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USAID GLOBAL HEALTH SUPPLY CHAIN PROGRAM

TECHNICAL ASSISTANCE

JAMAICA NATIONAL SUPPLY CHAIN ASSESSMENT
SEPTEMBER 2016

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About Global Health Supply Chain Program Technical Assistance

The Global Health Supply Chain Program Technical Assistance program will serve the health commodity technical assistance needs of USAID, other USG agencies, partner country governments, non-governmental organizations (NGOs) and other entities across all health elements (e.g. malaria, family planning, HIV/AIDS, TB, maternal and child health) to meet the evolving challenges in ensuring long-term availability of health commodities in public and private services worldwide. The program will serve to strengthen country supply systems, and ensure strategic collaboration to improve the long-term availability of health commodities.

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Contents

ACRONYMS

AIDS – Acquired Immune Deficiency Syndrome
ART – Antiretroviral Therapy
ARVs – Antiretroviral drugs
CMM – Capability Maturity Model
GF – Global Fund
GOJ – Government of Jamaica
HIV – Human Immunodeficiency Virus
JSI – John Snow Inc.
KPI – Key Performance Indicator
LMIS – Logistics Management Information System
MOH – Ministry of Health
NCC – National Contract Commission
NFPB – National Family Planning Board
NHF – National Health Fund
NHP – National HIV/STI Programme
NPHL – National Public Health Laboratory
NSCA – National Supply Chain Assessment
ODK – Open Data Kit
OI – Opportunistic Infections
PEPFAR – U.S. President's Emergency Plan for AIDS Relief
PIMS – Pharmaceutical Inventory Management System
PLHIV – People Living with HIV
PPE – Personal Protective Equipment
RTKs – Rapid Test Kits
SCMS - Supply Chain Management System
SKUs – Stock Keeping Units
SOP – Standard Operating Procedures
TCS – Treatment Care and Support
USAID – United States Agency for International Development
VEN – Vital, Essential and Necessary Medicines List
WHO – World Health Organization
WMS – Warehouse Management System

EXECUTIVE SUMMARY

Introduction

USAID Jamaica requested the Supply Chain Management System (SCMS) program to conduct an assessment of the public health supply chain, focusing on commodities related to HIV and AIDS. The purposes of this assessment are to collect and supply the Ministry of Health (MOH) with the data required to: help prioritize relevant areas for supply chain strengthening; and to provide the information necessary for an evidence-based decision-making process to determine the most appropriate management actions and systems strengthening activities. The National Supply Chain Assessment (NSCA) was carried out as a joint exercise between the MOH, USAID Washington, USAID Jamaica, Axios International with partner Abt Associates, and SCMS (JSI).

Assessment Methodology

In order to understand the current state of the supply chain in Jamaica, this assessment utilized the NSCA toolkit, comprised of the Capability Maturity Model (CMM) and country-specific Key Performance Indicators (KPIs) to 1) determine whether operational functions are achieving expected outcomes; and 2) develop an evidence-based roadmap for improvement.

A team comprised of Axios, USAID Washington, SCMS and the MOH collected data from August 22-September 1, 2016. The team reviewed records covering the period February to July 2016 at the treatment sites and records covering all of 2015 for the Central Level Procurement unit. In-depth interviews were conducted with site managers in the selected areas.

The sites assessed were island-wide, with at least one site from each Regional Health Authority. The NSCA teams collected data from 12 hospital and health center HIV treatment sites as well as the National Health Fund (NHF), which manages the public sector medical stores, the National Public Health Laboratory (NPHL), the MOH (which handles procurement and forecasting for HIV commodities), and the National Family Planning Board (NFPB) (which procures and warehouses condoms). Three teams of three people each visited 1-2 sites per day over a 6-day period. At least one MOH colleague joined each data collection team. Assessment teams also recorded descriptive observations at each facility to provide information on areas such as Storage Conditions, Stock Data, Inventory Management, Transportation, Logistics Management Information System (LMIS), Ordering data, and Expiries.

The MOH selected a tracer list of 18 products as part of the survey, which included products from or related to the HIV/AIDS program.

Structured, in-depth interviews were conducted at each treatment site visited. Quantitative data was collected from stock cards, physical stock counts from the day of visit, order records, ARV reports, and LMIS reports both paper-based and electronic through the PIMS system. This data focused primarily on 18 HIV/AIDS program "tracer commodities" selected by the MOH. KPI analysis was performed on the quantitative data collected under 5 thematic areas: Storage conditions, Inventory Management, Transportation, LMIS, and Expiries. Central level data regarding: Forecasting and Supply Planning, Procurement, Warehousing and Inventory

Management, Transportation, Waste Management, LMIS, and Laboratory Issuing were also analyzed. For the CMM, teams conducted structured, in-depth interviews at all assessment sites.

Data collectors made direct observations related to storage conditions and general facility information. For KPI data, data was collected for the following time periods: at treatment sites, the team reviewed records covering the period of February through July 2016, and at the central level procurement unit, records covering the year of 2015.

Observations and Recommendations

Recommendations include those related to the specific CMM functional areas, those tied to particular Key Performance Indicators (KPIs), and those based on overall observations and discussions by and among the assessment teams. While in-country stakeholders need to identify which recommendations will be addressed and when and how they will be addressed, the recommendations noted in this report have the potential to provide a large impact on that functional area within the supply chain.

Forecasting and supply planning. There is capacity for efficient quantification based on adjusted dispensed-to-user data from the Logistics Management and Information System (LMIS). A quantification was supported by Global Fund in 2015 mainly using the facility based-ARV reports, and an excel spreadsheet application to generate a three-year forecast. It is recommended that the National Health Fund (NHF) and the Ministry of Health develop their own capacity to produce annual forecasts and quarterly supply plans which will help with procurement planning and overall supply chain functionality.

Procurement. The MOH procures ARVs to fulfill the national need through international procurement methods with lead times of up to eight months. Suppliers are issued a contract based on a purchase order with contract awards based on product quality vis- à-vis supplier quotations. Order periods are more demand-driven than periodic, though the two types of orders are placed equally. Products are delivered by the supplier, but with orders from the NHF. The supply chain in Jamaica is multi-directional with supplies either being delivered by the NHF, being collected by treatment sites traveling to the NHF, or by treatment sites transferring commodities between themselves. The system between treatment sites appears to be ad hoc but substantial and functional, especially for RTKs and for DrugServe sites. Relatively short distances between sites foster communication and commodity sharing since sites can easily pick up commodities when needed. It is recommended that the procurement process be shortened using any means possible as procurement lead times often contribute to system level stockouts. At lower levels of the system, the commodity transfers between sites ought to be encouraged as they often mitigate site-level stockouts. Moreover, the procurement system should begin to monitor performance through key performance indicators then use that data to determine next steps for improvement. If procurement timelines can be shortened and the NHF receives more regular shipments stockouts should decrease.

Warehousing and Inventory Management. Inventory control for ARVs is carried out on a quarterly basis through stock counts. The most common causes of stock outages at treatment sites were

"delays in delivery" and "quantities delivered not in conformity with quantities ordered". Whereas, the most common cause of stock outages or low stock at the Central level was procurement delays due to tender evaluation committee delays. These problems are linked back to the procurement timeline. It is recommended that the procurement timeline be shortened using any means necessary, which will reduce pressure on the sites and NHF to ration supplies.

