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Evaluation of the Zimbabwe Assisted Pull System (ZAPS)

Baseline Report

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Abstract
This report provides results from the baseline measurement for the evaluation of the Zimbabwe Assisted Pull System (ZAPS). The ZAPS, which is being piloted in Manicaland Province, consolidates management of four existing health commodity distribution systems for the primary health care facility level: Delivery Team Topping Up (DTTU); Zimbabwe Informed Push/Primary Health Care Package (ZIP/PHCP); Zimbabwe ARV Distribution System (ZADS); and Essential Medicines Pull System (EMPS). For the hospital level, the ZAPS consolidates the DTTU and the malaria and tuberculosis portions of the ZIP/PHCP while the ZADS and EMPS continue to operate as separate systems. The evaluation aims to compare performance and costs of the ZAPS with these existing distribution systems. Results from this evaluation will feed into the decision on whether to expand the ZAPS model from Manicaland to the rest of Zimbabwe.

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Contents

Acronyms v
Acknowledgments vii
Executive Summary ix
Background ix
Methods ix
Results x
Discussion and Conclusions xi
Introduction 1
Study Rationale 1
Existing Supply Chains and the Development of the ZAPS 2
Research Questions and Hypothesis 5
Methods 7
Study Design 7
Sample 7
Data Indicators 7
Data Collection 9
Data Analysis 12
Potential Limitations Associated with the Study Methodology 12
Timeline 12
Results 15
Performance 15
Customer Response 19
Cost 25
Cost-Effectiveness 28
Discussion 31
Next Steps 31
References 33
Appendices
1. Health Facility Survey on Supply Chain Effort 35
2. Detailed Stock Status, DTTU and ZIP, Full-Supply Products 39
3. Detailed Stock Status, ZADS Full-Supply Products 41
4. Detailed Costs by System, Main Function, and Item 43
5. Detailed Costs by Tier, Main Function, and Item 45

6. Details on Commodity Throughput by System 49

Figures

1. Map of Zimbabwe Showing Provinces 3
2 Study Hypothesis of How the ZAPS Will Reduce Redundancy and Cost While Maintaining and Improving Performance 6
3. Framework for Cost Collection and Analysis 11
4. Timeline for the ZAPS Pilot and Evaluation Activities 13
5. On-Time Data Collection During Baseline, DTTU and ZIP 16
6. On-Time Data Submission During Baseline, ZADS 17
7. Average Number of Days Since Last Order and Delivery Visit, DTTU and ZIP, by Quarter 18
8. Average Number of Days Late for Data Submission for the ZADS by Delivery Period 19
9. Baseline Stock Availability on Day of Visit, DTTU and ZIP, by Quarter 20
10. Baseline Stock Availability on Day of Visit, ZADS, by Bimonthly Period 21
11. Of Facilities with Stockouts, Percentage with Stockout Duration 22
12. Stock Status, DTTU and ZIP, by Quarter 23
13. Stock Status, ZADS, by Bimonthly Period 24
14. Expiry Rate, DTTU and ZIP, by Quarter 25
15. Expiry Rate, ZADS, by Bimonthly Period, Manicaland 25
16. Supply Chain Costs at Baseline, by System 26
17. Supply Chain Costs, by Main Function 27
18. Annual Cost, by Tier 27
19. Annual Commodity Volume and Value, by System 28
20. Next Steps Going Forward 32

Tables

1. Products That the ZAPS Manages, by Health Facility Type and Current System 4
2. Characteristics of the Distribution Systems in Place in Zimbabwe Compared with the ZAPS 5
3. Sample for the ZAPS Evaluation 7
4. Comparison Indicators 8
5. Comparison Indicators and Source of Data at Baseline and During the ZAPS 9
6. Full-Supply Products Included in the Baseline Analysis 10
7. Tools for Collecting Cost Data 11
8. Baseline Reporting Coverage, DTTU and ZIP 15
9. Reporting Coverage Rate for the ZADS, by Bimonthly Period 15
10. Cost-Effectiveness Measures for Combined DTTU, ZIP/PCHP, and ZADS Systems 29
11. Data Needed Moving Forward, by Source and Frequency 32

Acronyms

ADC	area distribution coordinator
AIDS	acquired immune deficiency syndrome
AMC	average monthly consumption
ART	antiretroviral therapy
ARV	antiretroviral
DPM	district pharmacy manager
DPS	Directorate of Pharmacy Services
DTTU	Delivery Team Topping Up
EID	early infant diagnosis
EMPS	Essential Medicines Pull System
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
HIV	human immunodeficiency virus
JSI	John Snow, Inc.
LMIS	logistics management information system
MOHCC	Ministry of Health and Child Care
PHC	primary health care
PHCP	primary health care package
PMTCT	prevention of mother-to-child transmission
POC	point of care
POD	proof of delivery
PPM	provincial pharmacy manager
RTK	rapid test kits
SC	supply chain
SCMS	Supply Chain Management System
STI	sexually transmitted infection
TB	tuberculosis
USAID	U.S. Agency for International Development
ZAPS	Zimbabwe Assisted Pull System

ZADS	Zimbabwe ARV Distribution System
ZIP/PHCP	Zimbabwe Informed Push/Primary Health Care Package
ZNFPC	Zimbabwe National Family Planning Council

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Executive Summary

Background

This report provides results from the baseline measurement for the evaluation of the Zimbabwe Assisted Pull System (ZAPS). The ZAPS, which is being piloted in Manicaland Province, consolidates management of four existing health commodity distribution systems for the primary health care facility level: Delivery Team Topping Up (DTTU); Zimbabwe Informed Push/Primary Health Care Package (ZIP/PHCP); Zimbabwe ARV Distribution System (ZADS); and Essential Medicines Pull System (EMPS). For the hospital level, the ZAPS consolidates the DTTU and the malaria and tuberculosis portions of the ZIP/PHCP while the ZADS and EMPS continue to operate as separate systems. The evaluation aims to compare the performance and costs of the ZAPS with these existing distribution systems. Results from this evaluation will feed into the decision on whether to expand the ZAPS model from Manicaland to the rest of Zimbabwe.

The evaluation aims to help answer the following questions:

1. Can the ZAPS yield the same or higher levels of supply chain performance compared with the existing supply chain systems when performance includes both product availability and number/percentage of facilities served?
2. Can the ZAPS provide the same or higher quality reporting of logistics data compared with the existing supply chain systems? Can the system ensure the same level of data visibility as the existing systems?
3. Can the ZAPS improve product management, for example, stocked according to plan, stockout rates at the facility level?
4. Can the ZAPS improve on minimizing losses from product expiry (same low rates of expiry or lower)?
5. What will be the cost to operate the ZAPS compared with operating the existing supply chain systems?
6. Will the ZAPS be more efficient (cost-effective) than the existing supply chain systems?

The research hypothesis is that the ZAPS will provide better product availability, data availability, and reduced losses from expiry and will do so more cost-effectively than systems that the ZAPS replaces.

Methods

The study design is quasi-experimental for some elements and non-experimental for others. Specifically, for supply chain performance indicators already routinely collected through existing information systems, the study combines non-equivalent control and time series approaches. The general evaluation strategy will be to focus on the baseline performance and cost indicators for the DTTU, ZIP/PHCP, and ZADS for Manicaland Province for 2013 and the first quarter of 2014 and

compare those with the performance of the ZAPS in Manicaland Province during the 1-year pilot period (April 1, 2014–March 31, 2015). The baseline evaluation draws on data from Manicaland and from central-level actors such as NatPharm, the Zimbabwe National Family Planning Council, and the various development partners. The baseline evaluation focuses on measuring indicators for the comparison between the ZAPS and the existing systems. These include four groups of indicators that include information availability and quality, customer response, commodity availability/inventory management, and cost and cost-effectiveness. Data collection on the first three categories of indicators drew mainly on existing electronics databases, including AutoDRV/Top Up, ZISHAC, and Navision. Baseline performance on the EMPS was not available. Baseline cost data on the four existing systems came from financial records, interviews, and surveys.

Results

Supply Chain Performance

On the dimension of information availability and quality, the DTTU and ZIP show levels of reporting coverage of almost 100 percent; this is to be expected given that both systems receive visits from order/delivery teams who simultaneously produce required reports. Reporting levels for the ZADS are similarly high. Levels of on-time data collection are generally good for the DTTU and ZIP systems, with on-time or acceptably late data collection above 80 percent in most of the baseline quarters. For the ZADS, on-time data collection was good for most of 2013 and then deteriorated somewhat at the end of the year.

For the DTTU and ZIP, on-time delivery, an indicator of customer responsiveness, is equivalent to on-time data collection. On-time delivery statistics for the ZADS were not available for the baseline.

The existing systems also perform well on measures of commodity availability and inventory management for which the analysis focused on a subset of products in near full supply. The DTTU performs particularly well, showing almost 100 percent product availability. The ZIP performed well on product availability in the first half of 2013 and then showed some deterioration of performance through the first quarter of 2014, with product availability dropping to 73 percent in Q1 2014. Product availability for the ZADS averaged 86 percent throughout the baseline period. Those stockouts that did occur were generally of short duration. Overstocking of products appears to be one area of concern that the baseline evaluation uncovered, with between 30 and 40 percent of facilities showing significant overstocking during the baseline period. Despite this, the expiry rate, another indicator of inventory management, was low for all three systems, averaging less than 1 percent for the baseline.

Supply Chain Costs and Throughput

The total supply chain cost for Manicaland was $1.7 million. The ZIP/PHCP system accounted for the largest proportion of costs, followed by ZADS, DTTU, and EMPS. Costs were distributed almost equally between transport (25 percent), storage (25 percent), operating expenses (24 percent), and management and supervision (22 percent). Data management accounted for 4 percent of total costs. Although the study estimates costs of running the supply chain for Manicaland only, over half of these costs are, in fact, incurred at the central level, reflecting the degree to which the province depends on central-level storage, transport, and management tasks. These costs were associated with a yearly commodity throughput volume of 1,500 cubic meters, valued at almost $12 million. Although commodity volume was split evenly among the four systems, ZADS products (mostly high-value antiretroviral medicines) accounted for the large majority of commodity value.

Cost-Effectiveness

The results of the costing, when placed in the context of levels of throughput and performance, show the existing systems to be relatively efficient, with supply chain cost as a percentage of throughput value of 12 percent. When we adjusted throughput levels for system performance, the "performance-adjusted" cost per commodity value rose from 12 to 13 percent.

Discussion and Conclusions

The results from this baseline measurement validate previous analyses showing the DTTU, ZIP, and ZADS as mature, mostly stable, and well-performing systems. Although stakeholders generally believe the EMPS to have lower performance levels, the lack of concrete baseline data makes it impossible to confirm or refute this perception. The cost and cost-effectiveness values at baseline are only meaningful in the context of the values that will emerge from the end-line evaluation of the ZAPS. On their own, however, they show that current systems are relatively efficient. The estimate for supply chain cost as a percentage of product value is similar to the value found in the 2010 study of the DTTU (Sarley et al. 2010) and generally within the "normal" range found in other countries. Nonetheless, it is important to remember that the aim of the cost-effectiveness analysis is not to compare with other countries but rather to compare between two approaches within Zimbabwe.

As the study moves forward, data collection during the ZAPS pilot will require the ongoing cooperation of partners in providing the analysts with information on costs and performance. The end-line analysis is expected to be completed by the second quarter of 2015.

Introduction

The Zimbabwe Ministry of Health and Child Care (MOHCC) is piloting the consolidation of management of four existing health commodity distribution systems into a single Zimbabwe Assisted Pull System (ZAPS) for the primary health care facility level. The pilot began in April 2014 in Manicaland Province, one of 10 provinces in Zimbabwe. An evaluation compares performance and costs of the ZAPS with the existing distribution systems. This report provides results from the baseline measurement. Preliminary results from this baseline measurement were presented at a workshop in Harare on June 18, 2014.

Study Rationale

Most health commodities in the public sector are currently distributed via four different systems, each with a unique structure and associated costs and level of performance. Interest in merging these systems stems from the plan to shift primary responsibility for supply chain funding and management from international donors and technical assistance agencies to Zimbabwe's government. Government officials believe that a single, unified system will be simpler to manage, cost less, and produce similar or higher levels of performance than the current systems. Discussions among the various supply chain stakeholders culminated in an agreement in February 2013 to work toward integrating the management of most health commodities into a single "assisted pull" system, which underwent formal design in October 2013. Stakeholders agreed to pilot the ZAPS in one of Zimbabwe's 10 provinces, then roll it out nationwide if successful. The pilot will be deemed a success if it can be shown that the ZAPS generates the same or better level of supply chain performance at lower cost when compared to the existing array of distribution systems.

The main local parties interested in the evaluation of the pilot are the Directorate of Pharmacy Services (DPS) of the MOHCC, NatPharm (the public-sector central medical stores), and the various international partners, which include the U.S. government, the U.K. Department for International Development, and the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM). The USAID | DELIVER and Supply Chain Management System (SCMS) projects have been deeply involved in designing and providing technical assistance to the current supply systems and are leading the effort to support the MOHCC to design, implement, and test the assisted ordering system.

