

Philippine Tuberculosis Supply Chain Options Analysis: Technical Report

October 2015



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SLAPS 
Systems for Improved Access
to Pharmaceuticals and Services

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The SIAPS logo consists of the word "SIAPS" in a bold, green, sans-serif font, followed by a stylized blue graphic of a person with arms raised in a V-shape.

This report is made possible by the generous support of the American people through the US Agency for International Development (USAID), under the terms of cooperative agreement number AID-OAA-A-11-00021. The contents are the responsibility of Management Sciences for Health and do not necessarily reflect the views of USAID or the United States Government.

About SIAPS

The goal of the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program is to assure the availability of quality pharmaceutical products and effective pharmaceutical services to achieve desired health outcomes. Toward this end, the SIAPS result areas include improving governance, building capacity for pharmaceutical management and services, addressing information needed for decision-making in the pharmaceutical sector, strengthening financing strategies and mechanisms to improve access to medicines, and increasing quality pharmaceutical services.

Recommended Citation

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Soucy Brown, M., and D. Lee Chin, E. Rutta, M. Gabra, L. Zackin. 2015. *Philippine Tuberculosis Supply Chain Options Analysis: Technical Report*. Submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health.

Key Words

Philippines, TB, tuberculosis, supply chain, options analysis, field assessment, procurement, distribution, logistics, storage, capacity, 3PL, third-party logistics, pharmaceutical management, MIS, LMIS, information management, stock-out

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ACRONYMS AND ABBREVIATIONS

3PL	third-party logistics
BnB	Botika ng Barangay
BNB	Botika ng Bayan
CHD	Center for Health Development
CHO	City Health Office
COBAC	Central Office Bids and Awards Committee
DOH	Department of Health
DOTS	Directly Observed Therapy, Short-course
FDA	Philippine Food and Drug Administration
GDF	Global Drug Facility
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
GMP	Good Manufacturing Practices
IMPACT	Innovations and Multisectoral Partnerships to Achieve Control of TB
IPT	intermittent preventive treatment
JPR	Joint Program Review
LGU	local government unit
MDR-TB	multidrug-resistant tuberculosis
MIS	management information system
MMD	Materials Management Division
NCDPC	National Center for Disease Prevention and Control
NCPAM	National Center for Pharmaceutical Access and Management
NCR	National Capital Region
NOSIRS	National Online Stock Inventory Reporting System
NTP	National Tuberculosis Control Program
PBSP	Philippine Business for Social Progress
PhilPACT	Philippine Plan of Action to Control TB
PHO	Provincial Health Office
PHP	Philippine peso
PMDT	programmatic management of drug-resistant TB
PNF	Philippine National Formulary
PPMD	public-private mix DOTS
RHU	rural health unit
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
TB	tuberculosis
USAID	US Agency for International Development
WHO	World Health Organization
WPRO	WHO Regional Office for the Western Pacific

ACKNOWLEDGMENTS

This report would not be possible without the contributions of the following consultants, who provided invaluable insight on the pharmaceutical system of the Philippines from central to municipal levels, on private sector capacity, status updates regarding key pharmaceutical policies and strategies, and system costing and who performed data collection:

Douglas Ball

Dr. Hilton Lam and the Institute of Health Policy and Development Studies Team at the National Institutes of Health, UP Manila

Dr. Sheila Laviña

Dr. Maria Imelda Quelapio

Denise Silfverberg

SIAPS/Philippines

Michael Gabra

Dr. Arthur Lagos

Nerizza Muñoz

USAID/Philippines

Dr. Kathryn Roa

Dr. Yolanda Oliveros

Judy Chen

Dr. Milton Amayun

Karen Klimowski

Philippines Department of Health

Dr. Jimmy Lagahid

Dr. Eric Tayag

Dr. Rosalind Vianzon

Dr. Irma Asuncion

National Tuberculosis Program

Dr. Anna Marie Celine Garfin

Dr. Ramon Basilio

Dr. Vivian Lofranco

National Center for Pharmaceutical Access and Management

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Central Office Bids and Awards Committee

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Philippines Food and Drug Administration

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PBSP: Eric Camacho

World Health Organization

Dr. Julie Hall (WHO Philippines)

Dr. Woojin Lew

Dr. Klara Tisocki (WPRO Regional Office)

Dr. Tauhid Islam (WPRO Regional Office)

Dr. John Wong, Lecturer, Ateneo University
Diana Van Daele, Task Manager, EU
Delegation

Dr. Madeleine Valera

Dr. Leonila Ocampo, Philippine Pharmacists
Association

EXECUTIVE SUMMARY

The US Agency for International Development (USAID)-funded Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program was established in 2011 to increase access to quality pharmaceutical products and services. The SIAPS strategy is a collaborative, comprehensive approach to pharmaceutical system strengthening and represents a commitment to enhancing countries' capacity to procure and distribute high-quality pharmaceuticals and building stronger systems for governance, human resources, information, health financing, service delivery, and product quality. A key component of the SIAPS and Management Sciences for Health strategies is the options analysis, which combines an indicator-based assessment of the health and pharmaceutical sector with total cost analysis of several strategies for addressing a specified problem.

In response to perceived issues affecting the supply chain for tuberculosis (TB) medicines in the Philippines, SIAPS initiated a supply chain options analysis in early 2014, and data collection was completed in July. A conference is anticipated in late 2015 to present the assessment findings to a variety of stakeholders and to foster collaboration to select from the proposed strategies and develop an implementation plan with stakeholder commitment to the process moving forward.

The objectives of the TB supply chain options analysis were to—

- Determine the key bottlenecks and determinants that affect the timely availability of quality-assured TB medicines and other TB-related commodities at the national, regional, and local levels
- Document good regional and local practices that can be replicated and can contribute to satisfactory supply management performance of TB medicines and related commodities
- Identify innovative strategies to improve the performance of systems, operations, and practices within the supply chain
- Analyze the total costs related to the present system and compare them to the estimated costs of the proposed strategies
- Identify barriers such as policies, laws, or regulations that impede implementation of proposed strategies
- Analyze the viability of strategies for improving the supply system and the interventions necessary to put them into practice
- Engage with relevant stakeholders to reach a broad consensus on the current issues, and agree on a strategy to address them
- Develop a road map for implementation of the selected strategies and measures

- Disseminate findings to key stakeholders

Specifically, the options analysis used the following steps and techniques to complete the process—

- Review of documents and reports from prior work in the Philippines, assessments undertaken by the Ministry of Health and other stakeholders and partners, legal and technical documents, policies and guidelines related to the supply chain and TB management practices in the Philippines and similar settings, and peer-reviewed and gray literature on these topics
- In-depth interviews and consultative meetings with staff from USAID, the National Center for Disease Prevention and Control (NCDPC), the National Tuberculosis Control Program (NTP), the Materials Management Division (MMD), the procurement service/Central Office Bids and Awards Committee (COBAC), the National Center for Pharmaceutical Access and Management (NCPAM), the World Health Organization (WHO), the Innovations and Multisectoral Partnerships to Achieve Control of Tuberculosis project (IMPACT), the Philippine Business for Social Progress (PBSP) social development foundation, the Philippine Food and Drug Administration (FDA), the Philippine Pharmacists Association, the Institute for Health Policy and Development Studies at the University of the Philippines, the League of Cities of the Philippines, the Department of Health (DOH), and other implementing partners
- Visits to central, regional, and provincial warehouses involved in the pharmaceutical public sector supply chain to review and assess procedures, ordering processes, storage, and distribution practices
- Health facility visits to obtain information on availability of selected TB medicines and commodities, stock-out levels, inventory management, and storage capacity
- Patient interviews conducted by data collectors at health facilities to gather information on stock-outs, treatment disruptions, and the economic impact that these issues had on patient finances
- Following data analysis, development and costing of strategies for presentation to stakeholders

The TB treatment supply chain in the Philippines has undergone several major changes in recent decades, from introduction and rollout of Directly Observed Therapy, Short-course (DOTS) to health system reform and decentralization. Advances in TB treatment and diagnosis require the supply chain to adapt to changing recommended commodities and guidelines, all while expanding access and coverage throughout the Philippines. The results of this options analysis indicate that a coordinated restructuring of the TB supply chain in the Philippines is necessary and feasible to carry out. This restructuring would significantly contribute to reduced stock-outs and waste and would improve the quality of information for decision making. It must address the gap between stock availability at the central level and at health facilities and weaknesses in

current operational structures, and it must leverage opportunities for new approaches to rationalize the supply chain as a whole. Although costs are associated with restructuring, the cost savings brought about by more efficient operations are important, as well as the consequent decrease in treatment disruptions, thereby resulting in reduced TB transmission and resistance to treatment.

The TB supply chain options analysis is organized into seven sections—

- Introduction
- Public sector TB diagnosis and treatment supply system, which describes the current supply chain model for TB commodities
- Private sector capacity, which assesses private sector capacity to perform storage and logistics functions
- Supply management and product availability, which presents selected data from the field assessment portion of the options analysis relating to current supply chain practices and stock levels
- Barriers to effective supply management, which analyzes the assessment data to identify issues in the current supply chain model
- Strategies to improve supply chain management, which presents strategies for improvement and their estimated cost
- The way forward

Following is a summary of the strategies related to advancing reform.

Strategy A: Increase Public Sector Storage Capacity

- Additional storage space may be constructed or rented at central, regional, provincial, or health facility levels. This would increase storage capacity where bottlenecks exist if storage is added to appropriate levels.
- Inventory management would not improve.
- Transportation resources and distribution practices would not improve.
- Private sector capacity is high to provide rental or construction services, though it may vary by area.
- High levels of capital investment are required to build and operate sites, and continued investment is required for rental or site maintenance.

- Political viability is perceived as limited.
- The strategy does not address other identified supply chain issues.
- Addition of space should be considered on very limited basis, evaluating factors relating to geography and accessibility.
- Rental contract management should be centralized and carefully conducted to ensure quality of services.

Cost implications	Build space	Rent space
	Annual cost: PHP 4,847,005.15	PHP 5,185,913.23 to 5,274,713.23
	Initial cost: PHP 2,775,000 to build and PHP 399,600 to 488,400 to rent for 1 year	
	Total Year 1 cost: PHP 7,960,913.23 to 8,049,713.23	
Percentage relative to current system cost	Annual cost: 101.27% Year 1: 166.33–168.18%	108.35–110.20%

Strategy B: Increase Frequency of Deliveries

- Increase delivery frequency through a combination of public fleet management, contracting with suppliers, and/or third-party logistics (3PL) operators, which reduces need for storage space (compared with current levels) at any given time at applicable levels of the supply chain.
- Information management does not improve, and administrative burden may increase with increased frequency of deliveries.
- Reliance on transportation resources increases.
- The strategy eliminates need for increased storage space and reduces supplier bottleneck at central level.
- Streamlining management may reduce administrative burden.
- Contract management with supplier is necessary to specify delivery size and frequency.
- The strategy can be used within public sector or with 3PL operator options.

Cost implications	PHP 4,687,536.35
Percentage relative to current system cost	97.94%

Strategy C: Information System Improvement

- Poor record keeping has resulted in large discrepancies between recorded stock levels and stock on hand in both warehouses and health facilities.
- The National Online Stock Inventory Reporting System (NOSIRS) is widely available in warehouses, but its use varies greatly. Lack of centralized reporting and inventory management systems contributes to poor and inconsistent reporting of need and consumption, which in turn obstructs the quantification process.
- Improve NOSIRS or develop an alternate system, and increase implementation.
- Strengthen record-keeping culture through trainings and increased oversight.
- Existing warehouse and distribution systems may be used more efficiently, but this does not fix their functional shortcomings.
- Storage capacity or transportation resource constraints will not improve.
- On the plus side, NOSIRS is an existing national system with the potential to track, quantify, and report on commodities.
- On the down side, NOSIRS is an online-only platform, suffers high turnover of trained staff, requires an intensive training process, and has limited rollout.
- Implementation should be scaled up, and use of NOSIRS should be mandatory and enforced.
- Training should include emphasis on use of all relevant modules.

Cost implications	PhP 6,256,670.70 + X (unknown capital investment in management information system)
Percentage relative to current system cost	130.72% + X

Strategy D: Direct Delivery

- Deliver directly from the central-level warehouse to the provincial warehouses or DOTS facilities bypassing the regional level of storage.

- Central storage is unchanged, increased storage is available at regional level for other supplies, and increased storage is available at provincial level with direct delivery to health facilities.
- Health facility storage may need to increase to accommodate regular deliveries from central level.
- Inventory and information management should improve with reduced supply chain levels, and fewer administrative requirements should result in decreased delay between central-level order and receipt at health facilities.
- Reliance on transportation is increased through a mix of fleet management contracting with suppliers and/or 3PL operators to reach increased number of facilities.
- This model has been tested in the Philippine context (ComPack, family planning programs) using a 3PL operator.
- Initial investment is required to increase transportation capacity; continued investment or outsourcing to private sector is required to maintain capacity.
- Effective coordination and reporting are required. Health facilities must be able to redistribute stock between provinces and facilities as needed.
- Consider outsourcing transportation and/or logistics to third party.
- Contract management should be centralized and carefully conducted.

Cost implications	MMD to provinces: PHP 10,351,557.76	MMD to regions: PHP 12,003,114.60
Percentage relative to current system cost	216.27%	250.78%

Strategy E: Third-Party Logistics Operators with or without Management Information System (MIS) Services

- Outsource all services, including packaging, sorting, storage, delivery of goods, to 3PL operator and perhaps add stock status monitoring and information management.
- Storage and transportation are managed by the service operator, and inventory and information management are done through NOSIRS; invoice and delivery receipts and replenishment of stocks at health facilities may be added to the agreement as well.
- These arrangements are efficient, flexible, and responsive and reduce the burden on the MMD in terms of human resources, administration, storage, transportation, and information management.

- Potential exists for cost savings with efficiencies if combined with existing programs using this model (ComPack, family planning).
- The strategy potentially reduces waste and stock-outs.
- With stock management and MIS services, health facility staff administrative burden is reduced or eliminated.
- The strategy requires coordination between private sector and public entities.
- Potential reluctance in private sector to work with government has been documented.
- MIS and stock management services are unprecedented in the Philippine context; costs will vary greatly depending on the market conditions and specific requirements.

Cost implications	Third-party logistics: PHP 12,535,335.04	Third-party logistics + stock management and MIS: PHP 12,535,335.04 + X (Unknown 3PL cost for MIS services)
Percentage relative to current system cost	261.90%	261.90% + X

INTRODUCTION

In the Philippines, tuberculosis (TB) is the sixth-leading cause of death and illness. The World Health Organization (WHO) classifies the Philippines as both high TB burden and high multidrug-resistant TB burden (WHO 2014) and estimated 260,000 incident cases and 28,000 deaths from TB in 2011. TB treatment is a long and complex process, requiring a steady stream of commodities to both diagnose and treat the disease, with treatment periods ranging from 6 to 8 months for medicine-susceptible cases to 20 months or more for drug-resistant strains. Treatment failures or interruptions can lead to the development of resistance, and treatment delay can result in worsening illness and increased exposure of others to the disease. Both are costly in terms of actual treatment and the socioeconomic burden of disease on the Philippines.

The US Agency for International Development (USAID) supports the government of the Philippines in its efforts to address the challenge of TB. USAID provides this support to the National Tuberculosis Control Program (NTP) through various programs and initiatives, with assistance centered on the goals set under the 2010–2016 Philippine Plan of Action to Control TB (PhilPACT). These goals include reducing the prevalence of TB, increasing the TB cure rate, and increasing the TB detection rate for all forms of the disease. A key aspect of USAID’s work is the strengthening of health system components and agencies to increase patient access to high quality and effective pharmaceutical and laboratory services through collaboration with the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program.

Anecdotal reports of stock-outs of anti-TB medicines, diagnostic supplies, and laboratory supplies and issues with forecasting and quantification, procurement, distribution, and inventory and stock management have long existed. To address the challenges and issues in the system and provide strategies for the Department of Health (DOH) to consider in moving forward to address identified issues, an understanding of the extent and nature of the problem is essential. To that end, SIAPS conducted an assessment of facilities in several regions at several levels of the system, aimed at evaluating product quality, storage conditions, inventory and stock management practices and logistics, and adequacy of supply for first- and second-line TB treatments (including pediatric regimens) and laboratory and diagnostic commodities at both health facilities and warehouses at the central, regional, provincial, and municipal levels. The data produced by the assessment were used to inform the development of actionable strategies to improve the supply chain and enhance the availability, accessibility, acceptability, affordability, safety, quality, and effectiveness of medicines and supplies.