Transportation. Responsibility for transport of commodities is divided between the National Health Fund (NHF) and the treatment sites and is determined in large part by the type of order – if it is a scheduled order NHF delivers but an off-schedule order is largely picked-up by the treatment site. Likewise, in some cases sites with a vehicle or access to a vehicle will support more frequent commodity pick-ups. Transportation is running well and all sites know which delivery schedule they are on (weeks 1 and 3 or weeks 2 and 4). It is recommended that the well-functioning transport system be utilized to alleviate the pharmaceutical waste held at some sites through a reverse logistics plan.

Waste Management. The MOH has leveraged an existing agreement held by the National HIV/STD Prevention and Control Program (NHP) for waste destruction services by a vendor in Spanish Town. The MOH recently (April 2016) sponsored a waste drive, collecting waste from health facilities and supporting the subsequent destruction. Due to this recent activity, most treatment sites had very little waste. Prescribing patterns that fail to conform to standard treatment guidelines (STGs) are a possible cause of expiration in medicine inventories as are close to expiry donations. It is recommended that the NHF and MOH leverage the existing waste destruction contract to reduce the waste held at the NHF, which is substantial. Additionally, utilizing the existing transportation resources to support reverse logistics for waste from the sites would behoove the sites by increasing usable space.

Lab Issuing

The central level National Public Health Laboratory manages inventory in two cold rooms at the headquarters in Kingston and informally uses a "First In, First Out" inventory management practice. The lab follows waste management and safety best practices. The lab plans to add a logistics module to their existing information system and that is the primary recommendation from the NSCA for the public health labs.

BACKGROUND

PURPOSE OF THE ASSESSMENT

The Government of Jamaica has made preventing and treating HIV a priority throughout the country, exemplified by the country's intent to transition to a Test and Treat HIV care model. In this context, USAID Jamaica requested the USAID SCMS program to conduct an assessment of the supply chain. The purpose of this assessment is to support the MOH and stakeholders in Jamaica to obtain a better understanding of the current state of the HIV and condom supply chains, ultimately to prioritize critical areas for strengthening.

The main goals of the assessment are to:
• Establish a baseline of the current supply chain functions in term of capability and performance,
• Analyze the national supply system within the context of supply management functions, and
• Determine areas where donor support could improve system functionality, ultimately to increase commodity availability.

The assessment was also part of the hand over and transition of the NSCA tool from SCMS to the new contractor, Axios International. Axios will be the primary point of contact for this assessment and tool from this point forward.

COUNTRY CONTEXT

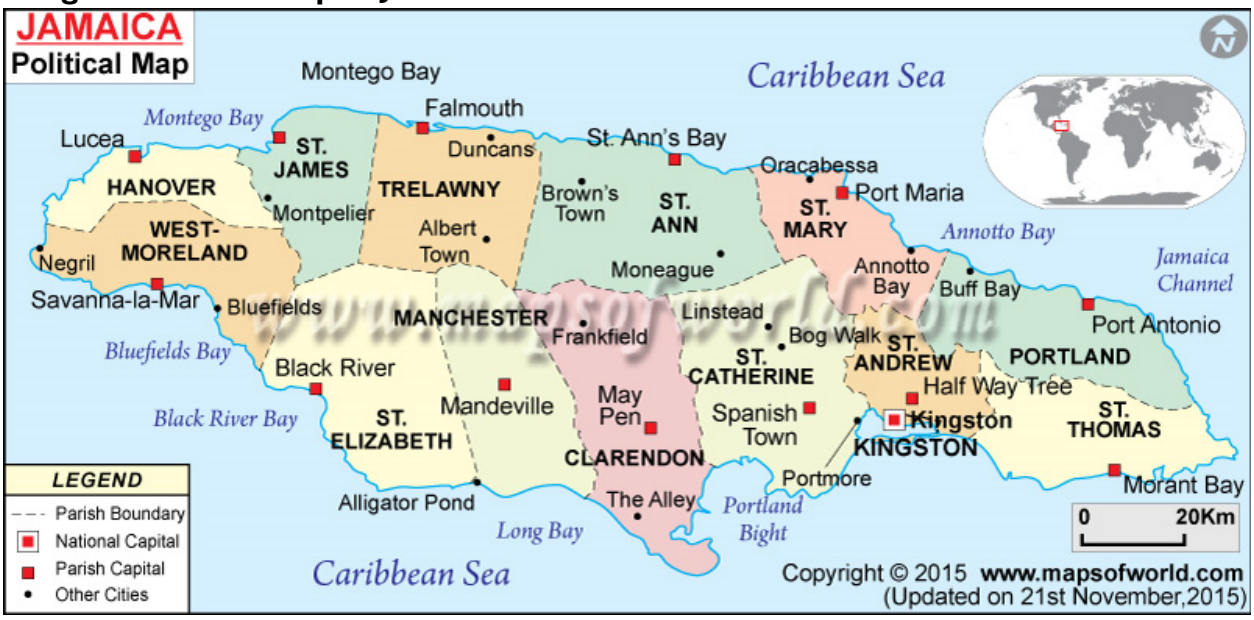
Jamaica is the largest English-speaking Island in the Caribbean. Jamaica's Human Development Index (HDI) ranking for 2014 is 99 out of 188 — which places the country in the high human development category. [1] Jamaica's population is growing; as of 1 January 2016, the population of Jamaica was estimated to be 2 798 802 people. This is an increase of 0.38 % (10 484 people) compared to a population of 2 788 318 the year before.[2]

Jamaica consists of fourteen parishes. The capital city, Kingston on the South East coast and Montego Bay on the North Coast are the two main urban areas. Under the National Health Services Act of 1997, the public health sector institutions are administered through 4 Regional Health Authorities that serve the 14 parishes as follows:

- North East - Portland, St. Mary, St. Ann
- Western - Trelawny, St. James, Hanover, Westmoreland
- Southern - St. Elizabeth, Manchester, Clarendon
- South East - St. Catherine, Kingston, St. Andrew, St. Thomas

[1] UNDP Human Development Report 2015
[2] http://countrymeters.info/en/Jamaica

Image 1: Political Map of Jamaica



The strategic policy priorities of the MOH are to:

- Enhance health sector governance (leadership, management and accountability);
- Ensure access to healthcare services;
- Provide quality assurance in the delivery of health services to the population;
- Reduce injury, disability and premature deaths from preventable illness, and to lessen the severity of the impact of non-preventable diseases.[3]

HIV continues to play a significant role in the morbidity and mortality level of the population, and carries an enormous financial and human resource cost to the health sector. Over 30,000 cases of HIV have been reported to Jamaica's MOH. HIV affects all 14 parishes with the most urbanized parishes having the highest cumulative number of reported HIV cases (St. James – 2,195.9 HIV cases per 100,000 persons and Kingston & St. Andrew – 1,656.2 cases per 100,000 persons). Parishes with significant tourism-based economies have the next highest number of reported HIV cases: ranging from 1053.5 per 100,000 persons in Trelawny to 1257.9 cases per 100,000 persons in St. Ann.[4] The sites selected for data collection in Jamaica's NSCA support ARV treatment for approximately 11,000 HIV positive patients and provide care for more than 15,500 HIV positive patients. Therefore, approximately half of the estimated HIV positive population in Jamaica is treated at the 12 treatment sites chosen for NSCA data collection.