Beyond the local drivers for the adoption and evaluation of the ZAPS, the USAID | DELIVER PROJECT supports a public health supply chain strengthening research agenda at the global level. The PROJECT believes that formal evaluation of the ZAPS will provide understanding for other developing country public health systems in terms of the distribution design options available to them and that economic evaluation of this pilot will contribute to global best practices for economic evaluation research methodologies for public health supply chains.

Existing Supply Chains and the Development of the ZAPS

Four public health supply systems distribute the vast majority of products in Zimbabwe.[1] The Delivery Team Topping Up (DTTU) and the Zimbabwe Informed Push/Primary Health Care Package (ZIP/PHCP) both use a "rolling warehouse" approach via informed push to about 1,600 service delivery points. The DTTU distributes condoms, contraceptives, human immunodeficiency virus (HIV) and syphilis rapid test kits (RTKs), antiretroviral (ARV) medicines for prevention of mother-to-child transmission (PMTCT) of HIV, early infant diagnosis (EID) bundles, and cluster of differentiation 4 (CD4) point-of-care (POC) commodities to approximately 1,600 service delivery points. The ZIP/PCHP distributes malaria products, tuberculosis (TB) medicines, and 26 other essential medicines and medical supplies. The Zimbabwe ARV Distribution System (ZADS) is a traditional "pull" system that distributes ARVs for antiretroviral therapy (ART) and Fluconazole to 481 sites currently, with plans to scale up to more than 900 sites in the future. The Essential Medicines Pull System (EMPS) is a traditional ordering/requisition system used by all sites for all other essential medicines and medical products not distributed by another system.

Although the DTTU and ZIP/PCHP have historically performed well, they are very resource intensive. Both systems rely on team leaders who collect data on laptops, determine resupply quantities, and do resupply while at the facility. The involvement of the team leaders contributes to a higher level of data integrity but doing resupply from the "rolling warehouses" is a time-consuming process. Both systems are at their limits in terms of number of products that they can manage, and increasing volumes of products will require more delivery runs to serve the same number of facilities. Finally, both systems rely on the same vehicles, so any delay in one delivery run affects the other. Local human resources manage the systems, and they currently rely heavily on donor funding.

The ZADS has also performed well, but getting the reports from the facilities on time requires considerable effort from the central level. Central-level resources are also required to ensure data quality and order integrity; all orders are reviewed before being approved. As with the DTTU and ZIP/PHCP, local human resources currently manage the system, but again, this system is heavily donor reliant.

The EMPS has historically suffered from low reporting rates, irregular ordering, and interruptions in product supply. Such problems have made it difficult to do regular resupply and to forecast long-term needs.

The existing systems essentially were managed separately, using different transport, warehousing, and management information systems, and drawing on different funding streams In this context, the MOHCC DPS was interested in bringing the management of all health commodities under a single unified system that it could cost-effectively manage. In November 2012, the DPS convened a meeting of over 50 local staff from all levels of the supply chain and central-level partners to review the current situation and explore options for moving forward. The results of that meeting included general agreement on the principle of moving forward with the integration of health commodity management and the formation of a smaller technical working group to recommend how to achieve such integration.

In February 2013, the technical working group met and agreed on the general outlines of what became known as the ZAPS. The ZAPS builds on the technology and lessons learned from the

[1] Two other relatively small supply chains deliver laboratory commodities (ZiLaCoDS, to 111 sites) and Voluntary Medical Male Circumcision products (VMMC, to 65 sites).

DTTU and ZIP/PHCP, yet removes the limits on the number of products the supply chain can manage. Subsequent to the group meetings, the MOHCC identified Manicaland Province as the desired site for the ZAPS pilot (figure 1).

Figure 1. Map of Zimbabwe Showing Provinces

Manicaland Province, whose capital is Mutare, has more health facilities—about 270—than any other province in Zimbabwe. Its size and diversity present the full range of challenges that the ZAPS implementation might face, thus making it a suitable proving ground for extending the model to other provinces.

A system design workshop held in Manicaland in October 2013 detailed the ZAPS procedures (Chiyaka and Printz 2013), which are summarized here:

- The ZAPS operates quarterly.
- The ZAPS combines ZIP/PHCP, DTTU, ZADS, and EMPS products for primary health care facility level (see table 1). Hospitals will continue to receive some products via existing systems.
- The pilot divides Manicaland into 11 resupply areas, each roughly corresponding to a district or subdistrict of about 30 health facilities.
- An ordering team comprised of a driver and a district pharmacist travels to all facilities in their resupply area (about 30) to assist health facility staff to collect essential logistics data and to place orders by using an automated system (AutoOrder).
- The ordering team transmits the order to the NatPharm Mutare branch.
- Staff at the NatPharm Mutare warehouse picks and packs the order.
- NatPharm Mutare then delivers pre-parceled orders to facilities.

Table 1. Products That the ZAPS Manages, by Health Facility Type and Current System

Product	Health Facility Type		System under Which the Products Are Currently Managed
	Primary Care Health Facilities (including rural hospitals)	District/ Mission/ Provincial and Central Hospitals	
Condoms	ZAPS	ZAPS	DTTU
Contraceptives	ZAPS	ZAPS	DTTU
HIV RTKs	ZAPS	ZAPS	DTTU
Syphilis RTKs	ZAPS	ZAPS	DTTU
ARVs for PMTCT	ZAPS	ZAPS	DTTU
EID reagents	ZAPS	ZAPS	DTTU
POC reagents	ZAPS	ZAPS	DTTU
Malaria products	ZAPS	ZAPS	ZIP/PHCP
TB medicines	ZAPS	ZAPS	ZIP/PHCP
Essential medicines and medical supplies that are in the primary health care list	ZAPS	EMPS	ZIP/PHCP
Selected nutrition products	ZAPS	ZAPS	ZIP/PHCP
Selected PHC essential medicines and medical products	ZAPS	EMPS	EMPS
ARVs for ART	ZAPS	ZADS	ZADS
Fluconazole	ZAPS	ZADS	ZADS

Table 2summarizes how the ZAPS compares with the four main current systems. In sum, the ZAPS changes the methods of order fulfillment, data collection, and delivery for the products migrating to the ZAPS. Meanwhile, it is assumed that procurement approaches and quantities will not change during the pilot.

Table 2. Characteristics of the Distribution Systems in Place in Zimbabwe Compared with the ZAPS

	DTTU	ZADS	ZIP/PHCP	EMPS	ZAPS
Products managed	Condoms, contraceptives, HIV & syphilis RTKs, PMTCT ARVs, EID, and POC reagents	ARVs & Fluconazole	Malaria, TB, selected set of essential medicines and medical supplies	All essential medicines and medical supplies (not managed by another system)	Combination of the four existing systems for primary health care level
Number of health facilities served (nationwide)	Approx. 1,600	≈1000 (scaling up)	Approx. 1,600	Approx. 1,600	267 (Manicaland only)
Type of logistics management information system	AutoDRV/Top Up (automated system)	Manual (facility level) ZISHAC (automated system at central level)	AutoDRV/ Top Up (automated system)	Manual (facility level) Computerized (central level)	AutoOrder/ Top Up (automated system)
Method of resupply	Forced order; push; data collection, resupply calculations and delivery on the spot by the DTTU team	Forced order; pull; delivery by NatPharm after submission of requisitions by the facilities and approval by DPS	Forced order; push; data collection, resupply calculations and delivery on the spot delivery by the ZIP team	Monthly; standard; pull; delivery by NatPharm	Forced order; pull; data collection and resupply calculations by order team; order fulfillment and delivery by NatPharm
Reporting cycle	Quarterly	Bimonthly	Quarterly	Monthly	Quarterly

Research Questions and Hypothesis

The objective of the pilot is to determine whether the ZAPS can achieve the same or higher level of performance while being more efficient than the current four systems.

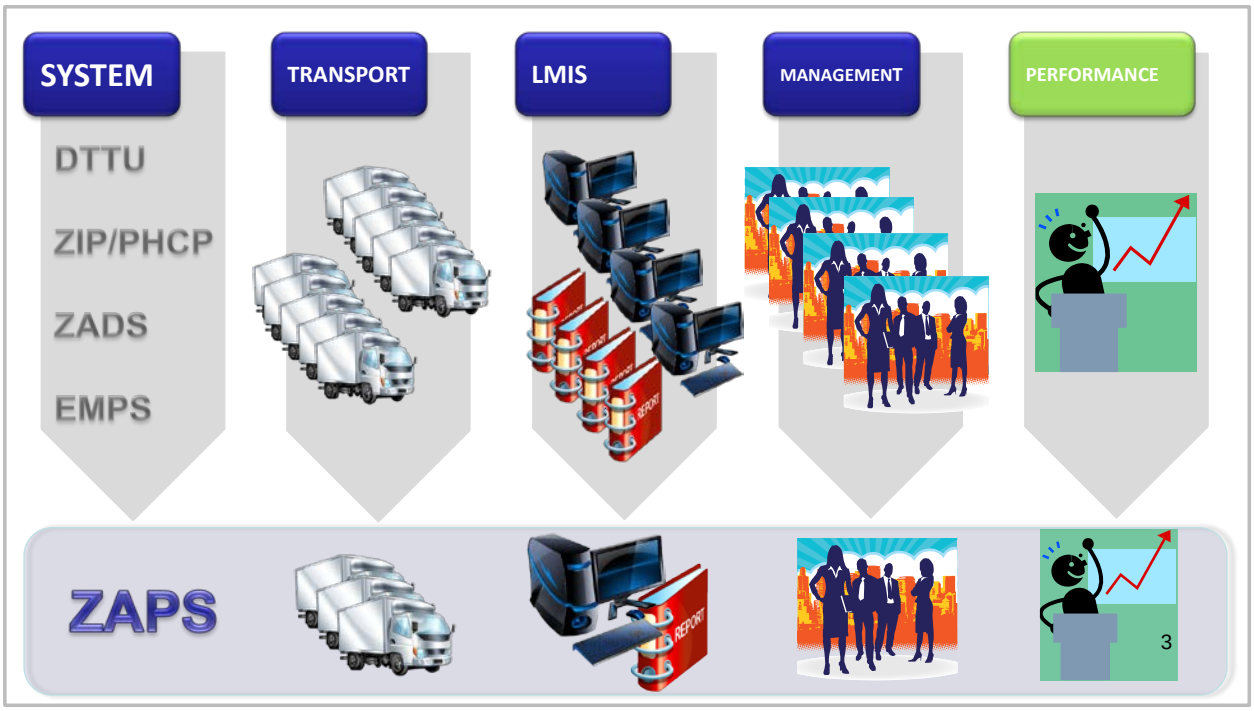
The evaluation aims to help answer the following questions:

1. Can the ZAPS yield the same or higher levels of supply chain performance compared with the existing supply chain systems when performance includes both product availability and number/percentage of facilities served?
2. Can the ZAPS provide the same or higher quality reporting of logistics data compared with the existing supply chain systems? Can the system ensure the same level of data visibility as the existing systems?

3. Can the ZAPS improve product management—for example, stocked according to plan, stockout rates at the facility level?
4. Can the ZAPS improve on minimizing losses from product expiry (same low rates of expiry or lower)?
5. What will be the cost to operate the ZAPS compared with operating the existing supply chain systems?
6. Will the ZAPS be more efficient (cost-effective) than the existing supply current systems?

The research hypothesis is that the ZAPS will provide better product availability, data availability, and reduced losses from expiry, and will do so more cost-effectively than systems that the ZAPS replaces (figure 2).

Figure 2. Study Hypothesis of How the ZAPS Will Reduce Redundancy and Cost While Maintaining and Improving Performance



Methods

Study Design

The design for this study is quasi-experimental for some elements and non-experimental for others. Specifically, for supply chain performance indicators already routinely collected through existing information systems, the study combines non-equivalent control and time series approaches. The general evaluation strategy will be to focus on the baseline performance and cost indicators for the DTTU, ZIP/PHCP, and ZADS for Manicaland Province for 2013 and the first quarter of 2014 and compare those to the performance of the ZAPS in Manicaland Province during the 1-year pilot period (April 1, 2014–March 31, 2014).

Sample

The design draws on data collected in the pilot province, Manicaland, and at central-level actors such as NatPharm, the Zimbabwe National Family Planning Council (ZNFPC), and the various development partners (table 3).

Table 3. Sample for the ZAPS Evaluation

	Number	Cost	Performance
Service delivery points (facilities)	267	√	√
Ordering unit[2]	11	√	√
Province	1	√	√
NATPHARM	1	√	√
ZNFPC	1	√	√
Development partners	6	√	

Data Indicators

The study measures two main groups of indicators. The first includes indicators for comparison between the ZAPS and the existing system. The second group includes indicators to monitor initial implementation of the ZAPS.

[2] The total of 11 ordering units includes 4 large districts divided into 8 ordering units and 3 small districts that form their own ordering unit.

Indicators for Comparison

Stakeholders identified four groups of indicators for the comparison of the ZAPS with existing systems (table 4). See the Monitoring and Evaluation Plan (Ministry of Health and Child Care, USAID |DELIVER PROJECT, SCMS 2014) for definitions of each indicator.

