INTRODUCTION

Building blocks of progress: Case studies in pharmaceutical systems strengthening

Timely access to quality-assured, affordable pharmaceutical products saves lives. Medicines treat TB and preeclampsia and control diabetes, vaccines prevent the spread of measles and other infectious diseases, insecticide-treated bed nets protect against malaria, condoms stop the spread of HIV. As the Lancet Commission reported in November 2016, universal health coverage and sustainable development cannot exist without essential medicines, which are "crucial to satisfy the priority health-care needs of the population, promote health, and achieve sustainable development."[1]

It takes a functioning health system—and a resilient pharmaceutical system working within and in support of it—to ensure access to those products for the people who need them. Until recently, many global health organizations focused on disease-specific interventions, but it soon became clear that adopting and taking them to scale also required supportive health systems.[2]

For example, the global response to the AIDS pandemic included multimillion-dollar initiatives to provide affordable medicines for HIV and AIDS, but these initiatives did not guarantee access to those medicines. That's because health care and pharmaceutical supply systems in many affected countries had limited capacity to deliver medicines and faced constraints, such as inadequate capacity in clinics and hospitals, inadequate pharmaceutical planning and information systems, and an inefficient supply chain.[3]

A new focus on systems strengthening

The global health community responded by taking a broader perspective in its work. In 2007, the World Health Organization (WHO) offered a framework for strengthening health systems, noting that,

like any system, a health system is a set of interconnected parts that must function together to be effective. Changes in one area have ripple effects in others.[4]

USAID has been implementing these principles in its global health work for more than two decades, partnering with countries to provide sustained, equitable access to essential, high-quality services.[5] Applying its vision to pharmaceutical systems—an integral element within strong health systems—the agency funded successive programs that sustained a focus on the intersections between the medical products building blocks and other health system components. These include [Systems for Improved Access to Pharmaceuticals and Services (SIAPS)](#), a seven-year program that began in 2011.

To address a gap in the global health systems community, SIAPS worked to ignite global interest in measuring pharmaceutical systems strengthening. To do so, SIAPS first proposed a definition of a pharmaceutical system and then of pharmaceutical systems strengthening.

SIAPS collaborated with its core and resource partners and WHO in 2014 to define pharmaceutical systems strengthening (Health Policy and Planning, May 2017):

The process of identifying and implementing strategies and actions that achieve coordinated and sustainable improvements in the critical components of a pharmaceutical system to

make it more responsive and resilient and to enhance its performance for achieving better health outcomes.

Principles in action

A well-functioning pharmaceutical system is the sum of its parts: strong leadership, robust financing, a well-trained workforce, solid information for evidence-based decisions, medical products and technology, and well-maintained facilities and logistics. A pharmaceutical system strengthening intervention then needs to consider each component of the wider health system it touches. Improvements may require widespread organizational change, from policy makers to the dispenser at the local drug shop. They may also require both top-down and broad-based work in such areas as strengthening the role of governance, enforcing medicine regulation, promoting appropriate use, and providing information for decision-making.

The case studies in this evidence collection show these principles in action. Collectively, the case studies demonstrate evidence-based improvements; provide actionable lessons and recommendations; and describe the technical framework, objectives, and specific measures to strengthen a pharmaceutical system.

The USAID-funded SIAPS Program is pleased to present this collection. As the global health community continues to develop

interventions that strengthen pharmaceutical systems, sharing knowledge and lessons learned is critical to designing ever more effective strategies, promoting better health outcomes, and saving lives.

METHODOLOGY

The USAID-funded SIAPS Program issued a global call for case studies of evidence of sustained improvements in pharmaceutical systems in low- and middle-income countries. The global call was open to all stakeholders, including donors, the private sector, governments, universities, and implementing agencies. Its purpose was to provide examples of interventions that strengthened and sustained responsive and resilient pharmaceutical systems, inviting commentary from the field and offering lessons learned.

Selected case studies include the following:

A description of how specific strategies and actions strengthened the pharmaceutical system to improve access to and use of pharmaceutical products and services.

Evidence that demonstrates sustained improvements in health systems performance and/or health outcomes resulting from pharmaceutical systems.strengthening activities.

Actionable lessons and recommendations gained from implementation experiences.

There were 46 case studies submitted that represented work from more than 25 countries. Expert reviewers at the Harvard Pilgrim Health Care Institute and Harvard T. H. Chan School of Public Health independently assessed the eligible case studies across seven domains, and 12 were selected to be included in this evidence collection. Each of the 12 case studies met the critical criterion of demonstrating evidence of sustained improvements in pharmaceutical systems.

The case studies in this collection showcase measurable systemic improvements. They contribute to a robust and growing base of evidence on how interventions can be effective in building responsive and resilient pharmaceutical systems.

CASE STUDIES

BANGLADESH

Saving Lives of Women and Children: Pharmaceutical Systems Strengthening Approaches to Improve Access to Contraceptives in Bangladesh

PHILLIPPINES

Improving TB Systems and Services through Stronger Community Health Leadership, Management, and Governance in the Philippines

ETHIOPIA

Transforming the Delivery of Pharmaceutical Services in Ethiopia: Auditable Pharmaceutical Transactions and Services (APTS) Approach

SOUTH AFRICA

Strengthening the Leadership and Management of Pharmaceutical Services in South Africa

INDIA

Empowering communities in low-resource environments to drive high-performing supply chains: India

TANZANIA

Complementing Public-sector Medicine Supply through a Public-private Partnership in Tanzania

MALAWI

Pharmacy Assistant Training Program in Malawi

UGANDA

Supervision, Performance Assessment, and Recognition Strategy to Strengthen Medicines Management in Uganda

NAMIBIA

Improved Pharmaceutical Inventory Management in Namibia through Monitoring Training Planning

UKRAINE

An electronic recording and reporting system for improved TB treatment in Ukraine

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SAVING LIVES OF WOMEN AND CHILDREN: PHARMACEUTICAL SYSTEMS STRENGTHENING APPROACHES TO IMPROVE ACCESS TO CONTRACEPTIVES IN BANGLADESH

BACKGROUND

Access to family planning (FP) commodities saves women's and children's lives by allowing women to delay and limit pregnancies in a healthy manner. The Government of Bangladesh, with support from donors and development partners, has undertaken targeted interventions to increase access to and availability of contraceptives over the years. These interventions, coupled with the increased public demand for FP services, have helped make some noteworthy progress. From 2001 to 2014, the total fertility rate (TFR) decreased from 3.0 to 2.3 births per woman and the maternal mortality ratio decreased from 322 to 194 maternal deaths per 100,000 live births. These results are consistent with the increased use of contraception among married women, from 61% in 2011 to 62% in 2014. As part of the FP2020 global partnership, Bangladesh has committed to further reduce the TFR to 2.0 by 2021. However, to sustain the reduction in fertility rate, it is essential to ensure that women and their partners have access to a range of safe and high-quality contraceptives at the point of need.

Over the last 25 years, USAID has been providing support to the Directorate General of Family Planning (DGFP), which is responsible for contraceptive security for the whole country, to strengthen its FP program. This support has included assistance to improve systems for supply chain management of contraceptives and ensuring their availability at each tier, including the service delivery point (SDP) level. Although improvements were made, ensuring a continuous supply of contraceptives down to the SDP level remained a challenge for the DGFP even a few years ago. The DGFP had an inadequate tracking system that caused delays in procurement of contraceptives and contributed to chronic stock-outs at SDPs. Procurement managers did not have access to the list of in-country registered medicines. This, coupled with inaccurate forecasting, led to the procurement of incorrect products and, ultimately, the unavailability of required products. A lack of accurate and real-time logistics data from the SDP, limited access to data, and poor feedback mechanisms only added to the DGFP's challenges. This increased the risk of unwanted pregnancies and endangered the lives of women and children.

IMPLEMENTATION

Since 2011, the USAID-funded Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program has built on the work of its predecessor, the Strengthening Pharmaceutical Systems (SPS) Program, by collaborating with the Ministry of Health and Family Welfare (MOHFW) and the DGFP to conduct thematic assessments to identify the root causes of the prevalent challenges and explore ways to enhance the resiliency and efficiency of supply chain management systems. This is critical for adequate planning and maintenance of contraceptive availability. To address the identified challenges, SIAPS used system strengthening approaches through a system thinking framework that focused on improving the governance and coordination mechanisms, reforming procurement processes, establishing systems to capture regular and quality data, and building the DGFP's institutional and human capacity.

Strengthening Governance of Supply Chain Functions within the DGFP

SIAPS assisted the DGFP to form a Forecasting Working Group (FWG) in 2012 that meets annually to review annual need and facilitate data-informed procurement decisions. The FWG, represented by multiple stakeholders, uses data collected through information management platforms and conducts quantification exercises based on the consumption of contraceptives. The FWG also plays an instrumental role in assisting the DGFP to secure guaranteed funding or additional donor support to bridge any shortfall and ensure the timely release of funds by advocating at the highest levels. SIAPS also helped the MOHFW and DGFP produce standard operating procedures, guidelines, and tools to promote good governance practices.

Reforming Procurement Systems and Streamlining Procurement Processes

SPS experience had shown that a web-based procurement tracking system can help DGFP officials track the status of procurement packages at every step of the way and ensure the packages' smooth progress. SIAPS helped the DGFP to extend the online procurement tracking system, developed in the SPS era, by incorporating more sophisticated features, such as the World Bank

approval process, and hosted it on the MOHFW's Supply Chain Management Portal (SCMP) (https://scmpbd.org/index.php/tracker/tracker-dashboard). It was deployed within the government for user acceptance testing by DGFP officials and launched on February 15, 2011.

Increasing the Availability of Data for Decision Making

With SIAPS' support, the DGFP introduced an electronic logistics management information system (eLMIS) in 2011 to collect aggregated data on FP commodities. Although the system helped reduce subdistrict-level stock-outs, it did not provide disaggregated facility and provider information to link with national-level program policies and plans. Therefore, sporadic stock-outs of contraceptives were occurring at SDPs. SIAPS helped the DGFP enhance the existing eLMIS and implement a nationwide, web-enabled SDP dashboard module (https://scmpbd.org/index.php/lmis-dashboard) with simplified charts, maps, and tables to monitor and track the contraceptive stock situation at more than 29,000 SDPs. SIAPS also integrated a Short Messaging Service (SMS) within the eLMIS to send reminders about and track report submissions and to alert managers about stock imbalances and

impending stock-outs. This module also allows the DGFP to map out potential vacant positions and develop necessary human resource planning.

Building the Capacity of Supply Chain Managers, Storekeepers, and SDP Staff

When the eLMIS was ready for use and scale up, SIAPS undertook a cascade training approach to build the capacity of the actual users and management teams for the changing process of logistics information management (from manual to electronic system). SIAPS and the DGFP identified champion users from eLMIS pilot sites and government managers and created a pool of master trainers and troubleshooters. SIAPS oriented staff at 72 subdistrict SDPs on the eLMIS to increase their awareness about the importance of contraceptive availability. SIAPS also conducted a nationwide training program on basic logistics management for DGFP officials and introduced a post-training action plan (PTAP). Each trainee completed the PTAP and committed to using the training knowledge to improve logistics management for reproductive health commodities, including contraceptives. SIAPS built the technical capacity of DGFP officials to manage the forecasting processes and analyze the FP2020 indicators relevant to stock availability.

RESULTS

Improved Coordination in Forecasting and Supply Planning Leads to Cost Savings

With SIAPS support, a five-year (2012–2016) forecast and a two-year supply plan for FP commodities were developed in 2012. Due to this

exercise and coordination between the FWG and other stakeholders, the DGFP decided not to procure 65,000 implants in FY 2012–13 and 410,000 implants in FY 2014–15. This saved approximately USD 5.48 million.

Streamlined Procurement Processes Reduce Procurement Lead Time

Using the procurement portal, the DGFP was able to reduce procurement lead time by 57% (32.8 weeks in 2014 compared to the targeted 58 weeks in 2012–13)

for any package procured by the directorate. Using the SIAPS-developed procurement procedures manual, supply manual, framework agreement bidding document, and subnational procurement manual, DGFP procuring entities are now more capable of efficiently performing their procurement and supply chain management responsibilities.

Improved Logistics Information Systems Contribute to a Responsive Supply Chain

To ensure data transparency and increased accountability, the eLMIS is open to all. Using eLMIS data, managers now respond more quickly to avoid stock-outs and overstock of FP commodities. This tool is allowing local-level managers to transition from being data producers to data users and has improved decentralized decision making. The reporting rate for contraceptives (any method) increased from 90% in 2014 to 99% in 2016, which has supported national-level, supply chain-related decision making. The SDP-level stock-out rate for contraceptives has remained at <1% since December 2016.

Enhanced Human and Institutional Capacity of the DGFP

To date, 5,028 DGFP officials, including district- and subdistrict-level managers, storekeepers, and SDP staff, have received eLMIS and basic logistics management training from SIAPS.

SIAPS and the DGFP conducted an evaluation in 2015 to assess the effectiveness of the logistics training

based on the PTAP. Primary data were collected through in-depth interviews with storekeepers and health managers from 72 randomly selected subdistricts. Secondary data were collected from the SCMP and other sources on stock status and lives saved due to contraceptive use. It was found that 62% of subdistricts fully implemented PTAP commitment-related activities. Of these, 34 successfully improved their record keeping systems and uploaded monthly logistics reports to the eLMIS on time.

SIAPS helped the DGFP develop its first-ever master facility and SDP list with eligibility mapping for dispensing items. SIAPS also developed terms of reference for the DGFP Tool Management Committee and provided specialized training for DGFP IT technical staff on backend language, troubleshooting, and site support to ensure the smooth management and operation of the eLMIS. SIAPS advocacy resulted in the formation of a national steering committee to ensure data transparency, increase accountability, and promote a culture for data use to make informed decisions.

Successful Transitioning to Country Ownership

From the outset, SIAPS targeted sustainability and country ownership by handing over the management of the SCMP/eLMIS to the MOHFW. In 2014, SIAPS worked with the MOHFW to develop a sustainability and advocacy

plan for the seamless transfer of the operation, maintenance, and oversight of the system tools. SIAPS also conducted an assessment to determine the MOHFW's technical and financial readiness to take over full responsibility of maintaining all logistics management tools and developed guidelines covering the SCMP's technical, technological, organizational, and financial aspects, as well as user manuals. On March 4, 2017, the entire transfer and installation process of the SCMP was successfully completed. This handover was accelerated because of government and donor commitments to ensuring contraceptive security and has been regarded as a significant step in terms of the country's commitment to pharmaceutical system strengthening.

Functional eLMIS Helps Strengthen Partnerships with Other Government Entities and Implementing Partners

Acknowledging the success of the DGFP's eLMIS, the Directorate General of Health Services engaged SIAPS to create a similar system to improve logistics management of essential health commodities, particularly life-saving maternal, neonatal, and child health medicines. eLMIS data are now being used by other implementing partners, such as UNFPA and Save the Children, to achieve common development objectives.

CONCLUSION

Because of the overall pharmaceutical supply chain system performance in terms of data availability and informed decision making, the availability of modern contraceptives has increased significantly, which helped avert an estimated 4.99 million unintended pregnancies in 2016 and prevented 5,000 maternal deaths.

SIAPS' system strengthening approaches build local capacity, create stronger partnerships among stakeholders, rationalize investments, and lead to a resilient supply chain system that is needed to achieve the FP2020 and country's sector program targets. To ensure the system's optimum use, the DGFP needs to further improve the analytical capacity of its staff, provide sufficient decision making authority to local-level managers, and foster a data-use culture.

A systematic and functional national supply chain ensures the availability of affordable, safe, effective FP commodities, including contraceptives, when and where they are needed. This begins with appropriate forecasting exercises using scientific methods and tools; sustainable, effective LMISs that make data accessible to decision makers and serve as an advocacy tool for evidence-based supply planning of essential commodities; and efficient and timely procurement processes. It is also crucial to analyze and share available information across systems and stakeholders for improved decision making. This mechanism ensures good governance and accountability and fosters stronger partnerships among stakeholders, ultimately saving the lives of women and children.

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TRANSFORMING THE DELIVERY OF PHARMACEUTICAL SERVICES IN ETHIOPIA
The Auditable Pharmaceutical Transactions and Services Approach

BACKGROUND

In recent years, Ethiopia's Federal Ministry of Health (FMOH) has made tremendous efforts to improve the quality of health services at the hospital level, as laid out in the Ethiopian Hospital Reform Implementation Guide.[1] However, frequent stock-outs of essential medicines and poor quality of pharmacy services pose challenges to achieving the desired level of success in hospital improvement.

A 2003 assessment of Ethiopia's pharmaceutical sector showed that the average duration of stock-outs of essential medicines was 99.2 days in the last year in public health facilities and regional drug stores. The accumulation of medicines that were of limited utility to the catchment population led to expiry and wastage of limited resources, with expired medicines in health facilities reportedly as high as 8%. It was also observed that 43% of medicines dispensed to patients in health facilities were inadequately labeled, and 33% of patients who received medicines did not know how to take them correctly.[2] In addition, according to the fourth National Health Sector Development Program (2010/11–2014/15), the antibiotic prescribing rate was 58% and antibiotic use in the treatment of non-pneumonia acute respiratory tract infection was 61%, both of which indicate deviation from recommended norms.[3]

Many of these problems were attributable to poor governance in the pharmaceutical sector. Specifically, a lack of transparency and accountability left pharmaceutical transactions and services vulnerable to mismanagement, including poor planning, decision making, prescribing and dispensing, and reporting, which compromised both the availability and use of medicines. The FMOH—with support from USAID's Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program and its predecessor, the Strengthening Pharmaceutical Systems Program—designed an innovative and comprehensive package of interventions referred to as Auditable Pharmaceutical Transactions and Service (APTS) to increase transparency and accountability, thereby contributing to a continuous supply of essential medicines, optimal budget utilization, and improved pharmacy services.

TECHNICAL APPROACH

APTS embodies a pharmaceutical system strengthening approach. Its interventions fall under five results areas, which correspond to the five system strengthening building blocks: transparency and accountability in managing medicine transactions, effective workforce deployment and development, reliable information, efficient budget utilization, and improved customer satisfaction. Its comprehensive approach identifies problems and root causes and then considers interventions within each health system component to more systematically address those causes.

IMPLEMENTATION

APTS implementation involves several processes that are undertaken at multiple levels of the health system with extensive stakeholder engagement. An implementation guide, developed by the first region in Ethiopia to pilot and roll out APTS, provides instructions to managers at regional health bureaus (RHBs) and facilities on the steps involved in planning and implementing APTS interventions— including stakeholder buy-in, tool development, capacity building, and baseline assessment—as well as roles and responsibilities of key personnel, working groups, and committees at the regional and facility levels. Early in the roll-out of APTS, formal visits to the pilot site (Debre Markos Hospital) were conducted to facilitate information exchange and buy-in.
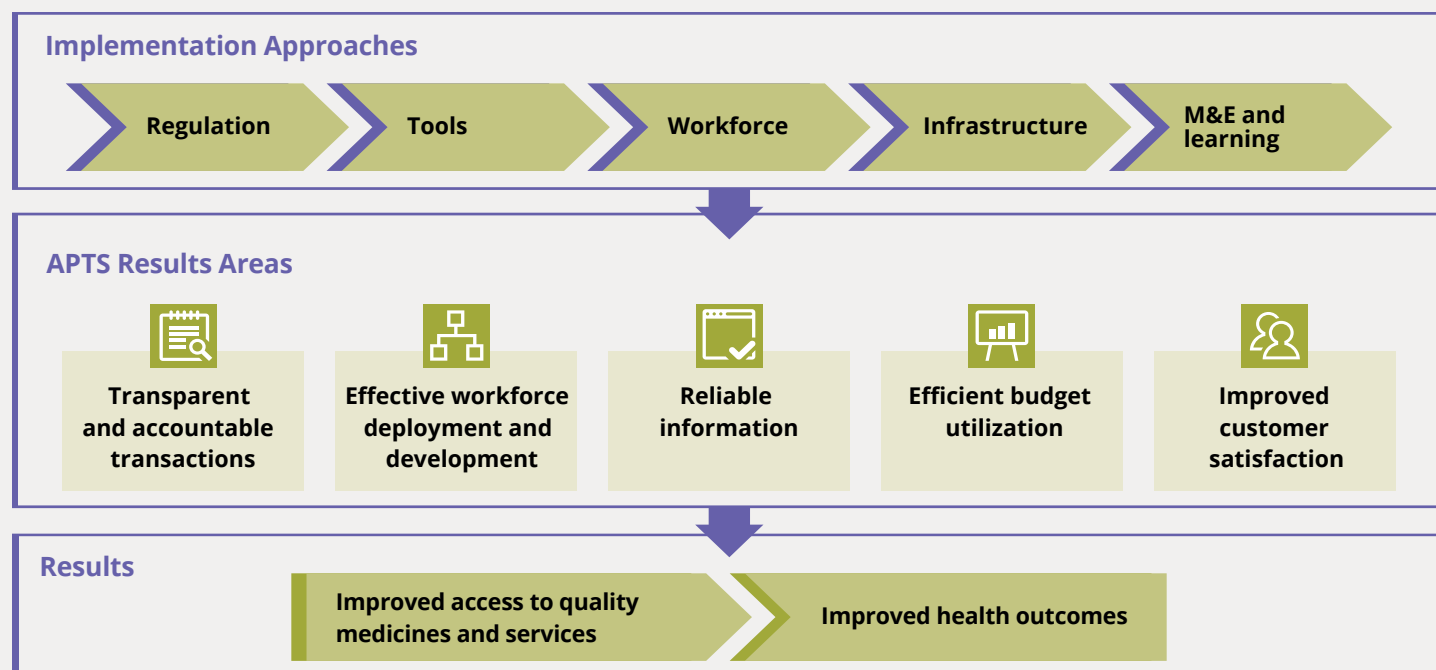
The main APTS interventions consist of:

- Developing and enacting APTS regulations at the regional and federal levels to support institutionalization
- Developing APTS tools to ensure transparency and accountability in the overall management of medicines at health facilities
- Conducting an ABC analysis of medicines expenditures and reconciling it with a VEN (vital, essential, non-essential) analysis to prioritize medicines that address the population's greatest health needs and ensure rational utilization of the medicines budget
- Conducting a stock status analysis and taking subsequent measures to minimize wastage and stock-outs of essential medicines
- Conducting a workload analysis to guide workforce development and

deployment at the facility, regional, and federal levels
- Improving infrastructure and reorganizing pharmacy units to ensure proper space for medication counseling and patient privacy, reduce waiting times, and improve convenience for patients and staff
- Continually collecting data on products, financial transactions, and services to monitor progress and performance and inform the decision making process

Each process, its related interventions, and the overall implementation timeline for APTS vary depending on factors that include political commitment, existing infrastructure, and capacity (figure 1). APTS implementation does not have an end point, allowing for continuous improvement and institutionalization.