Previous TB Supply Assessments and Recommendations

Previous TB supply assessments include the Joint Program Review (JPR) of the National Tuberculosis Control Program of the Philippines (Joint Program Review 2013) and the USAID/Philippines External Evaluation of the Tuberculosis Portfolio (USAID/Philippines 2012). Currently, implementation of the National Tuberculosis Control Program Laboratory Network Strategic Plan 2013–2016 (DOH/PhilPACT 2013) is under way and is an additional

source of recommendations to improve the TB supply system, specifically with regard to laboratory commodities and diagnostic supplies.

The JPR examined the following assessment areas: local TB epidemiology; basic Directly Observed Therapy, Short-course (DOTS) implementation; laboratory network operations; public-private partnership in DOTS; advocacy, communication, and social mobilization for DOTS; programmatic management of drug-resistant TB; TB medicine and commodities supply management; program-related policy, financing, and governance; and NTP organizational systems and capacity. The JPR aimed to assess progress toward and constraints in the achievement of the PhilPACT goals to decrease TB prevalence by increasing case detection and cure rates, and the JPR issued recommendations to increase progress and revise PhilPACT for the 2014–2016 period. Seven teams were each assigned a thematic area and a geographic region, and they administered a standard survey at each site visited. Once the data were collected, teams examined data from all regions and compiled findings and recommendations. Final recommendations were discussed in plenary and agreed upon by all JPR members before presentation to stakeholders. Procurement and logistics was only one portion of the review, and the review does not constitute an in-depth assessment of pharmaceutical management practices at facilities and warehouses. The recommendations pertaining to this area address broad issues and do not include detailed information concerning budget and implementation.

The USAID TB Portfolio Evaluation examined the eight programs USAID supported to strengthen the NTP between 2006 and 2011. Of these programs, three had TB-specific targets. The portfolio was assessed in terms of its support in achieving PhilPACT goals, and the following four key recommendations were issued to strengthen the portfolio and improve its support to the NTP (USAID/Philippines 2012)—

- USAID should continue its support for TB prevention and control in the Philippines at approximately the same level of funding.
- As a precursor to developing separate plans of activities for future projects, USAID should develop an overarching strategic plan for how to best invest its resources in TB activities in the Philippines. Greater efforts should be made to continue activities that had the highest impact in the period evaluated.
- USAID should strategically focus on ensuring that national policies and tools are directed and expanded at lower levels of the health system. The priority for USAID should be to ensure that its technical assistance and capacity building are closely aligned with national strategies and plans and support existing and emerging national approaches to delivering care.
- USAID must remain closely in touch with other donors and institutions to ensure its activities are complementary and not duplicative.

More-specific recommendations were issued in the full report in 11 technical and programmatic areas, based on a desk review of portfolio initiatives, interviews with management and technical representatives of implementing agencies and national stakeholders, and interviews with service

providers throughout the country at all levels of the health system, both public and private, at USAID- and non-USAID-supported sites (USAID/Philippines 2012). In the Anti-TB Drug Supply section of the report, observations for the NTP consisted of implementing monitoring of anti-TB medicine storage and quality at service delivery levels, and analyzing the costs of supporting second-line medicine supply following termination of funding from the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) and developing a strategy ensuring sustainability through national resources. Recommendations to USAID included supporting surveillance and pharmaceutical quality, making improvements in pharmaceutical management at service delivery levels, implementing WHO prequalification for national anti-TB medicine manufacturers, and enforcing existing policies preventing access to anti-TB medicines without a prescription.

The National Tuberculosis Control Program Laboratory Network Strategic Plan 2013–2016 is currently being implemented and in part deals with the supply management system as part of its second objective to improve the TB laboratory network management systems. The gap analysis portion of the laboratory strategic plan assesses management issues and the overall structure of the supply management system in the laboratory network, but it does not focus on the supply chain or logistics specifically.

Problem Statement

Although the procurement budget for anti-TB medical supplies has increased, recent concerns are related to quality of the medicines procured, stock-outs of key products, storage capacity, inventory management practices, and other aspects related to the supply chain. Recognizing that the supply of anti-TB medicines and other health commodities is challenged, the NTP has requested that SIAPS undertake an assessment of the NTP's supply management to provide options for optimization (Ball 2014).

Objectives

The objectives of the TB supply chain options analysis were as follows—

- Determine the key bottlenecks and determinants that affect the timely availability of quality-assured TB medicines and other TB-related commodities at the national, regional, and local levels
- Document good regional and local practices that can be replicated and contribute to satisfactory TB medicines and related commodities supply management performance
- Identify innovative strategies to improve the performance of systems, operations, or practices within the supply chain
- Analyze the total costs related to the present system and compare them to the estimated costs of the proposed strategies

- Identify barriers such as policies, laws, or regulations that impede implementation of proposed options
- Analyze the viability of strategies for improving the supply system and the interventions necessary to put them into practice
- Disseminate findings to key stakeholders
- Engage all relevant stakeholders to reach broad consensus on the issues and way forward
- Develop a strategic road map for the implementation of selected strategies and measures

Methodology

A group of international and national consultants together with the SIAPS team carried out the options analysis. The process involved reviewing information from previous studies and assessments, legal and technical documents, and policies and guidelines related to the supply chain and TB treatment; conducting stakeholder interviews; making the field assessment; and developing and costing strategies.

Specifically, this analysis used the following steps and techniques to complete the process—

- Review of documents and reports from prior work in the Philippines, assessments undertaken by the DOH and other stakeholders and partners, legal and technical documents, policies and guidelines related to the supply chain and TB management practices in the Philippines and similar settings, and peer-reviewed and gray literature on these topics
- In-depth interviews and consultative meetings with staff from USAID, the National Center for Disease Prevention and Control (NCPDC), the NTP, the Materials Management Division (MMD), the procurement service/Central Office Bids and Awards Committee (COBAC), the National Center for Pharmaceutical Access and Management (NCPAM), the WHO, the Innovations and Multisectoral Partnerships to Achieve Control of Tuberculosis (IMPACT) project, the Philippine Business for Social Progress (PBSP) social development foundation, the Philippine Food and Drug Administration (FDA), the Philippine Pharmacists Association, the Institute for Health Policy and Development Studies at the University of the Philippines, the League of Cities of the Philippines, the DOH, and other implementing partners
- Visits to central, regional, and provincial warehouses involved in the public sector supply chain to review and assess procedures, ordering processes, storage, and distribution practices
- Visits to health facilities to obtain information on availability of selected TB medicines and commodities, stock-out levels, inventory management, and storage capacity

- Patient interviews at health facilities to gather information on stock-outs, treatment disruptions, and the impact of stock-outs on patient finances, conducted by data collectors
- Following data analysis, development and costing of strategies for presentation to stakeholders

Supply Chain Options Analysis Overview

Like many high-burden TB countries, the Philippines has struggled to have a well-functioning supply chain that ensures availability of anti-TB medicines and diagnostic supplies. The SIAPS strategy is designed to improve supply chain performance from the top of the health system to the bottom, working from procurement to distribution to dispensing and use.

This method combines total cost analysis methods with indicator-based assessment in the TB supply chain. Analysis of this kind explores both the merits and deficiencies of current practices at various levels of the supply chain, which are then compared to alternative practices and structures that may be introduced (Uganda Ministry of Health and Uganda SURE 2011).

Because no simple solutions exist and barriers will hinder implementing new strategies and altering existing structures, critical regulations and policies affecting issues such as supply chain governance, procurement, and financing and cash flow must be open to reform. In addition, the government of the Philippines must be able to meet financial requirements and commit to finding sustainable long-term solutions within the public and private sectors.

The analysis identifies new policy and procedural reforms to improve the supply chain, as well as stakeholders and organizations necessary to involve in the process of implementing proposed changes and barriers to executing these reforms. The analysis identifies alternative strategies so that stakeholders may choose from several strategies, taking feasibility of implementation into account. The new supply chain reform focuses on strengthening procurement, storage, and distribution, examining both alterations to the existing structure and contracting services out to private service providers. Addressing the lack of storage capacity and rationalizing disparate inventory management and product delivery practices are the most critical variables for ensuring consistent product availability at all levels and reducing or eliminating the need for local government procurement of TB treatments and commodities or related patient out-of-pocket spending. Strategies will most likely involve standardization of delivery schedules and contracting a third party to manage one or more portions of the supply chain: distribution, storage, or procurement and logistics information management.

The options analysis began with the literature review in the first quarter of 2014. By May 20, the data assessment tools were developed, data collectors were trained, and data collection began on June 1 and was completed by July 3, 2014. Following the data analysis, several strategies for action were developed and shared with a broad audience of stakeholders through a series of consultative meetings held in October 2014. A conference to present the findings and proposed strategies to a broad assembly of stakeholders to consider options and plan next steps is anticipated for early 2015.

Review and Analysis of Documents

The preliminary literature review covered previous reports from fieldwork in the Philippines, peer-reviewed and gray literature on TB medicines and commodities supply chains in the Philippines and in other low- and middle-income country settings. Findings from the review were organized in a Google Docs spreadsheet, noting identified stakeholders, barriers to access, enablers of access, steps in the supply chain, recommendations issued, and other relevant information. Using these findings, the SIAPS team mapped the supply chain for first- and second-line TB medicines and for diagnostic and laboratory commodities.

Data Collection and Assessment

Information gathered from the review also guided the development of the assessment tools and highlighted potential bottlenecks and issues requiring further examination. Identified stakeholders were consulted throughout the tool development process to give feedback and distinguish priority areas for assessment. The following research questions were developed—

- What is the TB commodity (laboratory supplies and TB medicines) management situation in the health care system?
- What is the availability of TB commodities, infrastructure capacity, and human resources capacity at health facilities and provincial and regional warehouses?
- What are the implications of lack of availability of TB commodities for TB patients?

Six regions were selected from the major island groups (National Capital Region or NCR, Luzon, Visayas, and Mindanao) to provide a representative sample. Regions selected had USAID IMPACT project sites, offered differing levels of TB burden and TB treatment facilities, made up a geographically diverse sample with both easily accessible and hard-to-reach areas, and included NTP priority regions with a mix of well- and poorly performing facilities. In each selected region, up to 30 health facilities were randomly selected from the DOH DOTS directory of facilities in the provinces. A mix of hospitals, programmatic management of drug-resistant TB (PMDT) facilities, public-private mix DOTS (PPMD) facilities, and rural health units (RHUs) were selected. All facilities for the management of multidrug-resistant tuberculosis (MDR-TB) (PPMD and PMDT units) and warehouses in the selected regions and provinces were included in the survey (see table 1 for a summary of selected sites). At each service delivery site, at least eight TB patients were selected for interview as they exited facilities to assess their perception of availability of medicine and its impact on TB treatment.

Table 1. Summary of Sites Selected for Survey

Region	Province	TB treatment facilities: hospitals/RHUs	MDR-TB treatment facilities	Regional/provincial warehouses
Region IV-A (CALABARZON)	Batangas	10	1	1
	Cavite	9	1	1
	Laguna	12	1	1
	Quezon	12	1	2*
	Rizal	12	1	1
Region IV-B (MIMAROPA)	Occidental Mindoro	6	0	1
	Oriental Mindoro	8	0	1
	Romblon	3	0	1
CAR	Benguet	14	1	2*
Region VII (Central Visayas)	Cebu	32	2	2*
Region X (Northern Mindanao)	Bukidnon	13	0	1
	Misamis Oriental	13	1	2
ARMM	Tawi-Tawi	7	0	1
NCR-Quezon City		27	3	2*
NCR-Manila		18	4	1
TOTAL	15	204	16	20

Note: CAR = Cordillera Administrative Region, ARMM = Autonomous Region of Muslim Mindanao.

* Includes regional warehouse.

Data were collected through three structured questionnaires: facility assessment questionnaire, regional and provincial warehouse questionnaire, and patient exit interview questionnaire. At health facilities and warehouses, data collectors conducted physical inventory of commodities and verified all supply and inventory records. This allowed validation of some responses in the structured questionnaires and permitted comparisons between physical and recorded stock levels. The tools were designed to address stakeholder concerns about lack of quantitative data to support anecdotal information provided in several recent assessment reports and lack of or limited data from the field on availability and supply chain barriers.

Development of Strategic Options

Following data collection and analysis, options were developed based on alternate supply chain designs described in the literature and examination of other supply chains in operation or proposed for implementation in the Philippines (in particular the third-party logistics, or 3PL, model being implemented for the ComPack and the family planning programs) or in similar settings. Strategies were also drawn from strategies already being considered by stakeholders and involved government agencies, and costs were estimated for consideration of the alternative strategies.

Costing of Strategic Options

The study team estimated the costs associated with the current supply chain system of the MMD and NTP for management of TB commodities and determined the projected costs associated with the various strategies to improve supply chain management.

Costing of the current supply chain configuration was based on data from Region IV-A and was carried out through a series of key informant interviews. These interviews included members of the NTP, warehouse managers, regional office program coordinators, municipal health officers, and public health nurses. In addition to these interviews, budget allocations for storage and distribution were reviewed to further break down costs into components by unit for analysis.

Supply chain options were based on modifications to the current supply chain configuration. They included further information obtained from local service providers relating to storage, transportation, and inventory management services.

Once component costs were collected, each option was assigned a total cost based on the sum of the relevant component costs. For example, strategies involving direct delivery removed storage costs at the eliminated warehouse levels and added transportation costs to the total.

PUBLIC SECTOR TB DIAGNOSIS AND TREATMENT SUPPLY SYSTEM

The procurement of goods and services in the public sector is governed by the Government Procurement Reform Act (Government Procurement Policy Board 2012) and its Implementing Rules and Regulations. This act sets out the rules and procedures for public procurement. Procurement should be undertaken as competitive bidding except under “highly exceptional circumstances.” Alternative methods of procurement include limited-source bidding (for specialized goods), direct contracting (single source, proprietary, or critical goods), repeat orders (superior winning bids of prior bidding), shopping (emergency procurement below certain monetary limits), and negotiated procurement (following two failed bids and other circumstances). Tenders are advertised and awards posted through the Philippine Government Electronic Procurement System (<http://www.philgeps.net>). National competitive bidding is encouraged in the procurement of goods, and foreign bidders may participate in a tender if they meet requirements laid out in the Implementing Rules and Regulations. Furthermore, Article XII of RA 9184/2003 and Section 43 of the Implementing Rules and Regulations allow for domestic preference of 15% of the value of the contract if both international and domestic bidders participate in a tender.

The regulation of pharmaceuticals is governed largely through the following laws that effectively also state government policy with respect to the pharmaceutical sector (table 2).

Table 2. Major Legislation Governing Pharmaceuticals in the Philippines

The Pharmacy Law of 1987 (RA 5921/1987)	Regulates pharmaceutical education, registration of pharmacists, and practice of pharmacy.
The Generics Act of 1988 (RA 6675/1988)	Promotes generic medicines through use of generic names in marketing, prescribing, and dispensing; encourages local production of generic medicines as well as public education of generic medicines. In particular it establishes a national essential medicines list and requires all public agencies to use generic names in procurement and other transactions involving medicines.
The Universally Accessible Cheaper and Quality Medicines Act of 2008 (RA 9502/2008)	Acts to promote effective market competition through revision of intellectual property provisions, allowing medicine price controls (the maximum retail price), establishing medicine price monitoring and strengthening generic medicine promotion and enforcement
The Food and Drug Administration (FDA) Act of 2009 (RA 9711/2009)	Enhances and strengthens the capacity of the FDA in its regulatory functions and merges the regulation of food, pharmaceuticals and medical devices under one agency.

The Philippine National Formulary (PNF) is the effective essential medicines list of the Philippines and is produced by a Formulary Executive Committee appointed by the DOH under the NCPAM. Government units should procure only medicines that are listed in the PNF in line with Executive Order 49/2003.

The Philippines does not have a comprehensive national medicine policy document. Statements of policy are made within Republic Acts (laws) and subsequent regulations. The Aquino administration has established the NCPAM as an advisory body under RA 9502. The responsibilities of the NCPAM include, among others, implementing the provisions of RA 9502, managing and implementing the national medicine policy, undertaking policy studies related to access to medicines, and updating the essential medicines list. Other than the NCPAM, the DOH does not have a permanent pharmacy directorate or office responsible for pharmaceutical services. Central procurement is undertaken by COBAC; central warehousing and coordination of distribution is undertaken by the MMD; and logistical planning, direction, and oversight are provided by program managers of individual health programs, for example the TB program or family planning program.

The national medicines regulatory authority in the Philippines is the FDA, formerly the Bureau of Food and Drugs. Following the promulgation of RA 9711/2009, the FDA is responsible for the regulation of foods, medicines, medical devices, cosmetics, and other products that may affect public health.

In the Philippines, 164 TB medicines are registered, of which 80% are manufactured domestically. None of the second-line medicines are registered. There are 172 domestic manufacturers, 27 of which produce TB medicines; all require a license to operate and FDA Current Good Manufacturing Practices (GMPs) certification, but none are prequalified by WHO. GMP certification by the FDA is not internationally accredited by the Pharmaceutical Inspection Convention/Pharmaceutical Inspection Scheme, but the FDA has been working toward achieving accreditation in 2015/2016. The FDA was to conduct GMP inspections of foreign manufacturers starting in 2014, although not TB medicine manufacturers. Concern may exist about lack of remedial actions relative to GMP issues, but the FDA has recently issued a recall of products from two manufacturers, and one manufacturer with persistent GMP issues may be potentially facing closure.