Table 4. Comparison Indicators

Category	Indicator
• Information availability & quality	• Reporting coverage • On-time data collection
• Customer response	• Time and level of effort to complete a resupply cycle • On-time delivery
• Commodity availability/inventory management	• Stock availability/stockout rate • Stocked according to plan (at the time of data collection) • Stockout durations • Expiries
• Cost and cost-effectiveness	• Total operating costs • Average cost-effectiveness

Indicators for Monitoring the Initial Implementation of the ZAPS

Stakeholders also deemed it important to put in place monitoring systems to gauge how well the ZAPS adheres to the various system design assumptions. For example, the design team set minimum and maximum stock levels based on assumptions about lead time. If the lead time assumptions turn out to be inaccurate (in the case the assumed lead times are too short), the stock levels set will not allow the system to perform; that is, minimum and maximum stock levels would be too low to resupply facilities adequately in light of actual (longer) lead times. If this happens, it will need to be determined as soon as possible after pilot implementation begins so that minimum and maximum stock levels can be adjusted to provide adequate stocks.

Stakeholders identified the following indicators[3] for measurement during the ZAPS pilot:

- lead time: data collection/ordering rounds
- lead time: time to database
- lead time: picking and packing at NatPharm branch, Mutare
- lead time: delivery from NatPharm branch to the receiving facility
- available human resource capacity at NatPharm Mutare Branch
- order fill rate (quantity supplied vs. quantity ordered)
- percentage of facilities that do physical count

[3] This baseline report does not include any information on these indicators, if the collection began after the implementation of the ZAPS.

- percentage of facilities that completely and correctly fill the facility order worksheet before the arrival of the order facilitator.

Data Collection

Performance Data Collection

As table 5 shows, automated systems are the primary source of performance data at baseline and for the ZAPS. For the baseline, the study collected available DTTU, ZIP/PHCP, and ZADS data from the AutoDRV/Top Up and ZISHAC databases, disaggregating by Manicaland Province versus the rest of the country. Baseline performance on the EMPS was not available.

Table 5. Comparison Indicators and Source of Data at Baseline and During the ZAPS

Category	Indicator	Baseline Data Source	ZAPS Data Source
Information availability and quality	Reporting coverage	AutoDRV/Top Up ZADS consumption and requisition forms	AutoOrder
	On-time data collection	Original, actual data collection schedules	Original actual data collection schedules
Customer response	Time and level of effort to complete a resupply cycle	Travel expense reports, data collection/delivery team costing surveys	Travel expense reports, data collection/delivery team costing surveys
	On-Time Delivery	Original delivery schedule, proofs of delivery (PODs)	Original delivery schedule, PODs
Commodity availability and inventory management	Stock Availability /Stockout Rate	AutoDRV	Site visits (physical inventories), as recorded in the AutoOrder
	Stocked according to plan	AutoDRV	Site visits (physical inventories), as recorded in the AutoOrder
	Stockout duration	AutoDRV Facility worksheet	AutoOrder Facility worksheet
	Losses due to expiry	• Physical count of expired (proxy: reported quantities that expired) • Total quantity of the product at the beginning of the reporting period (at the facility, within the district, within the province) • For value: value of the product	• Physical count of expired (proxy: reported quantities that expired) • Total quantity of the product at the beginning of the reporting period (at the facility, within the district, within the province) • For value: value of the product

For purposes of comparison, the analysis focused on a subset of products in full supply or "near" full supply. For the purposes of this evaluation, a full-supply product is a product that is never stocked out at any central-level warehouse in-country (ZNFPC and NatPharm) during the period being evaluated. Although the products managed under the DTTU and ZIP/PHCP have generally maintained full supply over the recent past, the same is not true for other products that the ZAPS is now incorporating, such as some of the essential medicines. It is also possible that some products that traditionally have been in full supply could fall out of full supply during the pilot year, which would then risk providing a false assessment of the ZAPS. The final ZAPS assessment will take into account a situation when any products fall out of full supply during the pilot. Table 6 lists the full-supply products included in the baseline measurement.

Table 6. Full-Supply Products Included in the Baseline Analysis

System	Product (condition or disease)
DTTU	• Control oral contraceptive (family planning) • Male condom (family planning and sexually transmitted infection and HIV prevention)
ZIP/PHCP	• Artemether/lumefantrine 120 mg 1X6 blister (malaria) • Rapid diagnostic test (malaria) • RHZE 150/75/400/275 mg tablet (tuberculosis)
ZADS	• Lamivudine 150 mg + Zidovudine 300 mg + Nev 200 mg (HIV and acquired immune deficiency syndrome (AIDS) antiretroviral drug) • Lamivudine 300 mg + Tenofovir 300 mg (HIV and AIDS antiretroviral drug) • Zidovudine 60 + Lamivudine 30 + Nevirapine 50 mg tab (HIV and AIDS antiretroviral drug)

Cost Data Collection

The study collects relevant cost data at all supply chain tiers (health facility, district, province, and central) and for a range of supply chain functions (logistics management information system [LMIS], storage, transport, and management) to estimate total supply chain costs, by using the framework in figure 3.

Figure 3. Framework for Cost Collection and Analysis

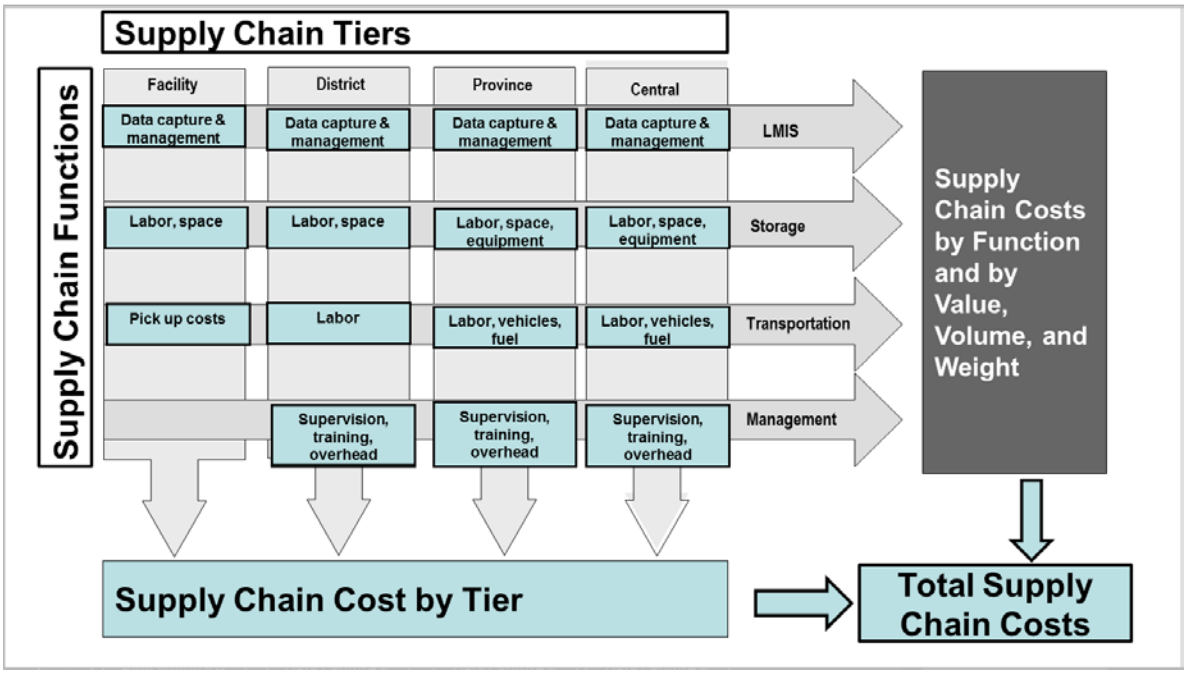


Table 7 describes the main sources of cost data. Line-item spending analysis provides much of the information on baseline spending, particularly for the three systems that are primarily donor-funded: DTTU, ZIP/PHCP, and ZADS. To facilitate the collection and analysis of the cost data, study teams interviewed officials at NatPharm Harare and Mutare, the ZNFPC, the MOHCC DPS, the DPS Logistics Unit, Crown Agents, the GFATM/United Nations Development Programme, the United Nations Children's Fund, and John Snow, Inc. (JSI). The team also interviewed provincial and district officials in Manicaland. These interviews of upstream supply chain actors also provided information on time and resource use for incorporation into cost calculations. The team also surveyed health workers from 58 facilities in Manicaland to calculate labor associated with LMIS data capture and storekeeping, as well as transport and storage costs (see Appendix 1 for survey tool).

Table 7. Tools for Collecting Cost Data

Tool	Source	Content	Sample Size	Procedure
Line-item spending analysis	Government and implementing partners supporting current systems	Direct and indirect costs and charged expenses for all cost categories	8	Interviews and review of financial documents
Activity-based survey—upstream supply chain actors (central, provincial, district)	Logistics Unit, ZNFPC, NatPharm, area distribution coordinator (ADC), provincial pharmacy manager (PPM),	Time use	8-central 2-province 4-district	In-depth interviews

Tool	Source	Content	Sample Size	Procedure
	district pharmacy managers (DPMs)			
Activity-based survey—facility supply chain actors	Health facility workers in Manicaland	Labor associated with LMIS data capture, storekeeping; transport costs; storage costs	58 facility workers	Short survey applied during ZAPS training

Data Analysis

Following data capture from routine information systems and distinct data collection efforts, the data was cleaned and analyzed in spreadsheet format. At end line, for performance metrics, analysts will test significance of differences through both single and paired *T*-tests. For costing and cost-effectiveness, confidence intervals and significance are generally accepted to be "hard to compute and interpret" because the comparison figures are ratios (Petrou and Gray 2011). However, collected cost data and associated findings will undergo sensitivity analysis through Monte Carlo simulation to gauge the robustness of study findings and conclusions. Analysis of cost- effectiveness will generate average cost-effectiveness measurements but will likely not support measurements of incremental cost-effectiveness or cost–benefit (Rosen 2014).

Potential Limitations Associated with the Study Methodology

A significant threat to internal validity (defined as the extent to which a causal relationship can be inferred from the study findings) related to supply chain performance comparisons is the extent to which commodities are available at central warehouses for delivery to facilities. For that reason, the study restricts performance comparisons related to stockouts and months of inventory to full-supply commodities—that is, products that are never stocked out at any central-level warehouse in-country during the period of the evaluation.

For the costing approach, non-controlled factors such as inflation or other events that influence the cost of otherwise comparable resource inputs can affect internal validity. However, this problem should only affect a limited subset of resources (for example, civil service pay scales should not be affected this way) and inflation-affected prices will be calculated and presented in constant U.S. dollars.

Without a comparable baseline and end line for costs across other provinces in Zimbabwe, full external validity (in other words, the ability to generalize from the study findings to the rest of Zimbabwe) may not be achievable for total cost and cost-effectiveness measures. To address this shortcoming, the study plans to include modeling to estimate costs on the basis of the scale of logistics operations (for example, number and distance of facilities served) and other environmental factors.

Timeline

Figure 4 shows how the evaluation fits into the timeline for the pilot. The ZAPS pilot will operate for 1 year (four order and delivery rounds). Cost data collection will mainly take place at baseline and after 1 year. Performance data collection took place at baseline and will continue periodically

throughout the pilot. Routine implementation monitoring will take place throughout the pilot. The main analysis and dissemination of results will happen at two points.

Figure 4. Timeline for the ZAPS Pilot and Evaluation Activities

Activity	Calendar Year 2013	Calendar Year 2014				Calendar Year 2015		
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
ZAPS Pilot	ZAPS Design		Pilot in Manicaland					
Cost Data Collection		Baseline	Round 1	Round 2	Round 3	Round 4	Endline	
Performance Data Collection		Baseline	Round 1	Round 2	Round 3	Round 4	Round 5	
Routine Monitoring			Implementation Monitoring					
Analysis			Baseline				End line	
Dissemination			Baseline					Final

Results

Performance

This section presents baseline results for the indicators that the study will use in the comparison to the ZAPS. The results shown in this report are for Manicaland Province only, the site of the pilot. The evaluation is also measuring these same indicators for the rest of the country, at baseline and throughout the pilot period. The end-line report will include information on both Manicaland and the rest of the country.

Information Availability and Quality

The category of information availability and quality includes indicators on reporting coverage as well as on-time data collection. The results are grouped for the DTTU and ZIP because both systems have similar quarterly reporting guidelines and data collection procedures. The ZADS results are shown separately, because the ZADS works on a bimonthly reporting cycle.

Reporting Coverage

For the DTTU and ZIP, reporting coverage is the number of facilities receiving a quarterly order/delivery team visit divided by the total number of eligible facilities. As table 8 shows, reporting coverage was very high, averaging 98 percent for the DTTU and 100 percent for the ZIP during the baseline. A reporting coverage rate above 100 percent, shown for the ZIP in Q1 2014, is likely because teams visited facilities not originally on the route plan.