The HIV prevalence rate in the general population is 1.6% with a concentrated epidemic among the most vulnerable populations. For sex workers, the reported prevalence is 9%, and for men who have sex with men, the rate is 32%. Additionally, HIV infection rates are increasing among women and

Number of people living with HIV	29,000
Women aged 15 and over living with HIV	11,000
Adults aged 15 to 49 prevalence rate	1.6%
Deaths due to AIDS	1,200
Orphans due to AIDS aged 0 to 17	13,000

Source: UNAIDS Jamaica

[3] MOH Strategic Business Plan 2015-2018
[4] Jamaica Country Progress Report, Global AIDS Response Report, March 31, 2014

girls, and girls in the 10-19 year age group are three times more likely to be infected with the virus than young men in the same age group.[5]

Stakeholders, including the Government of Jamaica, non-governmental organizations, civil society, private sector groups, international development partners, and persons living with HIV, guide Jamaica's national response to the HIV epidemic. The national response, led by the National HIV Programme (NHP), continues to benefit from access to technical and financial support from development partners who play a key role in the multi-sectoral response to the HIV epidemic. The national response has been primarily financed through a loan agreement with the International Bank for Reconstruction and Development (IBRD/ World Bank), grants from the Global Fund to fight AIDS, Tuberculosis and Malaria (GF) and the United States Agency for International Development through the U.S. President's Emergency Plan for AIDS Relief (USAID/PEPFAR) with support from the Government of Jamaica. HIV prevention efforts in Jamaica have been robust over the past several years largely due to resources from the Global Fund, which finances over 90% of the national response and 70% of the commodity procurement budget. With the impending reduction in Global Fund resources due to Jamaica's middle-income classification, there are aggressive attempts by the government to ensure sustainability of the national response to combat HIV and AIDS.

Public sector procurement is pooled at the national level (i.e. there is centralized procurement for the regions); procurement is the responsibility of the Ministry of Health. The following tender processes are used for public sector procurement: international competitive bidding, national competitive bidding, and negotiation/direct purchasing. Public sector procurement is limited to medicines on the Vital, Essential and Necessary Medicines (VEN) List. There are regulations for local preference in public sector procurement. There is a national procurement mechanism for supply management system for medications, ARVs, condoms, lubricants, and opportunistic infections (OI) drugs.

The M&E Unit at the MOH captures HIV-related data on diagnosis, treatment and clinical progression of all reported people living with HIV (PLHIV). Information is used to increase understanding of the epidemic, inform appropriate response, monitor the national program, and determine the effectiveness of the national response. HIV data are reported by site through the ARV form, which is sent to the Parish, Regions and central level. Parishes aggregate data for condoms, and then report to the Region and National Family Planning Program.

ASSESSMENT METHODOLOGY

This assessment utilized the NSCA toolkit, which is comprised of the Supply Chain Mapping Workshop, Capability Maturity Model (CMM) and Key Performance Indicators (KPIs), to 1) benchmark the supply chain performance; and 2) document the supply chain's capabilities, in the form of resources and processes.

[5] Jamaica: Adolescent Health and Empowerment. UNICEF. http://www.unicef.org/jamaica/hiv_aids.html Accessed on October 3, 2016.

THE NATIONAL SUPPLY CHAIN ASSESSMENT APPROACH

The assessment of the public supply chain was conducted through structured interviews using the NSCA standard tools adapted to fit the context for Jamaica as well as a supply chain mapping workshop. The NSCA is a comprehensive toolkit that was collaboratively developed by SCMS, USAID|DELIVER PROJECT and SIAPS. The NSCA tool assesses the capability and performance of supply chain functions at all levels of a health supply chain. Assessment results help supply chain managers and implementing partners develop their strategic and operational plans, and to monitor whether activities are achieving their expected outcomes.

The assessment consists of three components:

- The supply chain mapping workshop: provides the opportunity to diagram the system allowing participants to identify different practices for each product. In some cases, this activity aids the participants to identify areas for optimization.
- The CMM Diagnostic Tool: A qualitative diagnostic tool that assesses the capability maturity (presence of resources and processes) of a supply chain.
- The Supply Chain KPIs: A set of indicators that comprehensively measure the performance of a health supply chain.

SUPPLY CHAIN PROCESS-MAPPING WORKSHOP

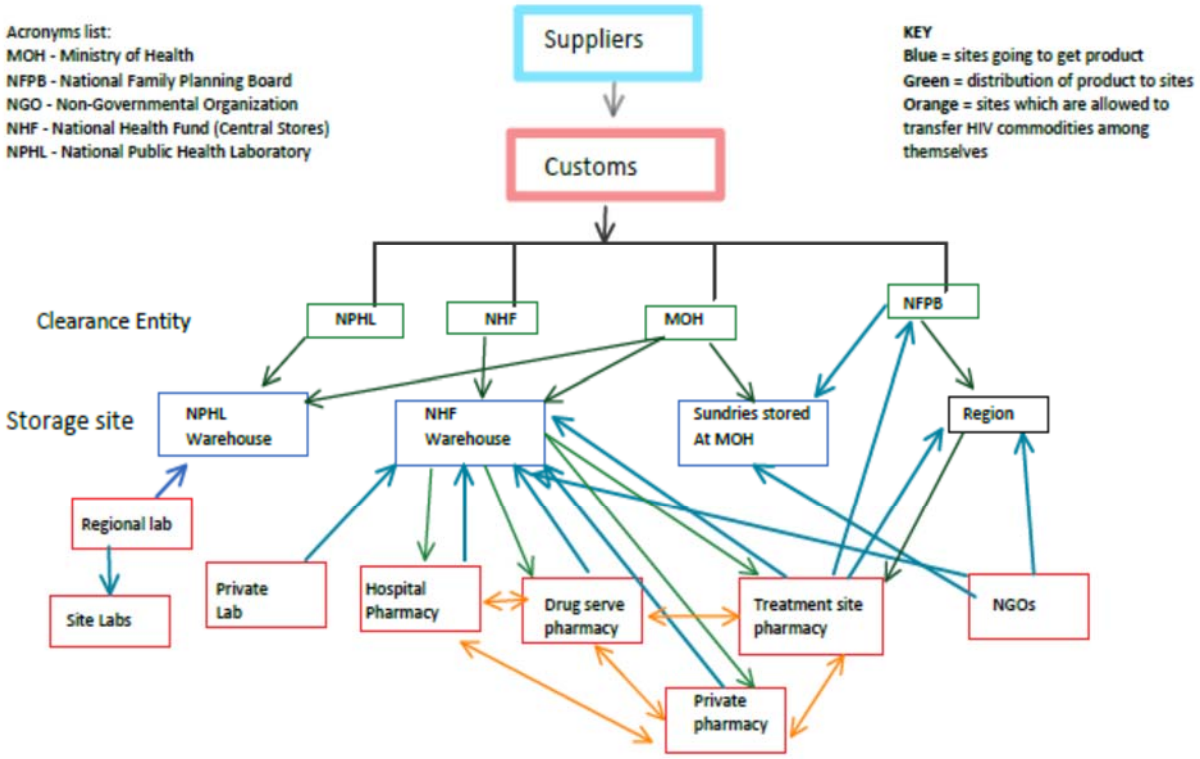
A mapping exercise was conducted before data collector training to provide both the NSCA team and stakeholders with a comprehensive illustration of the structure and interactions between stakeholders of the public health supply chain. Participants consisted of personnel from the USAID Washington, the Axios and SCMS teams and, most importantly, senior management from the MOH, including Medical Officers, National Program Officers, Supply Chain Advisors, Warehouse Managers from the NHF, M&E Advisors, HIV Advisors, Procurement Specialists, Regional Treatment Care and Support Officers, and a scientist. In all, there were approximately 13 participants. (See Annex 1 for Participant List)