Box 1: Policy, Legal, and Regulatory Key Points

- The Philippine National Formulary (PNF) is the essential medicines list of the Philippines.
- All TB medicines are listed in the PNF, and public procurement is conducted according to the PNF.
- Public procurement procedures require national competitive bidding for products available in the Philippines.
- The Food and Drug Administration (FDA) is responsible for registering manufacturers, distributors, and health products and devices.
- Publicly procured medicines require a passing certificate of analysis from the FDA before distribution and payment of suppliers.

The FDA is responsible for ensuring the quality of medicines on the market, implemented through the registration process, application of GMP certification, and postmarketing surveillance. With regard to procurement of medicines in the public sector, local government units and procurement entities are required to obtain a certificate of analysis from the FDA

showing compliance with quality standards before they use their medicines and release payment to the supplier.

Recent data indicate that less than 1% of TB medicine samples failed quality control tests (2012–2014); USAID’s Promoting the Quality of Medicines Program from 2009 to 2003 reported a 2.7% failure rate, based on FDA confirmatory testing of samples, but 11.1% had been considered doubtful because the manufacturer had not complied with the legal requirement to notify FDA of the batch production before its release to the market. No counterfeit or fake TB medicines have been detected. However, when products fail quality control tests, effects on TB supply logistics and treatment may be widespread, as experienced recently with failure of a Category II kit.

Overview of Current Public Sector Supply Chain for TB Medicines and Commodities

For the NTP, first-line medicines and laboratory supplies are procured through the DOH’s COBAC. Medicines and GeneXpert cartridges for PMDT are currently funded through a Global Fund grant and procured by the Principal Recipient, PBSP, in line with the Global Fund procurement policy.

Local government units undertake procurement of health commodities for the health care services under their jurisdiction in the decentralized and devolved system in place in the Philippines. With regard to TB, they are responsible for procuring single-ingredient TB medicines as well as procurement to cover any stock-outs to ensure continuity of treatment.

Once TB medicines and supplies have passed quality testing by the FDA at central level, they proceed to the provincial and regional levels. At this point, Centers for Health Development (CHDs) and local government units (LGUs) are responsible for storage, distribution, and transport, and practices vary widely.

First-Line Medicines

The DOH procures a wide range of medicines and laboratory supplies covering general essential medicines as well as those of separate programs, including TB medicines and supplies (refer to table 3 for an overview of the supply chain with an estimated timeline). All DOH programs use COBAC for procurement of their health supplies, although in some cases particular conditions may be imposed or special procurement mechanisms used (as for second-line TB treatments and GeneXpert cartridges, through the Global Drug Facility, or GDF).

Table 3. Activities and Timeline for Supply of First-Line TB Medicines

Activity	Duration
A. Quantification and warehousing	
1. Projecting procurement	Varies by program
2. Receipt of order from NTP to completion of documents by MMD	Depends on terms of reference. Currently, it takes 60 days with their courier (XIMEX). If delivery takes more than 60 days, the courier is penalized.
3. Completion of documents to pick up by 3PL	1–2 weeks
4. Pick up by 3PL until delivery to regional warehouse	1–4 weeks
5. Delivery of procured goods from receipt of request by manufacturer to the delivery of goods to the warehouse	1–2 weeks
6. Updating of warehouse stock cards/inventory record and supply outlay once delivered goods are received	Immediately done
7. Processing of request for delivery by the end-users to the delivery itself	For medicines: -If urgent (via air travel), 3 days -If not urgent (via land and water travel), approximately 15 days For perishable goods: within 24 hours
8. Updating of the inventory outlay and data once delivery has been done	Inventory outlay is updated once a month. Data are updated immediately whenever there are movements of goods.
B. Delivering to lower-level facilities	
1. Processing and acceptance of requests	For medicines: -If urgent (via air travel), 3 days -If not urgent (via land and water travel), about 15 days For perishable goods: within 24 hours
2. Retrieval of goods for return	Immediately done
3. Exchange of goods with appropriate stock	For medicines: -If urgent (via air travel), 3 days -If not urgent (via land and water travel), about 15 days For perishable goods: within 24 hours
4. Updating of inventory data and inventory outlay	Inventory outlay is updated once a month. Data are updated immediately whenever there are movements of goods.

Because first-line medicines are available on the domestic market, national competitive bidding was conducted annually from 2011 to 2013; domestic preference was not applied in any case. International bidding or procurement through international agencies can be used only if the product is not available on the local market or national bidding has failed twice. COBAC also performs procurement of services and has contracted shipping and warehousing services in the past. However, this has not been specific to TB health products but for the DOH as a whole. COBAC initiates payment of suppliers after notification of receipt of goods by the MMD and receipt of a certificate of analysis from the FDA for pharmaceuticals.

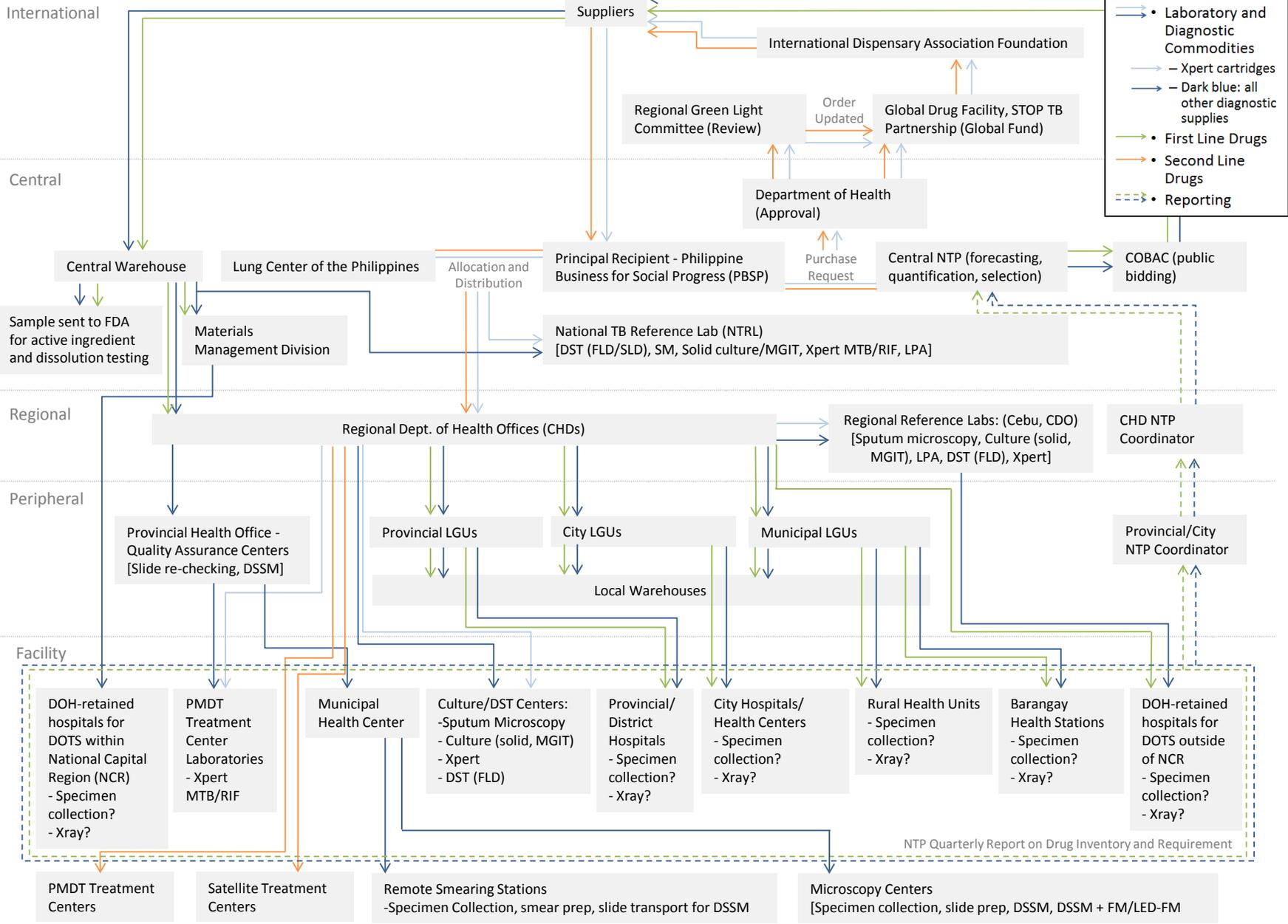
Reporting and quantification of needed TB commodities and first-line medicines in the Philippines occurs on several levels because of the decentralized nature of the system. Reports and requested quantities are consolidated from the local level to the provincial/city NTP coordinator, which are then sent to the CHD coordinators through to the NTP and COBAC at central level for final consolidation and ordering. First-line products flow from suppliers to the central MMD warehouse, where they undergo FDA inspection and quality testing, then are transported from the central level along with diagnostic supplies (except Xpert cartridges) to regional and provincial warehouses, and finally to LGUs and health service delivery points and diagnostic centers and labs. (See green and dark blue arrows in figure 1 for full details.)

Second-Line Medicines and GeneXpert Cartridges

The supplies for second-line medicines and other health commodities for PMDT are managed by the Principal Recipient, PBSP, under a Global Fund grant. Second-line medicines are procured through the GDF and Green Light Committee mechanism; therefore, only WHO-prequalified second-line medicines are procured through the GDF procurement agent (currently the International Dispensary Association Foundation). DOH procurement of second-line medicines is not permitted outside the Global Fund grants, and no second-line medicines are registered with the FDA for sale on the private market. Ancillary medicines to manage the side effects of second-line treatment are procured locally; only items on the PNF may be procured.

Reports from treatment centers that contain information on ongoing patients and their regimens are used for quantification and monitoring logistics, and these reports follow the same path as those for first-line medicines. Once the monthly reports are submitted to the NTP, a purchase request is created in collaboration with the PBSP, which is approved through the DOH and sent to the Regional Green Light Committee for review and the GDF Stop TB Partnership for initial processing. Once the request is reviewed and approved, the GDF sends the request to the International Dispensary Association Foundation, and subsequently the medicines and commodities are procured from suppliers and sent to the PBSP. The Lung Center of the Philippines and the PBSP are jointly involved in managing allocation and distribution of commodities to the National Tuberculosis Reference Laboratory and CHDs. From the CHDs, the commodities are distributed to health service delivery points, and Xpert cartridges are distributed to designated diagnostic centers (see light blue and orange arrows in figure 1).

Figure 1. Public sector TB supply chain in the Philippines



Supply Chain Strategies for Other Public Health Programs

In the traditional DOH programs (Expanded Programme on Immunization or EPI, malaria, essential medicines), pharmaceuticals follow a four-tier system and are passed from the national, regional, and provincial levels to RHUs or service delivery points. Because of decentralization, each municipality can select the medicines it needs at its respective health facilities. No centralized reporting system exists; quantities of medicines to be ordered and commodity types are usually determined based on past consumption data and available funds. Assessment papers (Laviña 2014) have observed that inconsistencies in procurement and distribution practices have led to variations in system efficiency in the different regions. Regional DOH offices coordinate with LGUs, which administer the City Health Offices (CHOs), Provincial Health Offices (PHOs), and other municipal and barangay health services for distribution and/or pickup to service the local health facilities. Municipalities also select modalities of transport and set their own preferences for delivery and ordering practices. It has been observed (based on interview responses) that this distribution system is characterized by irregularity of deliveries to end-users and stock-outs because of inefficient coordination and reporting systems using forecasts not based on actual consumption and need at the service delivery level.

A mapping exercise for public health programs in the Philippines (Villegas Reyes, Mapping of Health Development Partners' Procurement and Distribution System - Philippines 2012) found that international partners tend to use more variety in storage points than the DOH and tend to use storage down to the municipality level before dispensing to the target health facilities rather than centralized DOH systems. A related rapid assessment survey of health product distribution in the Philippines found that most peripheral health facilities are currently serviced through LGUs (56%) and provincial warehouses (55%), rather than central or regional warehouses (28% each) (Villegas Reyes, Rapid Assessment Survey on Health Procurement and Distribution System - Philippines 2012). Warehouse capacity (comprising regional, provincial, and district warehouses) was only considered adequate in 25% of cases, whereas 68% of health facilities considered their storage space adequate. Good storage principles were observed in the majority of cases in this rapid assessment report, and computerized stock management was reported at all warehouses, whereas health facilities used manual stock management records.

The rapid assessment of distribution practice (Villegas Reyes, Rapid Assessment Survey on Health Procurement and Distribution System - Philippines 2012) reported varying information on distribution practices. Warehouses were said to always provide deliveries to the health facilities, but in 56% to 80% of cases service delivery points were expected to pick up supplies from the warehouse. Only 42% of health facilities considered transport capacity adequate, with 42% of warehouses reporting that they have transport for deliveries.

The ComPack Program (NCPAM, DOH)

Programs that use freight forwarders or external agencies to distribute supplies and manage some aspects of inventory management relieve the burden on the MMD. The ComPack program exemplifies this arrangement; it uses a two-tier system in which commodities are transferred from the central level directly to RHUs via a 3PL service provider, bypassing regional and provincial levels.

The NCPAM serves as the overall coordinator of the chain, playing a role in procurement, management, and 3PL provider selection. COBAC carries out the procurement process. The NCPAM calculates the amount of stocks needed to be distributed based on annual forecasting reports by the RHU. Because deliveries are made every quarter, the NCPAM divides the annual RHU requirement by four. Orders are then bid out. Once awarded, manufacturers directly ship the commodities to the 3PL warehouses, and samples are sent to the FDA for testing and clearance. In each turnover, chain of custody is documented through an online tracking system.

From this point onward, the 3PL takes care of the storage and distribution to the RHUs. The 3PL's contract stipulates that the commodities must be delivered to the RHU itself. Every quarter, the 3PL sends a delivery report to the NCPAM. Pharmacists are hired by the NCPAM and based in regional offices. These pharmacists conduct quarterly monitoring visits to the RHUs to check on stocks and program implementation. These pharmacists report directly to the NCPAM. Sometimes, the pharmacists also collect RHU forecasting reports and forward the reports to the NCPAM.

This model of contracted services and regularity of supply is under consideration for expansion to other programs. However, issues still exist in getting consumption reports from service delivery points, particularly RHUs, so overstocking and stock-outs may still occur at these sites.

Family Health Office (DOH)

The forecasting and allocation of family planning commodities that come from the DOH Central Office are managed by the Family Health Office. COBAC handles procurement, and the MMD oversees storage and distribution of these commodities, while some storage and distribution functions are outsourced to a 3PL service provider.

Previously, the family planning program followed the traditional four-tier system of the DOH, but in the final quarter of 2014, supply distribution and management for these commodities shifted to a two-level system consisting of transfer of goods directly from the national level to the RHUs, following the model of the ComPack program.

Budgeting and planning for procurement for the family planning program are conducted in the last quarter of each year, to take into consideration the allocated budget approved by the national government. Forecasting for the amount and allocation of commodities is done using the Department of Social Welfare and Development National Housing Targeting System for Poverty Reduction data bank. Work plans and financial plans are then approved by the Disease Prevention and Control Bureau Director and Secretary of Health, at which point purchase orders can be made and submitted to the Procurement Division for clearance and then to COBAC for the bidding process. Once awarded, medicines and supplies are delivered to the MMD.

Upon receipt of commodities, the MMD performs inventory and accommodates the bioequivalence testing performed by the FDA. Once cleared, the national program coordinator notifies the MMD to prepare the necessary documents for delivery, whereupon the MMD notifies the 3PL to perform repacking and distribution. Commodities are delivered to RHUs within a 21-day period stipulated in the 3PL contract.

According to interviews with the MMD, the 3PL usually is unable to follow the prescribed quarterly delivery schedule. Document preparation for delivery to more than 2,000 RHUs takes two to three months, which results in a delay in releasing the commodities for distribution. Because of this delay, some areas receive only two shipments per year.

Lack of data from the lower levels to the central office contributes to issues with this arrangement. The most reliable monitoring and evaluation report comes from the Field Health Services Information System; however, these reports are usually delayed and underestimate the actual amount of supplies used at lower levels. The regional and provincial levels, along with RHUs, are expected to use NOSIRS to report to the central office regarding inventory of medicines and supplies. However, most facilities are not using NOSIRS, mainly because of online-only availability of encoding forms and high turnover of trained staff. MMD representatives also stated that NOSIRS is not user-friendly and cannot handle all data for all DOH programs. They noted that the DOH is currently working to address issues with NOSIRS.