Table 8. Baseline Reporting Coverage, DTTU and ZIP

Product	Q1 2013 (%)	Q2 2013 (%)	Q3 2013 (%)	Q4 2013 (%)	Q1 2014 (%)	Average
DTTU	96	97	98	99	99	98
ZIP	98	100	100	n/a	102	100
Average	97	99	99	99	100	99

Under the ZADS, reporting coverage is the percentage of eligible facilities submitting a bimonthly report. Table 9 shows the ZADS with a similarly very high reporting coverage rate, averaging 93 percent over the baseline period, though dipping to 74 percent in March–April 2014.

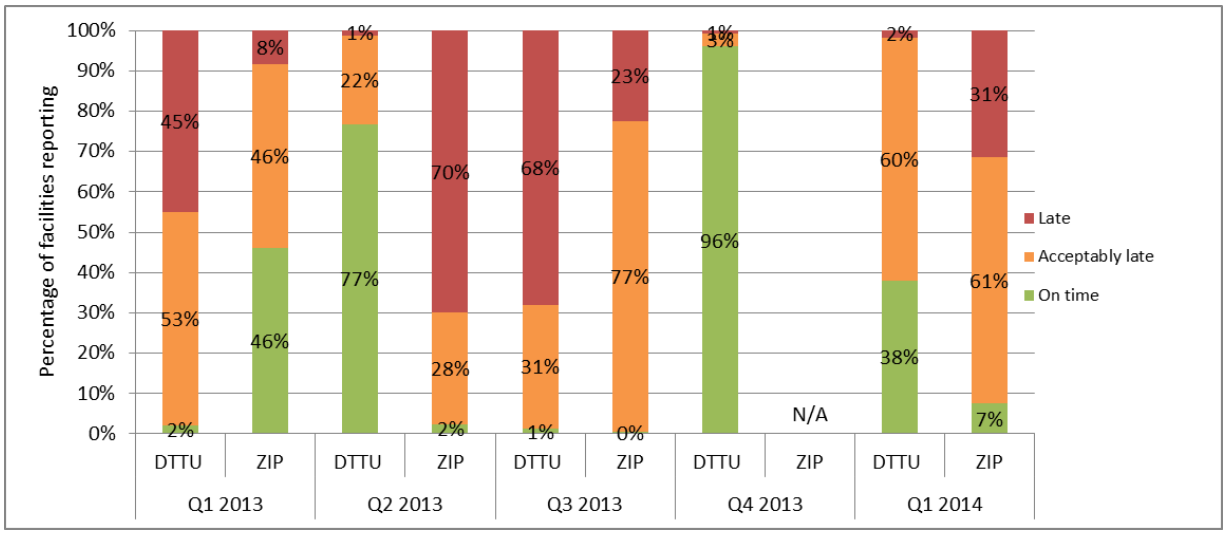
Table 9. Reporting Coverage Rate for the ZADS, by Bimonthly Period

Product	P1 2013	P2 2013	P3 2013	P4 2013	P5 2013	P6 2013	P1 2014	P2 2014	Average
ZADS	100%	100%	91%	96%	97%	98%	96%	74%	93%

On-Time Data Collection

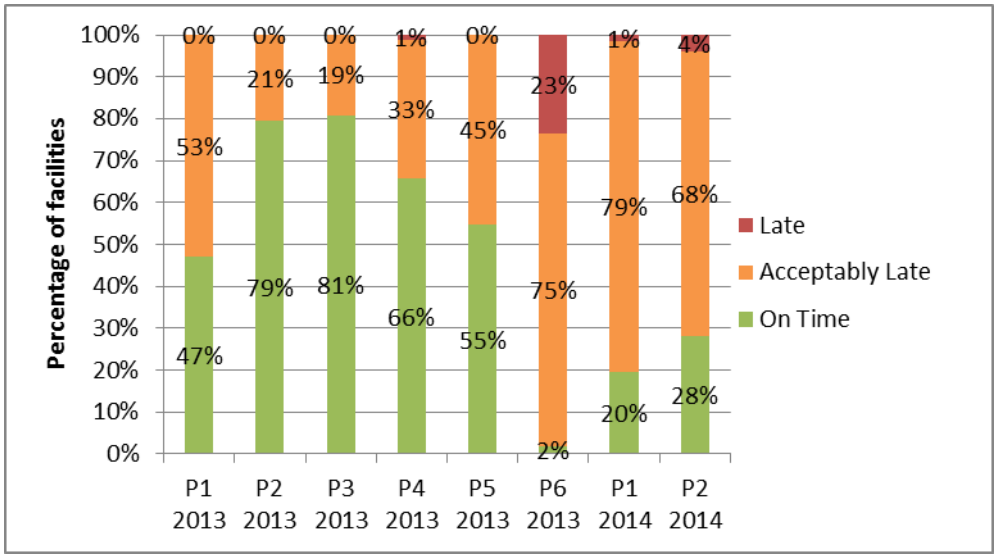
For the DTTU and ZIP, data collection occurs at the time of the visit of the order and delivery team, which is scheduled at 90-day intervals. For the purposes of the evaluation, "on-time" is within 90 days from the last visit of the order and delivery team. A visit that occurs between 90 and 120 days after the last visit is "acceptably late." A visit that occurs after 120 days is "late." Figure 5 shows generally good rates of on-time data collection for both systems, with some exceptions. In Q1 2013 and Q3 2013, the DTTU had a high rate of late deliveries, 45 percent and 68 percent, respectively. However, the following quarters reverted to mostly on-time delivery. The ZIP had one quarter (Q2 2013) with a low rate of on-time delivery and one quarter (Q4 2014) when the entire delivery run was skipped because of problems obtaining the essential medicines kits that are a key part of the ZIP delivery.

Figure 5. On-Time Data Collection during Baseline, DTTU and ZIP



For the ZADS, facilities are required to submit their reports within 5 days of the end of their bimonthly reporting period. For the purposes of the evaluation, "on-time" is when a facility submits a report by the 5th day of every period. Reports submitted after 5 days and before 21 days are considered "acceptably late." Reports submitted 21 days or later are "late." As figure 6 shows, facilities appear to have submitted reports within an acceptable time period.

Figure 6. On-Time Data Submission During Baseline, ZADS



For the DTTU and ZIP, another way to measure the timeliness of data collection is by looking at the average number of days since the last order and delivery team visit.

Figure 7 shows the average number of days since the last delivery for the DTTU and ZIP by quarter. Once again, if deliveries are not made within 90 days of the last delivery, they are considered late. On average, deliveries were made late in all quarters for the ZIP and all quarters except Q2 2013 and Q4 2013 for the DTTU. Again the trend can be seen for the DTTU: for Q1 2013 the deliveries are late (average of 117), in Q2 2013 they drop and are on time (average of 85), then go up in Q3 2013 (average of 128), and then drop again in Q4 2013 (average of 67).

Figure 7. Average Number of Days Since Last Order and Delivery Visit, DTTU and ZIP, by Quarter

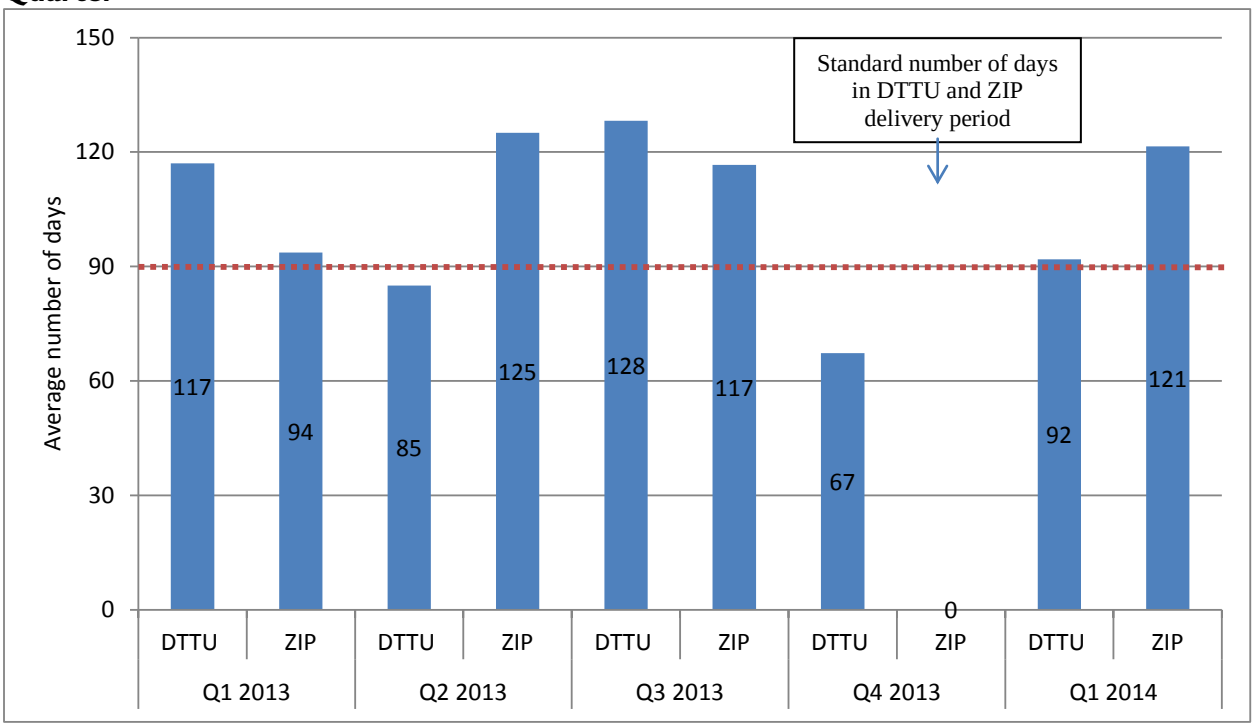
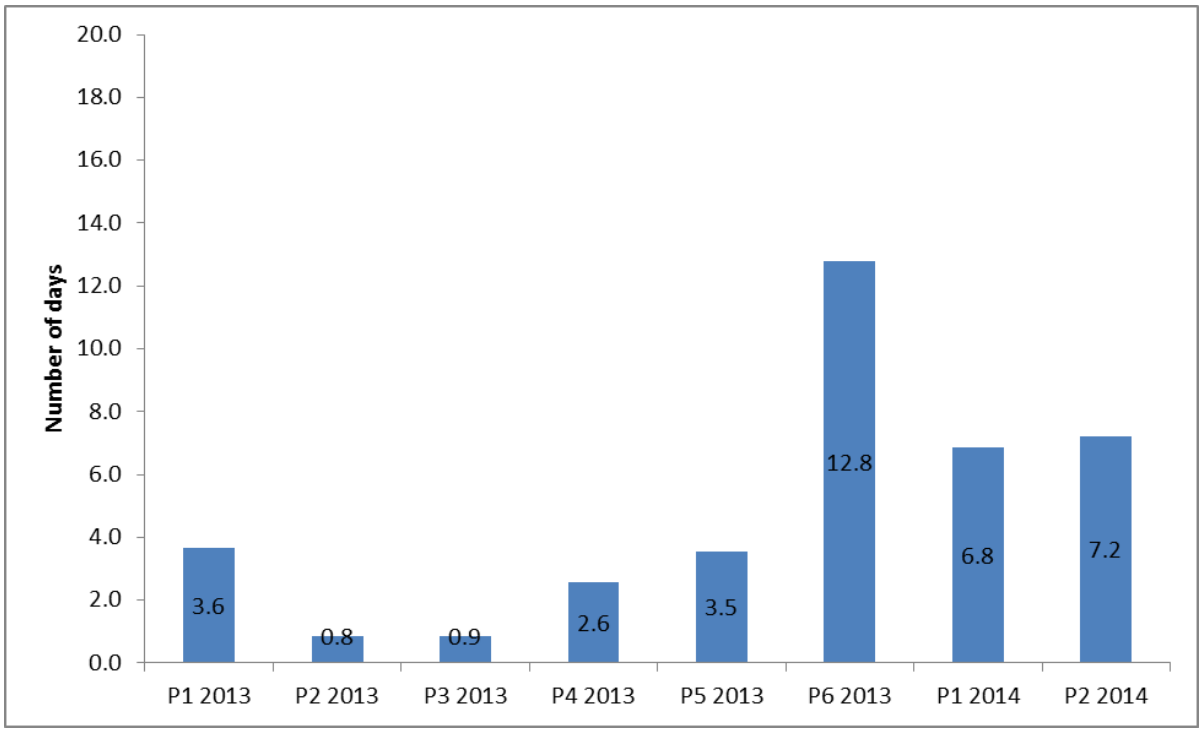


Figure 8 shows the average number of days late for data submission for the ZADS by reporting/delivery period. The average number of days late was low throughout most of 2013, less than 4 days on average, then spiked at the end of the year.

Figure 8. Average Number of Days Late for Data Submission for the ZADS by Delivery Period



Customer Response

Customer response indicators assess the relationship between each supply chain system and its customers, principally the health facilities. These indicators include on-time delivery and time and level of effort to complete a resupply cycle. The cost study addresses the latter.

On-Time Delivery

For both the DTTU and ZIP, order and delivery teams collect data at the same time. Thus, the measures of on-time delivery are equivalent to the measures of on-time data collection reported above. For the ZADS, we were not able to calculate on-time delivery measures from existing data.