Figure 1. APTS results areas and implementation approaches

Implementation Approaches

Regulation → Tools → Workforce → Infrastructure → M&E and learning

APTS Results Areas

- Transparent and accountable transactions
- Effective workforce deployment and development
- Reliable information
- Efficient budget utilization
- Improved customer satisfaction

Results

Improved access to quality medicines and services → Improved health outcomes

RESULTS

APTS interventions have yielded changes in the way pharmaceutical services are managed in participating hospitals. APTS was piloted in January 2011 at Debre Markos Hospital, where the preliminary results were so promising that the Amhara RHB collaborated with SIAPS and the Debre Markos teams to share results and encourage scale-up to other facilities in the region. The problems, root causes, and corresponding interventions that were identified at Debre Markos Hospital (figure 2) proved to be relevant throughout Ethiopia's public health system and ultimately formed the basis for the design and implementation of APTS throughout the country.

Figure 2. Identified pharmaceutical problems and root causes
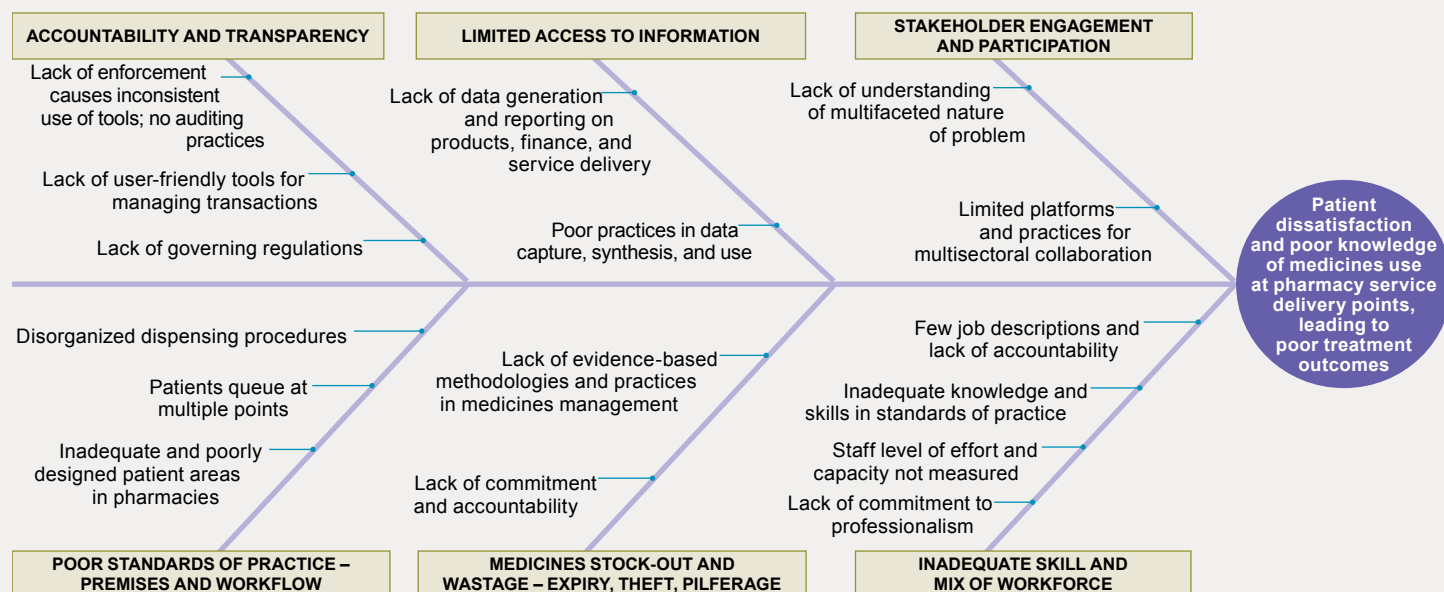
As of December 2016, the federal government and 10 of the 11 RHBs had developed and enacted regulations to support APTS implementation. In total, 77 health facilities across the country had implemented APTS, including 70 hospitals and 7 health centers (figure 3). These facilities have shown remarkable improvements in the quality of service, patient satisfaction, waiting times at pharmacies, and patients' knowledge of medicines dispensed to them. In most hospitals, the availability of essential medicines increased from 65% to more than 95%, nearly reaching the national health sector development goal of 100%.[4]

Figure 3. APTS scale-up by region, 2011–2016
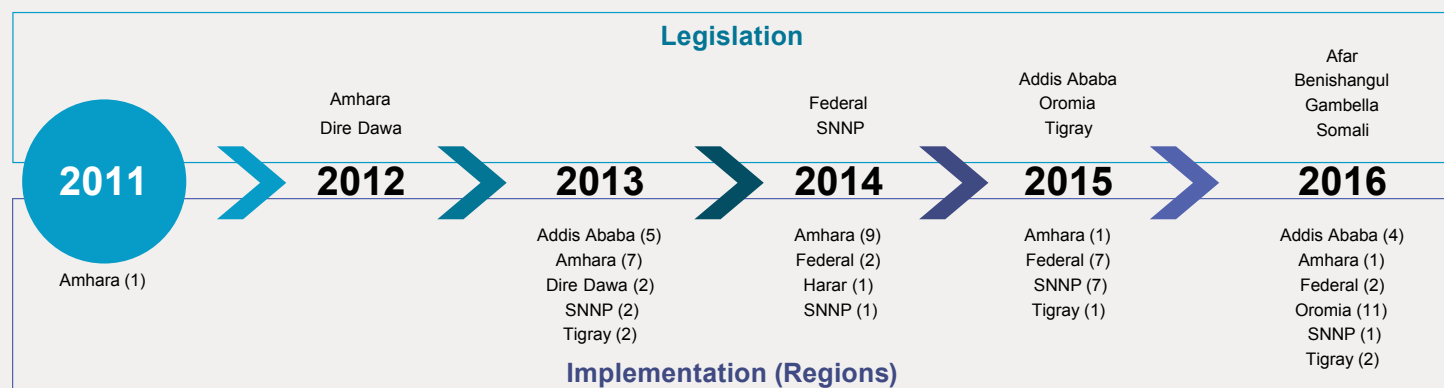
Key APTS Achievements by Results Area

Transparent and Accountable Transactions: SIAPS has worked with government entities to adapt APTS financial and transactional tools to federal and regional contexts. An APTS assessment conducted in 2016 reported that 25% of APTS-implementing sites performed financial auditing of pharmaceutical transactions, and random product auditing was reportedly practiced by more than two-thirds of APTS-implementing sites.[5] Prior to APTS, none of the hospitals tracked medicine sales, recorded daily amounts of medicines dispensed, or generated monthly service delivery reports. At the end of 2015, nearly 73% of APTS-implementing facilities conducted all of these activities.[4] Health facilities now generate monthly sales reports, including information on cash sales, credit sales, and items freely dispensed to patients and staff, enabling senior management to see progress in terms of financial gains and losses.

Effective Workforce Deployment and Development: Many APTS-implementing hospitals prepare and analyze monthly reports on the pharmaceutical services they provide. This information has enabled hospital managers to monitor the level of effort of pharmacists and determine the need for more, or a different mix of, human resources. As a result of APTS implementation, hospitals have improved their institutional capacity by increasing their trained workforce to deliver appropriate pharmacy services (figure 4).

Figure 4. Selected workforce improvements from 48 APTS-implementing facilities
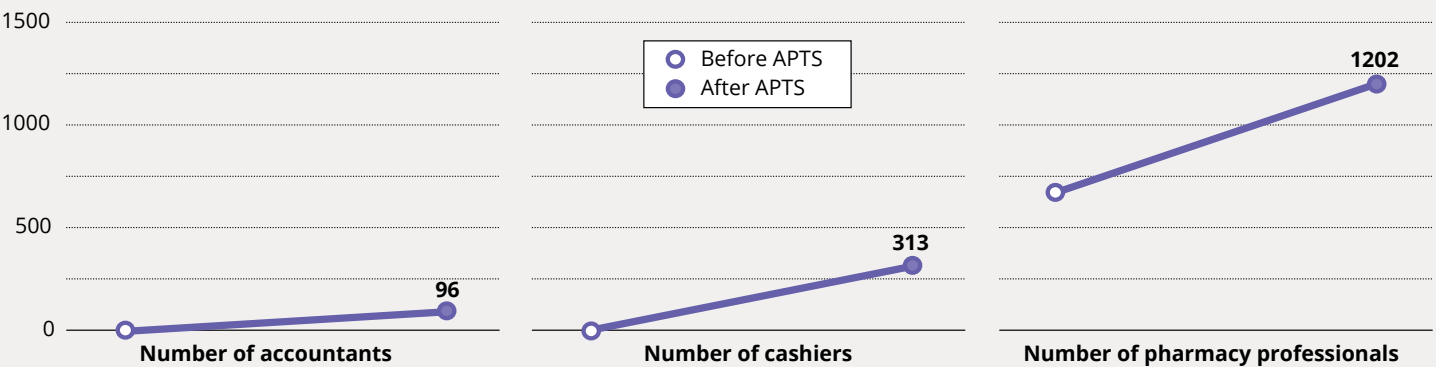
Reliable Information: Pharmacies in hospitals that have implemented APTS now regularly generate information related to products, finances, services, and staff workload by reporting on indicators that are monitored continually to track progress and make timely decisions. There has been a paradigm/cultural shift in generating and using information at facility level (table 1).

Efficient Budget Utilization: After implementing APTS, a 2014 ABC analysis of medicine expenditures at three Tigray region hospitals found that more than 96% of items procured were on the hospitals' medicines lists. Hospitals used the VEN classification system to confirm that the medicines being purchased were appropriate based on the health needs of the hospitals' catchment population. Minimizing wastage of medicines is another means for ensuring efficient budget utilization. In 2015, it was reported that wastage of medicines due to expiry decreased from 8.24% to less than 2% in most facilities.[4]

Improved Customer Satisfaction: All APTS-implementing hospitals upgraded and reorganized their infrastructure, creating more efficient space for both patients and service providers. The change in pharmacy layout improved patient convenience at service delivery points, especially for mothers and the elderly (see before and after photos). Three of the hospitals implementing APTS (Axum, Felege Hiwot, and Debre Markos) reported upward of 90% patient satisfaction based on exit interviews.

Table 1. Indicators Collected at Health Facilities, 2015

INDICATORS	2015
% of facilities submitting monthly financial reports	93.8
% of facilities submitting monthly service reports	93.8
% of facilities receiving regular feedback from RHB	33.3
% of facilities measuring patient satisfaction	75.0
% of facilities measuring patient care indicators	62.5

LESSONS

Champions and stakeholder buy-in are vital to APTS success. Effective implementation of APTS interventions requires the involvement of multisectoral partners. For example, the Justice Bureau was needed to draft legislation and submit it to a law-enactment body, while the Civil Service Bureau was needed to oversee workforce issues. At the hospital level, board members, managers, clinicians, pharmacists, and patients were all involved in some capacity in the planning, implementation, or monitoring of APTS. Collectively, these partners have contributed to making APTS a package of interventions that serves multiple interests.

Partial or incomplete implementation of the APTS package of interventions led to lower than expected results in some facilities. For example, Addis Ababa City Administration adopted select APTS tools (e.g., vouchers, sales tickets, registers) and trained pharmacy staff on APTS principles and implementation; however, without the appropriate legislation, the hospital CEO did not have the authority to allocate funding for infrastructure improvements or staff recruitment. This limited what the existing pharmacy staff could do. In addition, the pharmacy had sales tickets and registers but did not have a place to put the tickets or the personnel to staff the registers.

Sharing successes inspired participation. While APTS is a long, labor-intensive process, fast and dramatic results from a well-coordinated pilot inspired buy-in. For example, in Debre Markos Hospital, the postintervention increases in income from medicine sales increased the financial resources available for medicine procurement by 89.1% between June 2011 and June 2012. Such progress inspired staff, who were initially hesitant, to become APTS advocates. In addition, promoting APTS success to media and government authorities and encouraging them to communicate the effectiveness of the pilot intervention helped popularize the intervention on a wider scale and motivated others to adopt it.

Excessive reporting may be off-setting some of the benefits of APTS. As APTS expanded, SIAPS supported the development of new indicators to track performance and allow for comparisons across facilities. However, this resulted in time-consuming paperwork and rigorous data recording. The APTS evaluation in 2016 reported that 82% of pharmacy personnel believed that APTS increased their workload—a finding that may account for the higher attrition rate in APTS-implementing facilities.[5] The implementation of APTS relies on a steady, diverse, and well-trained workforce, and the impact of high attrition needs to be addressed to avoid future disruptions and inefficiencies.

APTS before and after photos from Felege Hiwot Referral Hospital

Before APTS – inconvenient, a lack of privacy for proper counseling, and time consuming and unsafe practices, especially for mothers and children

After APTS – improved premises, convenient workflow, decreased waiting time, better privacy, and overall improved services

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CONCLUSION

APTS improves the overall performance of hospital pharmacies by addressing issues that cut across all health system building blocks. Notable achievements that resulted from the implementation of APTS included improved pharmacy premises, streamlined work flow, improved mix of staff for hospital pharmacy services, reduced wastage, and improved efficiency in budget utilization—all of which contribute to improved health outcomes.

Moving forward, further scale-up of APTS is planned throughout Ethiopia. As of December 2016, National APTS coverage at hospitals was below 25%, with 77 of 400 hospitals implementing the system and only 7 of 3,000 health centers. The government's goal is to have full coverage within five years, as set forth in the country's Health Sector Transformation Plan II. To accomplish this, adequate funding is needed to further develop human resource capacity, improve pharmacy premises, and supply APTS tools to health facilities, among other necessities. Securing government funding and commitment from implementing partners will also be needed to support APTS expansion.

To maintain program standards and promote effective scale-up, RHBs need to closely monitor APTS sites and address emerging challenges. Automation of data recording tools will also be critical to decrease staff workload, promote sustainable and efficient data collection and reporting processes, and generate more reliable and consistent information for decision making.

Ultimately, the program's continued success will depend on building the capacity of existing and incoming staff at the FMOH and RHBs to lead facility implementation, apply the evolving federal monitoring and evaluation system, and maintain activities.

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Note: This case study highlights findings of the SIAPS publication "Transforming Pharmaceutical Services in Ethiopia through Auditable Pharmaceutical Transactions and Services." For more information, please refer to the complete publication:

http://siapsprogram.org/publication/technical-brief-transforming-pharmaceutical-services-in-ethiopia-through-auditable-pharmaceutical-transactions-and-services/

EMPOWERING COMMUNITIES IN LOW-RESOURCE ENVIRONMENTS TO DRIVE HIGH-PERFORMING SUPPLY CHAINS

BACKGROUND

A mother in the remote district of Chamarajanagar, India, carries her baby and walks 10 miles to the nearest government-run primary health center (PHC). At the end of the long walk, she is told that the polio vaccine that is needed to immunize her baby is out of stock. There is now a high probability that this mother and her baby will not return for the polio vaccine during the next weekly immunization session. The long walk in the heat is tiresome, there is no assurance that the vaccine will be available the following week, and the mother is not even fully convinced that vaccines work in the first place.[1]

According to WHO findings, 1.5 million vaccine-preventable deaths can be avoided every year if global vaccination coverage improves.[2] In developing countries, the availability of vaccines at the last mile is one of the major barriers to achieving higher immunization coverage. A baseline study conducted in 2012 at 29 remote last-mile PHCs across Karnataka, India, indicated that stock availability stood at 84%[3] (feared to be much lower in the rest of the country), resulting in a birth cohort of 10,683 babies[4] within the catchment area running the risk of not being fully immunized each year due to vaccine availability issues alone.

Availability of vaccines at the last mile is critical to improving health outcomes of communities.[5] This intervention focused on addressing the problems of availability and quality of vaccines in a sustainable and scalable manner within the constraints of low-resource environments typical in developing countries. The challenge was to move the needle on an availability rate that was already considered above average.

TECHNICAL APPROACH

Inclusive value chains for citizens will drive a renaissance for more than 50% of the developing world—fulfilling the promise of health equity and economic opportunity for 3 billion people across global emerging markets. High-performing supply chains in low-resource settings can unlock this potential, but they require a novel technology platform and compelling deployment methods to remain resilient.

Last-mile stock managers serve as gatekeepers of health for their communities and are the most accountable section of the supply chain because they are answerable to their communities. They have their ears to the ground and stand at a vantage point where they can augment real-time, data-driven insights with qualitative understanding from the field to make the right decisions. Shifting the decision-making calculus to last-mile stock managers and grassroots organizations encourages disciplined stock-keeping behavior. Empowered to fight supply chain inefficiencies and information asymmetry, these stakeholders will self-organize to correct and prevent stock-outs, eventually leading to improved health outcomes for their communities.

IMPLEMENTATION

In early 2012, Logistimo won the Grand Challenges Explorations, awarded by the Bill and Melinda Gates Foundation, to develop a "cloud-based mobile supply chain platform that enables information sharing and decision support to maximize immunization coverage for children"[6] and a "mobile-phone based bulletin board for capturing and broadcasting availability

and demand information for vaccines and medicines".[7] The grant was used to fund the intervention at 29 PHCs in remote areas of Karnataka, India, operated by Karuna Trust[8] (a nongovernmental organization in India's public health-care space) under a private-public partnership with the Karnataka State Government.[9]

The implementation can be viewed through the stages of planning, deploying, and monitoring.

In the planning stage of the implementation, a baseline study was performed, the supply chain landscape was studied, and an infrastructure adequacy assessment was conducted.[3]

In July 2012, the deployment stage began when feature phones were procured for all last-mile stock managers and a one-day train-the-trainers model was used to train two Karuna Trust supervisors on the inventory management functionality of the Logistimo application. At the end of the training, supervisory responsibilities were defined and important collaterals, such as standard operating procedures (SOPs), user manuals, and support infrastructure details, were handed over.[10] The following week, supervisors trained last-mile stock managers, and all 29 PHCs went live on the Logistimo platform.

In the monitoring stage, the initial focus was to define key performance indicators (KPIs) for adoption, data quality, and supply chain performance.[11] After the definition phase, the KPIs were monitored until they reached acceptable levels, after which the focus shifted to data quality and finally to supply chain performance.

Data Quality

To ensure data quality, the people, process, and product components were addressed individually.

People

- Last-mile stock managers were made to realize that they are also the beneficiaries of the intervention and that technology is a tool that can aid them
- The capacity of last-mile stock managers was developed through high-quality training sessions followed by comprehensive test exercises
- Roles and responsibilities of last-mile stock managers and supervisors were clarified to all stakeholders
- A toll-free number was set up to address any technical roadblocks

Process

- District health officers were requested to allocate time to

discuss stock position as reported by the Logistimo application in monthly meetings with medical officers from the PHCs, thereby ingraining the intervention with existing processes mandated by the government
- Last-mile stock managers were mandated to perform a monthly audit of the physical stock and to update stock position using the application
- Clear SOPs were defined
- An escalation matrix was created to be used in cases of SOP violation.