Movement against Malaria (Pilipinas Shell Foundation)

Founded in 2006, the Movement against Malaria is a corporate social responsibility program of Pilipinas Shell run by a consortium of stakeholders in the Philippines, including the DOH, the WHO, selected LGUs, and the Global Fund. The group is primarily responsible for the overall management and coordination of the supply chain of antimalarial medicines and other supplies for the program. For several years, the program has been serving 40 provinces in the Philippines where malaria is considered prevalent. Many of these provinces have shown significant reductions in the number of cases of malaria in their communities.

The supply chain for the malaria program generally follows the traditional DOH model with a few modifications. Procurement of commodities follows the usual annual bidding process, with participation from local and international procurement agents. Malaria medicines and insecticides are procured through international procurement agencies, and other commodities (including laboratory supplies) are procured using local suppliers. The steps constituting the procurement process are forecasting, procurement plan preparation, plan audit, and dissemination of the plan to the procurement agency.

Forecasting is conducted at the provincial level. Electronic reports are sent to the central office and compiled by the logistics officer into a procurement plan. The plan is then prepared and submitted to the procurement agent for processing. Audit is conducted by the LGUs/CHDs, and after any revisions and final approval, procurement follows.

After procurement at the national level, medicines and laboratory supplies are brought to and stored either in the MMD-DOH warehouse free of charge or in the local Quirino warehouse if the MMD warehouse is full. Long-lasting insecticide nets are brought directly to the major seaports ready for delivery to provincial warehouses through a 3PL service provider.

In contrast to the TB DOTS program wherein supplies are delivered from the central warehouse to the regional warehouses at certain points of the year, the malaria program delivers the bulk of

its supplies directly to the provincial warehouses once per year. The central office is notified of acceptance of supplies at the provincial level through a delivery receipt from the 3PL. Once supplies arrive, they are prepared for distribution to RHUs, and documents are prepared and processed. During this time, PHOs coordinate with RHUs to arrange pickup of supplies to minimize storage times at the provincial warehouse. Representatives from the RHUs pick up their needed supplies from the provincial warehouse using service vehicles provided by the LGU.

Inventory and monitoring of malaria supplies at the provincial level takes place at the end of the month through manual stock card completion. Reports are sent to the regional level for verification and then passed to the central office for further evaluation. A proposal to create an online monitoring package for the malaria program similar to NOSIRS has been reported. According to informant interviews, stock-outs at the LGU level are rare in this arrangement, and when one occurs, additional supplies may not be requested from the central warehouse. Instead, coordination with other LGUs is encouraged so that spare stocks may be redistributed to the areas where they are needed.

At the time of this writing, no cases of receipt of expired or damaged supplies had been reported. Provinces may send expired or damaged goods back to the dispatcher using the same 3PL courier. The MMD and PHOs would properly discard goods that expire at national and provincial storage points if necessary.

According to interviews with health facility and Movement against Malaria stakeholders, in general, stock-outs for the malaria program occur only at the RHU and barangay levels. According to interviews, this is mainly a result of delayed response of RHUs to their governing PHOs or delayed coordination, which results in late pickup of supplies and subsequent stock-outs in these facilities. In addition to coordination issues at lower levels, the informant reported that one of the major issues faced by the program is lack of space for storage in the current supply system.

For a comparison of supply chain management models used in other public sector health programs, see tables 4 and 5.

Table 4. Other Public Program Models

Program	Procurement	Storage	Distribution	External partners	Notes
ComPack ^{1,3}	NCPAM coordinates process; COBAC conducts procurement	Suppliers ship directly to 3PL warehouse	Distributed directly from 3PL warehouse to RHUs Quarterly, staggered deliveries	3PL	3PL reports quarterly to NCPAM. Quarterly monitoring by NCPAM pharmacists to RHUs Poor inventory and stock reporting, stock-outs and overstocking still likely
Family planning program	Budgeting by family planning program (annual); COBAC for bidding	Medicines and supplies delivered to MMD for storage; FDA checks	3PL delivers from MMD to RHUs (contract states within 21 days)	3PL	3PL usually cannot make quarterly deliveries due to documentation requirements, which take 2–3 months Lack of feedback from lower levels to central office, inaccurate forecast reporting, issues with NOSIRS
Movement against Malaria	COBAC bidding by international procurement agencies and local suppliers	Supplies delivered to MMD for storage, later storage at provincial warehouses	3PL distributes from MMD to provincial warehouses, RHUs coordinate pickup with PHOs and pick up supplies from provinces	Pilipinas Shell, WHO, Global Fund, 3PL for distribution	Forecasting at provincial level, monthly manual stock card preparation and reporting to regions and central office Some issues with pickup coordination between RHUs and PHOs can lead to delays, stock-outs No reported issues with expiry/damaged products
Vaccines/ EPI ^{1,2,3}	DOH procurement through United Nations Children’s fund (UNICEF)	Warehousing department of Research Institute of Tropical Medicines	From central office to CHDs quarterly through forwarders, CHDs to PHOs/CHOs quarterly; CHOs/PHOs to RHUs on monthly basis	UNICEF	Generally follows typical DOH model, except in use of forwarders to maintain cold chain and regularity of delivery schedule
Cheaper Medicines Program – Botika ng Barangay (BnB) ^{1,2,3}	DOH through Philippine International Trading Corporation (PITC) Rely on parallel medicine importation Have no control over types and quantity of medicines supplied	Cannot return expiring medicines	Depends on CHD supply system	Philippine Charity Sweepstakes Office, PITC	BnB are generic drug retail outlets in rural areas selected and managed by CHDs They purchase and distribute medicines through DOH network of BnB PITC is buyer and supplier of DOH medicines, sold to public drug outlets at lower prices No data on prescriptions and use, issues with regulating personnel and dispensing practices

Philippine Tuberculosis Supply Chain Options Analysis

Program	Procurement	Storage	Distribution	External partners	Notes
	Outlets pay for supplies they receive				
Cheaper Medicines Program – Botika ng Bayan (BNB) ^{3,4}	PITC supplies medicines BNBs pay PITC for all supplies by postdated check	BNBs may return or exchange product	PITC manages distribution based on orders received from BNBs	PITC Pharma, BNBs and their operators	BNBs are private franchises supported and supplied by PITC Can be managed by nongovernmental organizations, cooperatives, labor unions, or employee associations Can sell imported generics and locally branded generics Sold at prescribed maximum retail price (may turn profit) No data on prescriptions and use, issues with regulating personnel and dispensing practices
P100 Treatment Pack ^{3,4}	Supply through PITC Pharma		Inconsistent ordering and restocking practices Ad hoc ordering through PITC Pharma	PITC Pharma	Prepackaged generic drugs less than PHP 100 Available in DOH-retained and LGU hospitals No data on use is available

¹ (Ball 2014), ²(USAID/DELIVER Project September 2011), ³ (Laviña 2014), ⁴ (Picazo 2012), ⁵ (Loquias 2011)

Table 5. Other Procurement Models

Method	Examples	Procurement	Inventory management	Logistics management	Notes
Medicine consignments in government facilities ^{1,2}	Negros Occidental (Western Visayas) SPMC in Davao City	Consignor/ consignee	Private supplier Payment for consumed stock every 30 days, following inventory	Private supplier Delivery within 10 days of consignment order receipt	Private supplier places medicines in government health facilities Government facilities pay as medicine stocks are consumed Anecdotally efficient; no assessments or documentation
Pooled or bulk procurement ⁶	Pangasinan, Capiz, Bukidnon	LGUs/ provinces	LGUs select which model of pooled procurement to use: A: Informed Buying <ul style="list-style-type: none"> • LGUs share information about the price of procured medicine • Procure individually B: Coordinated Informed Buying <ul style="list-style-type: none"> • LGUs conduct joint market research and share information on supplier performance and bid priced • Procure individually C: Group Contracting <ul style="list-style-type: none"> • LGUs conduct tendering together through joint interlocal health zone committee • Purchasing by individual LGUs from winning supplier D: Central Contracting and Purchasing <ul style="list-style-type: none"> • The interlocal health zone committee forms or appoints a central body to conduct tendering and purchasing through use of pooled funds 		
Contracting procurement to international agencies ⁶	PMDT centers (Global Fund)	GDF	PMDT centers, online reporting and ordering system	PBSP, uses carrier forwarders to transport supplies to fulfill orders	Supply management for TB second-line medicines
Public-private partnership and local contracting ⁶	PhilHealth Primary Care Benefit 2, pilot testing in Pateros, Capiz, two sites in Palawan	Generika private pharmacies	Generika	Generika	Outpatient medicine benefit Prescriptions are sent to Generika to be filled at no cost to the patient Electronically audited by PhilHealth then reimbursed Medicines dispensed directly by pharmacy service provider to patients
Community trust funds ^{6,3}	Malaria control and prevention efforts	Individual projects	Agusan for People's Health Development Foundation Incorporated works with the Project Coordinating Committee and the PHO through the Provincial Health Resource Center to respond to proposals consistent with the Agusan del Sur Malaria Control and Prevention Projects and release Community Trust Fund funds to project partners. Principal Fund was established in 2004 as a perpetual trust, with funds reinvested each year and the interest earned supporting malaria control activities		

¹ (Ball 2014), ² (Wong 2004), ³ (Laviña 2014), ⁶ (Hii and Simpson 2012)

PRIVATE SECTOR CAPACITY

Several of the strategies presented for consideration rely on private sector service providers. The SIAPS team mapped the private sector capacity in the Philippines for companies that provide freight forwarding services, warehousing, and distribution through examination of licensing and accreditation lists.

According to the 2012 Census of Philippine Business and Industry (Republic of the Philippines Philippines Statistics Authority National Statistics Office 2014), 979 transportation and storage establishments employ more than 20 people who perform functions relevant to distribution, storage, and management of medicines (table 6).

Table 6. Transport and Storage Establishments with Total Employment of 20 or More in the Philippines

Industry description ^a	Number of establishments
Transport and storage (total)	979
Transport, railways	3
Transport, buses	145
Transport, land (other)	236
Transport, sea and coastal water	89
Support activities for transport	423
Courier activities	45
Warehousing and storage	38

a. Transport via pipeline and inland water transport data were not included due to disclosure control in the Census data. Passenger air transport was omitted for the purpose of this report.

The Department of Trade and Industry identified 184 companies with domestic freight forwarder accreditation from the Philippine Shippers' Bureau. These companies were emailed with a request to fill out a questionnaire that included questions on their freight forwarding capabilities, volume of business, and willingness to work with the public sector. Of the 184 companies emailed, 46 email addresses were not operational; only one company responded but did not return a completed questionnaire even after numerous follow-up emails.

The Aircargo Forwarders of the Philippines (AFP) lists 149 airfreight forwarders in the Philippines. All of these companies were emailed the same questionnaire, and six responses were received from SDV (SAC) Philippines Inc., Multimodal Transport and Logistics Inc., Freight Connection Philippines Inc., Royal Cargo Combined Logistics Inc., Damco Philippines Inc., and All Transport Network Inc. Two of the respondents (SDV and Damco) are on the list of top 25 global freight forwarders operating in the country. Three of the six respondents indicated that the perceived barrier to working with the public sector is the length of time it takes to get paid.

The companies were asked to indicate their interest and willingness to work with the public sector, from 1 to 5, with 5 being the most interested and willing. The answers ranged from 2 to a 5.

The warehousing logistics at the DOH is fragmented; some contracts (such as that with AirFreight 2100) include warehousing services while other commodities are retained in DOH's MMD. A review of the NTP states that for TB medicines in particular, second-line anti-TB medicines are distributed directly from the MMD every quarter, except for two regions with the highest number of patients, which receive distributions from their respective regional warehouses (Wehrens 2013).

Most of the freight forwarders in table 6 have warehousing capabilities. Most of these companies also have expertise in the health care industry, with specialized logistics operations servicing pharmaceutical companies and biotech companies. Five of the six respondents also specified that they have warehousing and storage capabilities with one (Royal Cargo Combined Logistics) specifically stating that it has one temperature-controlled pharmaceutical warehouse.

Out of the 20 listed leading pharmaceutical companies in the Philippines, 16 are FDA-accredited drug distributors. The FDA lists 1,050 accredited drug distributors in the Philippines. The FDA is currently planning to implement an accreditation system for Good Storage and Distribution Practices.

SUPPLY MANAGEMENT AND PRODUCT AVAILABILITY

Central Level

Central procurement by COBAC follows a relatively comprehensive public procurement act. The act favors domestic companies (whether manufacturers or distributors) through a requirement that locally available products be procured through national competitive bidding and a domestic supplier preferred when international bidders participate in these tenders.

COBAC is responsible for most central DOH program procurement, including almost all procurement of first-line TB medicines and TB diagnostic supplies, and its responsibilities are likely to increase to encompass second-line medicines when Global Fund funding ends. Currently, second-line medicines and some specialized diagnostics are procured by the Global Fund Principal Recipient through approved international procurement agencies. Tenders for first-line medicines involve relatively few bidders, but recent tender prices have been comparable to international reference prices. Bidders are usually distributors rather than pharmaceutical manufacturers themselves.

The MMD is responsible for the receipt, storage, and dispatch of all types of medicines and other health supplies, and all equipment and health devices covered by the health programs implemented by the DOH such as programs on immunization (EPI), infectious diseases such as HIV, noncommunicable diseases, family health including maternal and child care, and family planning commodities. In terms of the NTP, first-line medicines and diagnostic devices and supplies for sputum analysis pass through the MMD. Contracts with suppliers usually require two annual deliveries, with the second taking place three months after the initial delivery (refer to table 7 for an overview of MMD performance with respect to stock management of first-line TB medicines).

Currently, the MMD has four warehouses in Metro Manila, which are all government-owned properties and are used for storing health products (table 8). In addition, contracted shipping agents provide some warehousing, and the DOH is in the process of contracting additional air-conditioned warehousing from PhilPost. Under a new contract with freight forwarders that is currently out for tender, the winning bidder will be required to provide the DOH with a minimum warehousing capacity of 3,000 square meters, of which a minimum 1,000 square meters should be temperature controlled.

Table 7. Indicators of MMD Inventory of First-Line TB Medicines

Indicator	Value/description
Stock turnover ratio	Approximately 3 (stock replenished every 4–6 months)
Frequency of deliveries from MMD warehouse to regions	Every 3–4 months as determined by NTP
Number of emergency deliveries	No data available (MMD delivers as directed by NTP request)
Number of items supplied out of total requested by clients (service level)	Not applicable (the NTP only requests issue of stock on hand)
Average stock position in months	Range 0–5 months; insufficient data for calculation of average
Stock-out frequency for TB health products at MMD warehouse(s)	None reported but two items out of stock on day of visit
Percentage availability of DOH-procured TB medicines and diagnostic supplies	6 of 8 items in stock on day of visit (75%); insufficient data for more detailed calculation
Quantity and value of expired TB medicines over past year	None reported
Value of losses caused by damage and theft over past year	None reported
Distribution costs per ton per kilometer	No data (determined by freight forwarder contract)
Vehicle availability and frequency of breakdowns	Not applicable (contracted out)

Table 8. Warehouse Capacity at the Central Level

Warehouse site	Storage volume (40-foot containers)
Tayuman Manila	10
Quirino Memorial Hospital Compound, Quezon City	8
POPCOM Mandaluyong City	6
RITM cold storage in Alabang, Muntlupa City	2

The MMD is effectively also using supplier warehouses because it has refused to receive the delivery from the supplier of a current procurement order of Category I and III kits for TB even though these were already in the supplier warehouse. Without acceptance the supplier cannot get paid. There is no provision in the contract for the supplier to charge for warehousing so it is essentially being provided at no charge. (This situation likely may have influenced the supplier’s willingness to take part in future bids; longtime supplier United Laboratories did not participate in the 2015 tender for TB commodities.) An assessment of Quirino warehouse found the infrastructure and conditions to be mostly adequate. The temperature was around 27°C at the time of the visit (MMD considers temperatures less than 30°C acceptable). There is 24-hour security, but no functioning fire alarm. See table 9 for a review of inventory management practices from the assessment.

Table 9. Functions in Place at the MMD Central Warehouse

Function	Performed at MMD central warehouse
Forecasting of order quantities	No
Requisition/stock orders	No
Preparation of picking/ packing slips	Yes
Reports of stock on hand	Yes
Reports of outstanding order line	No
Expiry date management	Yes
Batch tracking	No
Reports of products out of stock	No

Source: WHO Philippines pharmaceutical country profile.

Any of the warehouses could be used for holding TB supplies, depending on the space available at the time of delivery, although the Quirino warehouse is currently being used. The MMD uses the concept of 40-foot containers (rather than square meters) to describe its storage space (table 8) because it helps visualize space available and coordinate deliveries with suppliers. In contrast with the eight 40-foot containers of space at the warehouse (that is also used for storage of other essential medicines), the MMD estimates that first-line medicines would require the following storage volumes—

- Category I and III kits: 20–25 40-footers
- Pediatric kits: 9–10 40-footers
- Category II kits: 5–7 40-footers

The MMD perceives that DOH procurement in all programs has increased in line with increases in the DOH global budget in recent years. This has led to the current crisis in warehouse space across all programs.