Commodity Availability and Inventory Management

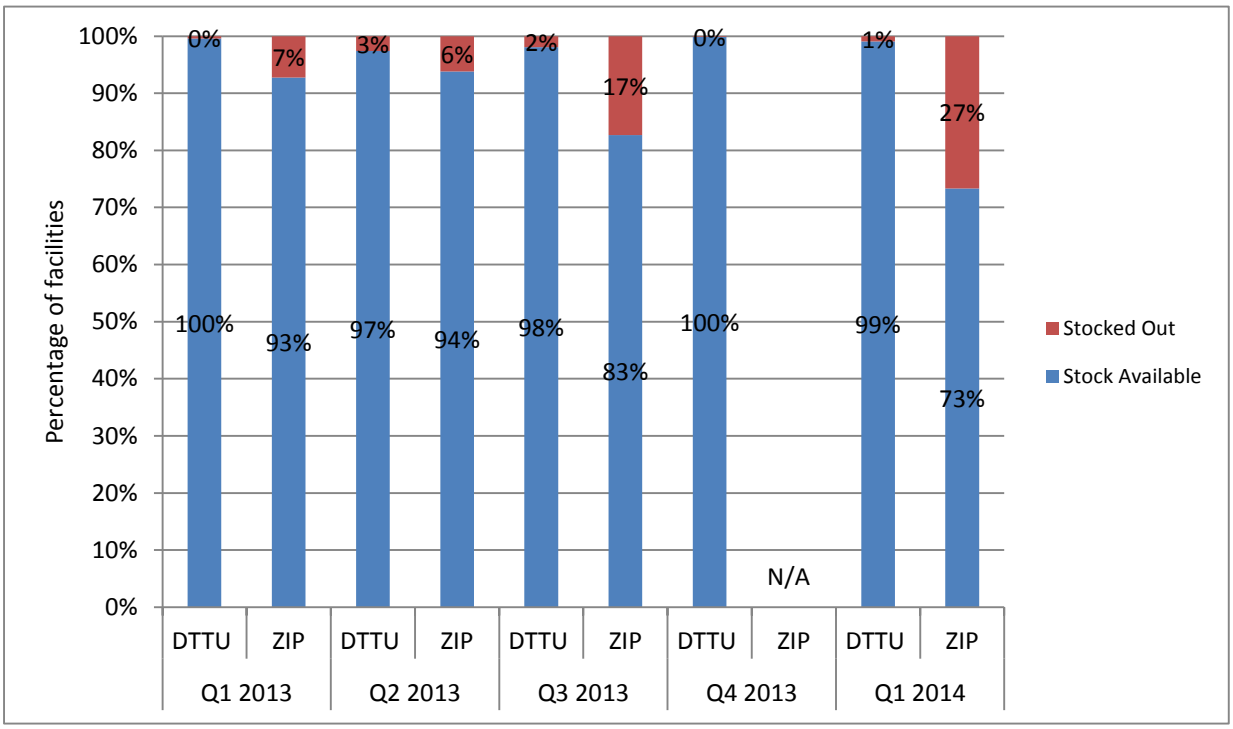
The category of commodity availability and inventory management includes four indicators, whose results are reported below. Because of the differences in the reporting periods, the study groups the results for the DTTU and ZIP while presenting the ZADS results separately. Q4 2013 data for the ZIP are not available because the ZIP run was skipped in that period.

Stock Availability

For the DTTU and ZIP, the stock availability indicator measures the percentage of eligible facilities with stock of full-supply products available on the day the order and delivery team visits the facility. As figure 9 shows, the stock availability is generally high for both systems during the baseline. For

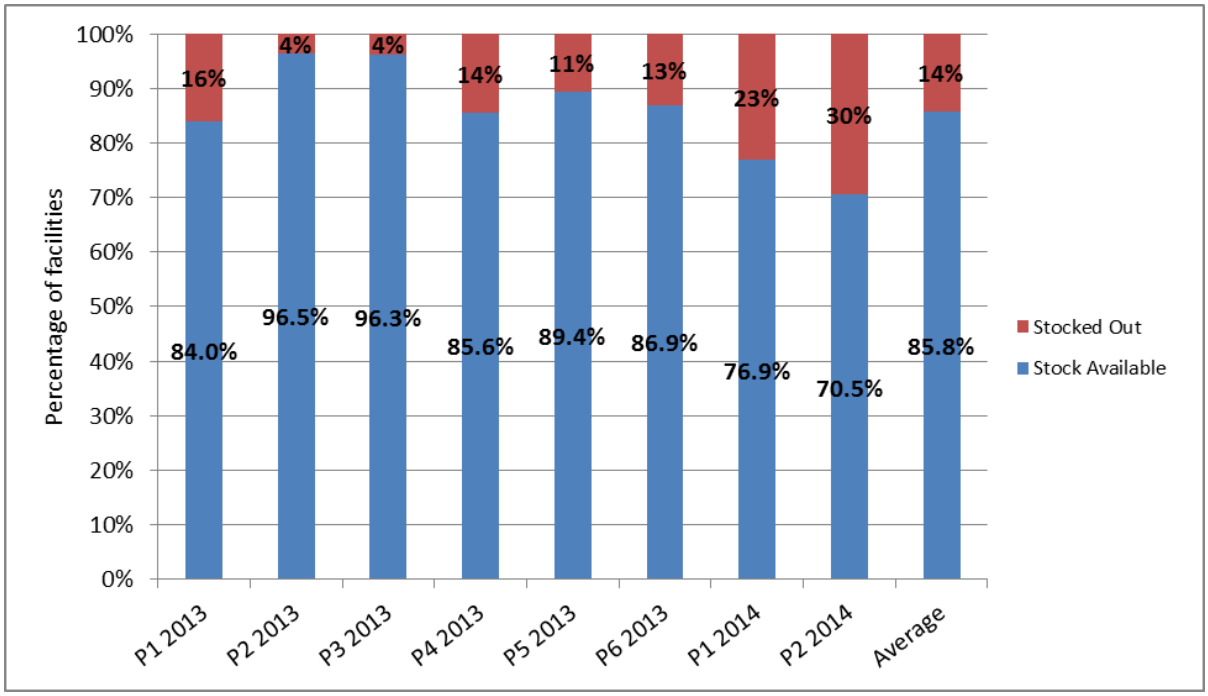
the DTTU, between 97 and 100 percent of facilities have products in stock for all five baseline quarters. For the ZIP, stock availability is 93 and 94 percent for Q1 and Q2 2013 and then dips to 83 percent in Q3 2013 and 73 percent in Q1 2014. The latter figure likely represents higher stockouts resulting from the ZIP run that was skipped at the end of 2013. For results by commodity, see Appendix 2.

Figure 9. Baseline Stock Availability on Day of Visit, DTTU and ZIP, by Quarter



For the ZADS, stock availability measures the percentage of eligible facilities with stock of full-supply products on the day the facility completes its report for the bimonthly period. Stock availability in the ZADS was good in 2013, ranging between 84 and 97 percent. Availability fell, however, for the first two periods in 2014, to 77 and 71 percent (figure 10). For results by commodity, see Appendix 3.

Figure 10. Baseline Stock Availability on Day of Visit, ZADS, by Bimonthly Period

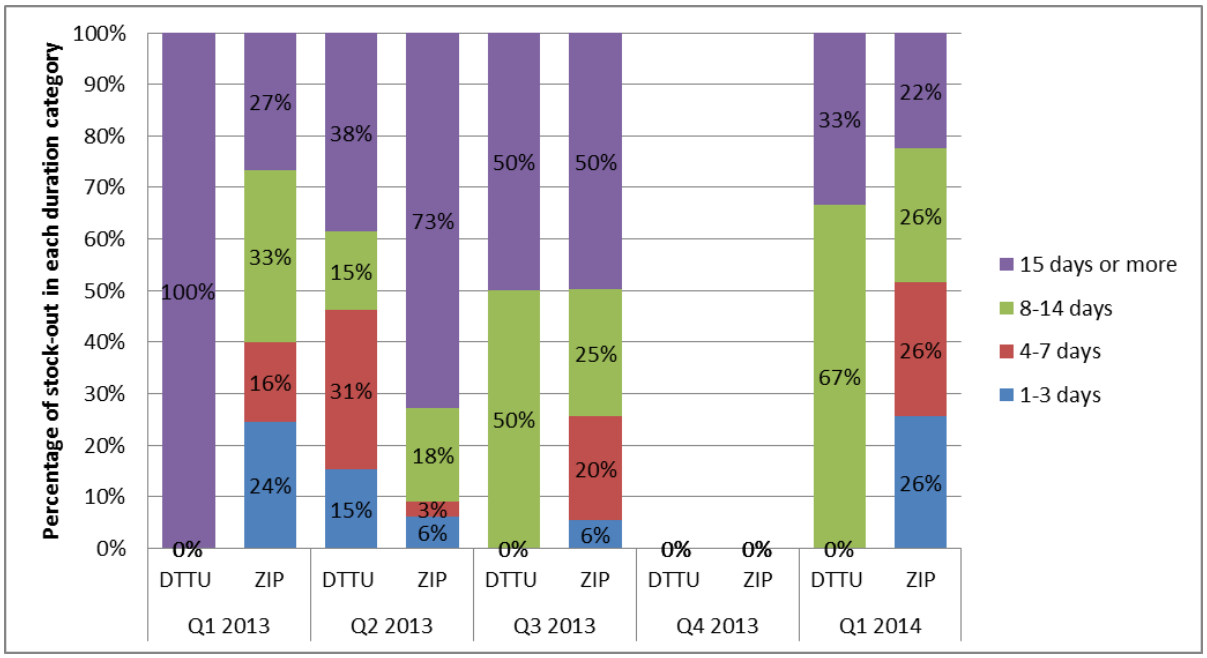


Stockout Duration

The stockout duration indicator measures the severity of those stockouts that do occur. For the DTTU and ZIP, duration is the number of days stocked out.

Figure 11 shows, of those facilities experiencing stockouts, the percentage of facilities that experienced stockout of the full-supply products for periods of 1–3 days, 4–7 days, 814 days, or 15 days or more. For the DTTU, the few stockouts that did occur were generally of short duration. For the ZIP, which had a higher rate of stockout (see figure 9), those stockouts that did occur tended to last more than 8 days.

Figure 11. Of Facilities with Stockouts, Percentage with Stockout Duration

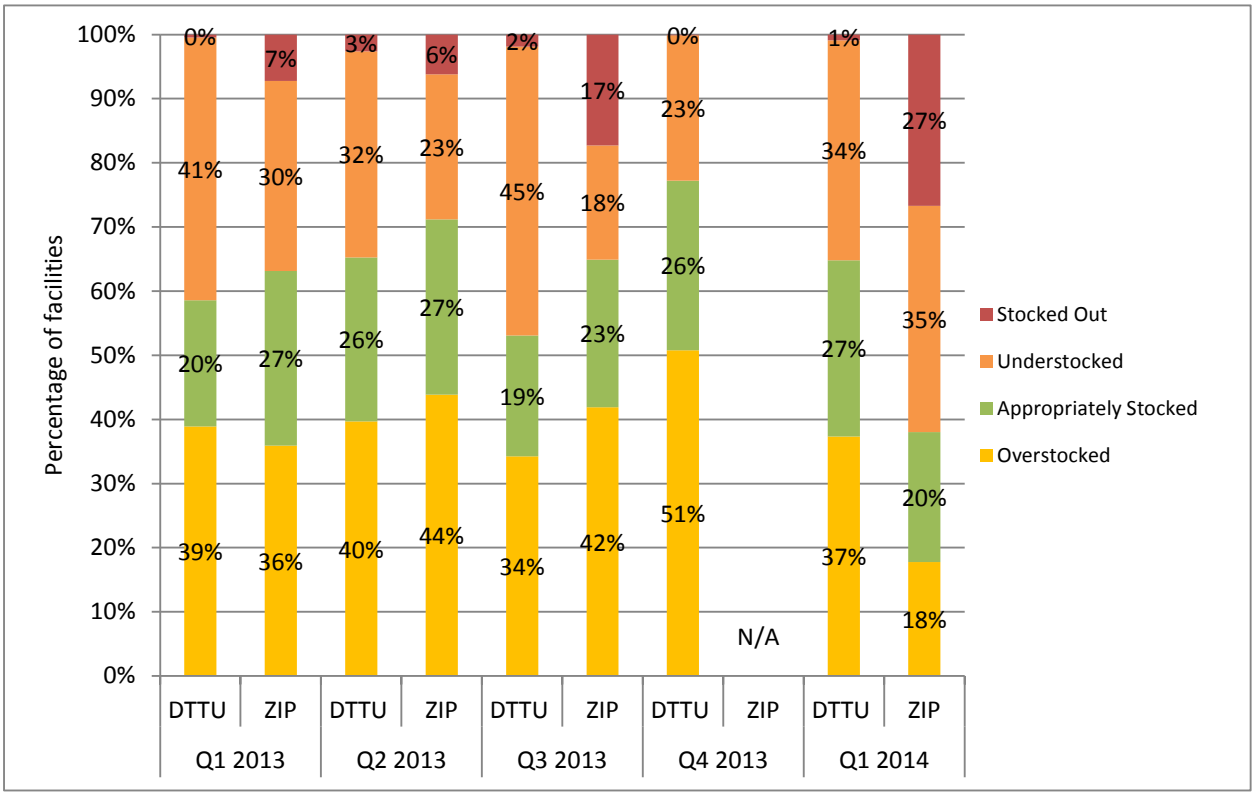


For the ZADS, information on the duration of stockouts is not available.