Product

- A bulletin board was set-up to call out critical events that needed immediate attention and this information was broadcast in real-time on a strategically position television screen.[3]
- SMS alerts and voice notifications were automatically generated by the application to last-mile stock managers who did not follow SOPs.
- Comprehensive custom reports that highlight violation of SOPs by last-mile stock managers were emailed to supervisors periodically
- Data entry constraints, such as handling units and other thresholds to prevent data inaccuracies at the source, were built into the application

RESULTS

As a direct result of the intervention, 14 months after go-live, vaccine availability increased from 84% to more than 99%, and the replenishment response time improved by 64% across the 29 PHCs for the nine vaccines that were monitored.[3] Greater discipline in the stock-keeping process was another

direct result of the intervention, and almost all last-mile stock managers were active on the platform every week and followed all mandated SOPs. A total of 223,011 data points were available for consideration across the period of study.[3] An indirect result of the implementation was stakeholder buy-in. Dr. Pandu

Vijayan, the District Health Officer for Chamarajanagar district of Karnataka, India, stated that "My wish is that we adopt this system across all districts of Karnataka, I hope all communities enjoy the benefits of the system".[12]

The availability of vaccines at last-mile PHCs improved and these improvements have been sustained.

Trust in PHCs and community health outcomes have also improved significantly. In Karuna Trust's annual report for April 2015 to March 2016, 99% of all deliveries were institutional deliveries, and the infant mortality rate decreased from 11% in 2012 to 8.8% in 2016 in the catchment area of the PHCs.[13]

Today, five years after the deployment, 22 of the 29 PHCs that remain under the management of the Karuna Trust are still active on the Logistimo platform. In addition to vaccines, the PHCs now manage family planning commodities, mental health drugs, essential and emergency drugs, and surgical equipment on the application. The application is also used to manage orders and remotely monitor the temperature of vaccines.[14]

Despite improving availability, PHCs still face several operational challenges, such as a shortage of doctors, technicians, and nurses; poor accessibility; frequent power cuts; and high attrition in government staff, all of which are critical to improving health outcomes in the community.

LESSONS

- **Quality is as important as quantity**
  The quality of temperature-sensitive materials, such as vaccines, is a major concern due to unreliable cold chain equipment and an intermittent power supply. This seems to be a major reason for discarded vaccines, and remotely monitoring temperature could be a possible solution. In addition, last-mile stock managers do not always follow first-expired-first-out policies, which could result in stocking of expired materials.

- **Terminology matters**
  Initially, the activity of disposing stock was referred to as "wastage" in the application. Last-mile stock managers were reluctant to report "wastage" because they feared being questioned by higher authorities. Reporting improved once "wastage" was renamed "discards".

- **Document and share findings**
  Challenges are forgotten after they are resolved, and replicating deployments takes considerable time and planning. Documenting experiences and learning is important to aid future deployments. Making lessons learned publicly available promotes cross-learning across organizations working in the public health space.

- **Implementations restricted to a single echelon may not drive impact**
  It is very difficult to achieve availability and efficiency at the last mile when implementations are restricted to just one echelon. Last-mile stock managers find it difficult to influence higher-level stock managers who are not part of the implementation.

CONCLUSION

- **Utilize consumption-based inventory thresholds**
  Population-based methods of calculating inventory thresholds, such as buffer stock and minimum stock, are unreliable because population census data are not updated frequently. In addition, they fail to take into account the effect of migrants who represent a large portion of the population in rural areas of developing countries. Consumption-based methods are far more accurate than population-based methods at forecasting demand. To further improve the accuracy of consumption-based methods, it is important to draw a distinction between true and actual demand.

- **Pull stock from the last mile**
  Policies must allow last-mile stock managers to pull stock from higher-level stores. Last-mile stock managers are highly contextualized to local settings and should be given the power to order stock on demand.

- **Leverage existing resources**
  Existing workforce and grassroots organizations should be leveraged as much as possible to sustain implementation for the long term. The capacity of people at the last mile must not be underestimated—if they are provided with clear instructions and motivated the right way, even first-time users of technology in a work environment become adept at using novel technology in a short time. An example of such an implementation can be found in India, where UNDP has achieved extraordinary scale in deploying the eVIN (Electronic

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Vaccine Intelligence Network) across the country.[15]

- **Integrate technology vertically and horizontally**
  Many, if not all, echelons of the supply chain and different health commodities should be integrated into the same platform. It is very difficult to achieve end-to-end visibility and desired impact if interventions operate in silos. The burden on the users decreases if they have to operate only one platform. When the technology implemented is an open source solution, the likelihood of long-term sustainability improves.

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12 Vaccine Logistics in Karnataka. 2013. https://vimeo.com/89488545

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14 On request, access can be provided to the latest data on the Logistimo application

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PHARMACY ASSISTANT TRAINING PROGRAM IN MALAWI

BACKGROUND

Pharmacy workers represent the third largest group of health workers in the world. They are broadly responsible for procuring[1] and dispensing prescription medicines as well as counselling patients on rational medicine use.[2] In rural settings, the pharmacy worker is often a patient's first point of contact with the health system.[3] Rural pharmacy workers also provide continuity of care by helping patients manage chronic conditions, such as HIV/AIDS.[4] Ultimately, rural pharmacy workers play an important role in shaping health outcomes in low-and middle-income countries (LMICs) where the majority of the population lives in rural areas.

Malawi has a very low pharmacist density of 0.3 per 10,000 population.[3] The country also faces a sizable shortage of pharmacy support personnel (table 1), including pharmacy technicians and pharmacy assistants (PAs). This shortage is exacerbated by the inequitable distribution of the workforce across sectors (public/private) and geographies (rural/urban).[5] The brunt of the pharmacy workforce shortage is borne by rural facilities. In 2013, prior to the introduction of the Pharmacy Assistant Training Program, Malawi did not have trained pharmacy personnel at any of its 650 government health centers.

Table 1. Pharmacy Worker Density and Pharmacy Training Capacity in Malawi

PHARMACIST PER 10,000 POP	0.04
PHARMACY TECHNICIANS PER 10,000 POP	0.10
PHARMACY GRADUATES PER YEAR	8
# PHARMACY SCHOOLS	1
# PHARMACY TECHNICIAN SCHOOLS	1

Data Source: FIP Global Pharmacy Workforce Report 2015; World Bank Population Data 2015

The shortage has dire consequences for a country contending with the burden of HIV/AIDS, tuberculosis, and malaria.[6] In the absence of pharmacy workers, pharmaceutical management tasks are performed by overburdened clinical staff, hospital attendants, community health workers who should be in the field, or untrained custodial staff, leading to suboptimal use of human resources, inefficiencies, and unsafe pharmaceutical practices.[7] The shortage of pharmacy workers has contributed to frequent and avoidable medicine stock-outs in Malawi and has been linked to irrational medicine use in other countries in sub-Saharan Africa.[8]

The long-term impacts of the pharmacy workforce shortage are significant—access to medicines is limited, patient health suffers, and public health goals remain out of reach.

> "*I am a clinician by profession, serving a population of over 30, 000 in the 25 villages that my health center serves. I am the only clinician at the health facility with a single nurse to assist covering when possible. We recently lost the only health surveillance assistant that was trained as a drug clerk. This leaves me as the only clinician and also the only person to manage stocks in the medicine store. I undertake the majority of dispensing responsibilities as the hospital attendants that sometimes need to fill this role are not knowledgeable about medicines. When it's month end, I am also responsible for doing the physical inventory and producing a monthly report. Each of these tasks requires time away from my primary responsibility of treating patients. This results in less time with patients, and inadequate reporting of essential information required to manage inventory…*"
>
> — *Andrew Hauli, Health Center Manager Nyungwe Health Center, Malawi*

IMPLEMENTATION

VillageReach, in close partnership with the Ministry of Health (MoH) in Malawi, the Malawi College of Health Sciences (MCHS), the University of Washington Global Medicines Program, and USAID, implemented a two-year, certificate-level program to train and deploy an enhanced cadre of Physician Assistants to fill the gaps in Malawi's health workforce. The Pharmacy Assistant Training Program (figure 1) aimed to increase medicine availability and improve rational medicine use in rural health centers by improving:

- *Human resource allocation and the availability of pharmacy workers*
- *The quality of inventory management and record keeping*
- *Dispensing practices and pharmaceutical care provided to patients*

Recruitment

VillageReach worked with MCHS and its partners to recruit students who were likely to succeed academically (i.e. those with strong academic credentials and high scores on entrance exams) and were either from rural areas or had a desire to serve rural communities.

Recruitment efforts included advertisements in local newspapers, working with District Health Offices (DHOs) to advertise scholarships, interviews with candidates, and encouraging qualified MoH staff to apply. Advertising materials emphasized that the training is targeted at students willing to work in rural areas.

Classroom-based and Practical Training

The Pharmacy Assistant Training Program provides students with preservice training that includes classroom-based learning and two practicum placements (table 2). Students spend approximately 20 weeks per year on campus and another 20 weeks working at a practicum placement site. Practicum placement includes a district hospital attachment in year 1 of the program and a health center attachment in year 2. During their practicum, students are supervised by pharmacy technicians who serve as preceptors.

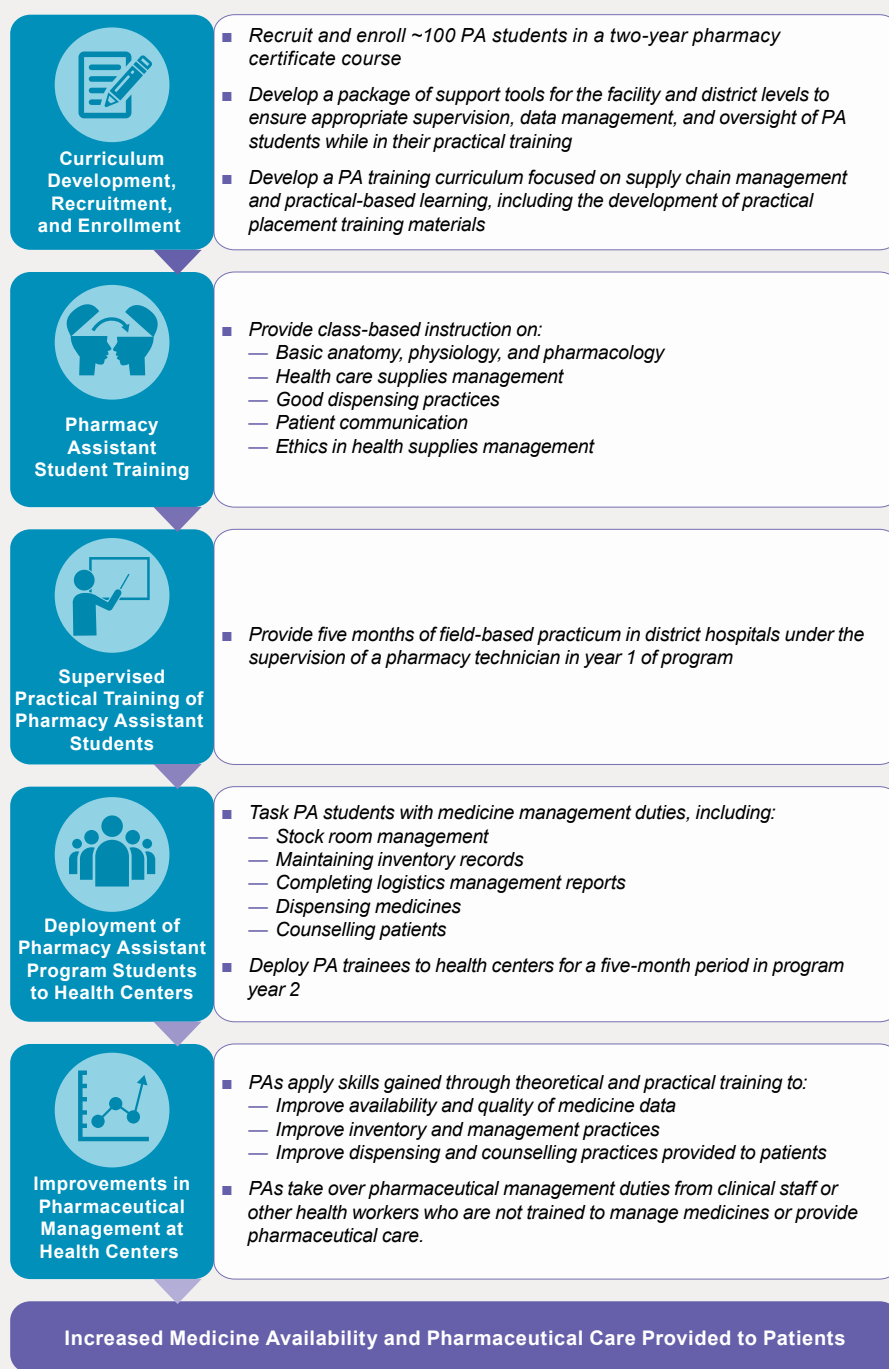Figure 1. Pharmacy Assistant Training Program Theory of Implementation

Curriculum Development, Recruitment, and Enrollment
- Recruit and enroll ~100 PA students in a two-year pharmacy certificate course
- Develop a package of support tools for the facility and district levels to ensure appropriate supervision, data management, and oversight of PA students while in their practical training
- Develop a PA training curriculum focused on supply chain management and practical-based learning, including the development of practical placement training materials

Pharmacy Assistant Student Training
- Provide class-based instruction on:
  — Basic anatomy, physiology, and pharmacology
  — Health care supplies management
  — Good dispensing practices
  — Patient communication
  — Ethics in health supplies management

Supervised Practical Training of Pharmacy Assistant Students
- Provide five months of field-based practicum in district hospitals under the supervision of a pharmacy technician in year 1 of program

Deployment of Pharmacy Assistant Program Students to Health Centers
- Task PA students with medicine management duties, including:
  — Stock room management
  — Maintaining inventory records
  — Completing logistics management reports
  — Dispensing medicines
  — Counselling patients
- Deploy PA trainees to health centers for a five-month period in program year 2

Improvements in Pharmaceutical Management at Health Centers
- PAs apply skills gained through theoretical and practical training to:
  — Improve availability and quality of medicine data
  — Improve inventory and management practices
  — Improve dispensing and counselling practices provided to patients
- PAs take over pharmaceutical management duties from clinical staff or other health workers who are not trained to manage medicines or provide pharmaceutical care.

Increased Medicine Availability and Pharmaceutical Care Provided to Patients

Table 2. Pharmacy Assistant Training Program Activities

	ACTIVITY	TASKS
1	Student Recruitment	▪ Place advertisements in local papers (The Nation and Malawi News) ▪ Send letters to all DHOs to advertise scholarships ▪ Encourage qualified MoH staff to apply through DHOs ▪ Conduct entrance examinations ▪ Recruit students of high academic caliber with a willingness to serve rural areas
2	Student Orientation	▪ Provide students with an initial 10-week orientation ▪ MCHS orients students on basic sciences and generic program courses ▪ MCHS orients students on the workbook exercises and code of conduct for the practicum
3	Training Material Development	▪ Develop a preceptor's manual that is distributed to all preceptors ▪ Develop a student workbook and distribute it to each student for use in practical placements
4	District Orientations	▪ Conduct three regional training meetings to orient DHOs, District Medical Officers, and pharmacy technicians to the Pharmacy Assistant Training Program and to the overall objectives and goals of the practical attachment
5	Preceptor Refresher Trainings	▪ Conduct refresher training for pharmacy technicians serving as preceptors of practical sites
6	Monitoring and Evaluation	▪ Conduct at least three rounds of supervision to practical sites each semester by a team comprising MCHS, MoH, and VillageReach ▪ Compile and share supervision reports after each supervision round with MoH, MCHS, and other partners ▪ Implement routine monitoring and evaluation plan to provide quarterly updates to all partners on progress of project
7	Practical Training Program Development	▪ Develop a practical training program for students for their district hospital attachment in year 1 and health center attachment in year 2 ▪ Develop orientation, training, and learning materials and assessment tools to ensure that quality is maintained at all levels and that practical experience is satisfactory for students, faculty, and preceptors
8	Health Center Practical Training Placements	▪ DHOs contacted to identify names of health centers suitable for student placements for their 20-week practical training ▪ Conduct orientation for supervisors of these health centers ▪ Place students at the selected health centers for their practical training ▪ Orient health center staff to the program
9	Supervision of Practical Training	▪ Develop supervision schedules in collaboration with MCHS lecturers ▪ Provide support for supervision in the form of supervision tools, approach, and logistical support ▪ Support teams from MCHS and MoH to conduct regular supervision visits to PA students training at practicum sites
10	Graduate Placement Strategic Development	▪ Work with MoH (Health Technical Support Services and Human Resources Management and Development) to develop and implement placement strategies for PA graduates ▪ Follow up with the MoH on the interviews, induction, and placements to ensure timely deployment of graduated students

RESULTS

Since the program was implemented, all students from the first cohort have graduated and remained in their posts for more than one year after deployment. Monitoring and evaluation (M&E) of the Pharmacy Assistant Training Program was conducted through supervisory visits to health centers where PAs have been deployed and a review of data and reports submitted by health facilities during student practicums. The evidence of impact of the Pharmacy Assistant Training Program was assessed using the following indicators:

▪ Storeroom management
▪ Medicine availability
▪ Data quality and report timeliness
▪ Pharmaceutical practice

Routine M&E data from the Pharmacy Assistant Training Program in Malawi demonstrates that deploying PA students to the last mile improves access to medicines and quality care in remote areas. Trained PA students in a health center leads to marked improvements in:

▪ Storeroom management, including organizing medicines to reduce the risk of expiration

▪ Availability of medicines
▪ Data reported to higher levels of the supply chain
▪ Patient pharmaceutical care, including adherence to proper dispensing practices and medicine management standards
▪ Use of human resources by reducing the burden of logistical tasks on clinical staff

Additionally, an impact evaluation conducted by the University of Washington showed that children living in households near health centers with PA students are

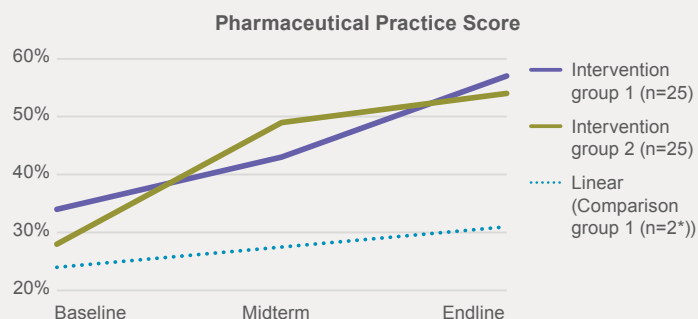PA graduate Esther Kantwera in a Malawi storeroom

significantly more likely to seek and receive treatment for malaria compared to children living in households near health centers without pharmacy personnel.[9]

As a result of the program, patients get better access to medicines and receive better care. In the long term, this program has the potential to improve health outcomes among patients in rural settings. M&E results from the Pharmacy Assistant Training Program are shown in figures 3a-3c.

Figure 3a. Pharmacy Assistant Training Program evidence of impact
A performance assessment of the initial cohort of pharmacy assistant students deployed to health centers in 2014–2015 illustrates evidence of impact on health facilities.

Pharmacy assistant students improve pharmaceutical management at health centers

Pharmaceutical Practice Score

- Intervention group 1 (n=25)
- Intervention group 2 (n=25)
- Linear (Comparison group 1 (n=2*))

Metric: Pharmaceutical practice measured quality of care, information patients receive when they are dispensed treatments, and the cleanliness and organization of the dispensing environment.
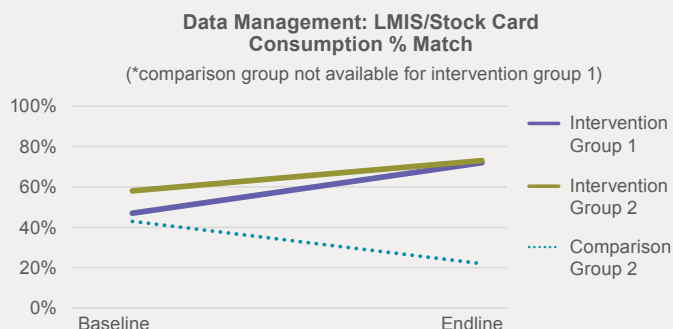
Finding: Average score for pharmaceutical practice increased by 43% in health facilities served by PA students during student practicums.

Implication: PA students enhance the quality of pharmaceutical care provided to patients at health centers. This promotes rational medicine use and can improve health outcomes in the long run.

Figure 3b. Pharmacy Assistant Training Program evidence of impact
A performance assessment of the initial cohort of pharmacy assistant students deployed to health centers in 2014–2015 illustrates evidence of impact on health facilities.

Pharmacy assistant students improve data management at health centers

Data Management: LMIS/Stock Card Consumption % Match

(*comparison group not available for intervention group 1)

- Intervention Group 1
- Intervention Group 2
- Comparison Group 2

Metric: Data management measures the match between medicine stock on hand and what is reported on the monthly Logistics Management Information System (LMIS) form as ending stock balance.