Second-line medicines are currently housed within the Quirino warehouse in a converted office, but they are managed separately by the Principal Recipient of the Global Fund grant with its own logistics manager.

A computerized logistics management information system has been introduced recently (NOSIRS), but was reported to lack a reporting function and is apparently intended mainly for inventory control. The system does not keep track of what stocks are in which warehouse and does not track stock that might be ready for delivery but is held with the supplier (as was the case with Category I and III TB kits at the time of assessment due to lack of receiving space). NOSIRS lacks location coding for within a warehouse, relying on the memory of the storekeepers as to where stock is placed. Given the shortcomings of NOSIRS—the fact that it requires an Internet connection that is not always available and that it has not been fully implemented in all regions—the MMD also maintains an Excel workbook to track inventory.

Provincial and Regional Levels

Warehouses at the provincial and regional levels were assessed for stock levels, inventory management, and distribution practices. For this assessment, stock-out was defined as having no stock of one or more of the medicines or commodities included in the survey. According to data presented in figure 2, both provincial and regional warehouses reported stock-outs of TB commodities in the past 12 months, though stock-outs were more common in provincial than in regional warehouses. The majority of products reported out of stock were first-line treatments, with no stock-outs of second-line medicines reported and up to 2.2% of facilities experiencing a stock-out of a normally stocked laboratory commodity. By contrast, up to 29.2% of assessed warehouses were out of stock of a given first-line TB medicine on the day of the assessment.

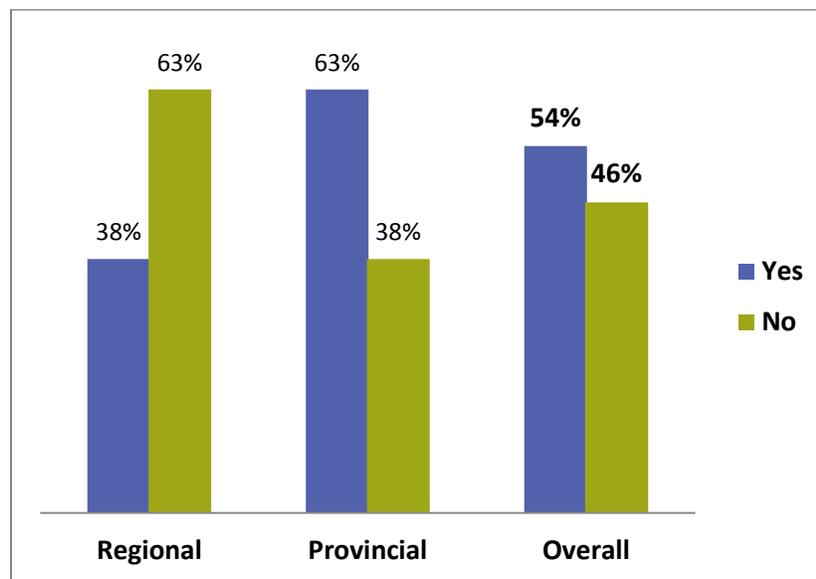


Figure 2. Warehouses reporting stock-outs of TB medicines in the last 12 months

Reported duration of stock-outs varies widely, and for first-line treatment ranges from 38 mean days out of stock for Category I/III kits to 123.6 mean days out of stock for intermittent preventive treatment (IPT) for children (figure 3). Though stock-outs of laboratory supplies are rare, when they occur they are usually prolonged, ranging from 63.5 days for NTP laboratory registers to 356 days for sputum cups (mean days out of stock).

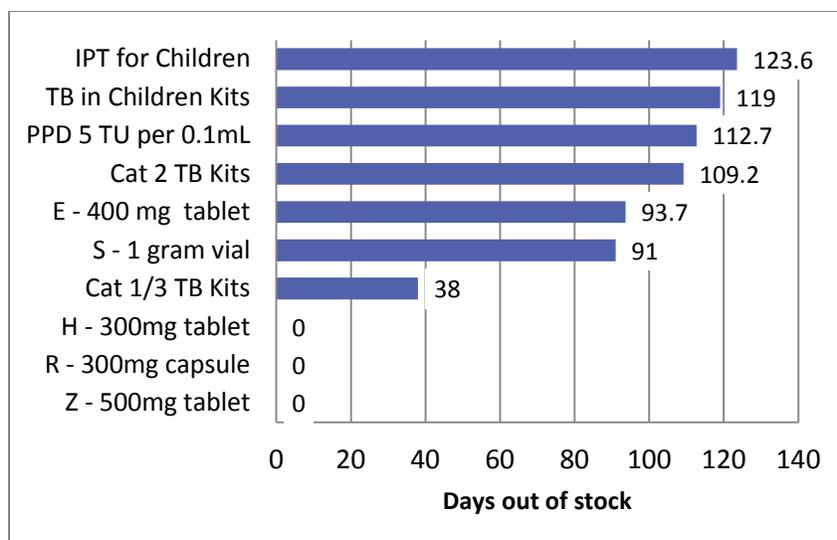


Figure 3. Mean days out of stock, first-line TB treatments at warehouses

Stock-outs were attributed to a variety of factors: the three most frequently cited were “no regular delivery schedule due to transport problems” (41.7% overall), “quantities delivered less than what was ordered” (37.5% overall), and “errors in forecast and quantification” (29.2% overall). Differences in response between regional and provincial warehouses were minimal (table 10).

Table 10. Reported Cause of Stock-outs of TB Supplies (Warehouses)

Variable	Regional n = 8	Provincial n = 16	Total N = 24
Delay in delivery	1 (12.5%)	5 (31.3%)	6 (25.0%)
Quantity delivered less than what was ordered	3 (37.5%)	6 (37.5%)	9 (37.5%)
No regular delivery schedule due to transport problems	3 (37.5%)	7 (43.8%)	10 (41.7%)
Stock cards are not up to date	1 (12.5%)	1 (6.25%)	2 (8.3%)
Errors in forecast and quantification	3 (37.5%)	4 (25.0%)	7 (29.2%)
Expiry of products received with a short shelf life	1 (12.5%)	2 (12.5%)	3 (12.5%)

The central warehouse reported that it delivers supplies every three to four months, as instructed by NTP request. Information regarding vehicle availability and frequency of breakdowns was not available at the Quirino warehouse because transport between the MMD and the peripheral warehouses is managed by a freight forwarding company. Additionally, peripheral warehouses reported a wide variety of distribution practices characterized by irregular delivery to and pick up by facilities, which likely contribute to warehouse stock-outs caused by inability to anticipate order volumes with rapid turnaround times.

Table 11 illustrates that 36% of warehouses deliver to facilities as needed, and an additional 33% reported that facilities come to pick up their supplies. Separately, 44% of health facilities surveyed indicated that they order and pick up supplies from warehouses on the same day, with 35% reporting turnaround of less than 30 days and only 11% of facilities reporting that supplies were delivered as scheduled. Because peripheral warehouses receive supplies from the central level only every three to four months, they find maintaining stock levels necessary to address these irregular distribution practices difficult.

Table 11. Warehouse Distribution Practices

How often does your warehouse distribute / deliver to health facilities?	Regional (n = 8)	Provincial (n = 16)	Total (N = 24)
Monthly	0	2 (12.5%)	2 (6%)
Quarterly	2 (25%)	5 (31.3%)	7 (21%)
Semi-annually	1 (12.5%)	0%	1 (3%)
As needed	4 (50%)	8 (50%)	12 (36%)
Don't deliver	0	1 (6.3%)	1 (3%)
Facilities come to pick up supplies	2 (25%)	9 (56.3%)	11 (33%)

Other frequently cited reasons for warehouse stock-outs included “quantities delivered less than what was ordered” (37.5% overall) and “errors in forecast and quantification” (29.2% overall). Both of these processes are affected by the irregular distribution practices previously cited and complicated by lack of adequate peripheral warehouse space to maintain sufficient stock levels with the buffer stock required to respond to same-day order and deliveries and other distribution irregularities.

Figure 4 shows that the majority of warehouses have the capacity to store only three to six months of commodities, not just for TB treatment but for all public sector health commodities. How much warehouse space is allocated specifically for TB supplies is unclear. Given the three-to four-month delivery schedule of supplies from the MMD and the limited storage capacity of peripheral warehouses, stock levels are largely depleted before replenishment by the NTP. Because insufficient space exists to receive the stock levels required, it has been said that the NTP must deliver less than what was initially requested by the warehouses to accommodate the lack of storage space.

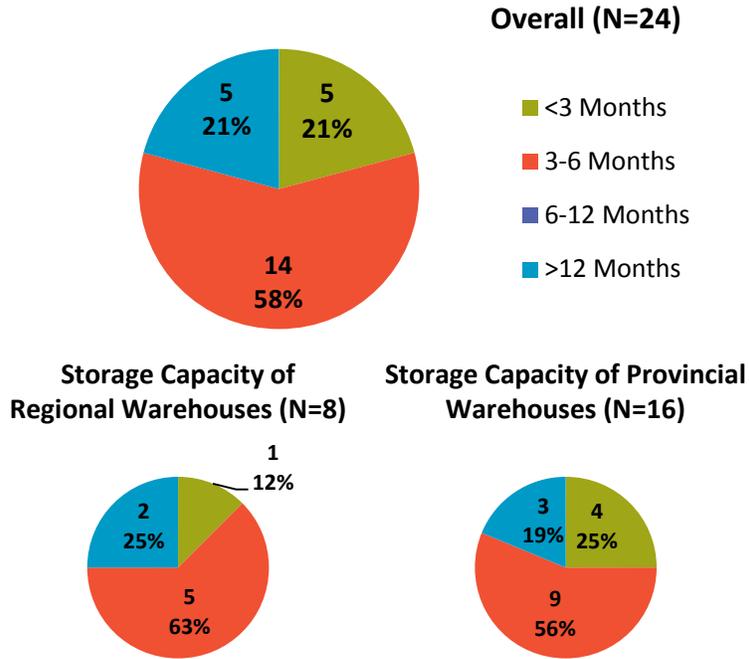


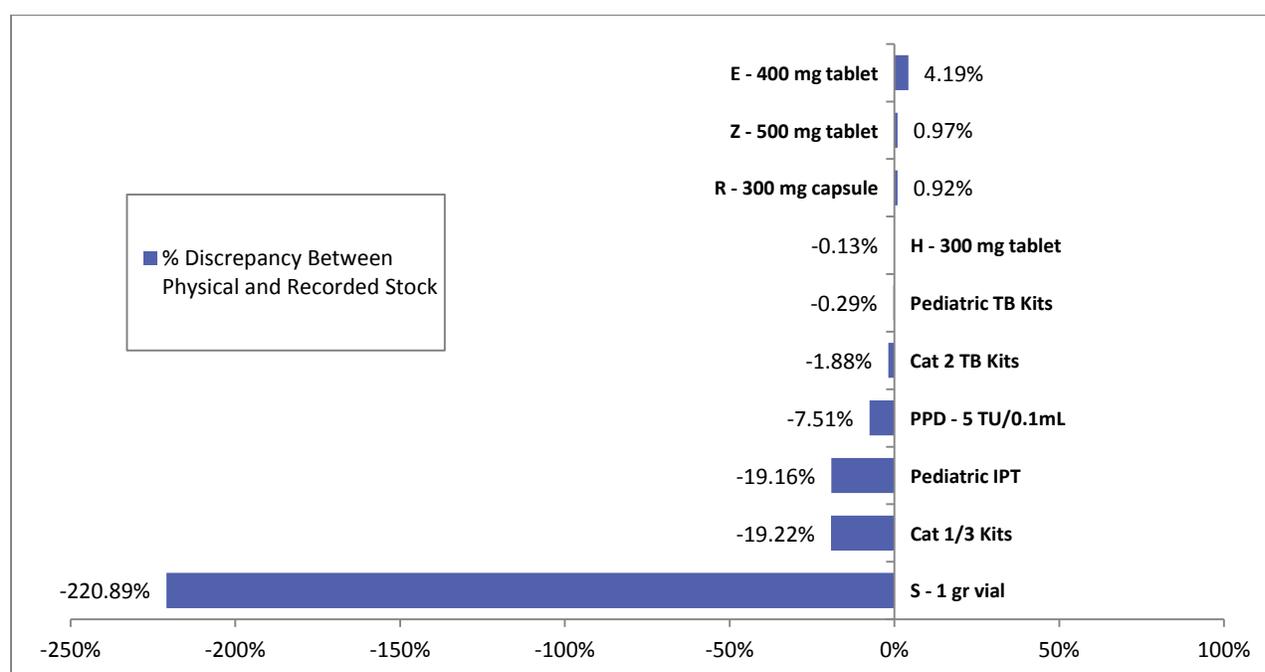
Figure 4. Warehouse storage capacity

In terms of inventory management practices, warehouses used NOSIRS inconsistently, with 58.3% of peripheral warehouses reporting any use at all, and those that use the system reporting a variety of use practices. Of warehouses assessed, 78.3% reported using another electronic system either in managing inventory or in another management information capacity (table 12). Despite the widespread use of electronic systems, discrepancies between physical and recorded stock levels were present. Figure 5 shows that although discrepancies were not widespread, the extent of the difference between recorded and physical stock levels was notable in some cases, particularly for streptomycin, where recorded stock levels were over two times the levels physically present in the warehouse. This outcome may be caused by the rapid turnaround of orders and distribution combined with lack of properly trained personnel or not following standard operating procedures. Unless stock levels are updated each time an order is released from the warehouse, given the rapid timeline from order to delivery, the recording system will fail to keep up with actual stock turnover.

Table 12. NOSIRS Implementation at Warehouses

Variable	Regional (N = 8)	Provincial (N = 16)	Total (N = 24)
% of warehouses implementing NOSIRS	4 (50%)	10 (41.7%)	14 (58.3%)*
% of warehouses using NOSIRS for various functions			
Tracking orders	3 (37.5%)	0	3 (12.5%)
Tracking deliveries	5 (62.5%)	0	5 (20.8%)
Accounting/financial	4 (50.0%)	0	4 (16.7%)
Inventory control	4 (50.0%)	3 (18.8%)	7 (29.2%)
Others	0	1 (6.3%)	1 (4.17%)
Warehouses using other electronic system apart from NOSIRS	5 (62.5%)	13 (81.2%)	18 (78.3%)

Note: Some warehouses did not respond.



Note: E = ethambutol, Z = pyrazinamide, R = rifampicin, H = isoniazid, S = streptomycin.

Figure 5. Discrepancy between physical and recorded stock levels: First-line medicines at warehouses

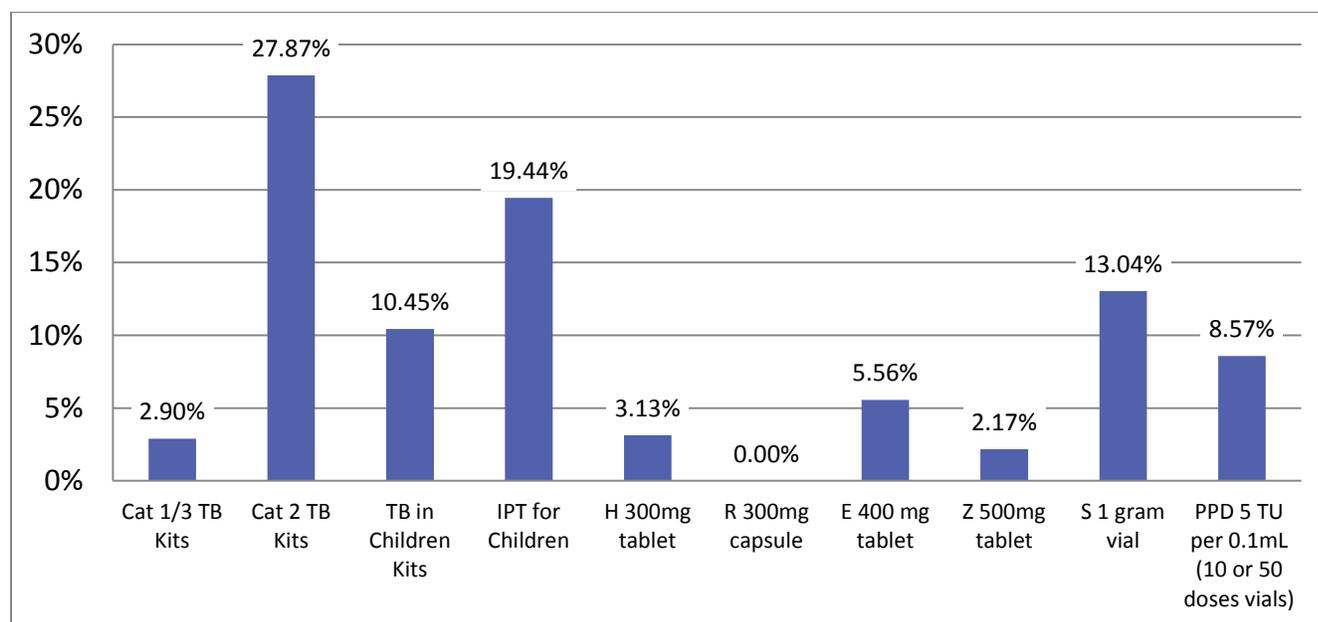
Local Level: Municipalities and Health Service Delivery Points

Reported stock-outs in surveyed health facilities were limited to RHUs and PPMD facilities, which reported stock-outs in 27.1% and 22.7% of facilities, respectively (table 13). In the assessment, stock-out was defined as facilities having zero units on hand of one or more of the commodities included in this study. The first-line commodities most frequently out of stock included Category II Kits (27.87% of surveyed facilities that normally stock these kits), followed

by IPT for children (19.44%), and streptomycin (13.04%) (figure 6). There is evidence of substantial variation in procurement prices of medicines at DOH hospitals and through LGU procurement, which may explain the lack of reported stock-outs at hospitals and PMDT treatment facilities. For TB, LGUs usually procure only single-ingredient formulations of first-line medicines and supplementary stock in case of shortage (although patients commonly are simply directed to purchase supplies at private pharmacies because procurement funds are usually insufficient for needs) (Ball 2014). The JPR report identified confusion in that most pharmaceuticals are procured centrally except for the few single-ingredient formulations that are the responsibility of LGUs (Joint Program Review 2013).