The group was divided into 2 teams, each tasked with creating a supply chain process map, which identified:

- The various levels of the supply chain;
- The level at which forecasting and supply planning and procurement takes place, and
- The flow of product and information.

Once process maps were drawn, they were compared and consolidated to create one supply chain diagram and which attained group consensus. Each member of the group had knowledge of a particular segment of the supply chain: lab, family planning, first, second and third line ARVs and RTKs. It was due to all of these perspectives that the map below was successfully completed.

Image 2: Jamaica Lab, ARV, RTK and Condom Supply Chain Map



The supply chain map clarified that there were several central-level storage locations for various products and, in the case of family planning products, an extra level within the supply chain. The NPHL stored most laboratory commodities while the MOH stored lab sundries within their warehouse and the NHF stored Rapid Test Kits (RTKs). At the site level, the lab stored RTKs and all pertinent lab commodities, the family planning ward normally stored male and female condoms (available upon request) while the pharmacy stored the rest of the tracer commodities. NHF maintained inventory for all ARVs and the NFPB and the Regions stored condoms. Treatment sites and pharmacies are allowed to transfer commodities between each other, which has successfully aided the system to avoid or at least mitigate unknown numbers of stockouts of vital commodities.

This map may have some inconsistencies as the NFPB reported that they do not regularly distribute down to the facilities, but during the supply chain mapping workshop participants understood that they did occasionally. Furthermore, the MOH stores Ritonavir and coordinates transport for that commodity, which is prescribed to few patients.

CAPABILITY MATURITY MODEL

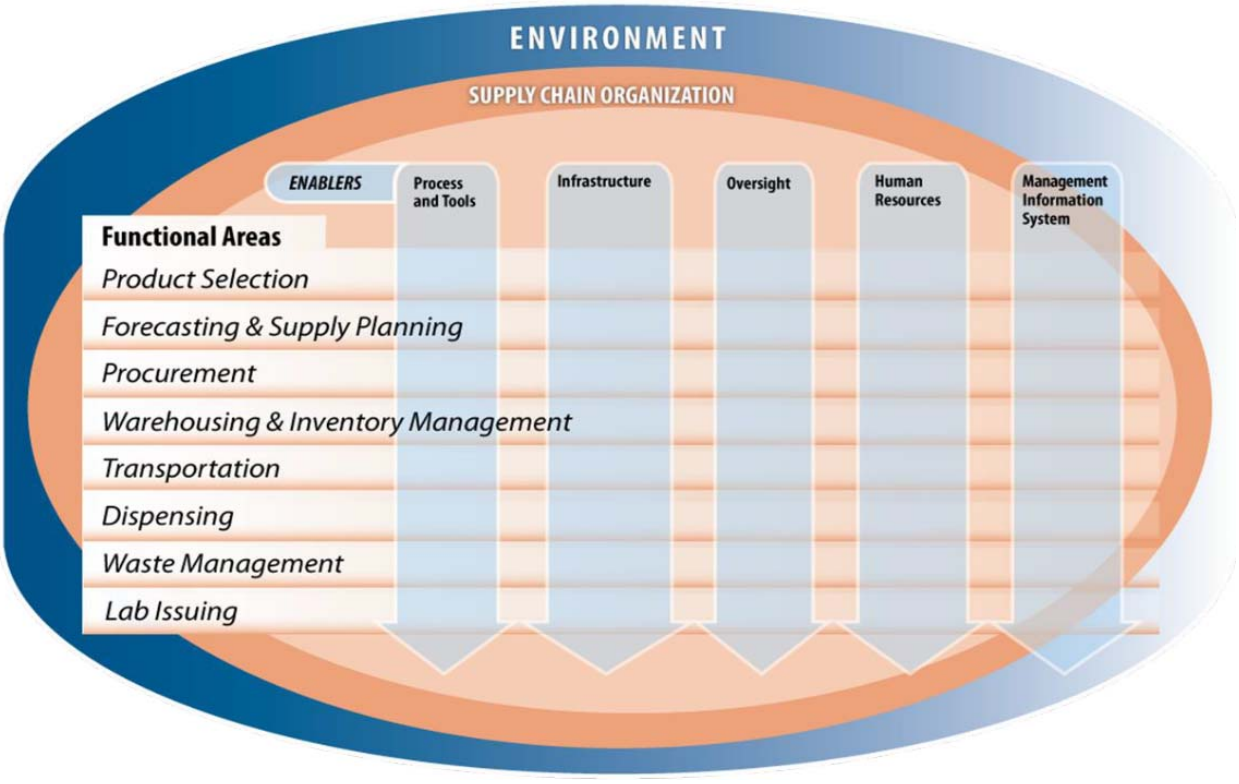
The CMM uses traditional supply chain functional areas as an organizing construct for the implementation of the diagnostic tool. Each functional area is broken down into a number of capabilities, resources, or processes that are required for a supply chain to operate and that can be measured and strengthened. Functional areas addressed in the tool include:

- Product Selection
- Forecasting and Supply Planning
- Procurement
- Warehousing and Inventory Management
- Transportation
- Dispensing
- Waste Management
- Lab Issuing

Through a combination of interviews and observation, the CMM assesses the capability maturity of a supply chain at multiple levels – from the central level to treatment sites, and across functional areas at all levels, through cross-cutting organizational elements, or enablers, such as human resources, processes and infrastructure. The enablers allow analysis of the capability maturity for a specific functional area by each enabler, i.e. analysis of the maturity of processes, human resources or infrastructure across all the supply chain functions mentioned above.

The image below illustrates the guiding framework for the supply chain functions and the cross-cutting enablers assessed by the CMM diagnostic tool.