Finding: Average score for data management increased by 40% in health facilities served by PA students during student practicums.
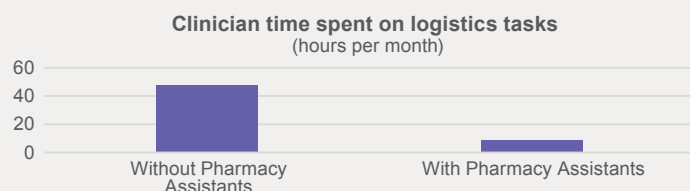
Implications: PA students improve the quality of timeliness of medicine data reported, thereby providing greater visibility of medicine availability at health centers. This is a critical step for ensuring medicine availability at health centers.

Figure 3c. Pharmacy Assistant Training Program evidence of impact
A performance assessment of the initial cohort of pharmacy assistant students deployed to health centers in 2014–2015 illustrates evidence of impact on health facilities.

Pharmacy assistant students improve clinical workflow

Clinician time spent on logistics tasks
(hours per month)

60	
40	
20	
0	

Without Pharmacy Assistants — With Pharmacy Assistants

Metric: Clinical time spent on logistical tasks measures how much time clinical staff spend on tasks that should be performed by pharmacy workers.

Finding: Clinician time spent on logistics tasks decreased by 81%, from 48 hrs/month to 9 hrs/month in facilities served by PA students.

Implications: PA students allow clinical staff to focus on their primary duties of clinical care, thereby reducing clinician workload.

LESSONS

- **Practical training is integral to the program**
  By spending almost half of the two-year program in the field, PA students gain hands-on experience in patient care and logistics management and more thoroughly understand the challenges of the settings in which they will work. An added benefit of the practicum placements is that students have an immediate impact on the health system by improving medicine management and pharmaceutical practice at their practicum sites, even before earning certificates.

- **Training mid-level pharmacy workers helps make optimal use of scarce human resources for health at the last mile**
  As workers dedicated to medicine management, PAs help clinicians focus on clinical care provision. In doing so, they allow doctors and nurses to make most of the short amount of time they spend with patients (estimated to be 2.3 minutes per patient in Malawi[10]). Further, they provide the checks and balances needed to ensure that patients are prescribed and dispensed the right medicines and provided the right information about medicine use.

- **Mid-level pharmacy workers are likely to serve rural areas**
  PAs require shorter preservice training and less education than pharmacists.[11] The shorter training period enables rapid scale up of this workforce to address shortages in rural areas. While this training equips workers to effectively fulfill pharmaceutical and supply chain duties, it does not qualify them for jobs in other sectors or geographies in the way that a pharmacy degree would, making PAs less susceptible to internal or external brain drain.[12]

PA student practicum training in Malawi

- **Recruitment strategies can help retention**
  Interviewing candidates is a critical step in the recruiting process. It provides an opportunity to screen candidates and determine who will be best fit to serve rural areas, which will help ensure retention during training and after graduation. This recruitment strategy proved successful, with a 100% retention rate of the first cohort of PA students, who remained in their rural posts for more than one year after deployment.

- **Cohort size is an important factor in maintaining the quality of training provided**
  Due to current training capacity gaps, a cohort of 100 PA students was found to be challenging to manage. Based on our experience, smaller cohorts of 50 to 75 would be ideal to maintain the quality of the practicum supervision.

- **Government engagement in early stages of the program is a critical success factor**
  The Malawi MoH requested that the Pharmacy Assistant Training Program be re-established and was involved in implementation from the onset. The direct support and advocacy from the MoH has been critical to the success of the program and has led to the enrollment of additional student cohorts at MCHS.

CONCLUSION

The pharmacy workforce is an integral component of a functioning health system. Pharmacy personnel enable the smooth functioning of the health supply chain and facilitate clinical care in health facilities. In doing so, they can help shape health outcomes in countries. Investments in strengthening the pharmacy workforce can help improve the quality of care at the last mile.

The Pharmacy Assistant Training Program is an effective strategy for addressing the shortfall of pharmacy workers in LMICs. A complete health care workforce—including pharmacy personnel—allows for a more efficient allocation of tasks, which improves the care patients receive

and ultimately improves their health. PAs and PA students have already made noticeable improvements to the management of medicines and dispensing practices. Ultimately they can help improve medicine availability at the service delivery point.

There is interest from the government and donors to maintain and enhance this program through

support of future student cohorts and a desire to expand the program to new training institutions. Maintaining the high quality of training, including supervision and continued technical support, is critical for the program and for the overall improvement of medicine management and pharmaceutical practice at the last mile.

> "*I am completely relieved to have this additional workload of dispensing and inventory management taken over by those specially trained to do the job through the introduction of the Pharmacy Assistant Training Program. Through the Pharmacy Assistant Training Program, our health center receives one student who has already received training in the areas of dispensing and inventory management—more training than anyone currently working at the health center, including myself.*"
>
> — Andrew Hauli, Health Center Manager Nyungwe Health Center, Malawi

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About VillageReach

VillageReach is a non-profit global health innovator that develops, tests, implements and scales new solutions to critical health system challenges in low-resource environments, with an emphasis on strengthening the "last mile" of healthcare delivery. Through partnership with governments, local communities and other non-governmental organizations, VillageReach combines expertise across public health, technology, and the private sector to bring life-saving innovation to scale and sustainability in the world's most underserved communities.

www.villagereach.org

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IMPROVED PHARMACEUTICAL INVENTORY MANAGEMENT IN NAMIBIA THROUGH MONITORING TRAINING PLANNING

BACKGROUND

Namibia is challenged by a high burden of HIV, estimated at a prevalence of 13.3% among adult 15–49 years old and a TB/HIV co-infection rate of 40% in 2015. In response to the HIV burden, the Government of the Republic of Namibia scaled up antiretroviral therapy (ART) services to more than 80% coverage in 2011 and 2012. The high infectious disease burden stretched the public health system, and efficient systems were critical for ensuring uninterrupted access to quality pharmaceuticals and services.

As Namibia continued the rapid scale up and roll out of its HIV/AIDS program in 2011 and 2012, the need for appropriate pharmaceutical inventory management became critical for the consistent availability of and access to ART services at the point of care.

Namibia's Ministry of Health and Social Services (MoHSS) manages approximately 350 public health facilities in 14 regions. It operates a Central Medical Store at Windhoek and two Multiregional Medical Depots (MRMDs) (figure 1).

Decentralization of ART services to primary health care (PHC) facilities and outreach points in Namibia has

Figure 1. MoHSS pharmaceutical pipeline
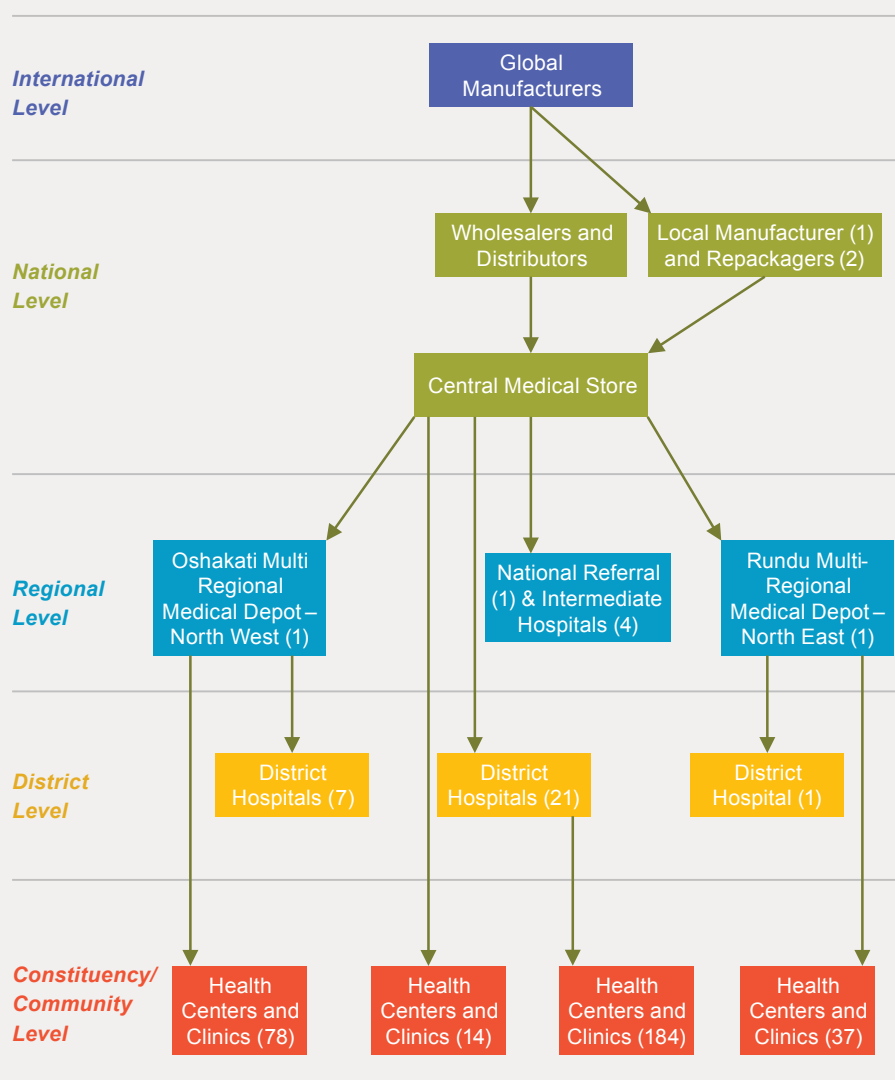
Key: → Product Flow (#) = Number of entities

increased the burden of inventory management at peripheral health facilities. More than 90% of PHC facilities were run by nurses and did not have pharmacy staff, which necessitated enhancing the skills and knowledge of nurses on pharmaceutical inventory management of antiretroviral (ARVs) and other essential medicines. The MoHSS was cognizant of the challenges at the PHC level mainly in terms of ordering for resupply of medicines, stock accuracy, and cold chain management.

A quarterly report of the USAID-funded Supply Chain Management System project (USAID/SCMS, 2011) based on health facilities served by the Oshakati MRMD showed that the MRMD had been managing five interim orders against two main orders per facility per quarter during the nine months of implementation; this was attributed to a lack of inventory control and the ordering skills of nurses at the PHC facility level. The numerous interim orders from PHC facilities, many of which had inaccurate order quantities, was identified as a major challenge in the effectiveness and efficiency of operations at district hospitals and the Oshakati and Rundu MRMDs, which supply PHC facilities.

To address inefficiency, SCMS collaborated with the MoHSS to implement the Monitoring Training Planning (MTP) approach for improving inventory control and good storage practices. The MTP approach was reinforced by mentoring and on-the-job training (OJT) for 12 months (October 2012 to September 2013).

Following the successful implementation of the intervention at 19 PHC facilities, the MoHSS adopted the MTP approach for countrywide improvement of pharmaceutical inventory management.

IMPLEMENTATION

The implementation was done in two phases. Phase one covered 19 PHC facilities whose practices were evaluated against baseline status and 17 control (nonintervention) facilities. Phase two covered the roll out of the intervention countrywide.

Figure 2. Chronological flow of the intervention and key milestones in pharmaceutical inventory improvement processes

Preparation Mar–Sep 2012
- Facility selection
- 19 facilities baseline assessment
- Training and action planning

Phase I Oct 2012–Sep 2013
- 19 facilities phase implementation
- 2 structured follow up visits per facility in 12 months
- Tools and guidelines disseminated
- Feedback provided

Evaluation of Phase I Oct 2013
- 19 intervention and 17 control facilities
- 36 nurses and pharmacist assistants involved
- SCMS and MRMD principal pharmacists involved in evaluation
- Disseminated the findings

Phase II 2014 to date
- 65 PHC facilities assessed countrywide
- Multidonors support for intervention
- Standard operating procedures and manuals revised
- Training of trainers conducted for 22 MoHSS staff
- 20 trainings and 408 people trained
- Annual assessment with on-the-job support

Phase 1: Implementation at 19 PHC Facilities

Based on the evidence collected from MRMDs, SCMS supported the MoHSS to adapt and implement the MTP approach, supported by mentoring and OJT, to enhance the skills of nurses in inventory management at 19 PHC facilities. The MTP approach is a Management Sciences for Health (MSH) pharmaceutical management methodology used for performance improvement by providing mentoring and OJT at selected PHC facilities.

The intervention began with problem identification through a baseline assessment conducted in March 2012. An analysis of pharmaceutical distribution data from 19 health facilities served by the Rundu and Oshakati MRMDs and hospitals found that poor inventory management practices were the root cause of interim orders from PHC facilities. Frequent interim orders of
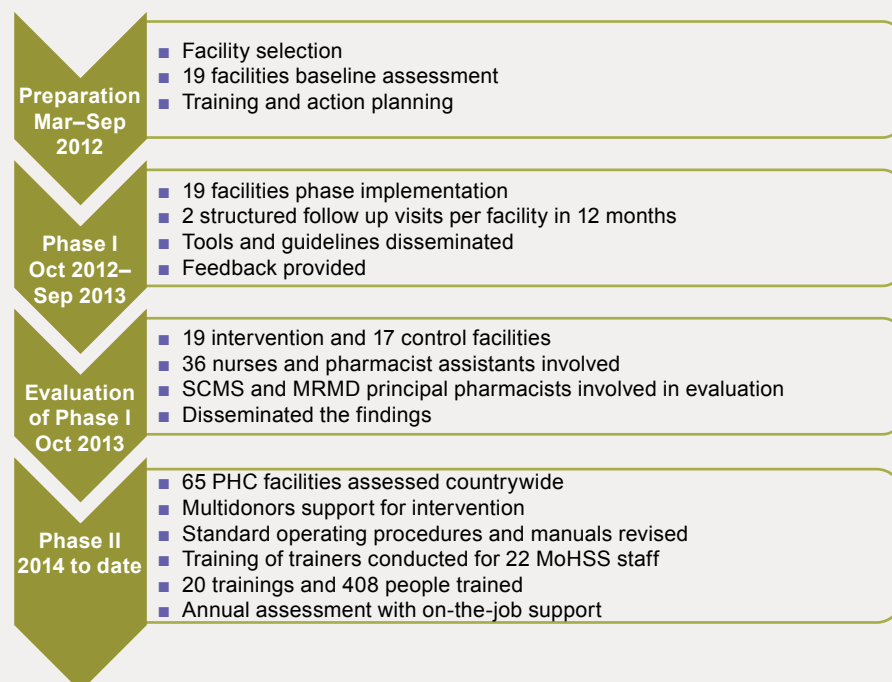
pharmaceuticals by PHC facilities reduced efficiency of the MRMDs and hospitals. Orders containing errors wasted the time of already constrained human resources. The baseline findings guided interventions at selected PHC facilities.

The MRMD selected 19 health facilities in immediate need of capacity building on inventory control and storage practices. SCMS, in collaboration with the two MRMD principal pharmacists, conducted a five-day training in June 2012 for 25 nurses. The training covered basic concepts of inventory control and good storage practices. At the end of the training, trainees drafted action plans, which they finalized with their health facility supervisors in August 2012.

The intervention incorporated a follow-up mentoring program involving targeted OJT through two structured support visits conducted in a 12-month period. The OJT was supported by posters and job aids showing good storage practices, the Namibia Essential Medicine List (Nemlist), standard operating procedures (SOPs), and problem-based discussions at health facilities. Documented feedback on observations of PHC facilities' inventory control and storage practices and improvement strategies were provided on site, and written feedback was communicated to facility managers. The intervention was implemented from October 2012 to September 2013, after which a postintervention evaluation was conducted.

A comparative assessment of 19 intervention facilities and 17 control facilities was done to compare

inventory control and storage practices. Thirty-six nurses and pharmacist assistants participated in the assessment. Data were collected October 13–25 and November 10–23, 2013, by SCMS senior technical advisors and the two MRMD principal pharmacists. The team discussed challenges and provided verbal feedback in all health facilities visited and with the regional directorates and pharmacists. Selected inventory control and storage practice indicators and trends of improvement were compared.

The Government of Namibia accepted the reported recommendations of the MTP approach to inventory control and storage practice improvement. The findings, conclusions, and recommendations of the intervention at the 19 PHC facilities motivated the MoHSS to adopt and roll out the MTP approach with OJT to facilities countrywide as a cost-effective strategy for improving inventory control and storage practices. In 2014, the Government included all PHC facilities in the improvement program.

Phase 2: Countrywide Implementation

The MoHSS, with technical support from SCMS and the Systems for improved Access to USAID-funded Pharmaceuticals and Services (SIAPS) program, collected baseline data on inventory control and storage practices from 65 PHC facilities during the national pharmaceutical support supervision visits (SSVs) in February and March 2014. This was followed by a revision of the old SOPs for hospital pharmacies and the Manual for Medicines and Medical Supply Management for PHC facilities in November 2014. Using

these guidelines, SCMS, SIAPS, and the MoHSS conducted a five-day training of trainers in November 2014 for 22 regional pharmacists, hospital pharmacists, pharmacist assistants, PHC supervisors, and nurses.

The training equipped participants with knowledge and skills on basic inventory control and good storage practices as well as skills for facilitating and evaluating adult learning and developed plans of action that participants used for rolling out trainings in their respective regions.

Between 2015 and 2017, guidelines and tools, SOPs for hospital pharmacies, the Manual for Medicines and Medical Supply Management, and Nemlist were printed and distributed to PHC facilities; 20 trainings were conducted in all 14 regions of Namibia. A total of 408 nurses and pharmacist assistants were trained on inventory control and good storage practices with support from SCMS and SIAPS. Regional pharmacists have mentored and provided OJT to PHC facilities in their respective regions. Results were measured annually in February and March between 2014 and 2017 and were compared with the baseline inventory control and good storage practice indicators, including storage conditions, stock card use at PHCs, and EPI vaccine management. The three indicators primarily assess product availability, stock accuracy, order accuracy, good storage parameters, vaccine availability, and vaccine quality assurance. Data were entered into Excel for analysis. Summary data, findings, and recommendations were compiled into annual national pharmaceutical SSV feedback reports.

Nurses at PHC facilities reported that the interventions helped them improve their work. One nurse who had worked at Sangwali HC since 1992 said that the inventory management training conducted by

SCMS in 2015 was her first-ever training on the subject.

This phase was made possible by the Government's commitment and by technical and financial support

from the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) and PEPFAR through USAID. USAID support was provided through SCMS and SIAPS, both of which were implemented by MSH.

RESULTS

Results from Phase 1

A marked improvement was noted on several inventory control parameters (figures 3 and 4). Stock accuracy increased by 11% for the intervention facilities, and the percentage of health facilities indicating min-max on stock cards more than doubled (40% increase). The interim orders from the intervention facilities decreased from an average of five to two (table 1). Control facilities were placing twice as many interim orders per facility than were intervention sites during the evaluation period.