Stocked According to Plan

The stocked according to plan indicator measures the percentage of facilities that manage products within the correct range of months of inventory. For the DTTU and ZIP, the order and delivery team measure stock on hand at the time of their visit to the facility. If the stock on hand equals 0, the product is classified as stocked out. If the stock on hand is greater than 0 but less than 3 months of average monthly consumption (AMC), the product is "understocked." If the AMC is between 3 and 6 months, the product is "appropriately stocked." If the AMC was over 6 months, the product was "overstocked." Figure 12 shows the percentage of the full-supply products by stock status for the DTTU and ZIP. The percentage of facilities that are appropriately stocked ranges between 19 and 27 percent and is consistent over the baseline period. Overstocking of the full-supply products analyzed is common in both systems and ranges from 18 to 51 percent of facilities.

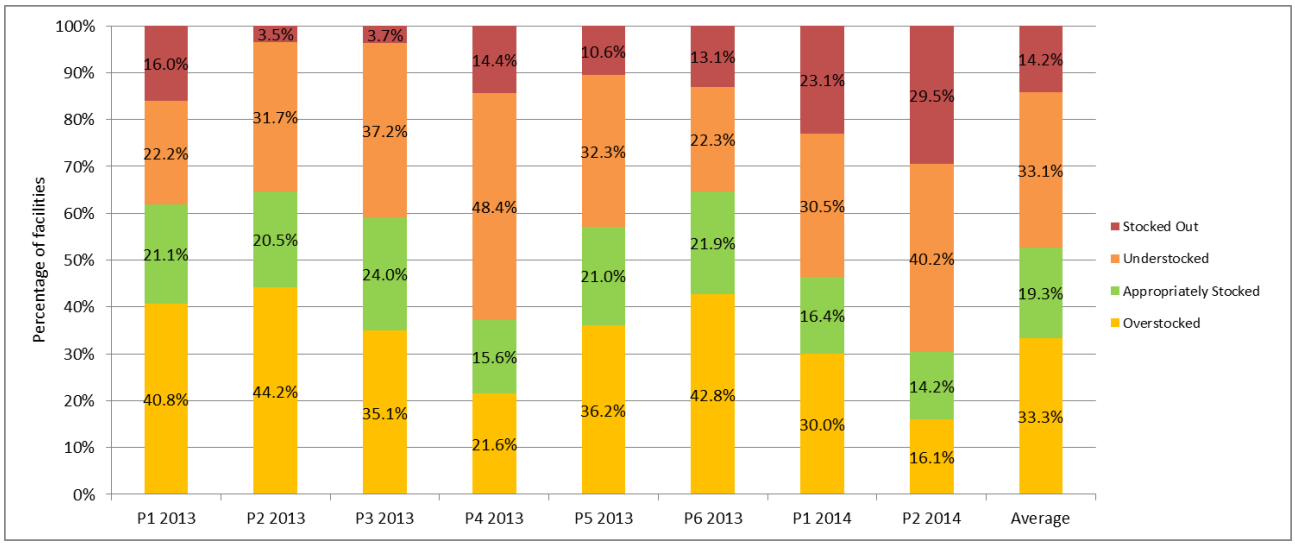
Figure 12. Stock Status, DTTU and ZIP, by Quarter



For the ZADS, facility staff calculates stock on hand at the time they submit their bimonthly report. If the stock on hand equals 0, the product is classified as "stocked out." If the stock on hand is greater than 0 but less than 3 months of the AMC, the product is *"understocked"* If the AMC is between 3 and 5 months, the product is "appropriately stocked." If the AMC is over 5 months, the product is "overstocked."

Figure 13 shows the percentage of the full-supply products by stock status for the ZADS. The percentage of facilities that are appropriately stocked is consistent over the baseline period, ranging narrowly between 15 and 25 percent. As for the DTTU and ZIP, the ZADS shows significant levels of overstocking, with one-third of facilities on average overstocked with the full-supply products.

Figure 13. Stock Status, ZADS, by Bimonthly Period

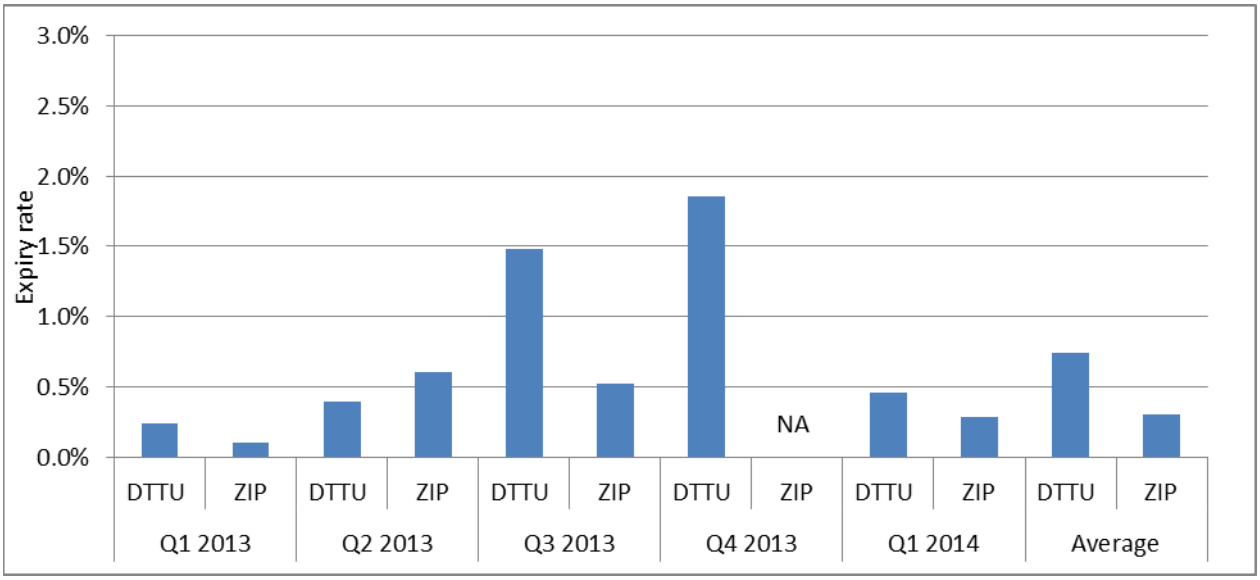


Expiries

The expiry rate is the proportion of expired products, calculated by dividing the total quantity of product that expired during the specified period by the quantity[4] of the opening balance of the product at the beginning of the period. Figure 14 shows the baseline expiry rate for the DTTU and ZIP by quarter and on average for the baseline. The expiry rate for the DTTU system was less than 1 percent, with the exception of Q3 2013 and Q4 2013, which saw rates of 1.5 to 2.0 percent. Expiry rates for ZIP products were less than 1 percent for the entire baseline period.

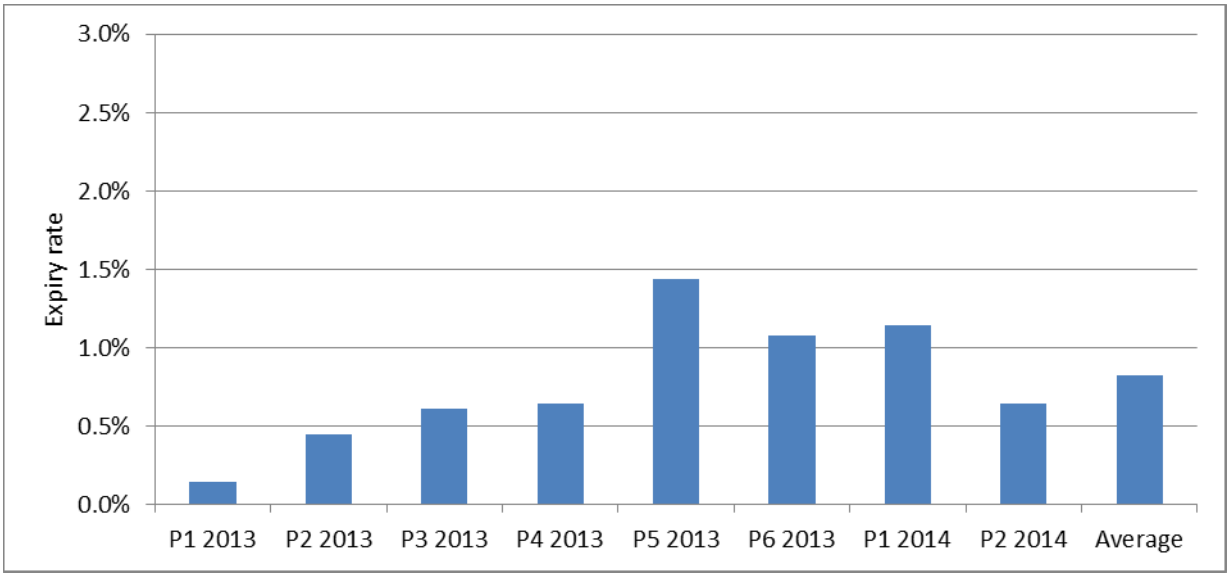
[4] The study also calculated the expiry rate using product value rather than quantity. The expiry rate based on value is similar to the rate reported here based on quantity.

Figure 14. Expiry Rate, DTTU and ZIP, by Quarter



The baseline expiry rate for ZADS products was also low (figure 15), averaging 0.8 percent for the baseline period.

Figure 15. Expiry Rate, ZADS, by Bimonthly Period, Manicaland



Cost

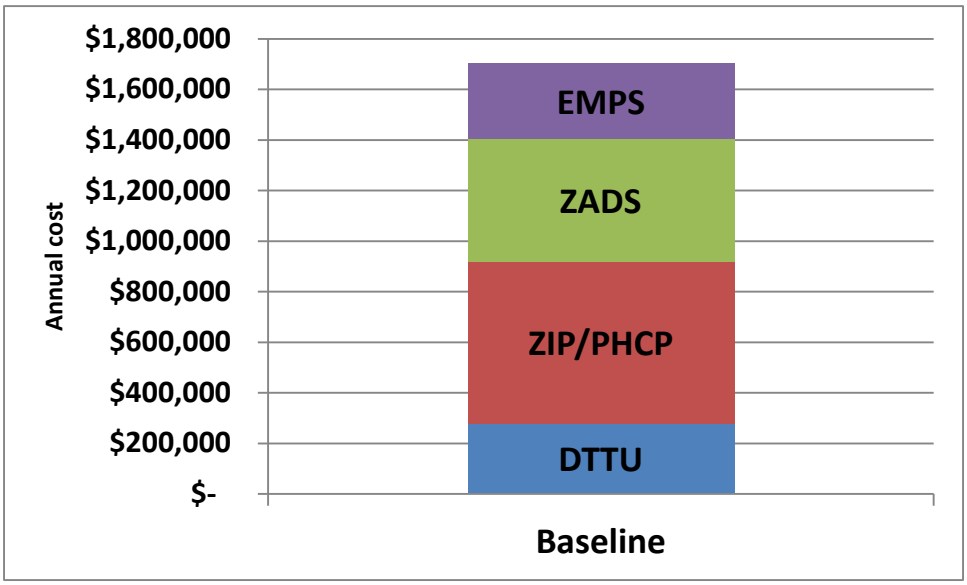
The cost analysis helps to compare the existing systems to the ZAPS on indicators of cost and on efficiency (cost-effectiveness). This section presents results on the annual cost to operate the supply chain in Manicaland during 2013. Costs are shown by system (DTTU, EMPS, ZADS, and ZIP), by main function, (transport, warehousing, etc.), and by tier (central, province, district, and facility). All

costs are presented in constant 2013 $U.S. This section also includes information on the value of commodity throughput.

Total Cost

The total annual supply chain cost for Manicaland was $1.7 million (figure 16). The ZIP/PHCP made up the largest proportion of costs, followed by the ZADS, DTTU, and EMPS. The study will measure costs during the ZAPS pilot and compare these to the baseline findings.