Image 3: Assessing Supply Chain Capability and Performance

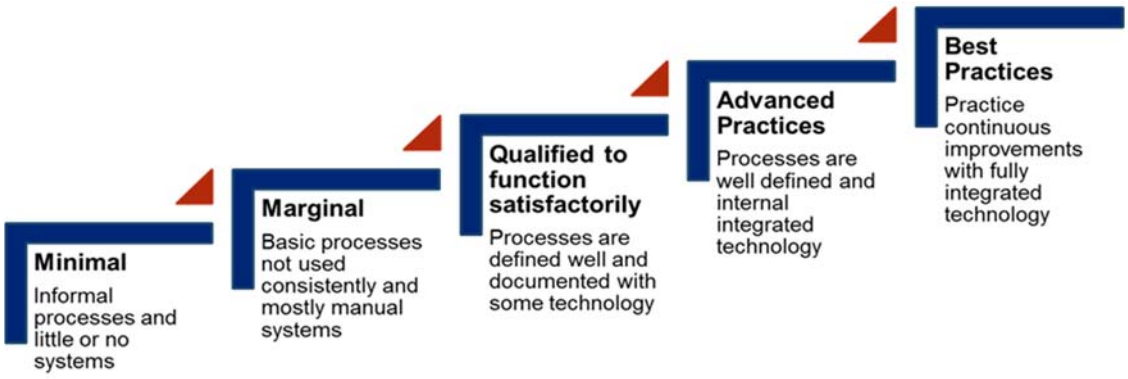


An overall maturity scale guides the definitions in the CMM tool, broadly defining each capability level (1-5). For each capability, there are defined components at each level of the

capability maturity scale that represent these broadly defined levels. The CMM scores are represented by percentages in this report and CMM interviews were conducted at all sites.

Image 4 illustrates a capability with a specific maturity scale, with components of capability defined at each level (1–5).

Image 4: Capability maturity scale



KEY PERFORMANCE INDICATORS

The KPI review consists of using a set of indicators to analyze and measure supply chain performance, both at the process- and outcome-level to address overarching performance and the performance within specific functional areas. The KPIs provide insight into the efficiency and effectiveness of the national supply chain's operations. KPI data were collected at each of the selected sites from the central to the treatment site level using the ARV report, bin cards, and the electronic system, Pharmaceutical Inventory Management System (PIMS). These KPIs are the key pieces of information a manager needs to understand the performance of the overall supply chain. Illustrating the problem areas within a supply chain, the KPI data informs high-level decision making, in terms of operational changes and potential systems strengthening activities. A limitation to KPIs is data availability. In some sites, data from six months in the past was not available, therefore, KPIs could not be calculated for that site and that site is not included in the aggregate KPI calculation.

Focused at the outcome level, the high-level KPIs include overarching measures (e.g., stock-out rates and total supply chain costs), as well as outcome-level measures within functional areas (e.g., order fill rate, on-time deliveries). The NHF uses three of the NSCA KPI's to monitor its own performance on a quarterly basis.

The KPIs employed during this assessment are detailed in the Table below. (See Annex Two for KPI formula)

Table 1: Key Performance Indicator List

Key Performance Indicator grouped by Functional Area	Level
Stock Availability	
Stock out rates (% of tracer commodities experiencing a stock out during the reporting period)	Central and Treatment site
Stocked According to Plan	Central and Treatment site
Forecasting and Supply Planning	
Forecast Accuracy	Central – NA (unable to calculate due to lack of data)
Human Resources	
Staff turnover rate (%)	Central and Treatment site
Management Information Systems	
Facility Reporting Rates: On Time (%)	Treatment Site
Warehousing and Inventory Management	
Total stock expired (quantity) (Monitored by NHF)	Central and Treatment site
Stock accuracy (%) (Monitored by NHF)	Central and Treatment site
Order Fulfillment Rate	Central and Treatment site
Up to date Bin card (%) (Monitored by NHF)	Central and Treatment site
Procurement	
Vendor On-time Delivery (%)	Central
Emergency orders issued (%)	Central and Treatment site
Supplier fill rate	Central
Percent of international Reference Price Paid	Central – NA (unable to calculate due to lack of data)
Transportation	
On-time delivery rate	Central and Treatment Site

SITE SELECTION

The MOH selected twelve facilities to be included in the NSCA treatment site sample. Central level data were also collected from the MOH, NHF, NFPB, and the NPHL.

Below is a list of the sites that were visited during the assessment.

Table 2: Site Sample breakdown

Facility	Facility Category
Comprehensive Health Centre	Health Centre
Montego Bay Type 5	Health Centre
CHARES	Health Centre
Sav la mar Health Centre	Health Centre
St. Jago Park	Health Centre
Mandeville Health Centre	Health Centre
St. Anns Bay Health Centre	Health Centre
Kingston Public Hospital	Hospital
Cornwall Regional Hospital	Hospital
Port Maria Hospital	Hospital
Mandeville Hospital	Hospital
May Pen Health Centre/Hospital	Hospital
Ministry of Health	Central Level
National Family Planning Board	Central Level
National Health Fund	Central Level
National Public Health Lab	Central Level

LIST OF TRACER PRODUCTS

A key component of the NSCA assessment is tracing selected commodities throughout the supply chain. For this assessment, the MOH reviewed and approved the tracer commodities suggested by the assessment team prior to arrival. Products were suggested as tracer products based on both frequency of use, and importance in relation to HIV/AIDS prevention and treatment activities (see Table 3).

Table 3: Tracer Commodity List

Commodity	Commodity Type
Tenofovir 300mg/Lamivudine 300mg /Efavirenz 600mg (TDF/FTC/EFV 300/300/600mg), Bottle of 30	First Line Adult
Zidovudine 300mg /Lamivudine 150mg /Nevirapine 200mg (ZVD/3TC/NVP 300/150/200 mg), Bottle of 60	First Line Adult
Efavirenz 600mg (EFV 600mg) Bottle of 30	First Line Adult
Abacavir 600mg/Lamivudine 300mg (ABC/3TC 600/300mg), Bottle of 30	First Line Adult
Zidovudine/Lamivudine 300mg/150mg, Bottle of 60	Second Line Adult
Tenofovir 300mg /Lamivudine300mg (TDF/3TC 300/300mg), Bottle of 30	Second Line Adult
Atazanavir/Ritonavir 300/100mg, Bottle of 30	Second Line Adult

Lopinavir/Ritonavir 200/50mg, Bottle of 120	Second Line Adult
Darunavir 600mg, Bottle of 60	Third Line Adult
Ritonavir 100mg, Bottle of 30	Third Line Adult
Raltegravir 400mg, Bottle of 60	Third Line Adult
Zidovudine 60mg /Lamivudine 30mg /Nevirapine 50mg (ZVD/3TC/NVP 60/30/50 mg) Tablet	First Line Pediatrics
Abacavir 60mg /Lamivudine 30mg (ABC/3TC 60/30mg)	Second Line Pediatrics
Lopinavir 100mg/Ritonavir 25mg (LPV/RTV 100mg/25mg), Oral solution	Second Line Pediatrics
Determine Test Kit (Box of 100)	HIV Test Kit
Colloidal Gold Test Kit	HIV Test Kit
Male Condoms	Condoms
Female Condoms	Condoms

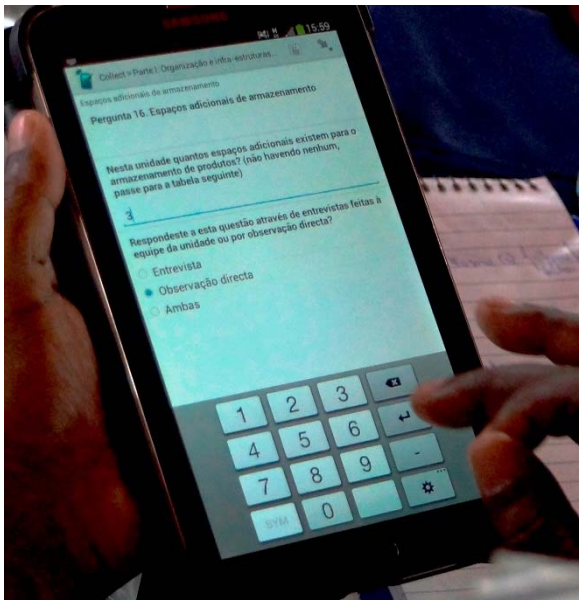
Data collectors collected data on the tracer commodities by reviewing stock cards, ledgers and/or the PIMS electronic system, to gain insight into commodity management and system performance over the previous six months (February to July 2016).

