	12	No target	0	1 pub.
PQM+ Global	0	4	No target	1 pub. (feedback)	0
			Total 5.2a	**9**	**7**
In the first half of PY4, PQM+ supported a total of 16 technical publications and presentations. ▪ Asia Bureau: Preliminary Analysis: Identification of Priority LMICs in Asia for Increasing Domestic Pharmaceutical Manufacturing for Local Needs. ▪ Burma: Two webinars ▪ Core MNCH Program: PQM+ gave feedback on Quality Assurance Practices for Medical Oxygen Systems at the virtual stakeholders' meeting held by MTaPS; also participated in calls with USAID and LSHTM regarding the Implementation Toolkit for Small and Sick Newborn Care developed by NEST 360 and UNICEF. PQM+ reviewed and provided comments on the toolkit. ▪ Ethiopia: Comprehensive external review of the National Malaria Program. ▪ Ghana: Presented the results of the Quality, Supply, Storage, and Use of Uterotonics and Iron-Folic Acid Supplementation survey to USAID/Ghana. ▪ Kenya: Conference poster, "Laying the Foundation for Quality Assurance of Antimalarial Medicines in Busia County," presented at the 4th Kenya National Malaria Forum. ▪ Nigeria: Assessment reports of the RQAS in three more Nigerian states (Benue, Kebbi, and FCT) ▪ Pakistan: Gap assessment of the safety surveillance system of Punjab. ▪ PQM+ Global: Uses of Medicines for Prevention and Treatment of Post-Partum Hemorrhage and Other Obstetric Purposes, a USAID/Reproductive Health Supplies Coalition publication.					
5.2e. Number of modules that were completed, by quarter					
Core NTD (Foundations of GMP)	4,000	1,790	2,500	873	467
5.3. Advocacy on the importance of medical product quality assurance for public health, including the link between medical product quality and AMR					
5.3a. Number of awareness-raising or advocacy events or activities around medical product quality supported by PQM+, by quarter					
Burkina Faso	0	0	0	1	0
Core NTD	0	1	2	1	0
Ethiopia	0	0	1	1	0
Nepal	0	3	4	2	0
Rwanda	0	0	1	0	1
South Africa	0	0	No target	1	0
Uzbekistan	0	7	6	2	0
			Total 5.3a	**7**	**2**

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
The following advocacy efforts took place in the first half of PY4: ▪ **Burkina Faso:** Relevant stakeholders (USAID implementing partners, the vaccination program, the university hospital centers, etc.) convened to validate a report on AEFI data from June 2021 to October 2022. ▪ **Core NTD:** A WHO PQ advocacy workshop for manufacturers was held in Mombasa, Kenya, in October 2022. The workshop was co-organized with the WHO LPA unit. During the workshop, PQM+ and WHO presented TA support opportunities that benefit NTD medicines manufacturers who participate in the WHO PQ process. ▪ **Ethiopia:** A national dissemination workshop on COVID-19 vaccine safety data and results from the assessment of the national AEFI monitoring system conducted by PQM+ and EFDA took place in Q1. Findings from active surveillance conducted on Janssen (Johnson & Johnson) and Pfizer COVID-19 vaccines and results from an assessment of the national AEFI monitoring system were disseminated. ▪ **Nepal:** Meetings were held with Nepal Medical Council, Nepal Pharmacy Council, Nepal Health Professional Council, and other academic institutions to promote a professional development course on SF medicines. ▪ **Rwanda:** PQM+ helped the Rwanda FDA with a radio and TV campaign to educate the public about the danger of fake drugs and encourage them to report counterfeit drugs. ▪ **South Africa:** To build the capacity of regulators and manufacturers across the six target Global VAX countries, PQM+ hosted a workshop on vaccine manufacturing from December 6-9 at key facilities and institutions in Cape Town, South Africa. ▪ **Uzbekistan:** In Q1, an Agency delegation (specialists from the Cabinet of Ministers responsible for the pharmaceutical industry, the First Deputy Director of the Agency, and heads of the newly created Department for RB-PMS) visited Ethiopia to learn about its RB-PMS program. During the visit, delegates learned about Ethiopia's RB-PMS implementation experience, including its benefits. The Agency funded the trip itself. PQM+ organized the visit in liaison with the EFDA. Following the visit, Agency officials developed a step-by-step roadmap for introducing PMS in Uzbekistan. During their time in Ethiopia, Agency officials also learned about WHO GBT implementation in Ethiopia. Under Uzbekistan's COVID work, three officials from the Cabinet of Ministers and the Agency (Deputy Director, Chairman of the Pharmacological Committee, and the Chief Specialist, Sports and Health Secretariat) visited the Moroccan PV Center to learn best practices in establishing a PV center. After the visit, the Uzbek delegation developed a roadmap for PV in Uzbekistan. The Agency also (1) established connections with the WHO Collaboration Center in Upsala through an agreement between the Upsala Center and Republic of Uzbekistan; and (2) ordered software (VigiBase, VigiFlow, VigiLyze, and VigiMobile application) for reporting.					
5.3b. Number of instances of media coverage of PQM+-supported medical product quality assurance-related events or topics, by quarter					
Core MNCH (social media)	0	0	No target	0	1
Cross Bureau (blog)	0	0	No target	10	0
COVID-19 therapeutics	0	n/a	No target	1	0
Bangladesh (Newsletter, digital, print, broadcast)	0	10	3	1	6
Benin (TV, print, digital)	0	2	1	0	3
Burkina Faso (Twitter)	0	1	1	1	2
Burma (Twitter, LinkedIn, Newsletter)	0	0	4	3	5
Ethiopia (Twitter, LinkedIn, Newsletter)	0	6	No target	6	2
Ghana (Twitter, LinkedIn, Newsletter)	0	8	1	9	6
Kazakhstan (digital, Twitter, LinkedIn)	0	4	4	1	3