Figure 3. Baseline and postintervention inventory control indicators for intervention facilities (2012–2013)
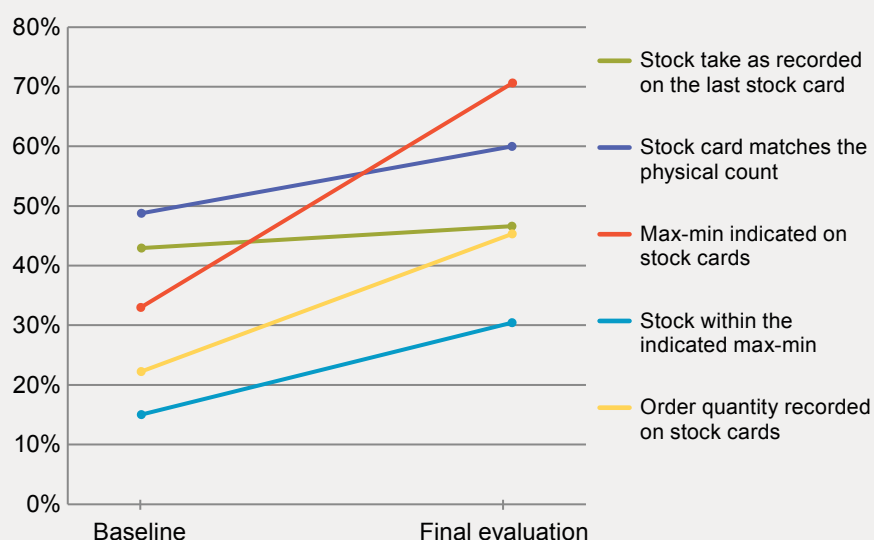

Figure 4. Baseline and postintervention inventory control parameters for intervention and control facilities
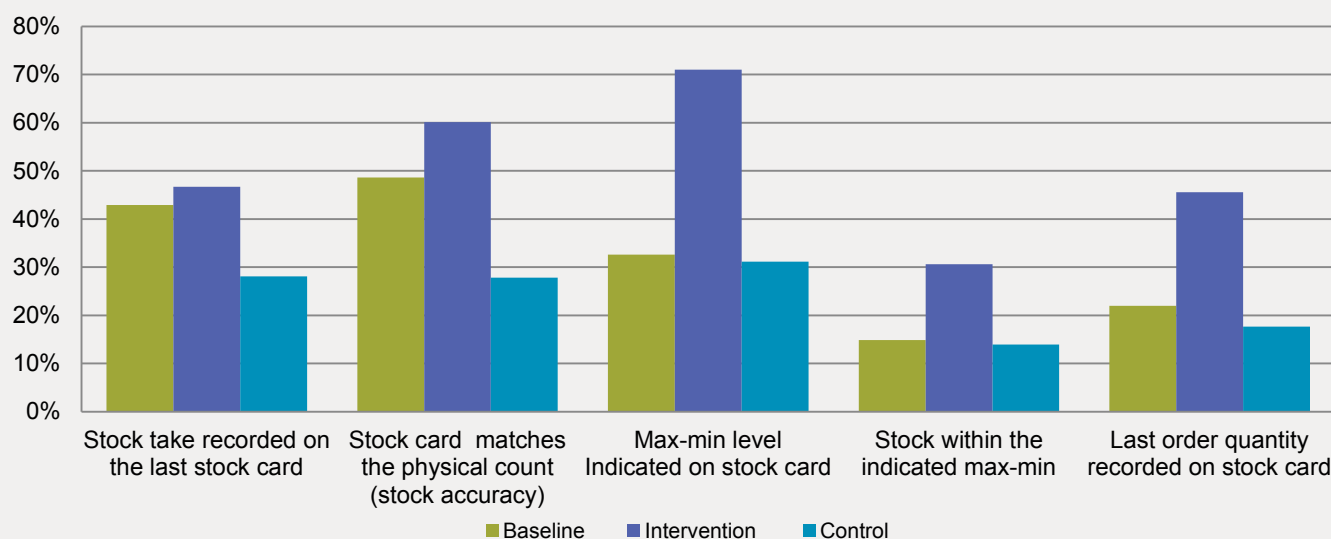
Table 1. Status of Emergency Orders for Pharmaceuticals at Intervention and Control Facilities; Results from Phase 1 (2012–2013)

| HEALTH FACILITY	TOTAL EMERGENCY ORDERS	AVERAGE EMERGENCY ORDERS PER FACILITY PER QUARTER	PERCENT FREQUENCY
Baseline (19 intervention facilities)	103	5	-
Final evaluation (19 intervention facilities)	44	2	37%
Control facilities (17) (final evaluation)	74	4	63%

Results from Phase 2

Figure 5 shows the average improvement of inventory control and good storage practice indicators over three years. The summary results show that overall medicine and medical supply management at PHC facilities improved by 26%, PHC facilities' storage assessment scores improved by 17%, and stock card use improved by 20%. Medicine supply management is the aggregate result of many contributing indicators measured during the SSVs. The use of the stock card at health facility enabled the monitoring of stock-outs, order calculation, and stock accuracy. EPI vaccines management, a core function at the PHC level, increased by 21%.

Figure 5. Inventory control and good storage practice indicators 2014–2017
(Source: MoHSS annual pharmaceutical SSV national feedback reports, 2017).
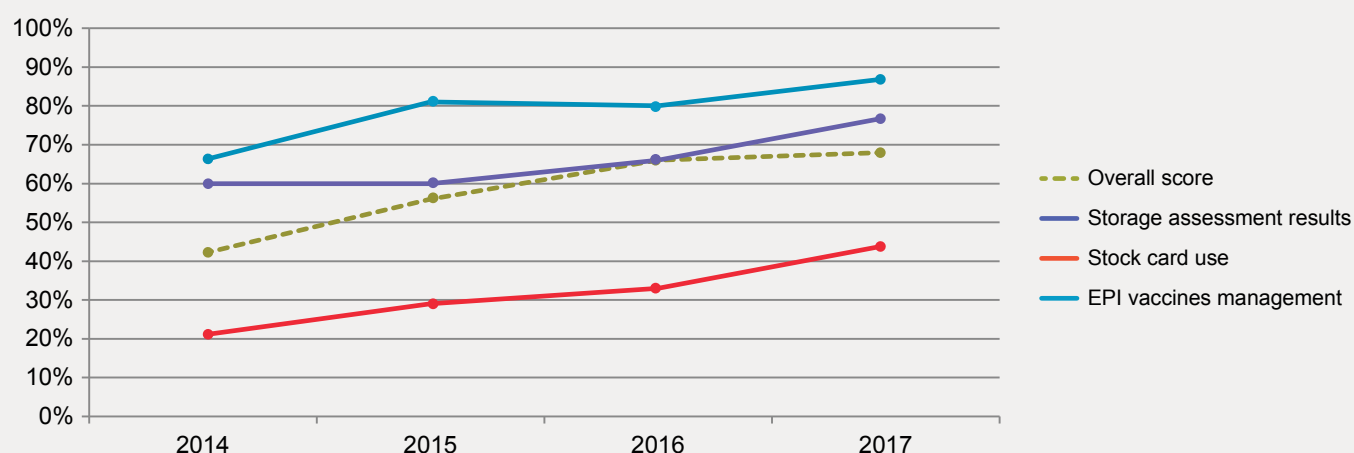
LESSONS

- Governments can adopt innovative approaches that are implemented and yield positive results. Government buy-in and subsequent support for implementation is essential for the continuity of such intervention strategies.

- Decisions based on country-specific data support buy-in for continued implementation and can be used to advocate for needed funding, such as that obtained from the GFATM. The GFATM committed resources for scaling-up the inventory control and storage practice improvement program countrywide, with technical support provided by SCMS and SIAPS and funded by USAID.

- Capacity building of available cadres, in this case nurses, rather than waiting for pharmacy professionals at PHC facilities, is needed because pharmaceutical service delivery continues with or without pharmacy professionals, resulting in the need to ensure quality of care by enhancing the skills of available cadres. Such support ultimately benefits patients.

- A training of trainers enhanced the capacity of regional pharmacists and PHC supervisors and built a critical mass of experts who played a key role in the rapid roll out of the intervention.

- Nurses generally lack inventory control and storage practice skills, and it is reported that the interventions helped them improve their work.

CONCLUSIONS

A structured and systematic MTP approach augmented with mentoring and OJT for health workers through regular support visits improved pharmaceutical inventory management at PHC facilities run by nurses.

This approach can be scaled-up to support the decentralization of ART services to peripheral health facilities. Regional pharmacists should provide quarterly SSVs and mentor PHC staff on proper inventory control and storage practices.

The enhanced MTP approach is implementable in several pharmaceutical management areas, including improving rational medicine use indicators, where results could be monitored.

These lessons can be shared with other low- and middle income countries and with development partners to categorically identify the specific problems and implement interventions using the MTP augmented with OJT and regular mentoring visits.

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IMPROVING TB SYSTEMS AND SERVICES THROUGH STRONGER COMMUNITY HEALTH LEADERSHIP, MANAGEMENT, AND GOVERNANCE

BACKGROUND

The devolution of health services to local government units (LGUs) in the Philippines through the Local Government Code of 1991 brought new challenges to the management and delivery of public health services at the local government and barangay (community) levels.[1] With devolution, LGU executives and barangay councils are now responsible for the general control and supervision of health personnel and facilities; delivery of health services; and formulation and enforcement of ordinances related to health, nutrition, sanitation, and are in charge of creating an environment conducive for establishing partnerships with all sectors at the local level.[2] However, most LGU and barangay elected leaders are not well equipped to lead and manage health programs. Thus, the delivery of quality health services remained weak, particularly in poor communities.

The USAID-funded Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program and the Quezon City Health Department implemented the Barangay Health Management Council (BHMC) initiative to strengthen the community-level health system to improve service delivery. BHMCs work as teams to enhance health leadership, management, and governance. By increasing capacity for health program stewardship, community health management, and stakeholder participation, health system strengthening can be achieved effectively, efficiently, and sustainably using the community's resources and lead to better health services.

IMPLEMENTATION

SIAPS provided technical leadership to the BHMC initiative using the National Tuberculosis (TB) Control Program as the model to implement:

- *BHMC conceptualization and establishment*. SIAPS worked with QCHD to develop the BHMC concept, including its purpose, objectives, and structure. It helped draft terms of reference, including roles and responsibilities of the BHMC chair and secretariat; provided suggestions on membership; and advocated with local health officials and community stakeholders to collaborate on BHMC implementation. SIAPS convened initial meetings with health officers, barangay officials, and community stakeholders to discuss the need for establishing BHMCs.[3]
- *Capacity building*. SIAPS improved BHMC capacity to organize and conduct effective meetings; analyze and use health information for decision making, planning, and setting strategic direction; coordinate stakeholder activities; promote stakeholder collaboration and cooperation; mobilize community resources; monitor the implementation of BHMC plans; and evaluate results. At the city level, SIAPS defined the roles of staff from District Health Offices and the Barangay Operations Center and improved their capacity to plan, monitor, and evaluate BHMC scale up in the city.
- *BHMC piloting*. In late 2011 and 2012, SIAPS provided technical assistance for piloting the BHMC in Barangay Payatas, an urban-poor community in Quezon City. Technical assistance focused on action planning, monitoring implementation, addressing implementation problems, and evaluating results. The results of the pilot implementation were reported to LGU officials in 2013.
- *BHMC planning workshops and meeting facilitation*. SIAPS assisted BHMCs in organizing and facilitating planning workshops, analyzing the community health situation, conducting problem and root cause analyses, prioritizing problems, and developing action plans. The workshops were designed to facilitate the active involvement of barangay officials and stakeholders, promote consensus building and evidence-based decision making, and focus on problems that are solvable

at their level to generate positive results in the short term. In addition, advice was provided to address implementation problems during BHMC meetings and to foster collaborative problem solving.

▪ *BHMC scale-up*. SIAPS organized planning workshops, field visits, and meetings to support BHMC organizing activities, action planning, implementation, and monitoring

and evaluation (M&E) activities. With SIAPS support, BHMCs were established in selected barangays in the six city districts.

▪ *M&E activities*. SIAPS developed performance indicators and provided guidance in integrating M&E activities into action plans. SIAPS helped analyze monitoring results, address program implementation problems, and formulate interventions.

▪ *Institutionalizing and sustaining the BHMC*. SIAPS helped develop the city ordinance entitled "Establishing Guidelines for the Creation of a Barangay Health Management Council" (2014, amended in 2015) and the draft implementing rules and regulations and provided input on BHMC barangay resolutions.

RESULTS

Improved leadership and management

▪ *Improved alignment of barangay and health center priorities*. Prior to the BHMCs, most barangay officials identified health priorities without guidance from health managers that were rarely based on a sound analysis of the community's health situation. Health managers prioritized objectives based on national priorities and rarely involved community stakeholders or elected barangay officials. BHMCs provided a platform for information sharing and consensus building among community health officers, barangay officials, and stakeholders to produce a unified community health action plan. This led to a better understanding of the health situation; better alignment of barangay and health center priorities, objectives, and resources; and shared commitments from political and health leaders to take preferential action to benefit the poor and most vulnerable in the community.

▪ *Generation and use of sound information for decision making*. Comprehensive health situational analyses were conducted using

community data to identify root causes of the health challenges and needs of the community. BMHCs used these analyses to inform action plans and activities and to determine resources to implement the plans.

Improved governance

▪ *Unified barangay health action plan and budget.* Since health staff, barangay officials, and stakeholders now work as one team, each BHMC develops a single, unified action plan and health budget for the barangay. As a result, duplicative efforts are avoided and BHMCs are able to leverage additional resources to address health problems. Before BHMCs, health budgets came mainly from the LGU health department; now they comprise funds from the barangay, city health department, and stakeholders.

▪ *Increased transparency, inclusiveness, and participatory decision making.* The participation of health officers, barangay officials, and stakeholders in the planning process and regular meetings resulted in increased involvement and transparency. To foster community engagement, BHMCs include representatives from civic groups for the elderly and disabled,

schools, transportation groups, and other sectors in the barangay in BHMC activities.

▪ *More accountability*. Increased transparency in identifying priorities, joint planning activities, reporting results, and the use of resources helped improve accountability.

▪ *More effective advocacy efforts*. The availability of robust data from the situational analysis and program indicators and improved visual presentation of pertinent information enabled health managers to be more effective in their advocacy efforts.

▪ *Fostered an environment for stronger community health leadership, management, and governance*. An important milestone in the scale up of the BHMC model was achieved with the passage of the city ordinance that established the guidelines for scaling up BHMCs in the city. Barangays also formulated resolutions to support the operation of BHMCs, including the provision of a yearly budget.

Improved program implementation

▪ *Improved coordination of efforts*. The improved coordination among stakeholders reduced duplication

of efforts and increased cooperation and collaboration.

- *Involvement of new partners*. Previously uninterested groups from the private sector and academia are now providing financial, material, and technical support to strengthen the delivery of health services.
- *Implementation of M&E activities*. BHMCs developed and used M&E plans linked to their action plans using indicators from SIAPS to monitor progress and report results.

Improved health systems performance[4]

- *Increased financial resources for health.* The increased involvement of barangay officials in the BHMC planning process sparked interest and motivation to address priority health needs, especially among the poor and most vulnerable. Officials helped mobilize funds from the barangay council and other community resources that enabled BHMCs to introduce new activities and improve the implementation of health services. improve accessibility of services.
- *Infrastructure improvements to improve accessibility of services*. Several BHMCs established new facilities to improve access to services and existing facilities. This helped bring services closer to the people. As a result, more patients were reached, TB case detection increased, and patients' out-of-pocket expenses decreased.

- *Improved health worker availability and deployment*. Increased funding and collaboration among health officers, barangay officials, and stakeholders enabled BHMCs to recruit additional staff, redeploy existing workers, and mobilize additional human resources from the community to fill workforce gaps.
- *Increased coverage*. As of June 2016, 17 functional BHMCs had been established, covering 45 of 142 barangays (32%) and reaching a population of 1.3 million (40% of the city's population).
- *Availability of essential medicines, diagnostics, and medical equipment*. Some BHMCs have procured medicines to address shortages and medical equipment to improve outreach services. Community partners provided TB medicines and supplies, which ensured continuous availability at health centers. Remote smearing stations were established in difficult-to-reach areas to improve accessibility to diagnosis and treatment (Payatas).
- Increased TB case finding and improved turnaround times for TB diagnosis and treatment. Poor access to chest X-rays is a barrier to TB diagnosis. Improved coordination and collaboration among nongovernmental organizations (NGOs) and health centers led to more available and affordable X-rays. The turnaround time for the diagnosis of smear-

negative cases decreased from one month to three days and increased case finding. The detection of smear-positive cases increased by 17% between 2011 and 2014 through better coordination between NGOs, health centers, and community volunteers and partners; sharing of diagnostic and treatment services; increased laboratory services (smearing stations); and increased identification and referral of presumptive TB cases.

- *Increased case finding of pediatric TB cases and access to prophylaxis or treatment*. Some BHMCs used their own funds to ensure the availability of tuberculin skin test kits and pediatric TB medicines to intensify case findings in daycare centers. Among children screened from two barangays, 22 were diagnosed with latent TB infection and given isoniazid preventive therapy, and 16 had active TB and started on treatment.
- *Improved performance of other health programs*. In some BHMCs (Libis), better management of the dengue program led to better community awareness, early detection and management of cases, and removal of mosquito breeding places. In Old Balara, BHMC-supported information campaigns resulted in more antenatal care visits and facility-based deliveries.

LESSONS

- Organized and focused community participation strengthens health programs even in resource poor communities by enabling communities to act effectively to overcome health challenges.

- With increased capacity and understanding, community leaders are motivated and confident to address the health challenges using their community's financial and human resources.

- Simple and culturally appropriate capacity building approaches are crucial to address institutional, community, and individual needs.
- Technical assistance must enhance, rather than replace,

existing capacities and structures in the community. In some cases, new technologies may be introduced provided that they are culturally acceptable, effective, affordable, and sustainable.

- Leadership and management practices, such as decision making, direction setting, coordinating, planning, monitoring, evaluating, communicating, and conducting effective meetings, must be enhanced and made appropriate and simple for nonprofessional managers typically found in the community.
- The BHMC experience suggests that the team approach to health stewardship and program management is more effective and sustainable than the traditional individualistic model.

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CONCLUSION

The BHMC model as implemented in Quezon City demonstrated its potential to strengthen the community-level health system, improve service delivery, and increase health program performance and results. The implementation of BHMCs was anchored in the TB program but can easily be adapted to other health programs. The model is feasible in highly urbanized centers but can be easily modified for rural communities or barangays.

Building the capacity of barangay elected officials, health workers, and other stakeholders in leadership, management, and governance practices is necessary to enable them to act as good stewards and managers. Capacity building should focus on strengthening structures, roles, functions, mandates, and processes as well as individual practices and skills. The technical assistance provided by SIAPS helped the BHMCs solve their health problems with their own capacity together with community stakeholders.

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STRENGTHENING THE LEADERSHIP AND MANAGEMENT OF PHARMACEUTICAL SERVICES IN SOUTH AFRICA

BACKGROUND

South Africa's health system is under enormous strain. A sizeable and increasing number of people suffer from chronic diseases. The country has the largest population living with HIV, estimated at 7 million, and an HIV prevalence rate of 19.2% among adults 15 to 49, and it had 180,000 HIV-related deaths in 2015.[1] South Africa also has the highest number of people on HIV treatment—nearly 2.6 million—and has committed to nearly doubling that number in the next few years.[2] It has a significant burden of tuberculosis (TB), including multi- and extensively-drug resistant TB. Maternal, neonatal, and child mortality is also high.

At the same time, progress in reversing the tide of HIV and TB deaths has led to longer life expectancies. The country's burden of communicable and noncommunicable diseases and its rapidly growing patient population have significant implications for the delivery of pharmaceutical services. Pharmacy managers face multiple leadership and management challenges that they may not be adequately prepared to handle. They need to respond to the complexity of the health challenges within the context of difficult conditions, including busy facilities with a high volume of patients requiring pharmaceutical services, a lack of human resources in terms of available and qualified pharmacy personnel, and a lack of other resources. These issues can impede efficient pharmaceutical service delivery and profoundly impact patient care.

IMPLEMENTATION

South Africa's National Department of Health and provincial heads of pharmaceutical services identified the need to strengthen the leadership and management capacity of pharmacy personnel through an in-service training program. In response, the USAID-funded Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program, implemented by Management Sciences of Health (MSH), introduced management training for pharmacy personnel. The training is based on the framework behind MSH's Leadership Development Program (LDP), which is a team-based, results-oriented process that has been implemented in more than 40 countries since its launch in Egypt in 2002.

The LDP uses an experiential learning method in which participants learn through a cycle of doing and reflecting on what they have done and a challenge/feedback/support model in which teams choose a specific challenge; create an action plan; and receive feedback from managers, facilitators, colleagues, and other stakeholders.[3] It also utilizes the Challenge Model, in which participants create a shared vision and define one measurable result, assess the current situation and identify opportunities for action, define their challenge and select priority actions, develop an action plan with measurable indicators, implement their action plan, and monitor and evaluate their progress toward achieving their desired result.[3] It was adapted to South Africa's pharmaceutical system, creating the Pharmaceutical Leadership Development Program (PLDP).
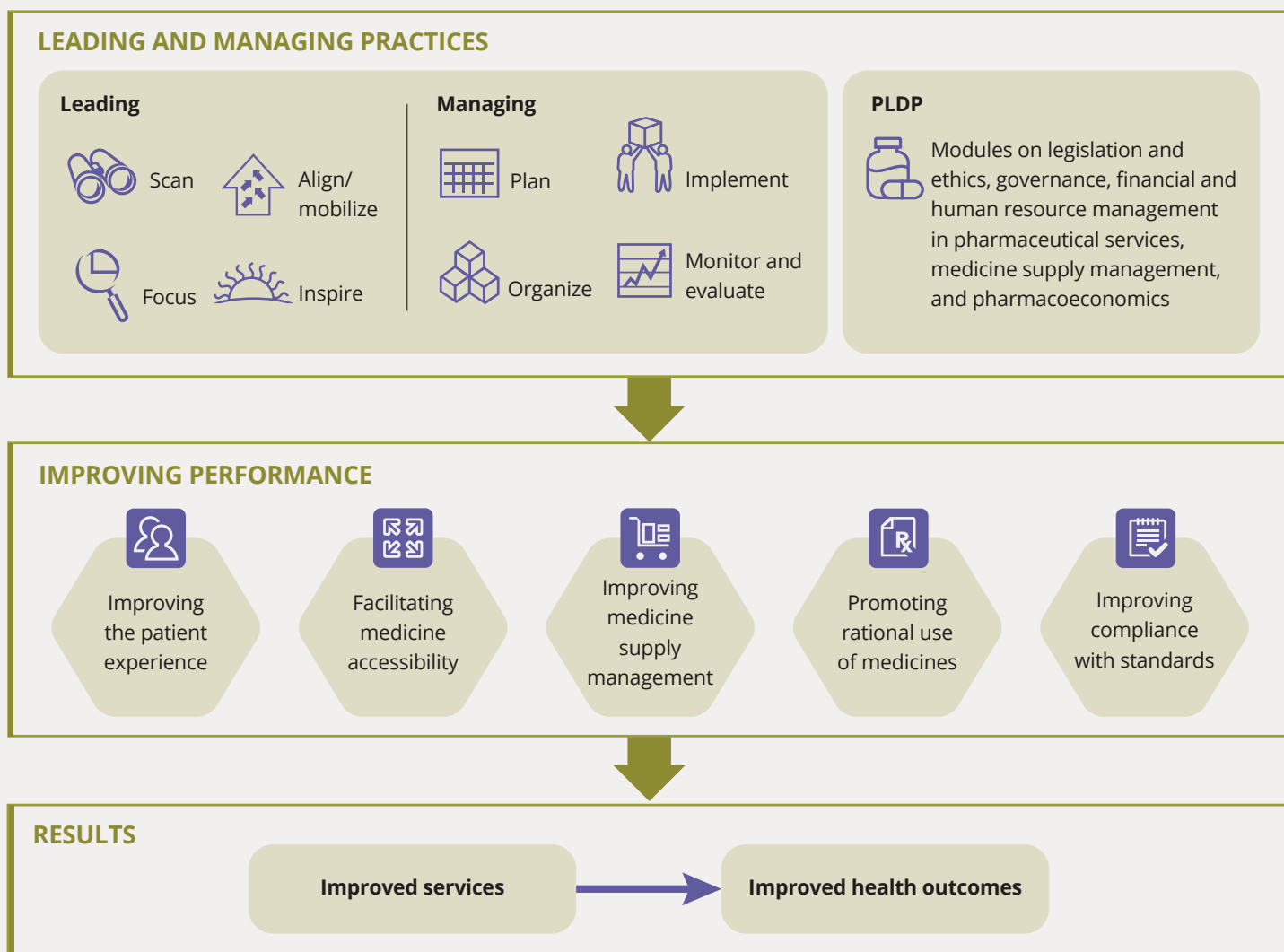
The PLDP is a participatory training program. It combines technical pharmaceutical knowledge with training and coaching in leading and managing pharmaceutical practices. The program equips pharmacy managers to better respond to persistent challenges in their work environment, such as high patient volumes, insufficient qualified pharmacy personnel, and a lack of resources.