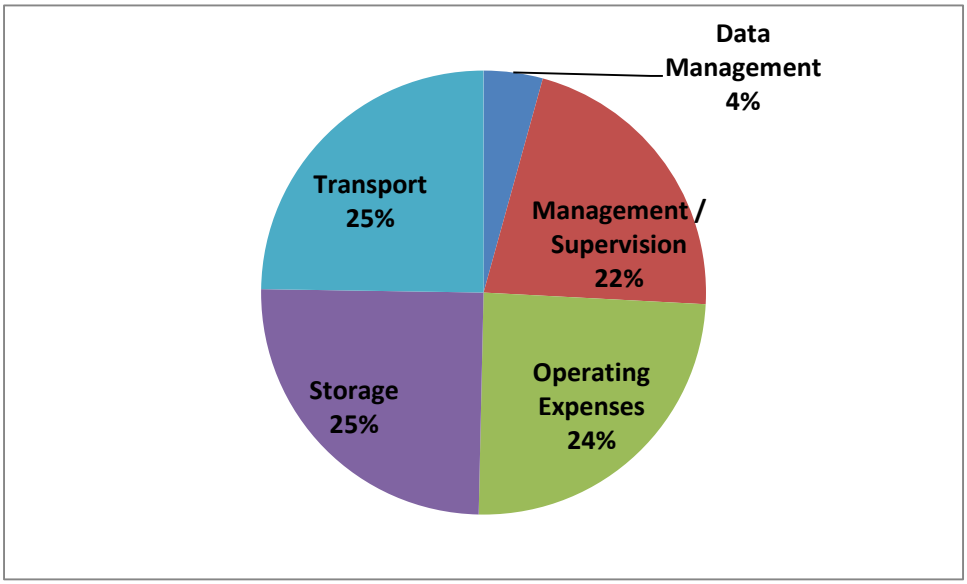
Figure 16. Supply Chain Costs at Baseline, by System



Costs by Main Function

To understand the structure of costs, we looked at costs by main supply chain function (figure 17.) For the four systems combined, costs were spread almost equally between transport (25 percent), storage (25 percent), operating expenses (24 percent), and management and supervision (22 percent). Data management accounted for 4 percent of total costs. For details on costs by system, main function, and item, see Appendix 4.

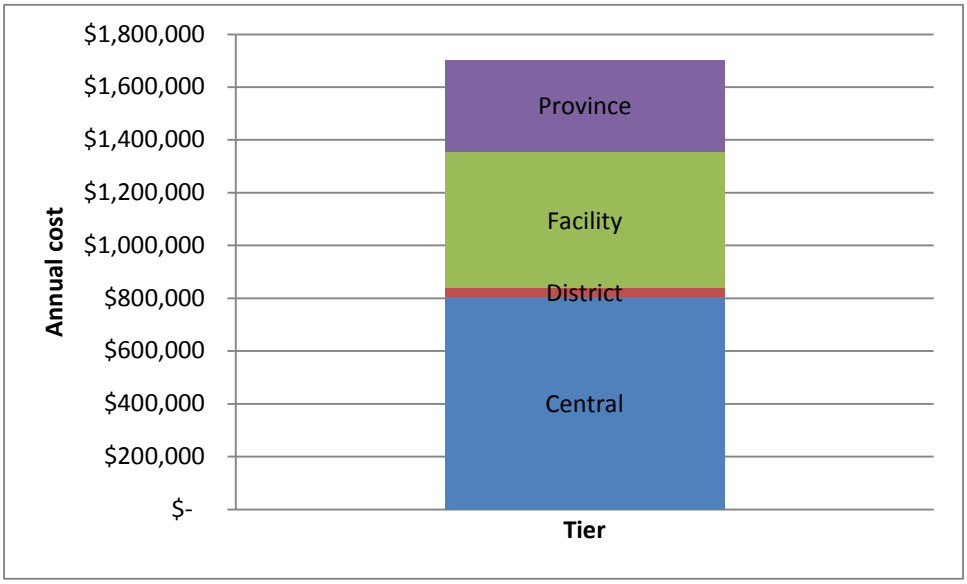
Figure 17. Supply Chain Costs, by Main Function



Costs by Tier

Just under half of costs are incurred at the central level, with the remaining incurred at the facility, province, and district (figure 18). For details on costs by tier, main function, and item, see Appendix 5.

Figure 18. Annual Cost, by Tier

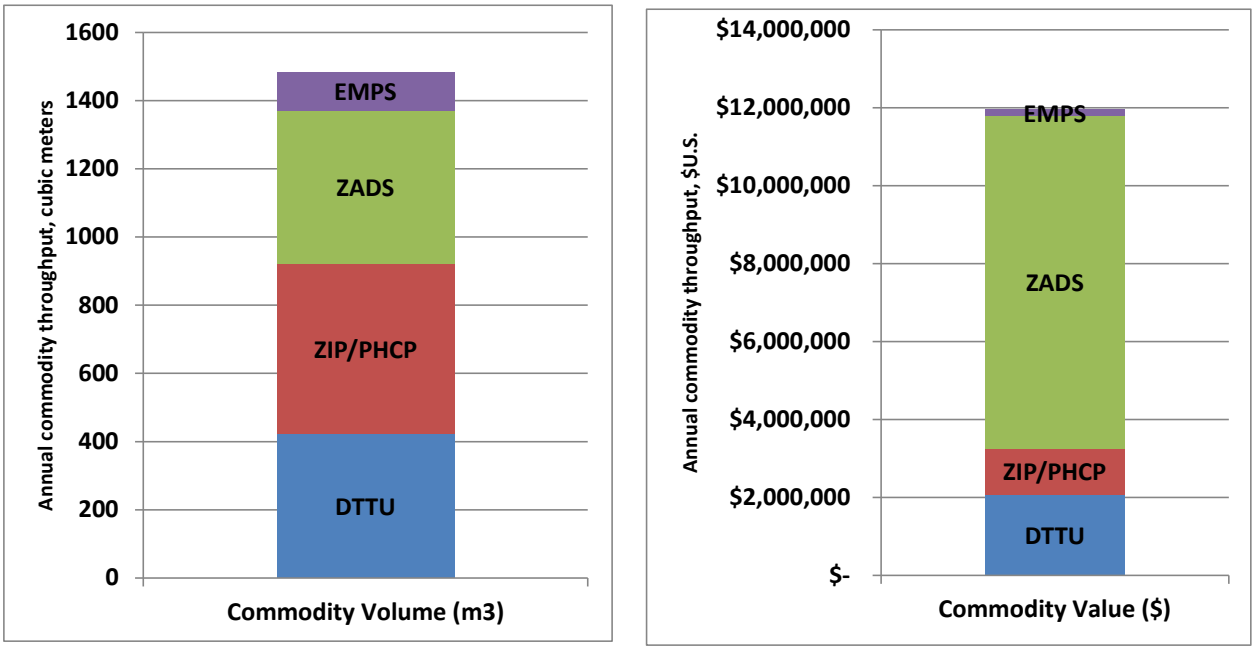


Commodity Throughput

These costs were associated with a yearly volume of 1,500 cubic meters (m^3), valued at almost $12 million (figure 19). Although volume was split evenly among the four systems, ZADS products

(mostly high-value antiretroviral medicines) accounted for the large majority of commodity value. See Appendix 6 for details on throughput values.

Figure 19. Annual Commodity Volume and Value, by System



Cost-Effectiveness

The study is trying to answer the question of how efficient the ZAPS is in comparison with existing supply systems. One measure of efficiency is cost-effectiveness, which combines cost with performance and throughput. Cost-effectiveness at baseline measures the efficiency of the existing supply chain systems, summarized in table 10 below. Results are for the three systems (DTTU, ZADS, and ZIP) for which information exists on supply chain performance, here measured in terms of product availability. Dividing the total supply chain cost ($1.4 million) by the value of throughput ($11.8 million) yields a cost as percentage of commodity value of 12 percent. Supply chain cost per cubic meter is $1,024. We also calculated a related measure of efficiency that takes into account the current level of performance of the systems in addition to the commodity throughput levels. This is calculated by multiplying the throughput level by the number of percentage points of product availability divided by 100. Because product availability is 90 percent, this calculation raises the "performance-adjusted" cost per commodity value from 12 to 13 percent. The study will make a similar calculation of ZAPS efficiency and compare with this baseline result.

Table 10. Cost-Effectiveness Measures for Combined DTTU, ZIP/PCHP, and ZADS Systems

Cost Measures	
Supply chain (SC) cost	$1,404,267.22
Effectiveness Measures	
Value of throughput ($)	$11,790,317.28
Volume of throughput (m3)	1371
Percent point product availability	90%
Cost-Effectiveness Measures	
SC cost as percentage of $ value of throughput	12%
SC cost per cubic meter of throughput	$1,024
SC cost per performance-adjusted throughput	13%

Discussion

This report provides results from the baseline measurement for the ZAPS evaluation, which aims to compare performance and costs of the ZAPS with existing distribution systems. The evaluation focuses on Manicaland province, the site of the ZAPS pilot. Results from this evaluation will feed into the decision on whether to expand the ZAPS model to the rest of Zimbabwe.

In general, this baseline measurement found existing systems to be relatively well performing. On the dimension of information availability and quality, the DTTU and ZIP show high levels of reporting coverage; this is to be expected given that both systems receive visits from order/delivery teams who simultaneously produce required reports. Reporting levels for the ZADS were similarly high. Similarly, levels of on-time data collection are generally good for the DTTU, ZIP, and ZADS systems. On-time delivery, an indicator of customer responsiveness, is similarly good for the DTTU and ZIP. On measures of commodity availability and inventory management, the DTTU performed particularly well, showing almost 100 percent product availability. On this measure, the ZIP performed well in the first half of 2013 and then showed some deterioration of performance through the first quarter of 2014. The ZADS had good stock availability in 2013 but saw some slippage in 2014. Those stockouts that did occur were generally of short duration. Overstocking of products appears to be one area of concern that the baseline evaluation uncovered. Product expiries, another indicator of inventory management, were generally low for all systems. The picture that the baseline measurement paints concurs with previous analyses and the general perception among stakeholders in Zimbabwe that the DTTU, ZIP, and ZADS are mature and mostly well-performing systems.

The results of the costing, when placed in the context of levels of throughput and performance, show the existing systems to be relatively efficient, with supply chain cost as a percentage of throughput value of 12 percent. This value is similar to the value found in the 2010 study of the DTTU (Sarley et al. 2010) and generally within the "normal" range found in other countries. Nonetheless, it is important to remember that the aim of the evaluation is not to compare with other countries but rather to compare between two approaches within Zimbabwe. The cost and cost-effectiveness values at baseline are only relevant in the context of the values that will emerge from the end-line evaluation of the ZAPS.

Next Steps

This baseline report incorporates feedback from the dissemination and validation meeting held in June 2014. The study will require the ongoing cooperation of partners in providing the analysts with information on costs and performance as the study moves forward according to the timeline in figure 20.

Figure 20. Next Steps Going Forward

Activity	Calendar Year 2013	Calendar Year 2014				Calendar Year 2015		
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
ZAPS Pilot	ZAPS Design		Pilot in Manicaland					
Cost Data Collection		Baseline	Round 1	Round 2	Round 3	Round 4	Endline	
Performance Data Collection		Baseline	Round 1	Round 2	Round 3	Round 4	Round 5	
Routine Monitoring			Implementation Monitoring					
Analysis			Baseline				End line	
Dissemination			Baseline					Final

Table 11shows the type of data needed moving forward. The financial data the study will need are very similar to what we collected during the baseline, with some minor adjustments. We also plan one more application of the activity-based survey of staff at all levels in 1 year. We will continue to request data on performance and monitoring quarterly, in sync with each round of the ZAPS.

Table 11. Data Needed Moving Forward, by Source and Frequency

Type of Data	Source	Frequency
Financial	Government, NatPharm, partners	Quarterly
Activity-based survey	Central, provincial, district, and facility staff	At end line
Performance and monitoring data	AutoOrder, Navision, program reports	Quarterly

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Appendix 1

Health Facility Survey on Supply Chain Effort

ZAPS Baseline Survey on Health Facility Supply Chain Effort

Please answer the following questions:

General Information

1) What is your position and title?

2) What is your civil service grade?

3) How many total years of service do you have?

4) What is the name of your facility? (optional)

5) What District is your facility located in?

6) Which of the following best describes your facility type? (check one)
□ *Primary Care Health Clinic* □ *District Hospital* □ *Mission Hospital*
□ *Provincial Hospital* □ *Cost Center*

DTTU

7) Each time the DTTU trucks arrive, how many minutes do you spend supporting the deliveries every 3 months?

8) How often do you do physical counts of DTTU products?

9) How many minutes does it take you on average to do a physical count for DTTU products?

ZIP/PHCP

10) Each time the ZIP/PHCP trucks arrive, How many minutes do you

spend supporting the deliveries every 3 months?

11) How often do you do physical counts of ZIP/PHCP products?

12) How many minutes does it take you on average to do a physical count for ZIP/PHCP products?

ZADS

13) Each time the ZADS trucks arrive, how many minutes do you spend supporting the deliveries every 2 months?

14) How often do you do physical counts of ZADS products?

15) How many minutes does it take you on average to do a physical count for ZADS products?

16) How many minutes does it take you on average to fill out the ZADS CR (consumption and requisition) Form?

Essential Medicines Pull System

17) How often do you place routine orders (not emergency) with NatPharm?

18) How many minutes does it take to place an essential medicine order from NatPharm? (filling out paper work or telephoning order)

19) Each time the delivery with Essential Medicines arrives, how many minutes do you spend supporting the delivery?

20) How often do you do physical counts of Essential Medicine products?

21) How many minutes does it take you on average to do a physical count for other essential medicines?

22) Do you have to pick up the Essential Medicines?

23) *If yes…*
How many times do you travel to pick up the medicines each month?