Indicator Code and Name	Baseline	PY3 Actual	PY4 Target	PY4 Q1	PY4 Q2
Kenya (Twitter, LinkedIn, Newsletter)	0	6	No target	11	1
Liberia (Twitter)	0	4	No target	0	2
Madagascar	0	2	No target	1	1
Mali (Twitter, LinkedIn, Newsletter)	0	1	1	0	5
Nepal (Twitter, LinkedIn, Newsletter)	0	3	No target	3	9
Nigeria (Twitter, LinkedIn, Newsletter)	0	5	No target	13	4
Pakistan (Twitter, LinkedIn, Newsletter, Success story)	0	12	No target	7	7
Rwanda (Twitter, Newsletter)	0	3	No target	2	2
Senegal (Twitter, LinkedIn, Newsletter)	0	2	1	7	3
South Africa (Twitter, LinkedIn, Newsletter, Webinar/Event)	0	n/a	No target	21	1
Tajikistan (Twitter, Newsletter)	0	0	3	1	2
Uzbekistan (Twitter, LinkedIn, Newsletter, digital)	0	15	10	13	9
			Total 5.3b	**111**	**74**
The table above indicates the extensive use of social and other media to share information on medical product quality assurance.					

Annex 1A. Results from Risk-Based Post-Marketing Surveillance That Concluded in PY4 Q1 and Q2, by Country

Country	Regions sampled	Medicines sampled	No. of samples collected/tested	Results from PMS	Interpretation of results
Benin (round 1, 2022-2023)	Subnational / 4 regions	Antimalarials (artemether lumefantrine)	202 of total sample size calculated for PMS (330)	▪ 4.5% of the samples tested failed ▪ 18% of products did not have market authorization ▪ Registrations for 10% of products were expired ▪ Results are not representative	The sample size (330) was not met, so the results are not representative of the four high-risk regions combined. Results are also not representative of each region since a sample size/per region was not calculated.
Liberia (round 2, 2022-2023)	Not national (34% from public sector & 66% from private sector)	Antimalarials & MNCH medicines 69% were antimalarials; 31% were MNCH medicines	146 samples	▪ Overall failure rate of the sampled products: 16% ▪ 13% of antimalarial samples failed; 22% of MNCH medicine samples failed ▪ Results are not nationally representative	This was not a national survey, so results are not nationally representative. Also, sample size was divided among different medicine classes, so the results are not representative for any specific medicine class.
Liberia (round 3, 2022-2023)	Not national (37% from public sector & 63% from private sector)	Antimalarials & MNCH medicines 63% were antimalarials; 37% were MNCH medicines	202 samples	▪ Overall failure rate: 11% ▪ 13% of antimalarial samples failed; 7% of MNCH medicine samples failed ▪ Results are not nationally representative	This was not a national survey, so results are not nationally representative. Also, sample size was divided among different medicine classes, so the results are not representative for any specific medicine class.
Mali, round 3, 2021-2022	9 subnational areas (Kayes, Koulikoro, Sikasso, Segou, Mopti, Gao, Kidal, Menaka, Taoudenit)	Antimalarials (Injectable, artemether + lumefantrine, quinine injection) MNCH (oxytocin injection, diazepam injection, Mg sulfate injection)	341 samples	▪ Overall failure rate: 6% ▪ 2% of antimalarial samples failed; 10% of MNCH products sampled failed ▪ 68% unregistered ▪ Results are not nationally representative	These results are representative of the nine subnational areas combined, but they are not nationally representative. One can say that 6% of the medicine samples tested from the nine subnational areas failed. However, because sample size was split among various medicine classes, one cannot generalize to medicine classes within the nine subnational areas. One cannot say that 2% of antimalarials in the nine subnational regions failed; one can, however, say, that 2% of antimalarial samples in the nine subnational areas failed. One cannot say that 10% of MNCH medicines in the nine subnational regions failed; one can say that 10% of MNCH samples in the nine subnational areas failed.