PRIMARY DATA COLLECTION

Prior to implementing the NSCA, the team members participated in a two-day training which included deep dives into the KPIs, CMM and data collection using Survey CTO on Tablets. Teams collected data using tablets and electronically submitted data on a daily basis.

Two of the NSCA evaluators downloaded and reviewed data submissions on a daily basis. Data were cleaned and issues identified were addressed through face-to-face conversations or via phone, also on a daily basis.

IMAGE 5: SURVEY CTO



Survey CTO is a mobile data collection tool that compatible with tablets or mobile phones. Survey CTO is an enhanced version of an open data kit (ODK), which is an open source platform for data collection. Analyses of the data are conducted separately, once data is downloaded using a data analysis tool of choice.

Tablets were selected for this assessment due to the relative size of the device, which was considered optimal for questionnaires, since they are lengthy and include a lot of text.

Five colleagues from the MOH were trained to collect data using the tablets and Survey CTO for CMM questionnaires and KPI data collection sheets. On the second day of the training, data collectors were assigned to one of three teams. Two of the teams assessed treatment sites, and the third assessed the central level. Data collectors from the central level were recruited for the central level team while regionally-based colleagues were selected to assess the selected treatment sites. Furthermore, treatment site MOH data collectors did not perform data collection in the region where they regularly work in order to reduce the potential for introducing bias.

The first day of data collection served as an extension of data collection training. All data collectors attended data collection at one health facility, taking the opportunity to become comfortable with the software and tablets as well as ask any questions as they arose. Three teams of three people visited 1-2 sites per day over a 6-day period. Teams were able to use the CMM and KPI forms on the tablets to record the requested data as well as the assessor's observations about the site, or important details gleaned during the interview, but not asked for directly in the form.

At each site, the team:
1. Interviewed managers, nurses, lab technicians and pharmaceutical officers using the CMM questionnaire(s). The questionnaires were used to assess the availability of non-expired medicines and commodities on the day of visit, identify site ordering procedures, record storage conditions, document expiries, cite transport and assess stock-outs over the previous 6 months. Interview results were verified by direct observation of the relevant supply chain space, such as a storeroom or warehouse.

2. Collected relevant KPI data for each functional area using monthly ARV (LMIS) reports for ARVs and lab products, PIMS, bin cards, and other data sources.

ANALYSIS AND RECOMMENDATIONS

The following section is organized by functional area, and it provides an overview of the results and recommendations within each section. For the purpose of presentation of results, all CMM scores are converted to a 0-100% scale rather than 1-5 scale.

Functional Maturity by Functional Area and Enabler

The graph below presents the average functional maturity scores for each CMM functional area by enabler, or the cross cutting organization elements such as: process and tools, management information, infrastructure, strategic planning and oversight, and human resources, which "enable" the capabilities in each functional area.

Summary Results

Capability Maturity Matrix Components

The table below presents the average scores for each CMM functional area by supply chain level collated from data or information collected from key informant interviews. The capability scores attempt to measure a functional area's potential to perform and identify areas for improvement. These scores are not measurements of success or failure, but rather resources available at the time of assessment.

Table 4: CMM scores by Functional Area - Central Level

Functional Area	CMM Score
Forecasting & Supply Planning (MOH)	54%
Procurement (MOH)	65%
Warehousing & Inventory Management (NHF)*	68%*
Warehousing & Inventory Management (NFPB)	63%
Transport (NHF)	59%
Waste Management (MOH)	63%
Laboratory Issuing (NPHL)	72%

*The Assessment team anticipates that the Warehousing and Inventory Management CMM score for NHF will change dramatically once the warehouse construction is complete. Therefore, this score should be viewed as a temporary one, since the NHF warehouse was under construction when data was collected

Image 6: NHF On-Going Construction

Construction is anticipated to be complete in the coming months. At this time, the assessment team understands that many of the recommendations made in this report are planned for the newly completed warehouse.

Table 5: Overall CMM scores at the Treatment Site Level

Facility	CMM Score
Health Centre Average	***47%***
Hospital Average	***61%***

Table 6: Central Level KPIs

Key Performance Indicator	KPI Score
Stock out rates (% of tracer commodities experience a stock out during the reporting period)	83%
Stock accuracy (%)	45%*
Total stock expired	27,209**
Vendor On-time Delivery (%)	97.6%

*Discrepancies between stock on hand and stock listed as available in the electronic database differed because the stock listed as available in the electronic database did not include product that had been ordered but not shipped. Once this discrepancy between the reporting system and the product on shelf is accounted for, stock accuracy is 100%.

**NHP in Jamaica sponsored a waste collection drive in April of 2016 during which time, over 27,000 items were collected and destroyed. This stock was not at the central level, but rather destroyed by the central level during the period assessed.

Table 7: Service Delivery Level KPIs

Key Performance Indicator	KPI Score
Up to date Bin card (%)	92%
Stock accuracy (%)	63%
Facility Reporting Rates: On Time (%)	56%
Total stock expired (quantity)	397 or 1.4%*
Emergency orders issued (%)	24%
Vendor On-Time Delivery (%)	62%
FStaff turnover rate (%)	26%

*Expiries at the site level were calculated using consumption for May, June and July as the denominator, and the quantity of expiries found at the site level (397) during the assessment as the numerator.

OBSERVATIONS

FORECASTING AND SUPPLY PLANNING

Table 8: Overall Forecasting and Supply Planning CMM and KPI Scores

Overall Forecasting and Supply Planning: CMM & KPI Scores	
Capability Maturity Score	54%
Key Performance Indicator	
Forecast Accuracy	N/A

Table 9: Forecasting and Supply Planning capacity by enabler

Forecasting and Supply Planning	Avg.	%
Process and Tools	2.5	50%
Management Information System	4.0	80%
Infrastructure	3.0	60%
Strategic Planning & Oversight*	N/A	N/A
Human Resources	2.5	50%

An HIV forecast was recently completed with the support of the Global Fund, using the CHAI excel-based forecasting tool, the ARV Procurement Forecasting Tool. Unfortunately, previous forecasts were not available at the time of the assessment, therefore, the forecast accuracy KPI could not be calculated, but CMM data was still collected. Since the GoJ did not implement the forecast, the strategic planning and oversight enabler was not included in this assessment. Within the GoJ, the Treatment Care and Support (TCS) Unit is responsible for the forecast. All computers and software used for forecasting and supply planning are maintained and supported by the Government entities utilizing them – NHP, NHF, MOH. Forecasting assumptions were unavailable during the assessment. The TCS liaises with the Procurement Unit and the NHF to ensure that the correct orders are placed according to the forecast.