Table 13. Health Facilities Reporting Stock-out of TB Medicines in the Last 12 Months

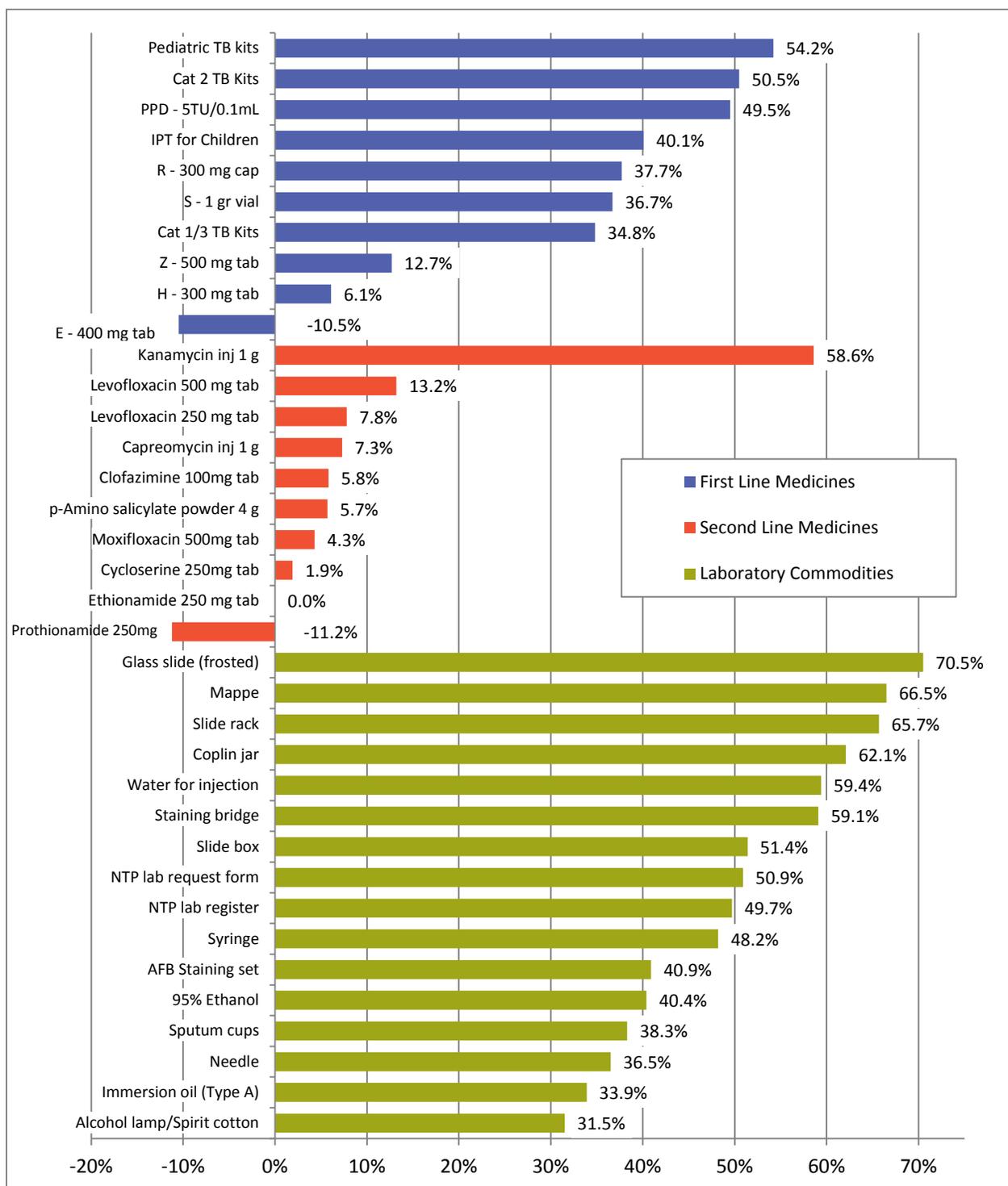
Overall N = 223 (%)	54 (24.2%)
Hospital N = 5 (%)	0 (0%)
PPMD N = 22 (%)	5 (22.7%)
PMDT N = 16 (%)	0 (0%)
RHU N = 181 (%)	49 (27.1%)



Note: E = ethambutol, Z = pyrazinamide, R = rifampicin, H = isoniazid, S = streptomycin.

Figure 6. Percentage of facilities that stock a given commodity experiencing stock-out of first-line medicine (December 2013–May 2014)

As in the provincial and regional warehouses, no stock-outs of second-line TB medicines were reported at surveyed health facilities. Stock-outs of laboratory supplies were infrequent; the most frequently reported commodity out of stock at the time of assessment was syringes, out of stock at just 1.75% of health facilities surveyed.



Note: E = ethambutol, Z = pyrazinamide, R = rifampicin, H = isoniazid, S = streptomycin.

Figure 7. Discrepancy between physical and reported stock levels: Selected commodities at health facilities

Inventory management issues at health facilities were similar to those observed at surveyed warehouses and included discrepancies between physical and recorded stock levels, shortage of storage capacity, and inconsistent pickup and delivery practices.

In contrast with the observed discrepancies at provincial and regional warehouses, health facilities tended to have more stock on hand than what was recorded. Figure 7 illustrates that for nearly all commodities included in the assessment, roughly 30% to 60% more stock was on hand than what was on record at the time. Only ethambutol (400 mg tablets) for first-line medicines and prothionamide (250 mg tablets) for second-line medicines had actual stock levels below what was recorded in stock records.

The observed disparity between stock on hand and stock records has a number of potential ramifications that contribute to supply chain issues. If recorded stock levels are deceptively low, this may trigger unnecessary reordering of supplies when in fact stock levels are adequate. This contributes to misallocation of resources and distortion of perceived demand. Additionally, excess stock on hand may remain in storage for longer periods of time before use and can contribute to expiry and waste.

Use of NOSIRS or other electronic inventory management tools was limited at the health facilities surveyed. Only 8.1% of health facilities reported use of NOSIRS and 55.2% had stock cards (table 14). Without consistent use of either a paper based or electronic stock monitoring system, forecasting, stock management, and requisition practices will continue on an ad hoc basis. For those facilities that do employ stock status monitoring through NOSIRS or stock cards, interview respondents indicated that records were updated irregularly due to the high administrative burden imposed by these systems, which contributes to the observed discrepancies between records and stock on hand.

Table 14. Inventory Management Practices at Health Facilities

Variable	Overall N=223 (%)
Health facilities with stock cards (N = 223)	123 (55.2%)
Health facilities using NOSIRS	18 (8.1%)
Health facilities with updated Drug Inventory and Requirement Report (N = 222)	139 (62.6%)

These inconsistencies may also exacerbate underlying storage capacity issues observed at health facilities. Although many facilities report that they do not have adequate storage to maintain sufficient stock levels (including buffer stocks), unneeded product on hand wastes the available storage space.

Of the 223 health facilities assessed, 175, or approximately 78%, estimated they were able to store six months' supply of commodities or less (figure 8). The majority of health facilities reported they were able to store between three and six months' supply, with the exception of surveyed hospitals. Only one of the four hospitals assessed reported having three to six months

of storage capacity, while the remaining three reported they could store less than three months' worth of supplies.

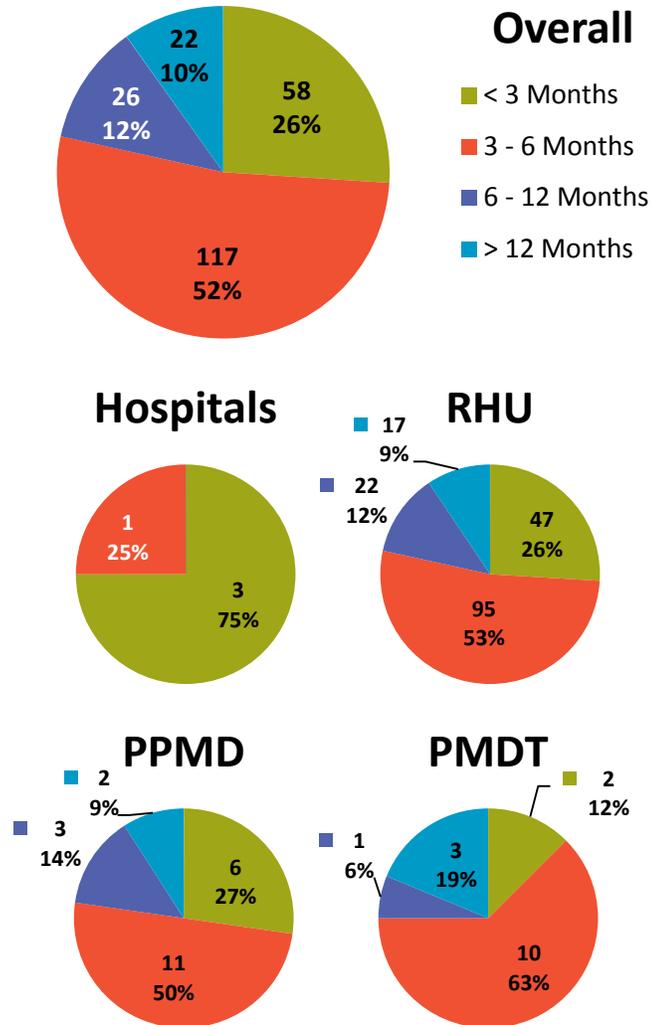


Figure 8. Health facility storage capacity

Under the current supply chain model, the lack of storage space prevents health facilities from maintaining sufficient buffer stocks to avoid or reduce the frequency of stock-outs. Because provincial and regional warehouses also lack storage capacity, stock may back up to the central level until sufficient space is available in peripheral warehouses. Storage is limitations at each level may cause significant delays in replenishing stock quantities at facilities if adequate levels of needed supplies cannot be stored in the regions and provinces.

As observed at the warehouses, inconsistent ordering and pickup or delivery practices were widely reported (figure 9). Rapid stock turnover and lack of a unified system or schedule increases the likelihood that stock records and actual stock levels are mismatched and calls for increased buffer stocks to accommodate same-day orders. Unpredictable demand prevents warehouses from effectively anticipating their supply needs and increases the challenge of maintaining accurate stock records and managing inventory effectively. Many health facilities reported that they ordered and received supplies on the same day (44%), and a further 35% of facilities reported receiving ordered supplies in less than 30 days. This may reflect lack of resupply planning and transport (delivery or pickup) issues.

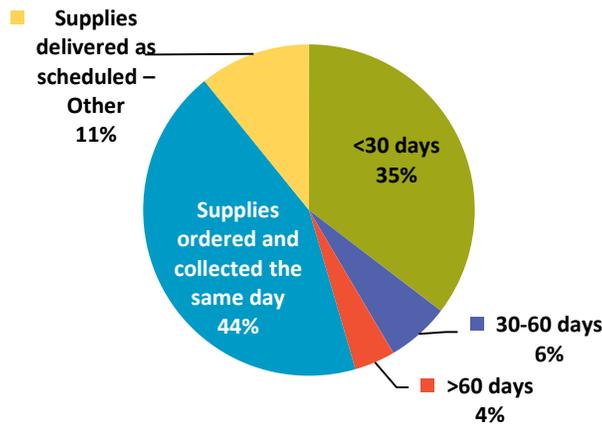


Figure 9. Average time between sending an order and receiving supplies

BARRIERS TO EFFECTIVE SUPPLY MANAGEMENT

Storage Capacity

Storage capacity at all storage levels is insufficient to maintain adequate buffer stocks to respond to order requests. Currently, annual orders for TB medicines are delivered to the MMD warehouse in two tranches, with the second following the first about three months after the initial delivery (Ball 2014). Lack of storage space, coupled with FDA quality assurance procedures at this stage, creates a bottleneck at the MMD warehouse and has prevented the MMD from accepting shipments of TB medicines in the past. Without acceptance, the supplier cannot receive payment, and the current contract has no provision for the supplier to charge for warehousing, essentially rendering this service free of charge. This situation has already resulted in the refusal of United Laboratories to participate in the TB supply tender for 2015. Medicine suppliers may build this cost into the price of TB commodities, if they have not already done so, thereby increasing product acquisition costs to cover this contingency.

Overall, 79% of surveyed warehouses reported storage capacity of less than six months (21% under three months, 58% three to six months; see figure 4). Restricted storage capacity is exacerbated by sporadic and infrequent deliveries caused by transport problems and delays at preceding levels. At health facilities, 78% report storage capacity less than six months (26% under three months, 52% three to six months; see figure 8). Lack of storage at the health facility level contributes to the irregularity of order and receipt of supplies at this level. Because facilities lack space to maintain adequate buffer stocks, many order and pick up supplies frequently and on a short time frame, which results in unnecessary transport expenditure to repeatedly pick up small amounts of supplies and contributes to inventory management issues at all levels.

Lack of Transport Resources

According to the regional and provincial warehouses surveyed, the most commonly cited cause of TB medicine stock-outs (41.7% of the time, see table 10) was “no regular delivery schedule due to transport problems.” In theory, deliveries from the MMD to regional warehouses and from regions to provincial warehouses are expected to occur quarterly. However, transportation limitations at all levels mean shipments go out sporadically.

At central level, the MMD currently uses a third-party distributor to transport commodities from the MMD warehouse to the regions. Following Typhoon Yolanda in November 2013, the MMD donated its transport vehicle to affected areas of the country to help with recovery efforts. Currently, this is the only level in the supply chain for TB commodities that uses a third-party service provider for transport on a systemwide scale.

Transportation resources at lower levels vary widely because LGUs and provinces may elect to maintain their own fleet of vehicles whereas others may hire drivers for supply delivery. At the health service delivery level, many interviewees indicated that health facility staff members use their own vehicles or public transportation to pick up commodities at provincial warehouses.

Because the peripheral levels of the health system are decentralized by design, no single mechanism is in use for distribution beyond the regional level. Without uniform procedures, provinces and health facilities may not have contingency plans in place when transport issues arise, which can result in delayed receipt of goods, unnecessary expenditure on emergency procurement and transport, and stock-outs.

Inventory Management Practices

At the central level, functions in place at the MMD warehouse consist of management of stock on hand and preparation of shipments to peripheral levels. According to the Philippine Pharmaceutical Country Profile (Philippines DOH & WHO 2011), the MMD central warehouse does not process requisition or stock orders and is not involved in forecasting. Functions relating to future stock and anticipated deliveries are fragmented among the MMD, COBAC, individual health programs, and a variety of government agencies. Because these functions are split and no coordination mechanism is in place, there is insufficient information about stock inflows, outflows, and anticipated stock levels, making it impossible to preallocate space or manage order timing to reduce bottlenecks and improve product flow.

On the peripheral level, stock management practices are inconsistent, and existing protocols are followed selectively. Though warehouses and health facilities are expected to use NOSIRS for inventory management, stock status reporting, and to aid in quantification and forecasting, in reality compliance with this requirement is quite low. Interview respondents indicated that the online-only platform for many forms and general difficulty to use were major hurdles to wider implementation. High turnover of trained staff and lack of reporting enforcement were also cited as reasons for limited use. Few health facilities (8.1% of those surveyed; see table 14) are able to use the system, and no warehouses surveyed used all of the relevant NOSIRS modules for inventory management. Overall, 58.3% of warehouses use NOSIRS in some way, and 78.3% have another electronic system (see table 12). None of the provincial warehouses assessed used the order tracking, delivery tracking, or accounting and financial modules in NOSIRS, and only 29.5% of all surveyed warehouses used NOSIRS for inventory control. This is likely because of the multiplicity of vertical programs and their reporting requirements.