In a series of workshops over six to seven months, participants learn how to manage teams to produce results; improve service delivery; and help ensure access to safe, effective medicines. Participants then complete quality improvement (QI) assignments at their own health facilities following each workshop. Facilitators guide them through the process of selecting a workplace challenge and identifying specific measurable results that can be achieved within the duration of the PLDP. Between workshops, coaches support participants in implementing their QI projects, monitor and evaluate progress made, and reinforce material covered in the workshops. To share what they have learned and build on and scale up successes, participants are required to present their results to senior managers and other key stakeholders from their province, district, and facility.

Pharmaceutical Leadership Development Program

LEADING AND MANAGING PRACTICES

Leading

Scan
Align/mobilize
Focus
Inspire

Managing

Plan
Implement
Organize
Monitor and evaluate

PLDP

Modules on legislation and ethics, governance, financial and human resource management in pharmaceutical services, medicine supply management, and pharmacoeconomics

IMPROVING PERFORMANCE

Improving the patient experience

Facilitating medicine accessibility

Improving medicine supply management

Promoting rational use of medicines

Improving compliance with standards

RESULTS

Improved services → **Improved health outcomes**

RESULTS AND LESSONS LEARNED

Since inception, the PLDP/LDP has been delivered in seven provinces. The program has also been offered once at the Department of Pharmacy at Sefako Makgatho Health Sciences University (SMU) for an additional 13 participants. The target was for 200 individuals to complete the PLDP/LDP. As of September 2016, when SIAPS participation ended, 287 participants and 76 teams had participated, exceeding the target by 44%. These participants represented 621 facilities (including provincial pharmaceutical services offices) and implemented 87 QI projects.[3]

The projects covered diverse areas such as improving patient safety, quality of services, medicine accessibility, patient compliance and experience, and ensuring rational medicine use. More than 50% of the teams participating in the PLDPs/LDPs achieved their desired measurable results within the six-month implementation period of the programs. Implementing facilities saw a number of quality improvements that increased medicine availability and accessibility; improved medicine supply management, facility compliance with national standards, and patient experience; and reduced waiting times at clinics. Leadership, management, and governance capacity has been strengthened, and pharmaceutical service delivery has measurably improved.[3]

Participants said they felt that the concepts presented could be immediately applied in the workplace. The program allowed them to think "outside the box," according to participants, and to feel empowered to tackle difficulties within the workplace and achieve results.[3]

> *"I really appreciated listening to projects undertaken and progress made. All have an impact on work and service delivery and can be replicated across districts."*
> — *Participant in KZN Province*

> *"It was excellent. Very relevant and time appropriate. It is for the first time attending a course of this nature. It is actively going to bring a change to our facility."*
> — *Participant in Khayelitsha, Western Cape Province*

Many of the teams continued to apply the tools and methods they learned to new challenges long after the PLDP was completed. Several teams continued to scale up their initial interventions. For example, one team expanded its QI project to increase patient access to chronic medicines by opening two community collection sites, thereby bringing medicines closer to the people who need them.[4] In one subdistrict in the Western Cape Province, key outcomes from the QI projects have been included in the performance agreements of both facility managers and pharmacy managers and have been expanded across the subdistrict.

By the time the PLDP was offered in a third province, the content and flow of the program had been firmly established. At the same time, the approach remained flexible, depending on and in response to the needs of participants and their formal evaluations of each workshop and the overall program.[4]

One of the key lessons from the implementation of the PLDP is the importance of stakeholders assuming ownership for the introduction and rollout of any system strengthening
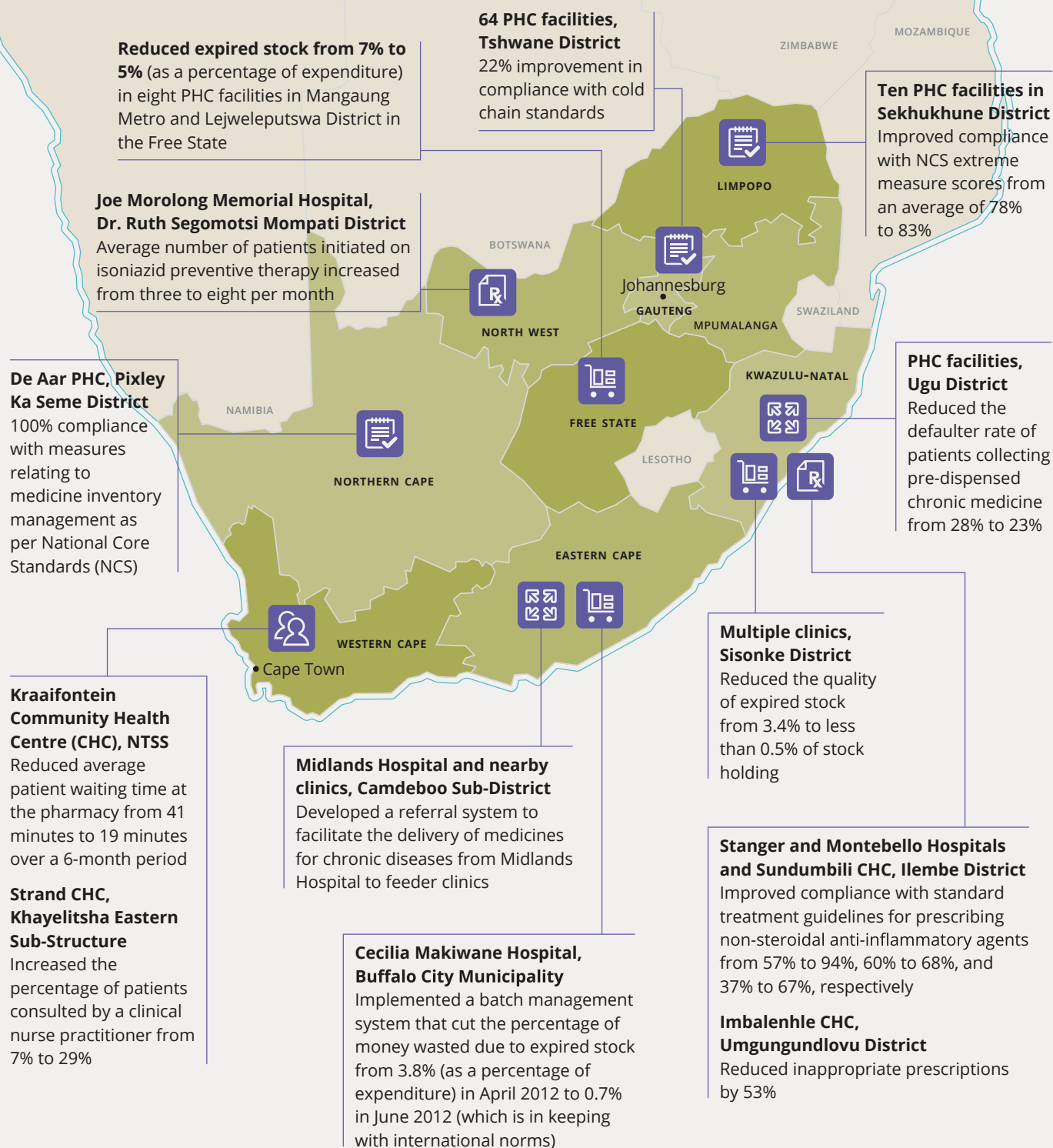
intervention through the development and nurturing of internal champions. The program was implemented based on interest from appropriate health authorities and local priorities, including key pharmaceutical-related indicators that they track. With assistance from each province, SIAPS identified local technical experts to cofacilitate HR, financial management, and other modules.

A number of factors contributed to the project's success. The rapid scale-up of the PLDP across eight of the nine provinces was in response to a compelling, recognized need for specific training in leadership and management. A stable, experienced core SIAPS South Africa team, who had the freedom to create what was needed in the specific context, delivered the trainings. The team refined the technical approach over time based on the implementation experience and participant feedback and needs. There were multiple opportunities to obtain this information, including the facilitators' daily reflections with participants and among facilitators, external content experts, and in later PLDPs, senior provincial pharmaceutical management staff. Participants also formally evaluated each workshop.[4]

It is critical to adapt the content and materials for countries and participants. MSH's standard LDP curriculum was used, but important adjustments were made to incorporate South African-specific information and to address weaknesses in the curriculum. For example, each Challenge Model completed by the teams was evidence based and aligned with a national, provincial, and/or district priority. Challenges

Examples of Quality Improvement Activities Implemented and Results Achieved

Achievements resulted from both SPS and SIAPS quality improvement activities.

Reduced expired stock from 7% to 5% (as a percentage of expenditure) in eight PHC facilities in Mangaung Metro and Lejweleputswa District in the Free State

64 PHC facilities, Tshwane District
22% improvement in compliance with cold chain standards

Ten PHC facilities in Sekhukhune District
Improved compliance with NCS extreme measure scores from an average of 78% to 83%

Joe Morolong Memorial Hospital, Dr. Ruth Segomotsi Mompati District
Average number of patients initiated on isoniazid preventive therapy increased from three to eight per month

De Aar PHC, Pixley Ka Seme District
100% compliance with measures relating to medicine inventory management as per National Core Standards (NCS)

PHC facilities, Ugu District
Reduced the defaulter rate of patients collecting pre-dispensed chronic medicine from 28% to 23%

Kraaifontein Community Health Centre (CHC), NTSS
Reduced average patient waiting time at the pharmacy from 41 minutes to 19 minutes over a 6-month period

Strand CHC, Khayelitsha Eastern Sub-Structure
Increased the percentage of patients consulted by a clinical nurse practitioner from 7% to 29%

Midlands Hospital and nearby clinics, Camdeboo Sub-District
Developed a referral system to facilitate the delivery of medicines for chronic diseases from Midlands Hospital to feeder clinics

Multiple clinics, Sisonke District
Reduced the quality of expired stock from 3.4% to less than 0.5% of stock holding

Cecilia Makiwane Hospital, Buffalo City Municipality
Implemented a batch management system that cut the percentage of money wasted due to expired stock from 3.8% (as a percentage of expenditure) in April 2012 to 0.7% in June 2012 (which is in keeping with international norms)

Stanger and Montebello Hospitals and Sundumbili CHC, Ilembe District
Improved compliance with standard treatment guidelines for prescribing non-steroidal anti-inflammatory agents from 57% to 94%, 60% to 68%, and 37% to 67%, respectively

Imbalenhle CHC, Umgungundlovu District
Reduced inappropriate prescriptions by 53%

Map labels: ZIMBABWE, MOZAMBIQUE, BOTSWANA, NAMIBIA, SWAZILAND, LESOTHO, LIMPOPO, GAUTENG, MPUMALANGA, NORTH WEST, KWAZULU-NATAL, FREE STATE, NORTHERN CAPE, EASTERN CAPE, WESTERN CAPE, Johannesburg, Cape Town

Legend:
- Improving the patient experience
- Improving medicine supply management
- Promoting rational use of medicines
- Facilitating medicine accessibility
- Improving compliance with standards

were identified through a review of routine district data generated for performance monitoring. Moreover, each district's progress in addressing its challenge became part of regular reporting practice at the provincial headquarters. Technical content on priority pharmaceutical management topics included adding information on South Africa's National Core Standards. The monitoring and evaluation (M&E) component was also aligned with M&E systems used in South Africa. Administering the PLDP through existing management structures ensured that participants understood the relationship between that and their regular work routines and also helped build local ownership.

A main success of the program was its coaching component, which prevented the teams from slipping back into "business as usual" when they returned to their workplaces following each workshop. The coaching visits were conducted by SIAPS facilitators. As the PLDP evolved, management staff from the provincial level became involved in the coaching visits, which were often conducted on-site at the participant's facility, especially if that participant was having difficulty applying what was covered in the workshops.

CONCLUSION

Through facilitated capacity development, technical assistance, and mentoring and coaching, the PLDP develops the skills and capacity of health care professionals to address service delivery challenges in the work environment, such as ensuring availability and accessibility of medicines and supplies, ensuring rational medicine use, and optimizing patient care at health facilities. Teamwork on the QI initiatives fostered a broad, multidisciplinary approach to addressing real workplace challenges.

When it is applied consistently, the PLDP methodology can bring about important health system changes. The teams' quality initiative projects have led to a wide range of individual, organizational, and health service delivery outcomes, including an improved reach and quality of services, time savings, and resource mobilization. Inspired by a shared vision of what they can accomplish, participants gain confidence in their ability to lead, manage, and produce results.

Based on its experience with the PLDP in South Africa, SIAPS offers the following recommendations for this and similar QI initiatives:

> "*Through this training, using the leading principles and other skills gained, we are now able to scan, analyze, and understand things differently. We are now confident that as pharmacists, we have an important role to play in ensuring the success of government initiatives, such as National Health Insurance [universal health coverage].*"
>
> — *Pharmacist, Mokopane Hospital*

- Use a flexible approach that is refined over time based on implementation experience and participant feedback and needs.
- Deliver the program via a stable core team of experienced facilitators supplemented by in-country technical experts and senior staff whenever possible.
- Adapt the program to accommodate specific contexts.
- Administer the program through existing management structures for coherence with regular work routines and to position the program as an initiative that is owned and implemented by local authorities.
- Align the program with national, provincial, and/or district priorities, with results ideally becoming part of regular reporting practice.
- Utilize a strong coaching component to accelerate progress and sustain lessons learned.
- Implement the program in response to a demonstrated, compelling, and agreed-upon need.

Several developments indicate that the program will be sustained, including evidence of its achievements, particularly in Western Cape Province; the presence of a former SIAPS facilitator in the Pharmaceutical Services Offices in the Eastern Cape; and the master's program at SMU. Many PLDP teams are showcasing the work they have done at various forums to other facilities. Close cooperation with the province ensures the buy-in of local stakeholders and the long-term sustainability of the approach, including institutionalizing key components and tools in organizational systems. In terms of financing agreements, the provinces support participants' travel to the workshops and provide venues for coaching visits. In some cases, provinces also provide venues for workshops and final presentations.

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COMPLEMENTING PUBLIC-SECTOR MEDICINE SUPPLY THROUGH A PUBLIC-PRIVATE PARTNERSHIP IN TANZANIA:
JAZIA—A PRIME VENDOR SYSTEM FOR DODOMA REGION PUBLIC HEALTH FACILITIES

BACKGROUND

The Health Promotion and System Strengthening (HPSS) project is part of a development cooperation between Tanzania and Switzerland. It supports the Dodoma Region in the areas of health insurance, community health promotion, pharmaceutical management, and management of maintenance and repair services. The project is funded by the Swiss Agency for Development and Cooperation and implemented by the Swiss Tropical and Public Health Institute.

Access to health care is determined by the availability of medicines and medical supplies. Patients equate quality of care with the availability of medicines. Clinicians depend on effective, safe, and good quality medicines to provide adequate health care. If medicines are out of stock, patients suffer and lose confidence in health services. Stock-outs discourage patients from enrolling in the Community Health Fund (CHF) and other insurance schemes.

The Medical Stores Department (MSD) is the backbone of the public medicine supply in Tanzania. It faces challenges in filling orders for health facilities. In the last few years, this supply gap has been growing and now includes more than 40% of orders.

Centrally, the Ministry of Health (MoHCDGEC) allocates defined sums for medical supplies for each health facility directly to the MSD. At the health facility level, complementary funds from the CHF, national health insurance, and cost sharing are generated and managed by the Health Facility Governing Committee. Therefore, health facilities have two main sources of funding for their supplies: direct funding deposited at the MSD by the Ministry and supplementary funds collected by the health facility. Of those supplementary funds, 67% are dedicated to the purchase of medicines by health facilities when the MSD is out of stock.

In the Dodoma Region, a 2010 situation analysis and a 2011 comprehensive baseline survey revealed an availability of essential medicines of 53% with a corresponding stock-out rate of 47% based on 24 tracer medicines. The order fulfillment rate by the MSD was 58.6%.

The supply gap of more than 40% stemming from the stock-out situation and the low order fulfillment rate for supplies by the MSD needs to be complemented by medicines from other sources. Health facilities normally fill this gap with purchases by quotation from multiple private sources both within and outside of the Dodoma Region and use complementary funds (e.g., insurance schemes, user fees, basket funds), incurring in the process high opportunity costs such as travel and fuel, per diems, and high medicine prices. This makes the whole task of filling this gap cost inefficient. The procedure is uneconomic, bureaucratic, intransparent, and lengthy and supplies are of questionable quality.

Alternative strategies were needed to fill the supply gap and complement the public-sector supply system. To resolve this situation, the Dodoma Regional Administration and Local Government embarked on a novel process to establish a Prime Vendor System (PVS) and to engage, on a public-private partnership (PPP) basis, one private-sector pharmaceutical vendor as the primary supplier for supplementary medicines needed by public health facilities in the region.

In principle, a PVS was established in the Dodoma Region to serve as a "one stop shop" intended to alleviate opportunity costs previously incurred by health facilities when they had to search for alternative sources for supplies they could not obtain from the MSD. At the health facility level, complementary funds were once used to make purchases from multiple private sources. However, this supplementary source was now to be used for purchases only from one appointed Prime Vendor (PV).

IMPLEMENTATION

A concept note was widely circulated and discussed. Districts and the region endorsed the PV concept involving the private sector. Procedures to procure complementary supplies from a single vendor in a pooled regional approach were developed. A supplier was selected based on good procurement practice. Prices from the contracted PV are fixed and comparable to MSD prices. The system was registered as Jazia PVS.

Districts now pool their demand for supplementary medicines at the regional level, allowing them to benefit from lower prices (economy of scale). This allows health facilities to manage their own funds following standard operating procedures (SOPs) and enhancing fiscal decentralization. Funds are used for pooled purchase from the PV based on a PPP framework contract.

The general steps and expected outputs presented in table 1 were required for successful implementation:

Table 1. General Steps for Implementation

STEP	OBJECTIVE	EXPECTED OUTPUT
1	Baseline data	Quantification of medicine needs is available Current private procurement practices are analyzed Financial management of complementary funds, flow, amount, and procedures is assessed
2	Advocacy and buy-in	Consent and buy-in is reached by all stakeholders
3	Administrative structures	A PV technical committee, PV board, and temporary tender evaluation committee are appointed with terms of reference A Jazia PVS office is identified, equipped, and staffed A Jazia PVS coordinator is appointed and trained
4	Jazia PVS documents	All documents driving the Jazia PVS are reviewed and approved
5	Vendor forum	Interested private suppliers are informed about possible PPPs and given prequalification documents
6	Prequalification	A selected number of potential suppliers have been prequalified
7	Tender	A final supplier (PV) is selected and approved
8	PPP contracting	A PPP contract is negotiated between RAS and private supplier
9	SOP and M&E documents	SOPs and a M&E framework are available and approved
10	PVS training	Regional and district stakeholders and health care workers at the facility level are competent in SOPs for Jazia PVS activities
11	Launch	The Jazia PVS is officially launched by signing contract between RAS and private supplier and operations start
12	Follow-up	Enablers and obstacles of Jazia PVS are assessed and the regional team is supported

The region operates a Jazia PVS office staffed by a PV coordinator, a dedicated pharmacist, and support staff. The system is closely managed and supported by mandated administrative structures, such as a Technical Committee and a Board appointed by regional authorities.