Data regarding stock on hand, estimated new cases, and consumption by pharmacies and the National Health Fund (NHF) were included to inform forecasting decisions and assumptions. The NHF provides stock management and dispatch reports on a monthly basis, and pharmacy reports are aggregated using Excel. The official supply plan in place for HIV commodities scheduled was intended to have annual shipments of first-line commodities and staggered shipments of low-use products, but often had several shipment of first-line commodities.

When short on stock, the TCS Unit is notified and it requests additional funding from the Government. Often this request results in a new, emergency, procurement. A supply planning data collection process is in place and is captured in an Excel document that has the needed time in place and estimates the lead time for each step in the procurement process. However, monitoring lead times, and shipments is done in an ad-hoc manner and not according to existing standard operating procedures (SOPs).

The CMM identified that the three greatest challenges for Jamaica in the area of forecasting and supply planning are: Strategic Planning and Oversight, Human Resources, and Processes and Tools. Future HIV and AIDS forecasts should follow the lessons learned from the previous forecast with regard to data collection, as access to data is one of Jamaica's greatest strengths.

To ensure the greatest forecast accuracy possible, future forecasts ought to continue the past processes of: validating the data provided in the site-specific ARV monthly reports and incorporating the health, morbidity and mortality data received by the MOH, NHF, and the NHP as well as the real-time data collected in PIMS, while estimating demand to account for stockouts experienced at the facility level. To address the weaknesses in Processes and Tools, quarterly forecast and supply plan reviews should be codified in a forecasting and supply planning SOP, which would result in procurement adjustments as needed. The Human Resource weakness identified in the CMM was not due to a lack of training, but rather due to a lack of people. If possible, following the new forecasting and supply planning SOP should be included in the job descriptions of several new staff members and must include liaising across the GoJ to ensure timely funding availability as well as procurements. Since a forecast from a year or more ago was not available, forecast accuracy could not be calculated; however, to address weaknesses in Strategic Planning and Oversight, the TCS unit should begin to track forecasting and supply planning utilizing standardized KPIs, accepted by all stakeholders. The results of the regular KPI analysis should be reviewed routinely and the results shared with decision-makers to increase awareness and mandate continuous quality improvement of the forecasting and supply planning activities.

FORECASTING & SUPPLY PLANNING CHALLENGES AND RECOMMENDATIONS SUMMARIZED

Challenges

- Lack a recently updated forecast and supply plan with a lack of people that felt responsible for either.
- Lack of forecasting and supply planning performance tracking
- No existing SOP or tool to do forecasting and supply planning

Recommendations

- Update the forecast and supply plan quarterly, if possible hire a person who can have this as part of their job description.
- TCS should begin to track forecasting and supply planning with KPIs and routinely share the result.
- Develop a forecasting SOP then adopt a tool for forecasting and supply planning, allowing quarterly updates.

PROCUREMENT

Table 10: Overall Procurement CMM and KPI scores

Procurement: CMM & KPI Scores	
Capability Maturity Score	65%
Key Performance Indicator	
Vendor on-time delivery	97.6%

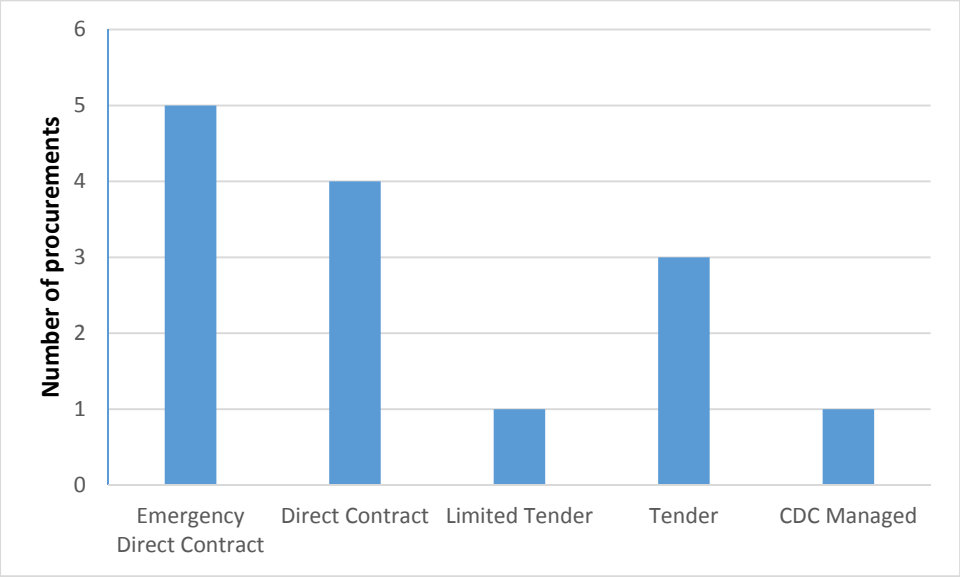
Table 11: Procurement capacity by enabler

Procurement	Avg.	%
Process and Tools	3.5	70%
Management Information System	2.3	46.7%
Strategic Planning & Oversight	3.5	70%
Human Resources	4.0	80%

Procurements can be started in two ways: 1) an open procurement where any entity can respond and 2) a procurement that solicits bids from specific, pre-approved vendors. Vendors for health commodities, specifically ARVs, are pre-approved based on The Global Fund's guidance on ARV procurement.