24) How much time does it take you to travel for a single round trip?

25) How much money do you spend traveling each time you pick up medicine?

All Four Systems

26) What percentage of your time do you spend on all supply chain activities for all four systems such as storekeeping/recordkeeping and dispensing commodities? (check one)

☐ 0%	☐ 15%	☐ 30%	☐ 45%	☐ 60%	☐ 75%	☐ 90%
☐ 5%	☐ 20%	☐ 35%	☐ 50%	☐ 65%	☐ 80%	☐ 95%
☐ 10%	☐ 25%	☐ 40%	☐ 55%	☐ 70%	☐ 85%	☐ 100%

27) How many other people work in your facility who perform supply chain activities?

Emergency Orders

28) How many times a quarter do you have to make an emergency run and pick up medicine from another facility or district or from NatPharm?

If yes…

29) How much time and money do you spend travelling for a single round trip?

Storage

30) What is the approximate length in meters of the space where you store commodities?

31) What is the approximate width in meters of the space where you store commodities?

32) Of the current space where you store commodities, what percent full is it?
(ex. 50% full, 80% full, 100% full)

Appendix 2

Detailed Stock Status, DTTU and ZIP, Full-Supply Products

Period and Stock Status (% of facilities)	DTTU			ZIP			
	Control Pill	Male Condoms	Avg.	Artemether-1X6	mRDT	RHZE 150/75/ 400/275mg Tablet	Avg.
2013 Q1							
Overstocked	37%	41%	39%	43%	22%	43%	36%
Appropriately Stocked	19%	20%	20%	27%	20%	35%	27%
Understocked	44%	38%	41%	24%	49%	16%	30%
Stocked Out	0%	1%	0%	6%	9%	6%	7%
2013 Q2							
Overstocked	36%	44%	40%	46%	34%	51%	44%
Appropriately Stocked	24%	27%	26%	32%	20%	31%	27%
Understocked	37%	27%	32%	15%	40%	13%	23%
Stocked Out	3%	2%	3%	7%	6%	5%	6%
2013 Q3							
Overstocked	34%	35%	34%	25%	53%	47%	42%
Appropriately Stocked	19%	19%	19%	15%	17%	37%	23%
Understocked	46%	44%	45%	17%	27%	10%	18%
Stocked Out	2%	2%	2%	43%	2%	6%	17%
2013 Q4							
Overstocked	52%	49%	51%	n/a	n/a	n/a	n/a
Appropriately Stocked	29%	24%	26%	n/a	n/a	n/a	n/a
Understocked	19%	26%	23%	n/a	n/a	n/a	n/a
Stocked Out	0%	0%	0%	n/a	n/a	n/a	n/a
2014 Q1							
Overstocked	35%	40%	37%	12%	15%	26%	18%
Appropriately Stocked	27%	28%	27%	24%	12%	25%	20%

Period and Stock Status (% of facilities)	DTTU			ZIP			
	Control Pill	Male Condoms	Avg.	Artemether-1X6	mRDT	RHZE 150/75/ 400/275mg Tablet	Avg.
Understocked	37%	32%	34%	38%	52%	16%	35%
Stocked Out	1%	1%	1%	26%	21%	33%	27%

Appendix 3

Detailed Stock Status, ZADS Full-Supply Products

Period									
Product, Percentage of Facilities Stocked Out	P1 2013	P2 2013	P3 2013	P4 2013	P5 2013	P6 2013	P1 2014	P2 2014	Average
Lamuv 150 mg + Zidov 300 mg + Nev 200 mg	11.6%	4.3%	4.7%	7.7%	5.7%	10.0%	24.7%	41.5%	13.8%
Lamuv 300 mg + Tenofovir 300 mg	24.6%	3.0%	4.8%	17.3%	17.6%	13.8%	13.9%	17.1%	14.0%
Zidovu 60 + Lamuv 30 + Nevirapine 50 mg Tab	11.7%	3.3%	1.7%	18.1%	8.4%	15.5%	30.7%	30.0%	14.9%
Average	16.0%	3.5%	3.7%	14.4%	10.6%	13.1%	23.1%	29.5%	14.2%

Appendix 4

Detailed Costs by System, Main Function, and Item

Baseline Cost by Major Function and Item

Major Function and Items	All Systems	DTTU	ZIP/PHCP	ZADS	EMPS
Data Management	$73,095	$21,106	$26,287	$25,702	$0
LMIS Paper Forms	$9,614	$1,279	$1,713	$6,622	$0
LMIS Software (licenses, server, etc.)	$1,300	$433	$433	$433	$0
Logistics Unit (LU) Data Encoder 1	$2,000	$2,000	$0	$0	$0
LU Data Encoder 2	$1,464	$1,464	$0	$0	$0
LU Data Encoder 3	$1,547	$0	$0	$1,547	$0
LU Data Encoder 4	$1,171	$0	$0	$1,171	$0
LU Internet	$47,786	$15,929	$15,929	$15,929	$0
NatPharm LMIS Data Encoder	$5,897	$0	$5,897	$0	$0
NatPharm LMIS Manager	$2,314	$0	$2,314	$0	$0
Management / Supervision	$367,020	$64,447	$90,147	$153,661	$58,765
ADC Labor	$19,578	$9,789	$9,789	$0	$0
ADC Per Diems	$8,160	$3,360	$4,800	$0	$0
DPM Team Leader Labor	$15,360	$0	$10,115	$4,870	$375
DPM Team Leader Per Diems	$16,380	$0	$10,080	$6,300	$0
Facility Emergency Order Labor to Pick Up Commodities	$49,477	$4,948	$24,739	$4,948	$14,843
Facility Supply Chain Management Tasks	$97,217	$12,782	$23,463	$20,046	$40,926
LU Deputy Manager	$5,476	$2,738	$0	$2,738	$0
LU Logistics Officer	$11,147	$0	$2,347	$8,801	$0
LU Overall Management	$25,582	$12,791	$0	$12,791	$0
LU PMTCT Logistics Coordinator	$6,129	$6,129	$0	$0	$0
PPM Labor	$7,104	$710	$1,066	$3,907	$1,421
PPM per Diems	$6,000	$600	$900	$3,300	$1,200

Major Function and Items	All Systems	DTTU	ZIP/PHCP	ZADS	EMPS
Training	$89,983	$1,174	$2,849	$85,960	$0
ZNFPC Team Leader Labor	$3,005	$3,005	$0	$0	$0
ZNFPC Team Leader per Diems	$6,420	$6,420	$0	$0	$0
Operating Expenses	$417,779	$34,229	$173,063	$149,464	$61,023
Fixed Assets: NatPharm LU Office	$2,402	$801	$801	$801	$0
Operating Expenses: NatPharm Harare	$282,138	$30,125	$66,131	$148,663	$37,219
Operating Expenses: NatPharm Mutare	$129,936	$0	$106,132	$0	$23,804
Operating Expenses: ZNFPC	$3,303	$3,303	$0	$0	$0
Storage	$424,134	$76,875	$213,200	$82,563	$51,496
Facility Storage Space	$192,154	$54,560	$64,897	$58,141	$14,556
NatPharm Harare Labor	$34,952	$3,732	$8,192	$18,417	$4,611
NatPharm Mutare Labor	$160,658	$0	$131,225	$0	$29,433
Storage Space: JSI Harare Contract	$4,027	$4,027	$0	$0	$0
Storage Space: NatPharm Harare	$11,398	$1,217	$2,672	$6,006	$1,504
Storage Space: NatPharm Mutare	$7,607	$0	$6,213	$0	$1,394
Storage Space: ZNFPC Harare	$2,706	$2,706	$0	$0	$0
ZNFPC Storage Labor	$10,633	$10,633	$0	$0	$0
Transport	$422,045	$82,128	$137,039	$74,358	$128,520
Facility Emergency Order Public Transport to Pick up Commodities	$70,766	$7,077	$35,383	$7,077	$21,230
Facility Labor to Pick Up Commodities	$30,126	$0	$0	$0	$30,126
Facility Public Transport to Pick Up Commodities	$77,165	$0	$0	$0	$77,165
Monitoring Vehicle Drivers' Labor	$9,164	$2,647	$2,546	$3,971	$0
Monitoring Vehicle Drivers' per Diems	$5,816	$1,680	$1,616	$2,520	$0
Monitoring Vehicle Maintenance & Repair, Insurance & Fuel	$26,425	$7,311	$12,112	$7,002	$0
Monitoring Vehicles	$2,841	$822	$1,362	$656	$0
Truck Dispatch Assistants' Labor	$17,010	$4,310	$7,943	$4,757	$0
Truck Dispatch Assistants' per Diems	$21,904	$6,120	$11,280	$4,504	$0
Truck Drivers' Labor	$38,063	$9,643	$17,774	$10,645	$0
Truck Drivers' per Diems	$21,904	$6,120	$11,280	$4,504	$0
Truck Maintenance & Repair, Insurance & Fuel	$96,936	$34,913	$34,284	$27,739	$0
Trucks	$3,925	$1,485	$1,458	$983	$0
Grand Total	$1,704,072	$278,783	$639,735	$485,748	$299,805

Appendix 5

Detailed Costs by Tier, Main Function, and Item

	Tier at Which Cost Is Incurred				
Major Function and Items	**Central**	**Province**	**District**	**Facility**	**Grand Total**
Data Management	$73,095				$73,095
LMIS Paper Forms	$9,614				$9,614
LMIS Software (licenses, server, etc.)	$1,300				$1,300
LU Data Encoder 1	$2,000				$2,000
LU Data Encoder 2	$1,464				$1,464
LU Data Encoder 3	$1,547				$1,547
LU Data Encoder 4	$1,171				$1,171
LU Internet	$47,786				$47,786
NatPharm LMIS Data Encoder	$5,897				$5,897
NatPharm LMIS Manager	$2,314				$2,314
Management / Supervision	**$138,319**	**$50,267**	**$31,740**	**$146,694**	**$367,020**
ADC Labor		$19,578			$19,578
ADC per Diems		$8,160			$8,160
DPM Team Leader Labor			$15,360		$15,360
DPM Team Leader per Diems			$16,380		$16,380
Facility Emergency Order Labor to Pick up Commodities				$49,477	$49,477
Facility Supply Chain Management Tasks				$97,217	$97,217
LU Deputy Manager	$5,476				$5,476
LU Logistics Officer	$11,147				$11,147
LU Overall Management	$25,582				$25,582
LU PMTCT Logistics Coordinator	$6,129				$6,129
PPM Labor		$7,104			$7,104
PPM per Diems		$6,000			$6,000

	Tier at Which Cost Is Incurred				
Major Function and Items	**Central**	**Province**	**District**	**Facility**	**Grand Total**
Training	$89,983				$89,983
ZNFPC Team Leader Labor		$3,005			$3,005
ZNFPC Team Leader per Diems		$6,420			$6,420
Operating Expenses	$287,843	$129,936			$417,779
Fixed Assets: NatPharm LU Office	$2,402				$2,402
Operating Expenses: NatPharm Harare	$282,138				$282,138
Operating Expenses: NatPharm Mutare		$129,936			$129,936
Operating Expenses: ZNFPC	$3,303				$3,303
Storage	$63,715	$168,265		$192,154	$424,134
Facility Storage Space				$192,154	$192,154
NatPharm Harare Labor	$34,952				$34,952
NatPharm Mutare Labor		$160,658			$160,658
Storage Space: JSI Harare Contract	$4,027				$4,027
Storage Space: NatPharm Harare	$11,398				$11,398
Storage Space: NatPharm Mutare		$7,607			$7,607
Storage Space: ZNFPC Harare	$2,706				$2,706
ZNFPC Storage Labor	$10,633				$10,633
Transport	$243,988			$178,056	$422,045
Facility Emergency Order Public Transport to Pick Up Commodities				$70,766	$70,766
Facility Labor to Pick Up Commodities				$30,126	$30,126
Facility Public Transport to Pick Up Commodities				$77,165	$77,165
Monitoring Vehicle Drivers' Labor	$9,164				$9,164
Monitoring Vehicle Drivers' per Diems	$5,816				$5,816
Monitoring Vehicle Maintenance & Repair, Insurance & Fuel	$26,425				$26,425
Monitoring Vehicles	$2,841				$2,841
Truck Dispatch Assistants' Labor	$17,010				$17,010
Truck Dispatch Assistants' per Diems	$21,904				$21,904
Truck Drivers' Labor	$38,063				$38,063
Truck Drivers' per Diems	$21,904				$21,904
Truck Maintenance & Repair,	$96,936				$96,936

	Tier at Which Cost Is Incurred				
Major Function and Items	**Central**	**Province**	**District**	**Facility**	**Grand Total**
Insurance & Fuel					
Trucks	$3,925				$3,925
Grand Total	$806,960	$348,468	$31,740	$516,904	$1,704,072

Appendix 6

Details on Commodity Throughput by System

	Total	DTTU	ZIP/PHCP	ZADS	EMPS
Commodity Volume (m^3)	1483	421	501	449	112
Commodity Value ($)	$11,941,378	$ 2,066,021	$ 1,196,071	$ 8,528,225	$ 151,061

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