While the MSD will remain the backbone for medicine supply, this unique PVS has the objective to ensure that health facilities have the medicines and medical supplies to meet the needs of the people. This PPP supplements the regular government supply with additional supplies from a single vendor in a pooled regional approach. PV supplies are of assured efficacy, safety, and quality in accordance with MoHCDGEC and Tanzania Food and Drug Authority (TFDA) standards.

Figure 1 illustrates the fully functional Jazia PVS and the synergy created by the collaboration between the MSD and the PV system in improving medicine availability from the perspective of public health facilities in the Dodoma Region.

Figure 1. Concept of the fully functioning Jazia Prime Vendor System
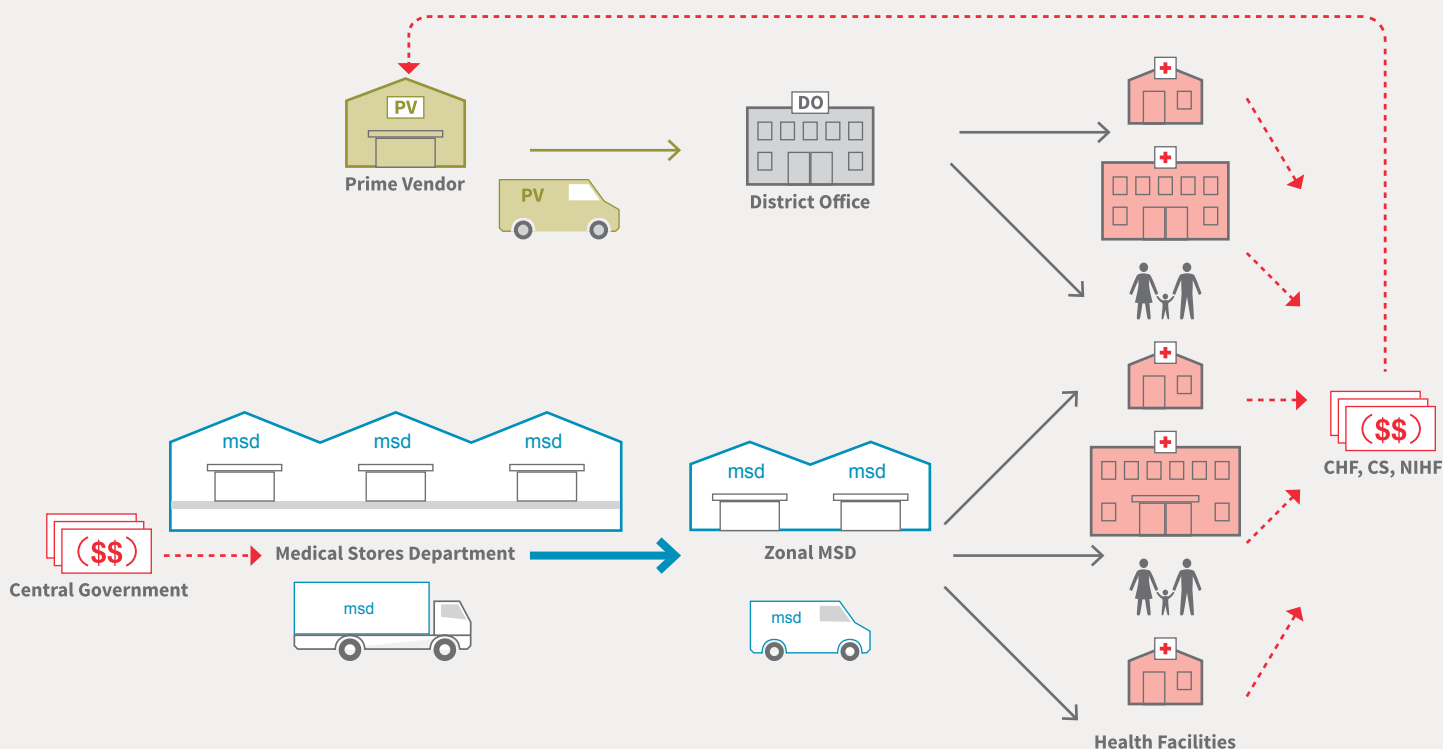
Operations of the Jazia PVS are managed and driven by SOPs. A comprehensive but user-friendly handbook with SOPs for health facilities and districts was developed that covers six key operational areas.

These SOPs now guide the process and purchase of medicines from the PV when these are out of stock, short supplied, or not stocked by the MSD. All purchases from the PV are consolidated at the district level and forwarded to the PV.

An M&E handbook provides a framework for evaluating the performance of both the system and the PV. System performance is monitored quarterly using supply chain indicators such as medicine availability, utilization, district HQ delivery time to health facilities, promptness of payment to PV by district, and stock sufficiency. The performance of the PV is monitored using overall physical product quality, service level/order fulfillment rate, shelf life remaining at time of delivery, delivery lead time, delivery point, general quality of communication, and overall satisfaction with PV services.

All stakeholders involved in the Jazia PVS were trained in the use of the SOPs. Monitoring is conducted by the PV coordination office.

Table 2. Standard Operating Procedures

| SOP	PRIME VENDOR OPERATIONAL AREA
1	Determination of quarterly order quantities to be purchased from PV by health facility
2	Health facility orders consolidation at district HQ and forwarding to PV
3	Receiving and inspection of consignments from PV at district HQ
4	Inspection of supplies from PV at health facility
5	Funds transfer and payment to PV by health facility
6	Lines of communication within PVS

RESULTS

Tracer medicine availability in the region increased from 54% in 2011 to more than 80% in 2016. All districts place orders with the PV. PV utilization in 2016 reached 50% as compared to the value of orders from the MSD. District and health facility satisfaction with PV performance as a complementary supplier is good. The performance score reached 94% in 2016. The PV adhered to and generally significantly undercut the contractual delivery time of 22 days. Prices of medicines by the PV are negotiated and contractually fixed. Average prices of PV supplies equaled listed MSD prices.

Twenty-four tracer items are used to monitor medicine availability at health facilities. Due to the innovative Jazia PVS and accompanying measures,

such as auditing and coaching, mean medicine availability in the region increased by more than 40% between 2011 and 2016.

Figure 2. Medicine availability (2011–2016)
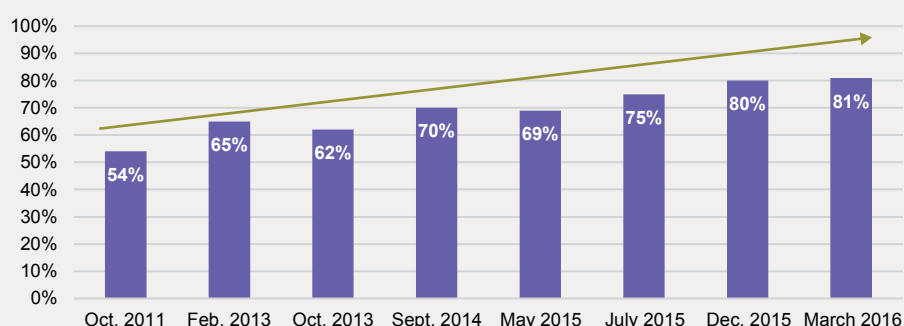
LESSONS

Challenges

The development of advocacy, tools, tendering, and establishing a regional PV system is time intensive because it follows good procurement practice. Payment to the PV was initially delayed by districts due to weak financial management and to resistance to a transparent new supply system. Mitigating measures were the simplification of financial transfers, continued persuasion of all actors regarding the successful intervention, pressure and sanctions by local authorities, and visibility of good performance in the region. Another challenge was initial compliance with the SOPs. This has improved after repeated training followed by internal coaching and supervision.

Enablers/Drivers

Enabling factors included strong political will and support by the regional secretariat and Regional Health Management Team (RHMT); leadership by committed district medical officers; ownership of Jazia PVS by the region and stakeholders; an engaged project implementation team; and constructive collaboration with the MSD, TFDA, and other stakeholders. Additional drivers were an official circular to underpin and instruct purchases by health facilities limited to the two approved suppliers (MSD and PV), incorporation of PV operations into the RHMT's routine operations, and recognition of good performance. Participation and engagement of all actors created

ownership and pride in the functional system. A systemic approach to supply chain management that included a bundle of accompanying activities in pharmaceutical management and accountability was crucial. These enabling factors are further enhanced by regular meetings of all stakeholders, integration of pharmaceutical staff in decision making, and operational research. Dissemination of results and regular policy dialogue contributed to acceptance and ownership.

CONCLUSION

The Jazia PVS in the Dodoma Region is anchored in the regional health administration structures and in the decentralization policy of the country.

Its objective is to ensure that health facilities have medicines and medical supplies available to meet the needs of the people by supplementing

the regular government supplies. When quality of care is improved, the population will be motivated to join insurance schemes, which in

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turn generate funds to ensure the supply of medicines and maintain the quality of care. It is a new option that empowers public health facilities to purchase supplementary medicines and supplies with their own sources through a shortened and simplified procedure, thereby improving medicine availability without compromising quality or price.

In addition to the Jazia PVS, a bundle of systemic supply chain interventions, including capacity building, coaching, and auditing, is needed to improve accountability, medicine availability, and access to therapy for patients.

Following the successful implementation in the Dodoma Region, the Jazia PVS was expanded to two additional regions (Morogoro and Shinyanga) in 2016. Based on the convincing results from the pilot regions, the existing national policy framework, and requests from regions, the President's Office Regional Administration and Local Government (PORALG) and the MoHCDGEC have decided to scale-up Jazia PVS countrywide. To take into account the complexities of an urban context (e.g., population, mobility, level of care, public financial management, private sector, insurance schemes, coverage), additional technical assistance and an urban adaptation study will accompany and guide the implementation in the Dar es Salaam region.

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SUPERVISION, PERFORMANCE ASSESSMENT, AND RECOGNITION STRATEGY TO STRENGTHEN MEDICINES MANAGEMENT IN UGANDA

BACKGROUND

Despite Uganda's long-standing commitment to ensuring universal access to essential medicines, the health system and the pharmaceutical supply chain continue to face many well-documented constraints.[1] For example, in 2009 and 2010, the availability of a basket of 22 vital items in public health facilities averaged 53%, and the Ministry of Health (MoH) reported that fewer than 10% of all facilities had six vital indicator tracer medicines available.[2, 3] In 2013, only 35% of public health care providers correctly diagnosed at least four of five common conditions,[4] and providers at only 1% of health facilities provided the correct treatment for a simple cough and cold.[2] Meanwhile, fewer than 8% of 376 pharmacy posts in the public sector were filled, and 79% of all facilities lacked shelves, making it impossible to manage medicines appropriately.[2, 5, 6] In addition, a public and private nonprofit health facility survey in 2011 found high staff turnover; irrational medicine use; and inadequacies in filling out stock cards, ordering, and reporting.[7] For example, only 37% of private nonprofit facilities maintained an updated stock card for artemisinin-based combination therapies, which is required to accurately quantify drug needs.

In general, access to medicines in resource-limited countries has been addressed through fragmented and vertical interventions without considering the broader health system.[8] In Uganda, a number of predominantly educational interventions were implemented to strengthen the health care system and build capacity at the district and facility levels.[9, 10, 11] However, these interventions did not produce significant or sustainable improvements in medicines management or access.[2]

IMPLEMENTATION

With the aim of increasing access to quality medicines and health supplies, Uganda's MoH nationalized the strategy it developed with the The USAID-funded program, Securing Ugandans' Right for Essential Medicines (Uganda SURE), to build capacity, motivate health facility staff and supervisors, and improve medicines management in public and nonprofit health facilities. The supervision, performance assessment, and recognition strategy (SPARS) combines supportive supervision and training, indicator-based performance assessment, and a recognition strategy with incentives for both supervisors and health workers. SPARS is based on the tenet that a combination of interventions yields better and more sustainable improvement.[12, 13]

Medicines management supervisors. As the backbone of the approach, medicines management supervisors (MMS), who are district employees, provide supportive supervision and on-the-job training to improve health workers' medicines management skills. They also give managerial support to staff in the form of manuals and tools needed to standardize medicines management practices. District health officers select MMS based on their leadership and management skills and interest in and knowledge of pharmaceutical issues, although MMS could be clinical officers, nurses, midwives, pharmacy staff, or storekeepers. The MMS receive two weeks of training in the basics of medicines management, supportive supervision, mentoring, problem solving, and communication and one week of practical work in the field.

The MMS are provided a netbook to enter the findings from the performance assessment, and they receive three days of training in the use of the netbook and the electronic performance assessment tool. To increase their computer skills, they receive flash drives with self-paced learning aids about software packages and other technologies. To facilitate travel to

their facilities, which are often in rural areas with rutted dirt roads, they also receive motorbikes, riding gear, and training in defensive riding.

Performance assessment and recognition. To standardize the time between visits, a facility should receive a visit every other month;

however, after five visits, the interim time increases to every four months. Performance assessment at the facilities is based on 25 indicators grouped into five areas: dispensing, prescribing, stock management, storage, and ordering and reporting (table 1). Five is the highest possible score in each area, with a target

score of at least 20 out of 25. In addition, the SPARS data system has been fully computerized—from data capture through reporting—which ensures real-time access to high quality information. The submitted data are verified, cleaned, analyzed at the central level, and shared through district reports.*

Table 1. Facility Assessment Indicators by Medicines Management Area

1) DISPENSING QUALITY	2) PRESCRIBING QUALITY	3) STOCK MANAGEMENT
■ Dispensing time ■ Packaging material ■ Dispensing equipment ■ Services available ■ Patient care ■ Labeling ■ Discrepancy prescribed/dispensed	■ Correct recording of prescriptions ■ Rational prescribing ■ Adherence to STGs for diarrhea ■ Adherence to STGs for cough/cold ■ Adherence to STGs for malaria	■ Stock card availability ■ Correct filling of stock card ■ Physical count corresponds with stock card balance ■ Correct use of stock book
4) STORAGE MANAGEMENT	**5) ORDERING AND REPORTING QUALITY**	
■ Cleanliness of pharmacy ■ Hygiene of pharmacy ■ Medicines storage system ■ Storage conditions ■ Medicines storage practices	■ Reorder level calculation ■ Timeliness of order and distribution ■ Accuracy of HMIS reports ■ Filing	

Health facility staff improvements are recognized through a rewards system that also motivates. These rewards combine personal items, such as t-shirts, with items to improve the delivery of pharmacy services, such as dispensing trays. MMS and the corresponding district health officer receive airtime and a monetary allowance linked to defined milestones and submission of SPARS facility reports. To reduce the risk of fraud in the MMS allowance process, we conduct telephone verification of all MMS visit reports submitted into the database and perform physical audits when there is inconsistent recording at the facility level.

Implementation tools. Managerial tools are provided to the MMS and to facilities to facilitate supervision. A medicines management manual is distributed to all health facilities and MMS. Other tools include stock cards, stock books, dispensing logs, and standard operating procedures. MMS also receive laminated job aids to guide their explanation of how to correctly dispense medicines and use the dispensing guidelines. A supervisory book is placed at the facility and filled out by the MMS at each visit to record findings and agreed upon next steps. Each facility has a spider graph printed on a white board that can be displayed

in the pharmacy. The graph depicts performance progress between visits in the five medicines management assessment domains and functions as a management tool (figure 1).

To further motivate, coordinate, and strengthen SPARS implementation, MMS and district health officers attend biannual regional meetings and district meetings where they discuss national and district SPARS performance reports.

SPARS scale up. After SPARS was adopted as a national strategy in 2011, SURE and the MoH Pharmacy Department developed a SPARS rollout plan, documented

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* For more information, see Trap et al. Article 1: Supervision, Performance Assessment, and Recognition Strategy (SPARS) - a multipronged intervention strategy for strengthening medicines management in Uganda: method presentation and facility performance at baseline. *Journal of Pharmaceutical Policy and Practice* (2016) 9:21. DOI 10.1186/s40545-016-0070-x.

the implementation costs, and mapped implementing partners' district responsibilities. In addition, a guidance package was developed to help implementing partners put SPARS in place, and SURE/Uganda Health Supply Chain (UHSC) have helped the Pharmacy Department

coordinate and manage the national rollout. In 2013, religious medical bureaus were supported to develop a SPARS support system to complement the work of the district MMS in supporting private nonprofit health facilities. SURE/UHSC support to these facilities is

in line with the mandate to invest in the private sector to contribute to the achievement of health objectives. In addition, the Pharmacy Department wants consistency in logistics supervision practices and management tools in both public and private nonprofit health facilities.

Figure 1. Spider graph of facility performance scores
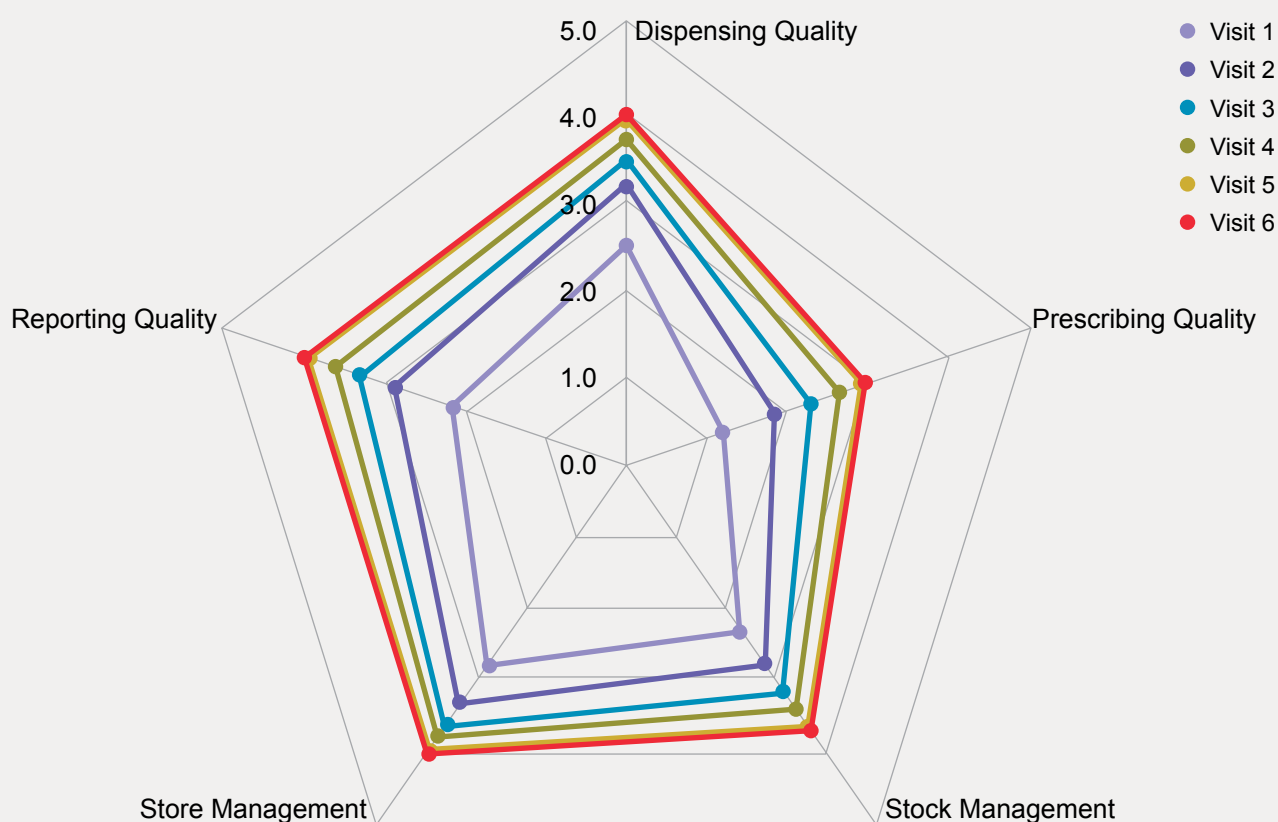
RESULTS

By September 2017, almost all government facilities had received at least one SPARS visit, and two-thirds of them had attained the target performance score of 20. In the private nonprofit sector, most facilities had received one or more SPARS visits, and half had achieved an adequate score of 20 or above.

After three years of implementation, an assessment was conducted based on the 25 SPARS indicators. The assessment included facilities at all service levels—85% public and 15% private nonprofit—from 45 districts where SPARS had been implemented between 2010 and 2013. The assessment was based on data from

4,100 SPARS visits to 1,222 facilities that had at least one follow up visit. A summary of the results follows.

Improvements in medicines management and use. In the first three years of implementation, the overall performance score increased by 69% after five visits, from a

SPARS score of 10.3 to 17.4, with the largest gains in prescribing quality (187%) followed by dispensing quality and the lowest in storage management (40%), which initially performed well and much better than prescribing and dispensing quality. The greatest effect was seen at lower-level facilities and there was no difference between government and private nonprofit facilities. Through SPARS, prescribing for malaria, diarrhea, and respiratory tract infections improved. Figure 2 illustrates improvements in appropriate treatment of non-bloody diarrhea with oral rehydration solution. Fewer patients receive antibiotics or injections, and the average number of medicines prescribed per patient has decreased (figure 3). Further, more patients now know why they are taking their medicines and how to take them, and at least 50% of the medicine labels included most of the important information—up from 10%.