In addition to inconsistent use of available electronic tracking and reporting systems, paper-based stock cards are not updated frequently and often did not accurately reflect stock on hand at warehouses or health facilities (refer to figures 5 and 7, respectively). According to the assessment, 44% of health facilities surveyed reported that they request and receive TB commodities on the same day (figure 9). This ad hoc ordering and delivery system similarly affects health facility staff's ability to keep up with the administrative burden of stock recording in addition to their time spent administering care and performing related duties.

STRATEGIES TO IMPROVE SUPPLY CHAIN MANAGEMENT

Following the field data assessment and identification of barriers to effective supply chain management, possible strategies to improve management practices were considered. The following sections discuss each strategy in terms of its effect on identified issues, advantages and limitations, additional considerations for implementation, and estimated cost relative to the current system.

Strategies to Improve Supply Chains for the Public Sector

Three major determinants of stock-outs, expiries, and suboptimal supply chain performance relate to—

- Insufficient and/or inadequate storage space at all levels of the system (MMD, regional, provincial, municipalities, and service delivery facilities)
- Insufficient transport resources for delivery or pickup of supplies
- Information management deficiencies (poor manual and electronic inventory record keeping, stock status reporting breakdowns)

Strategies to improve the supply chain will have to address these barriers to adequate supply. Strategies include—

- Increasing public sector storage capacity for procured and distributed supplies by (a) building new warehousing facilities, or (b) renting private sector warehousing services
- Reducing the need for storage space through more frequent deliveries but smaller delivery quantities (by supplier and to service delivery sites)
- Improving information management system and its use
- Contracting 3PL services for distribution

Table 21 is a synoptic matrix comparing these strategies.

The estimated cost of the current supply system is illustrated in table 15. Supply chain costing for the current system for TB medicines (category I/III, category II, and TB treatment for children, excluding laboratory commodities and the costs of the medicines themselves) is estimated at PHP 44.8 million for recorded stock orders at central level from 2014 data.

Table 15. Current System Costing

Cost component	Current system
A: Storage cost, national level	PHP 224,077.80
Area of MMD warehouse (square meters)	909.61
Duration in warehouse (years)	1
Utilities multiplier (PHP/square meter)	225.48
Number of staff persons	1
Staff time (hours per delivery)	5.6
Staff cost (PHP/hour)	99.675
Number of deliveries per year	2
B: Transport cost, central to regions	PHP 1,278,180.02
Volume of delivery (cubic meters)	682.21
Cost of transport, land	Varies
Cost of transport, sea	Varies
Cost of transport, air	Varies
Number of deliveries per year	4.00
C: Storage cost, regional level	PHP 79,862.97
Total area of regional warehouses (square meters)	227.40
Utilities multiplier (PHP/square meter)	225.48
Number of staff persons	3
Staff time (hours per delivery)	2.00
Staff cost (PHP/hour)	11,211.00
Number of deliveries per year	4
D: Transport cost, regions to provinces	PHP 1,064,692.77
Number of provinces	82
Frequency of delivery per year	4
Transport cost	Varies
Number of staff persons	2
Staff time (hours per delivery)	8
Staff cost (PHP/hour)	60
Staff per diem	250
E: Storage cost, provincial level	PHP 205,099.68
Number of provinces	82
Area of provincial warehouse	Varies
Utilities multiplier (PHP/square meter)	225.48
F: Transport cost, provinces to DOTS	PHP 1,934,400.00
Number of DOTS facilities	2,418
Frequency of delivery per year	4
Cost of pickup (PHP)	200.00
Total estimated cost	PHP 4,786,313.23
<ul style="list-style-type: none"> ■ Computed or assumed value ■ Based on interviews and available data 	

The current supply chain for TB is based on the central medical store model, in which centrally procured medicines and other health products are received at a central location and redistributed to other storage and service delivery points. It is a well-established system that maintains centralized control of first-line TB commodity procurement and distribution from the central level to the regions. This centralization at higher levels provides a relatively clear reporting structure and is useful to monitor stock status at national levels. However, devolution has placed greater dependency on local and municipal sources of funding and support for local TB supply operations, leading to fragmentation and a breakdown in the reporting structure. Although the central level should provide oversight of the supply system, at regional, provincial, and local levels, insufficient communication takes place with the central level on matters relating to stock status, consumption, and additional procurement of TB commodities. Centralized information management is necessary; even in decentralized systems; coordination is paramount for systems to function effectively. No single entity has authority or accountability pertaining to the supply system as a whole to ensure it achieves its objectives.

Strategy A: Increase Storage Capacity in the Public Sector

Increasing public sector storage capacity by either building or renting additional warehouse space for TB commodities would address the bottleneck at the MMD and its difficulties in receiving supplier shipments. A significant proportion of storage facilities and service delivery sites do not have sufficient or adequate storage space for up to three months of supplies. This option would improve storage capacity issues by adding space. The most significant improvement would likely occur at the central level, where current warehousing space constraints have backed up TB commodities to the supplier and increased the supplier's costs by forcing it to hold on to supplies. Supplier payment and FDA testing are delayed. Ample private sector capacity exists to provide either rental or storage construction services, although capacity and cost are likely variable across areas.

Increasing storage space alone will not address transportation limitations or current information and inventory management practices. Additionally, high levels of capital investment are required to build and maintain pharmaceutical warehousing. Renting requires continued expenditures and reliance on private sector capacity, with the possibility of price increases over time. Increasing warehouse space and maintaining more stock at various levels of the supply chain increase inventory holding costs and represent an undetermined financial opportunity cost.

Interviews indicate this option has limited or no political viability and is inconsistent with current policy that aims to reduce public sector infrastructure and staffing. Warehouse construction should be considered on a limited, rather than systemwide, basis. When contracting private sector service providers for construction and rental, contracts should be managed centrally and carefully managed to ensure that service quality is high.

Although new space construction or rental at central, regional, or provincial levels will likely have limited application, many health facilities likely need to invest in adequate storage to accommodate the full quantities of required TB medicines when the supply chain is finally functioning properly.

Table 16. Strategy A: Increasing Storage Capacity

Cost component	Strategy A	
	Build space	Rent space
A: Storage cost, national level	PHP 284,769.72	PHP 265,791.60
B: Transport cost, central to regions	PHP 1,278,180.02	PHP 1,278,180.02
C: Storage cost, regional level	PHP 79,862.97	PHP 79,862.97
D: Transport cost, regions to provinces	PHP 1,064,692.77	PHP 1,064,692.77
E: Storage cost, provincial level	PHP 205,099.68	PHP 205,099.68
F: Transport cost, provinces to DOTS	PHP 1,934,400.00	PHP 1,934,400.00
Construct warehouse space	PHP 2,775,000.00	
Construction cost (per square meter)	15,000	
Proposed size of new warehouse (square meters)	185	
Rent warehouse space	PHP 399,600–488,400	PHP 399,600–488,400
Rental cost (per square meter)	PHP 2,160–2,640	PHP 2,160–2,640
Proposed size of new warehouse (square meters)	185	185
Total estimated cost	Annual: PHP 4,847,005.15	PHP 5,185,913.23–5,274,713.23
	Total Year 1 Cost: PHP 7,960,913.23–8,049,713.23	
Percentage cost relative to current system:	Annual Cost: 101.27%, Year 1: 166.33% to 168.18%	108.35% to 110.20%

Computed or assumed value
 Based on interviews and available data

For the costing of Strategy A (table 16), it was assumed that 185 square meters of space was added at the central level to alleviate the requirement for supplier-provided storage. To compute the cost of storage at central level, it was assumed that utilities were paid based on the existing storage space plus an additional 185 square meters for both building and renting space. Constructing additional space added the cost of a staff person to process deliveries at the new facility. Warehouse rental rates in Metro Manila ranged from PHP 180 to PHP 220 per square meter plus utilities, and warehouse construction was quoted at PHP 15,000 per square meter. It was assumed that construction would take one year and that during that time space would be rented. An undetermined cost savings will be associated with eliminating the hidden cost of storage by the supplier, although not enough data are available to provide an approximate figure, which will depend on the specific commodity and average delay in receipt.

Strategy B: Increase Frequency and Decrease Size of Deliveries to the MMD

Another strategy would involve increasing the frequency of supplier shipments to the MMD and reducing the quantities delivered per shipment. Shipment frequency between subsequent supply chain levels can also be increased, thereby reducing the required storage at each level.

This strategy increases the stock turnover rate and reduces the footprint of required storage at central level. The increased shipment frequency both reduces the financial cost of storage space and is more amenable to suppliers, if the MMD can receive the delivered shipments and there is no need to keep them in the suppliers' warehouses.

This strategy will not address the information system issues or inventory management practices. It is possible, however, that increasing the frequency of deliveries at the provincial and regional levels would slightly improve information management because quantities will decrease and quantities received should match quantities ordered, therefore making record keeping easier. Stock will turn over more quickly, thus increasing both the frequency of deliveries and the frequency of record-keeping activities. This strategy would increase demand for transportation resources at the provincial and regional levels. Currently, quarterly deliveries are expected between regions and provinces, although interview respondents indicated that deliveries are sporadic and likely to occur less frequently.

Increasing frequency of deliveries is expected to have the greatest impact at the central level, where the storage footprint may be reduced. However, if supplier shipments correspond to different manufacturing batches the demand for FDA quality testing will increase. The current quality assurance strategy (discussed later) may need to be modified. At this level, contract management with the commodity supplier is crucial to specifying delivery size and frequency to maintain a regular schedule and maximize benefit. This arrangement could also be applied both to the current public sector system and to a 3PL provider arrangement.

Costing for this strategy assumed that the storage footprint at the central level was reduced to one-third of the space used in the current system and that deliveries were made six times per year to the MMD warehouse (see table 17). The quarterly delivery schedule to regions and provinces in this model is unchanged. Instead of increasing delivery frequency at all system levels, lower-level enforcement of a regular schedule at regional, provincial, and health facilities will enable better supply planning and may improve inventory management issues that arise from ad hoc deliveries. Though this option represents a slight cost savings (2.06%) over the current system, suppliers may increase prices to account for the added cost of additional deliveries. However, these costs may be offset by the reduction in hidden costs currently assessed in commodity prices for supplier storage in the event of delays. If deliveries are increased peripherally, transportation costs will increase by a variable amount, depending on the levels affected and whether private transportation is used or public sector employees perform pickups and deliveries.

Table 17. Strategy B: Reducing Storage Needs

Cost component	Strategy B
A: Storage cost, national level	PHP 125,300.92
Area of MMD warehouse (square meters)	303.20
Utilities multiplier (PHP/square meter)	225.48
Staff cost per delivery (PHP)	558.18
Number of deliveries per year	6
B: Transport cost, central to regions	PHP 1,278,180.02
C: Storage cost, regional level	PHP 79,862.97
D: Transport cost, regions to provinces	PHP 1,064,692.77
E: Storage cost, provincial level	PHP 205,099.68
F: Transport cost, provinces to DOTS	PHP 1,934,400.00
Total estimated cost	PHP 4,687,536.35
Percentage cost relative to current system	97.94%

- Computed or assumed value
- Based on interviews and available data

Strategy C: Improving the Information System and Its Use

Improving the information system involves either investing in NOSIRS or creating a new system. Currently, NOSIRS includes a comprehensive set of modules to perform needed functions at warehouses and health facilities for tracking, quantifying, and reporting on commodities; however, implementation is quite limited. The online-only availability of most NOSIRS functions, coupled with the high turnover of trained personnel, intensive training process required, and limited rollout are major barriers to widespread implementation at health facilities, while inadequate enforcement at warehouses has resulted in inconsistent use of the system. With an insufficient number of health facilities using the system, the resulting large gaps in data render the information unusable for quantification and forecasting purposes. Stock card use is also low, with 57.8% of health facilities employing a paper-based stock card system.

Regular use of a reliable information system is essential for reporting, inventory management, and accurate forecasting and quantification. Inaccuracies in forecasting may result in overstock, costly emergency procurement, or misallocation of stocks. Investment in information infrastructure will likely impart cost savings over time and will contribute to reduction of stock-outs.

Investment in NOSIRS can take several forms. Enforcement is a key piece of scale-up and involves supervisory visits at all targeted levels. Rollout at health facility level would involve significant infrastructural improvements, including computers and Internet connections in addition to annual training and quarterly supervisory visits to ensure compliance. Alternately, efforts may be targeted at the provincial and regional levels, with a requirement that health facilities report inventory information to warehouses when supplies are picked up. In this configuration, warehouses become data entry points for NOSIRS, and infrastructural investment can be targeted to fewer sites.

Table 18. Strategy C: Information System Strengthening and Use

Cost component	Strategy C
A: Storage cost, national level	PHP 224,077.80
B: Transport cost, central to regions	PHP 1,278,180.02
C: Storage cost, regional level	PHP 79,862.97
D: Transport cost, regions to provinces	PHP 1,064,692.77
E: Storage cost, provincial level	PHP 205,099.68
F: Transport cost, provinces to DOTS	PHP 1,934,400.00
Supervisory visits (nationwide)	PHP 1,470,357.46
Salary (hourly)	107.84
Number of officers	78
Hours of work per DOTS facility	3
Number of DOTS facilities	2,418
Transportation allowance per day (PHP)	400
Total estimated cost	PHP 6,256,670.70 + X (unknown capital investment in MIS)
Percentage cost relative to current system	130.72% + X
<input type="checkbox"/> Computed or assumed value <input type="checkbox"/> Based on interviews and available data	

The cost model for this strategy mirrors the costing for the current system but includes quarterly supervisory visits at DOTS level for preparation of reports (table 18). The model assumes that a supply officer or other supervisor would allocate three hours per quarter to each facility and includes an annual training on report preparation and use of NOSIRS. The cost does not include the required infrastructure investment at health facility level (denoted as X, unknown capital investment in the system). Infrastructure improvements at health facilities would require a lengthy rollout period and undetermined expense. This model also assumes that all warehouses already have access to NOSIRS and Internet connections. Shifting the administrative burden of facility stock reporting to warehouses will likely require hiring and training additional staff and purchasing additional computers at these levels.

When undertaking information system improvements, system use should be mandatory and enforced to extract maximum benefit. At all targeted levels, training should include emphasis on use of all relevant reporting modules, so that information is complete and consistent.

Strategy D: Supplier Direct Delivery of Supplies to Service Delivery Sites

Supplies may be delivered directly by the supplier to designated delivery points, bypassing the MMD warehouse and regional and provincial warehouses to DOTS facilities. With direct delivery to health facilities, storage space and administration at both regional and provincial levels is eliminated and may be used for other commodities and programs.

This could result in improved management of information because the overall burden on the system is reduced and there are fewer opportunities for error and delay. Although the ComPack

supply chain basically uses a 3PL for distribution services, it is illustrative of the benefit of a supplier direct delivery approach.

Because the central level currently employs a third-party service provider for transport from the central level, this arrangement was extrapolated to direct delivery arrangements for costing purposes. Transportation rates were not available for delivery between central and provincial levels, so this was computed as an average of available transportation rates between the central level and regional warehouses, and the central level and RHUs (based on 2013 rates for the ComPack program). The cost of direct delivery to provinces was estimated at PHP 10,351,557.76 and direct delivery to DOTS facilities was estimated at PHP 12,003,114.60 (table 19). It is unclear how this would be factored into the prices or costs of products when suppliers submit their bids.

Table 19. Strategy D: Direct Delivery

Cost component	Supplier direct delivery	
	MMD to provinces	MMD to DOTS facilities
A: Storage cost, national level	PHP 224,077.80	PHP 224,077.80
B1: Transport cost, central to provinces	PHP 7,987,980.28	
B2: Transport cost, central to dots facilities		PHP 11,779,036.80
C: Storage cost, regional level		
D: Transport cost, regions to provinces		
E: Storage cost, provincial level	PHP 205,099.68	
F: Transport cost, provinces to DOTS	PHP 1,934,400.00	
Total estimated cost	PHP 10,351,557.76	PHP 12,003,114.60
Percentage cost relative to current system	216.27%	250.78%

Computed or assumed value
 Based on Interviews and available data

Supply Chain Strategies Using 3PL Operators

The following proposed supply chain strategies rely on private sector service providers for transportation, logistics management, storage, and information management. These models outsource most supply chain functions to relieve administrative burden, reduce the need for storage and transportation infrastructure, and provide a clear reporting structure. In the current arrangements of the family planning and ComPack programs, 3PL provider services include transportation, warehousing, and reporting on stock delivery and receipt.

Comprehensive 3PL agreements reduce the burden on MMD resources, including human resources, administration, storage, transportation, and information systems. These arrangements are tested in the Philippine context and are flexible, responding to contract changes from year to year. When applied to the supply system there is a potential for cost savings as waste and stock-outs are reduced.

These arrangements require strong coordination between private and public sector entities, and reluctance to work with government has been documented for some private logistics providers. Effective contract management is essential to ensure quality of services and to ensure that specified terms are upheld. Contract management should be centralized under an entity with oversight of the entire supply chain that has the capacity to monitor performance, enforce terms, and coordinate various stakeholders and entities. There have been issues regarding the performance of the 3PL services, and the experience has not been rigorously evaluated, even though enthusiasm exists for continuing to use this strategy. Key performance indicators have not been defined or monitored to date. Continuous performance monitoring and reporting must be stipulated in contract terms, and their enforcement is key to success. In particular, terms for stock status reporting must be explicit.

Strategy E1: 3PL Operator–Direct Delivery

The first 3PL operator arrangement proposed mirrors the basic terms of the ComPack agreement with Air21. For the purpose of calculating cost, contract rates for warehousing and insurance, packaging and sorting, and transport by land, sea, and air were used.

A key difference in the calculation shown in table 20 is the frequency of delivery to health facilities. To reduce the storage footprint in private storage, it was assumed that deliveries were made monthly while holding the equivalent of one month of average consumption as a buffer stock. This frequency of delivery offers maximum flexibility and reduces the size of each delivery, alleviating pressure on storage capacity at health facilities. The estimated cost for this arrangement is PHP 12,535,335.04.

This arrangement is feasible only if FDA batch testing can occur within the one-month time frame for the quantities of stock in each shipment. Based on available information on the family planning and ComPack programs, the 3PL was able to deliver to RHUs from the central level successfully within a 21-day time frame, so a monthly delivery schedule is feasible as long as quality control procedures are well coordinated and planned with FDA. All transportation rates specified in the contract are per cubic meter or per kilogram and do not take into account the anticipated number of trips. It is likely that transport rates will increase with the number of trips, although efficiencies and cost savings are possible if the NTP coordinates with the family planning and ComPack programs. Savings may also be achieved if central warehousing occurs at the MMD and the frequency of deliveries is reduced to four or six times per year, which allows additional time for administrative procedures and FDA testing.

Table 20. Strategy E: Third-Party Logistics Operators

Cost component	Contracting 3PL strategy	
	3PL provider	3PL provider + MIS
A: Storage cost, national level	PHP 545,768.17	PHP 545,768.17
Volume of central-level storage (cubic meters)	454.81	454.81
Duration in warehouse (days)	60	60
Warehouse rental (PHP/cubic meter/day)	20	20
B: Transport cost, central to DOTS facilities	PHP 11,779,036.80	PHP 11,779,036.80
Volume of delivery (cubic meters)	227.40	227.40
Cost of transport, land	Varies	Varies
Cost of transport, sea	Varies	Varies
Cost of transport, air	Varies	Varies
Number of deliveries per year	12	12
Packaging and sorting cost (per cubic meter)	77.15	77.15
C: Storage cost, regional level		
D: Transport cost, regions to provinces		
E: Storage cost, provincial level		
F: Transport cost, provinces to DOTS		
Total estimated cost	PHP 12,535,335.04	PHP 12,535,335.04 + X (unknown 3PL cost for MIS services)
Percentage cost relative to current system:=	261.90%	261.90% + X
<ul style="list-style-type: none"> ■ Computed or assumed value ■ Based on interviews and available data 		

Strategy E2: 3PL Operator–Direct Delivery and Inventory Management

The final option involves a 3PL operator model as before, with the addition of stock status monitoring services. This arrangement is untested in the Philippines; therefore costing estimates were not available but were assumed to be some unknown additional cost for this service in addition to the cost of 3PL services for warehousing, transportation, and packaging (see table 20).

Inventory management and reporting services would greatly reduce the burden on DOTS staff to monitor stock levels and enter data into NOSIRS or generate paper-based reports. In this arrangement, the 3PL operator would perform inventory when distributing supplies and would be responsible for entering information into NOSIRS or an alternate information system.

For a comprehensive and synoptic comparison of strategies, please refer to table 21.

Quality Assurance Strategy Effects on Supply Chain Performance

The requirement for, and implementation of, sampling and testing every batch received at the MMD warehouse has contributed to delays in distribution to regional and provincial warehouses. The MMD collects samples and sends them to the FDA laboratory. The FDA aims to report test results within 15 days with a 30-day maximum, but MMD staff report that it usually takes between three weeks and three months to receive the FDA certificate of analysis, and longer for products with multiple ingredients. There have been recent improvements in overcoming delays in collecting samples for testing and reducing testing delays.

The reliance on sampling and testing may be reduced if greater emphasis placed on GMP, either by requiring WHO prequalification or FDA-certified manufacturer compliance with international GMP standards. These methods ensure that products meeting quality standards are indeed manufactured. Sampling and testing could be done following a “risk-based strategy” targeting (a) products that have previously failed quality control tests, (b) products from new suppliers who must be GMP certified, (c) products with a quality problem, or (d) random checks to confirm GMP compliance by manufacturers. For domestic firms, sampling and testing need not wait until shipments are received at the MMD or designated delivery sites but can take place during manufacture.

This strategy could support the use of supply chain strategies such as more frequent supplier shipments and deliveries of smaller quantities, supplier direct delivery to RHUs and other service delivery points, and 3PL service contracts without causing sampling logistical difficulties with a requirement for mandatory quality control testing before release. It will also focus FDA laboratory capacities on detecting or confirming substandard product quality rather than confirming that a very small percentage of products are substandard.

This quality assurance strategy will require (a) enhanced FDA capacity for Pharmaceutical Inspection Convention/Pharmaceutical Inspection Scheme accredited GMP inspections and enforcement of standards; (b) FDA, NTP, MMD, and suppliers’ agreement that this will be a more effective and efficient approach; (c) careful design of the quality assurance program and its components; and (d) modifying current requirement for mandatory testing before release to one based on FDA-certified GMP compliance or WHO prequalification, supported by targeted testing as needed. Mandatory product testing before release for distribution appears to have been established by the Commission of Audit through an administrative order, but this needs to be verified to determine what instrument is most appropriate to provide the legal or regulatory framework, if developing and implementing a different strategy is agreed upon. In practice, not all public procurement seems to follow the requirement for quality testing before release, based on the number of testing requests received by FDA and anecdotal accounts of supplies being released from warehouses before the certificate of analysis is received because of delays in analysis and potential stock-out situations.

Table 21. Matrix of Strategies to Improve Supply Chain Management

Issues	Current system	Alterations to current system				Redesign of supply chain	
		A: Increase storage capacity	B: Increase frequency of deliveries	C: NOSIRS/ MIS	D: Direct delivery by supplier to local level	E: 3PL operators with or without MIS services	
Description	Vertical supply system from central MMD to provincial and regional warehouses, from which supplies are distributed to or picked up by RHUs	Additional warehousing space may be constructed or rented at central, regional, and/or provincial levels	Shipment size is reduced and frequency of deliveries is increased	Improve NOSIRS and increase implementation	Delivery from central warehouse directly to either health facilities or provincial warehouses. Both bypass the regional level.	E1: 3PL Includes packaging, sorting, warehousing, and delivery of goods	E2: 3PL + MIS Includes packaging, sorting, warehousing, delivery of goods, and stock status monitoring
Storage capacity	Insufficient storage capacity at central, regional, provincial, and health facility levels	Would increase storage capacity where bottlenecks exist if storage is added to the corresponding levels	Reduces need for storage space at any given time at all levels of the supply chain	Not addressed	Reduces need for MMD storage. Regional and provincial warehouse storage eliminated if supplies are delivered directly to health facilities. Health facility storage capacity may need to increase with direct delivery from supplier.	Addressed by 3PL (depending on starting point)	

Strategies to Improve Supply Chain Management

Issues	Current system	Alterations to current system				Redesign of supply chain	
		A: Increase storage capacity	B: Increase frequency of deliveries	C: NOSIRS/ MIS	D: Direct delivery by supplier to local level	E: 3PL operators with or without MIS services	
Inventory management and information	Inconsistent use of systems for inventory management and information	Not addressed	Not addressed	Accurate stock management system and reporting for forecasting	Should improve with reduced supply chain levels, fewer administrative requirements	Addressed by 3PL through invoice and delivery receipts and other desired reporting requirements	Addressed by 3PL through invoice and delivery receipts, and reporting of other desired data elements collected during replenishment of stock at RHUs
Transportation resources	Resources vary widely by region/ province. In practice, most RHUs pick up supplies at regional/ provincial level.	Not addressed	Increases demand for transportation resources because supplies are distributed more frequently	Not addressed	Dependent on supplier transport resources (own or subcontracted)	Addressed by 3PL	

Issues	Current system	Alterations to current system				Redesign of supply chain
		A: Increase storage capacity	B: Increase frequency of deliveries	C: NOSIRS/ MIS	D: Direct delivery by supplier to local level	E: 3PL operators with or without MIS services
Advantages	Well established, centralized control of TB commodities and practices	Increased storage capacity at additional sites. Private sector capacity would provide rental or construction services.	No need for increased storage space, reduced supplier bottleneck at central level	Existing national system; has the potential to track, quantify, and report on commodities	Reduces burden on MMD for storage and responsibility for distribution depending on desired delivery point (regional, provincial, or RHU)	<p>Reduces burden on MMD resources (personnel, administrative, storage, transportation, information); flexible and responsive; potential cost savings; potential reduction of waste and stock-outs. With MIS services, burden on RHU personnel for stock management is eliminated. Experience of ComPack and family planning programs with using 3PL services considered sufficiently positive, leading to interest and willingness to incorporate TB commodities.</p> <p>Addresses distribution to service delivery sites (and avoids having to pick up supplies).</p> <p>3PL inventory data collection can address shortcomings of weak local stock taking and reporting.</p>

Strategies to Improve Supply Chain Management

Issues	Current system	Alterations to current system				Redesign of supply chain
		A: Increase storage capacity	B: Increase frequency of deliveries	C: NOSIRS/ MIS	D: Direct delivery by supplier to local level	E: 3PL operators with or without MIS services
Limitations	Insufficient storage capacity, transportation resources, MIS, and inventory management	High levels of capital investment required to build and operate sites, continued investment required for rental. Limited political viability; does not address other major supply chain issues. Some areas may not have adequate private sector capacity.	Increases demand on existing transportation resources, may increase administrative burden as number of deliveries increases.	Relies on Internet access (online-only platform) and trained personnel (high turnover), intensive training process, limited rollout	Potential storage capacity issues at health facilities, loss of direct control over supplies Need for strong capacity to monitor supplier performance monitoring Need for strong and effective coordination and communication among the various levels	Requires strong coordination between private sector and public entities, potential reluctance in private sector to work with government if incentives are insufficient. MIS service provision is unprecedented and untested arrangement in the Philippine context; exact cost implication is unknown.

Philippine Tuberculosis Supply Chain Options Analysis

Issues	Current system	Alterations to current system				Redesign of supply chain
		A: Increase storage capacity	B: Increase frequency of deliveries	C: NOSIRS/ MIS	D: Direct delivery by supplier to local level	E: 3PL operators with or without MIS services
Cost implications	PHP 4.8 million	Build Space: Annual Cost: PHP 4.8 million Initial Cost: PHP 2.8 million to build and PHP 400,000 to 490,000 to rent for 1 year Total Year 1 Cost: PHP 7.9 million to 8.0 million	Rent Space: PHP 5.2 million to 5.3 million Cost reflects increased frequency of deliveries from supplier to MMD warehouse only, maintains quarterly deliveries at lower levels PHP 4.7 million	Cost includes current system + supervisory visits PHP 6.3 million + X (unknown capital investment in system and annual training)	Cost of delivery from MMD to provincial level: PHP 10.3 million Cost of delivery from MMD to health facilities: PHP 12.0 million Unclear what the costs would be for the supplier, and how this would be factored into the product cost (bid price)	Cost includes monthly delivery of supplies from supplier to central level, direct delivery from central level to RHUs quarterly PHP 12.5 million + X (unknown 3PL cost for MIS services)

Strategies to Improve Supply Chain Management

Issues	Current system	Alterations to current system				Redesign of supply chain
		A: Increase storage capacity	B: Increase frequency of deliveries	C: NOSIRS/ MIS	D: Direct delivery by supplier to local level	E: 3PL operators with or without MIS services
Other considerations		Building additional space should be considered only on very limited basis, evaluating factors related to geography and accessibility. Rental contract management should be centralized and carefully conducted to ensure quality of services.	Streamlining management may reduce administrative burden, contract management with supplier to specify delivery size and frequency, consider using with 3PL strategies	Implementation should be scaled up, use of NOSIRS should be mandatory and enforced, training should include emphasis on use of all modules		Detailed appropriate service specifications and strong contract management is critical to the success of this strategy. Key performance indicators must be included in the contract, closely monitored and evaluated, and enforced. Specifically, terms for stock status reporting must be explicit, and what must be reported by the 3PL and role, if any, relative to NOSIRS should be clearly established.

THE WAY FORWARD

A clear decision and commitment to delivery rather than pickup of supplies at regional and provincial levels will require sufficient budget allocation to cover these costs and clear definition of responsibilities for addressing these costs, which have been covered mostly by the local governments.

The DOH is expanding its use of outsourced distribution through 3PL contracts for the ComPack and Family Planning Programs, and now for first-line TB treatment supplies. Including a storage requirement would help reduce space needs, if properly linked to modifications related to procurement management and specifications for more frequent deliveries of smaller shipment quantities. If using the 3PL service provider to support inventory management is included in the scope of desired services, this strategy would reduce the burden on health facility workers, so they can focus on program and patient management and not on supply management. It would also address trained staff turnover. It would facilitate and support inventory management and forecasting through collection of stock status data at the time of delivery and its reporting to each level of the health care system (municipal, provincial, regional, and central). This will require an electronic information management system that may need to be developed, if not currently available from the 3PL service providers, and the relationship or communication with the current or an improved NOSIRS system must be clarified. Thus, a well-defined and clear scope of services and key performance indicators will be critical to ensure appropriate management of the evolving supply chain strategy and its evaluation.

Given the multiplicity of programs and remote and rural geographic challenges, several service providers likely will be needed to provide adequate coverage and service. Standardization and harmonization of supply performance indicators, collection of stock data elements, and data reporting will be required. Effective coordination, monitoring, and evaluation are essential.

Anticipating eventual integration of the MDR-TB program supply system with the first-line treatment supply program, this careful planning must begin now with stepwise implementation to avoid adversely affecting its current good performance.

To more effectively assure the quality of TB medicines specifically, and essential medicines in general, the DOH and the FDA should refocus the quality assurance program to place greater emphasis on enforcing international GMP standards and a more strategically designed and targeted sampling and testing program. This will address some issues related to the quality assurance program that affect the TB medicine supply system.

Requirements for the Way Forward

- Establish a common model for program supply chains based on contracting for 3PL services.
- Manage outsourced logistics services with explicit specifications of scope and nature of desired services (warehousing, distribution, data collection for inventory management, and performance monitoring), key performance indicators, and contractor reporting requirements.
- Work collaboratively with the 3PL service providers to ensure the quality of services provided, because there is currently much room for improvement and new services may be added where there is no previous experience (such as 3PL-managed inventory).
- Rigorously document and evaluate the ongoing experience, because the use of 3PL services has yet to be adequately assessed, despite enthusiasm for expanding its use.
- Enhance DOH/Procurement Division contract management capacity, which will likely require additional personnel and technical assistance.
- “Customize” solutions for “last mile” delivery to some geographical areas that are difficult to reach for current 3PL service providers and for service delivery sites to travel to pick up their supplies.
- Define or establish a central mechanism or entity with responsibility, authority, and accountability for effectively coordinating, monitoring, and evaluating supply system performance, and support the various DOH central programs.

Next Steps

- Engage stakeholders to achieve a shared vision of the current situation through one or more broad and participatory meetings, as needed. This will galvanize broad stakeholder support for supply system reform.
- Obtain agreement on reengineering the supply system to optimize supply chain performance for the various programs (not just TB supply), and possibly integrate the supply system for the various programs and improve effectiveness and efficiency.
- Once decisions are made and communicated, develop specific and detailed interventions and mobilize resources. This involves both technical specifications and budgetary considerations. Development of the technical plan may draw upon national and/or international partners for technical support and assistance to develop interventions that are feasible and specific. Budgetary considerations are an important piece of intervention development, and national, local, and donor funding sources should be taken into account from the beginning of this process.

- Define and assign responsibility, authority, and accountability for effective coordination and management of this system (in which the TB supply chain is only a part) to a competent entity, and if needed establish its capacity to perform this role.

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