Figure 2. Treatment of non-bloody diarrhea in SPARS facilities, 2010–2014
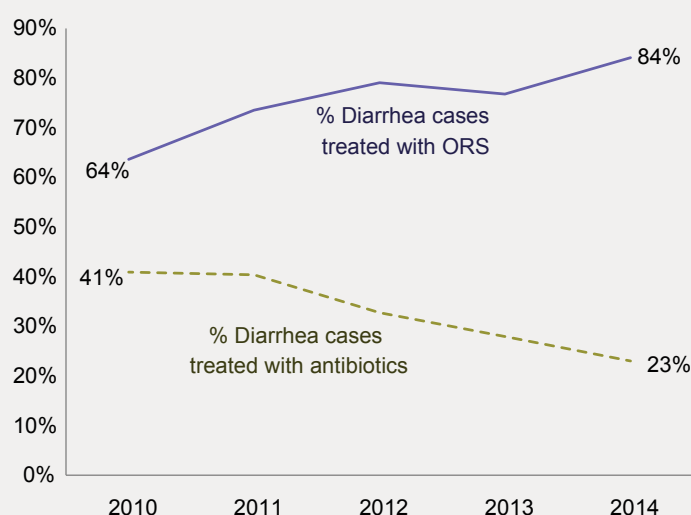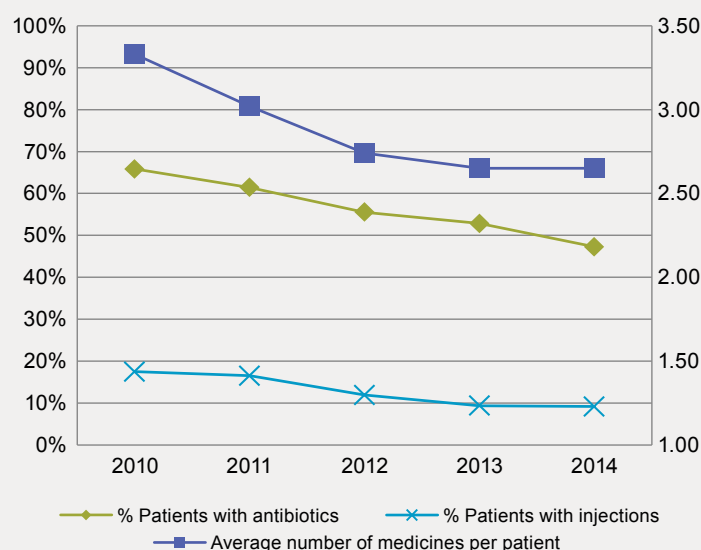

Figure 3. Rational medicines use trends in SPARS facilities, 2010–2014

Increased availability of medicines. The assessment suggests a correlation between SPARS-based performance and the availability of medicines in higher level of care facilities that order supplies (figure 4). As SPARS was rolled out, more medicines were on the shelves and the morale of health staff and patients increased. Improving both the appropriate use and the consistent availability of medicines inevitably boosts health status.

Effect of supervision quality. A qualitative study was conducted to determine whether the degree of supportiveness of MMS' supervision affected medicines management

Figure 4. Correlation between SPARS scores and availability of essential medicines and health supplies, 2010 to 2014
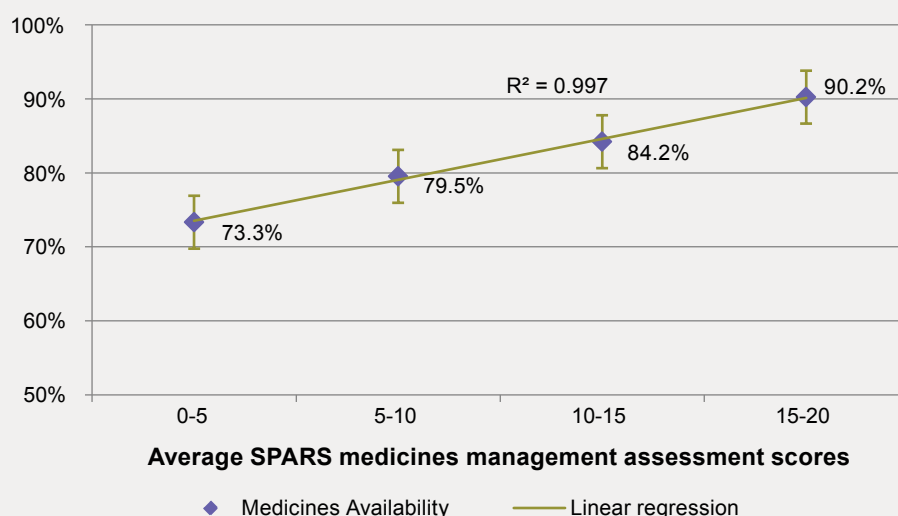
in health facilities assessed by the SPARS score. Ten MMS' supervisory interactions were observed and rated on 11 criteria, including establishing an understanding with their supervisee, communicating effectively, identifying problems, and giving constructive feedback. These individual supervision scores were compared to the facility's change in SPARS score per visit. Although the sample size was limited, the study indicated a link between an MMS's supportive supervision score and a facility's per visit change in SPARS score (figure 5). We learned that if MMS are more supportive supervisors, their facilities are likely to achieve greater improvements. We also learned that when the District Health Officer is engaged with the program, provides feedback on reports, and meets frequently with the MMS, the MMS have better results in the facilities they supervise compared to other facilities.

Other lessons learned include that capacitating MMS with strong training along with computers and internet access creates an "army" that can identify, investigate, and report immediately on pharmaceutical management status and issues in health facilities, such as medicine

Figure 5. Effect of supervision on performance[15]
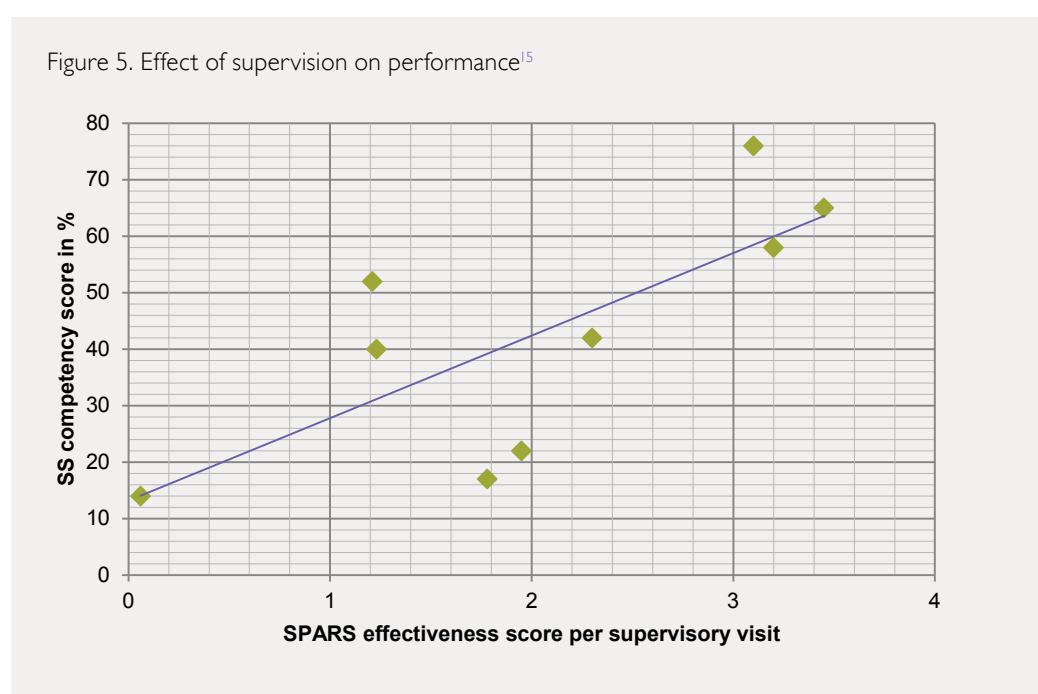
shortages. This system is far more resource efficient and robust than conducting one-off assessments that require recruitment, training, and travel for data collectors. Although SPARS data are useful for measuring facility-level performance and giving MMS targets for supportive supervision, we realize that managers at higher levels of the health system need to use SPARS data to maximize the initiative's effectiveness and have developed a pharmaceutical information portal using the SPARS data. The MMS also play a crucial role in improving

data quality in the health management information system (HMIS). For example, Uganda's DHIS2/health management information system had poor information on logistics and stock status, so indicators were incorporated into the SPARS tool to address facility reporting quality, which has resulted in better quality data in the national information system. Finally, the study of inter-rater reliability among MMS led to a recommendation to incorporate routine data quality comparisons in the program and suggestions for improving data validity and reliability.[14]

CONCLUSION

Based on the success of SPARS as a sustainable model for capacity building combined with performance assessment of medicines management in health facilities, the MoH is expanding the concept to build facility management capacity in tuberculosis (TB SPARS), laboratory

services (Lab SPARS), HIV/AIDS (ART SPARS), and pharmaceutical financial management. In addition, through the data that SPARS generates, Uganda now has a powerful pharmaceutical information system that stakeholders at all levels can use to better manage medicines

and health supplies, track progress, and detect problems. Other low- and middle-income countries wishing to standardize performance assessment in the health sector might consider adapting Uganda's experience with SPARS.

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AN ELECTRONIC RECORDING AND REPORTING SYSTEM FOR IMPROVED TB TREATMENT IN UKRAINE

BACKGROUND

In 2008, Ukraine was one of the World Health Organization's (WHO) top 27 tuberculosis (TB) high burden priority countries. According to the 2008 WHO Global TB report, 22% of TB cases in Ukraine were multidrug resistant (MDR-TB). The TB incidence was 106 per 100,000 population, with a TB mortality rate of 15 per 100,000 population.[1] Today, Ukraine remains a WHO priority for its high MDR-TB burden. According to the 2016 WHO report, an estimated 25% of new TB cases are MDR-TB. The TB incidence was 91 per 100,000 population and the related mortality rate was 11 per 100,000 population.[2]

Effective TB control requires gathering, integrating, and analyzing data from each level of the health system on TB and MDR-TB cases, medicine consumption patterns, and commodity forecasting needs. In 2008, as Ukraine confronted its growing TB and MDR-TB burden, it had no electronic system for its vast array of TB programs, which were managed piecemeal by various government agencies, including the state penitentiary system. The quality of the existing paper-based information systems varied and weak information, tracking, and reporting systems hampered TB control. Clinicians had to complete large log books for TB recording and reporting.[3]

Usability statistics among active users of the national tuberculosis (TB) registry by TB burden.

TB Burden
- High
- Medium
- Low
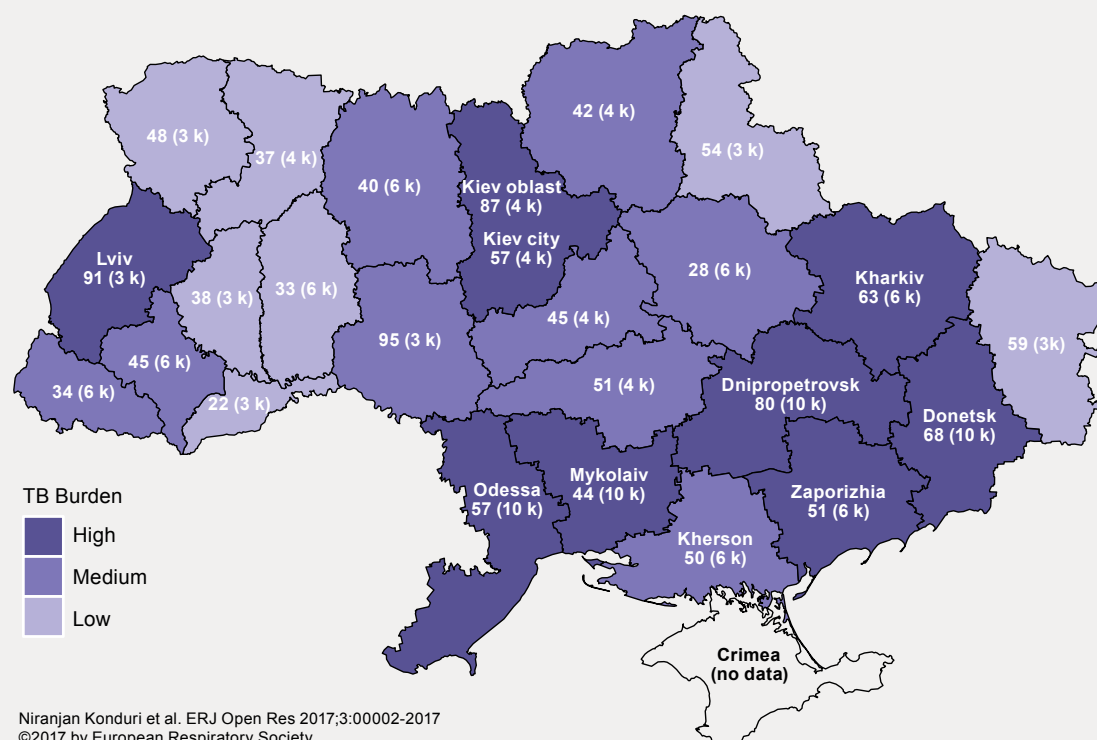
Usability statistics among active users of the national tuberculosis (TB) registry by TB burden. Each oblast (region) lists the number of active registry users in June 2016. Numbers in parentheses indicate average transactions per user in thousands (k). For example, the Kherson oblast with a medium TB burden has 50 active users with an average of 6000 transactions per user. Registry transactions are cumulative, from 2011 to June 2016 (online supplementary material). Nine out of 24 oblasts and Kiev accounted for 62.5% of cumulative transactions and 59% of the TB burden.

Niranjan Konduri et al. ERJ Open Res 2017;3:00002-2017
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IMPLEMENTATION

WHO has promoted electronic TB recording and reporting to improve surveillance and support meaningful decision making based on access to accurate, timely, and useful information.[4] Digital or electronic health applications for MDR-TB can also contribute to large-scale implementation of new diagnostics and novel medicines, particularly in resource-constrained countries.[5] One such electronic, web-based system is e-TB Manager, which manages much of the information needed by a country's national TB control program.

Developed by Management Sciences for Health (MSH) with funding from the US Agency for International Development (USAID), e-TB Manager is a web-based software program that integrates data across all components of TB control.[6] These include information on people with presumptive TB, patients, medicines, laboratory testing, diagnosis, treatment, and outcome. It helps the Ministry of Health's Ukrainian Centre for Disease Control (UCDC) and other stakeholders more efficiently and effectively manage interventions to address both susceptible and drug-resistant TB and TB/HIV co-infection. It promotes sound, data-informed decision making for managing inventory for first- and second-line TB medicines; effective medicine usage; reporting of treatment outcomes; and epidemiological and statistical reporting on TB by health system level and type of TB case.

In response to a request from Ukraine's Ministry of Health in 2008, the USAID-funded Strengthening Pharmaceutical Systems (SPS) Program conducted an initial assessment of the country's needs for e-TB Manager and developed a customized version of the tool. In 2009, e-TB Manager was piloted in six oblasts (regions) over a three-year period. For e-TB Manager to replace the inefficient paper-based reporting system, it was necessary to enter all TB cases into the new tool. Data entry began with the entry of 5,000 cases in the first two years and expanded to more routine entry from all pilot sites, with 67,000 cases entered. A 2010 WHO review of Ukraine's TB program acknowledged e-TB Manager's role in supporting evidence-based management decisions on improving the country's TB program performance, including information on case notification and the potential to contribute to improved treatment outcomes.[7]

In 2012, the UCDC designated e-TB Manager as the official national TB registry. A companion Ministry order specified official adoption, authorization, and requirements for use as well as reports to be produced. Despite the Euromaidan revolution and socioeconomic crisis, the registry was implemented in all 24 oblasts of Ukraine and the city of Kiev by 2014. It is now used nationwide, and data are entered on a regular basis according to approved standard operating procedures.

In October 2015, after more than seven years of international assistance and partnership, the USAID-funded Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program, which had handled the project since 2011 as a follow-on to SPS, handed over administration of the registry to the UCDC, which is now known as the Public Health Center.[8]

RESULTS AND LESSONS LEARNED

With the national rollout of the registry, the average time needed to prepare and complete facility-, regional-, and national-level TB reports has decreased from several days to a few hours. Compliance between national standardized quarterly reporting and the same report generated by e-TB Manager increased from 77% in the third quarter of 2013 to 85% in the fourth quarter of 2013 and then to 98% in the first quarter of 2014.

At the provider level, the registry enables doctors to better track patients and get a more complete picture of their medical history, which was challenging with a paper-based system. The registry speeds up the diagnosis and treatment timelines by allowing a patient's laboratory results to be accessed electronically. At the regional level, a chief TB doctor responsible for overseeing treatment protocols can more easily review individual cases and laboratory results, validate the treatment regimen, remotely monitor adherence to clinical guidelines, and take corrective action on alerts embedded in the registry. The UCDC is also using the registry to file WHO TB reports. In addition, the registry helps supervisors monitor clinician adherence to national TB treatment protocols.

Training for public health workers needed to take into account poor computer literacy and some initial

resistance to using an electronic system, particularly by older doctors and health workers.[9] Many health workers in Ukraine also lack access to computers or smartphones, and internet outages are common.

To help train users, SIAPS hired a local consulting company specializing in adult learning techniques and training of trainers methodologies. The company's job was to train oblast-level officials to run educational programs on e-TB Manager by themselves. Six training of trainers sessions were organized between August 2013 and September 2014 in Kiev city.

The Global Fund to Fight AIDS, Tuberculosis and Malaria and USAID supported the purchase of 534 computers, while the government of

Ukraine provided internet connectivity in each oblast. The UCDC assigned a dedicated team of supervisors to lead the national scale-up of e-TB Manager and ensure that doctors, nurses, pharmacists, and health workers received needed support. A full-time IT staff at the UCDC provides real-time national helpdesk services on demand via phone, email, and a group discussion forum. IT staff handle an average of 150 phone calls and emails a week, with more than 1,200 calls and emails each week right after a software update.[9]

To promote data quality, SIAPS and the UCDC jointly developed an assessment protocol to help ensure error-free registry and reporting. As of July 2016, 227,657 cases had been entered in the registry, with

a data entry consistency rate with the original paper-based reports of approximately 99%.

In 2015, the project conducted a cross-sectional, anonymous, nationwide survey to assess the overall user experience of the registry. Details of the hypothesis, statistical analysis, and findings are published elsewhere.[9] Users gave high ratings to the registry's ability to help improve case management. There was a generally high rating for improved workplace productivity. Management and clinical decisions can be made easily, reducing the time needed for decision making. One chief TB doctor reported that the time taken to initiate antiretroviral therapy among TB patients dropped from 104 days to 48 days.

CONCLUSION

Implementing a digital health tool such as e-TB Manager, particularly in large and complex high-burden TB settings, requires strong partnerships, organizational agility, and committed resources for success and sustainability. The project needed at least five years to build sustained individual user and institutional capacity to use the registry in Ukraine.[10]

However, functionality, organizational issues, and technical infrastructure are critical pillars of support for electronic systems in resource-constrained settings.[11] The experience of implementing e-TB Manager as Ukraine's national TB registry affirms that projects implementing e-health interventions to control MDR-TB should pay particular attention to ensuring basic infrastructure, building technical

capacity, and providing periodic supervision and dedicated IT support.[12] Also critical to ensuring e-TB Manager's sustainability were collaborative partnerships, strong leadership, a government champion, accessible technical expertise, a steady funding stream, and incorporating lessons learned from the pilot before scale-up.

As the national TB registry, e-TB Manager is recognized as an effective and important information management tool for Ukraine's efforts to control TB. It has strengthened the country's health system monitoring and evaluation. Digitizing patient information systems helps clinicians better track patients and get a more complete picture of their medical history—both of which were challenging tasks with the old paper-based system. The tool contributes

to improved decision making among doctors, enabling them to make faster, better informed diagnoses and treatment plans.

Ukraine's experience in implementing e-TB Manager as its national electronic TB registry is a best practice model for other national public health programs in resource-constrained countries. It has been implemented in nine countries to date, with high marks for user satisfaction overall. In a survey of 2,000 users in these countries, 81% of respondents agreed that the tool helps improve patient care, and nearly 70% found that e-TB Manager improves their workplace productivity. [10] The UCDC, now part of the public health center, provided strong leadership and a commitment to implementing the national TB registry despite political unrest,

military conflict, and socioeconomic challenges while confronting the MDR-TB burden

e-TB Manager's implementation and use in Ukraine as the national TB registry is a case study in how attention to a critical component of a pharmaceutical system—improving information and evidence for decision making—can improve patient care and the chances for the best possible health outcomes.

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