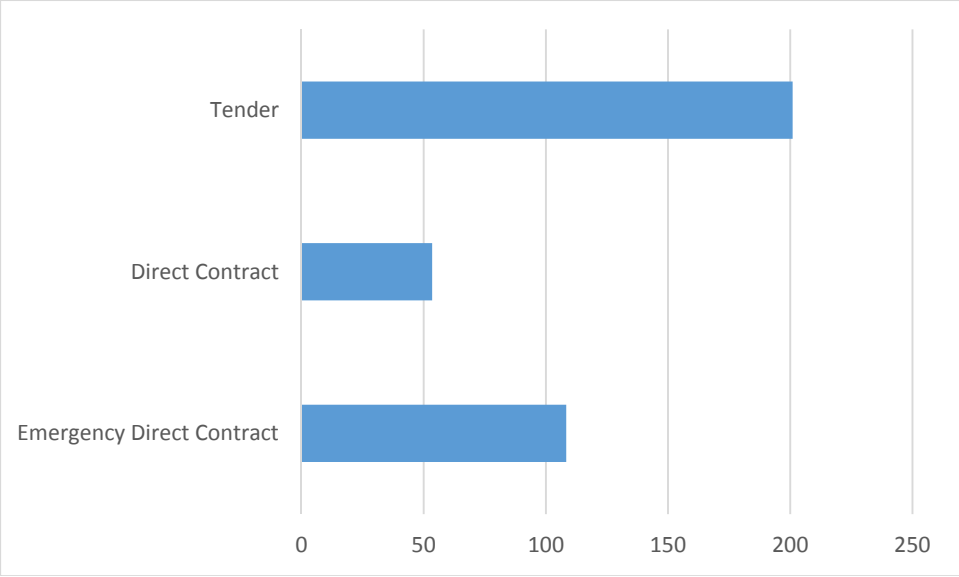
The GOJ procurement guidelines lay out levels of approvals based on value. Tenders over $40 million require cabinet approval. Tenders under $40 million do not require cabinet approval, and are assessed by the evaluation, procurement, and National Contract Commission (NCC) committees. Tenders under $17 million are reviewed by the evaluation and procurement committees. The process of procurement approval can take up to 6 months or more for awards of greater than $40 million. Lead times for suppliers range from 3 weeks to a maximum of 16 weeks, meaning that from the time an annual procurement is submitted to the Evaluation Committee to the time when the products arrive at NHF the timeline can be as long as 10 months (6 months to make the award and 4 months lead time from suppliers). This extended timeline for tender review often necessitates small emergency orders to avoid stockouts at the facility level. In fact, emergency orders are the most frequent type of procurement used in Jamaica during the year reviewed (and for which data were available; it excludes data from products procured with Global Fund money).

Figure 1: Type of procurement



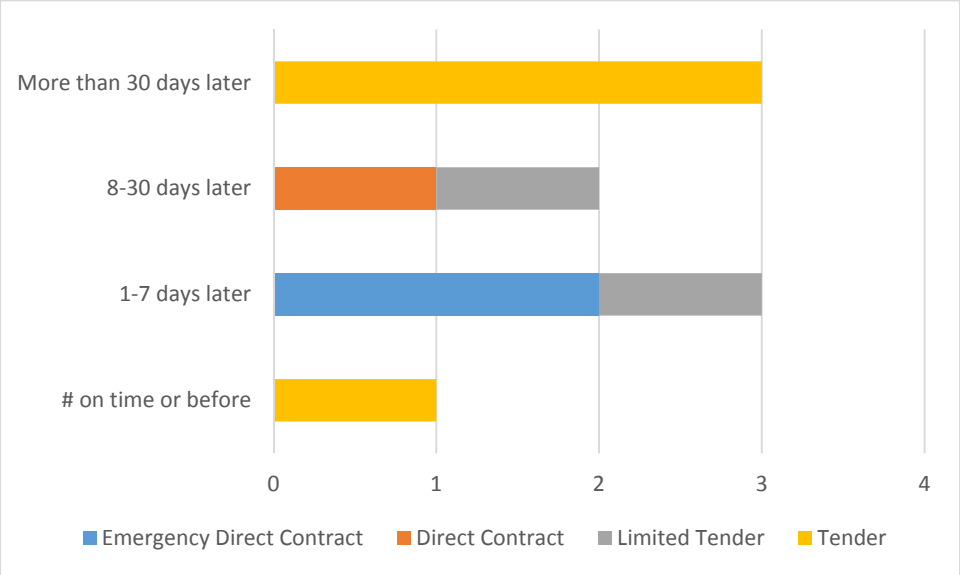
This is not surprising when considering the time associated with approval of each type of procurement. Considering only the internal process to approve a procurement an emergency order is half the time while a direct contract is a quarter of the average time for a regular tender.

Figure 2: Average days from procurement start to purchase order



A contributing challenge to streamlining the procurement process is the lead-times from award to product arrival at the NHF. This also varies by procurement type, but only regular tenders were a month or more late 75% of the time. Emergency orders were the most successful arriving a week or less late compared to the agreed delivery date.

Figure 3: Days late compared to agreed delivery date



Product specifications are updated annually for all GOJ-procured products and include unit costs and pack sizes. All ARV formulations procured by the GOJ have been approved by The Global Fund and the WHO through the treatment guidelines. The NPHL provides specifications for lab commodities, including test kits and reagents, but few specifications are in place for lab equipment components. Lab commodities, including sundries, are subject to the GOJ regulations and vendor registration on the National Contract Commission's (NCC) list. Registration on the NCC list is based on factors including lead times, price, and meeting specifications. Once a vendor is on the NCC list, it is invited to respond to quotes for the pre-approved products requested. This process leads to a challenge. Often, manufacturers are unwilling to respond to some of Jamaica's smaller orders, largely for second and third line ARVs, which are consumed in small quantities nationally. Thus, while Jamaica may issue a tender for these products, and procurement staff may approach manufacturers to procure them, the manufacturers may not respond to these requests because the quantity is not large enough to positively affect their financial bottom line.

When there is a public tender, where all are welcome to bid, each offer is checked to ensure that they meet all of the GOJ-required criteria. Only those that meet criteria advance to the evaluation committee, which is comprised of seven or eight members. The Evaluation Committee members are recruited and have other responsibilities, which membership on the Evaluation Committee takes them away from. Thus, while they complete the responsibilities assigned under the Evaluation Committee, their normal tasks go uncompleted. For this reason, the Evaluation Committee tries to work around the schedule of the members, which can cause delays in bid review, and, ultimately, the procurement itself is often delayed.

Internal controls to provide checks and balances are in place and well documented. Once the Evaluation Committee completes their review and submits the documentation supporting the tender then the Procurement committee evaluates whether the procurement process was followed properly. The Procurement Committee: explains the decision of the tendering type,

determines if the response time was sufficient, and assures that the right documents were used to assess the offers. The tender is not assembled by the Procurement Committee, but rather it is evaluated. Procurement and payment decisions are separated to avoid a conflict of interest. The Procurement Committee must include persons appointed by the Permanent Secretary. Committee members verify the submission and re-submit the procurement to the Permanent Secretary for review or approval depending on value. After the Permanent secretary's review, a notification of award can be sent to the selected supplier and a contract issued.

There is a procurement appeals process. Adequate appeals mechanisms exist and are included in tender documents. Appeals can be filed with the permanent secretary or Ministry of Finance to protest a decision. Complaints can also be lodged on the NCC website. The tenderer may also write to the auditor or contractor general to seek legal recourse or enforcement of procurement guidelines.

The procurement process is well documented and transparent. SOPs for procurement of health commodities are in place, and training on the SOPs is provided twice a year. Updates to SOPs take place across all levels of government, and minor changes are disseminated promptly. The SOPS detail what type of information should be included in a request for proposals (RFP). A records management system is in place with SOPs. Each bid has its own file. All corresponding documentation rests in this bid file. Paper and electronic files are maintained. Computers are available to all who participate in the procurement process.

The tendering process includes sole sources, limited tender, and international competitive processes. Tenders are advertised in the national newspaper and online on the website. Bid validity is normally between 120 to 180, meaning that if a regular tender averages over 200 days, any bid submitted would no longer be valid at the time a decision is made. Bid security must be included as a total value of the bid. Minimum documentation includes manufacturer's authorization, certificate of analysis, registration in Jamaica, and a banker's guarantee.

A quality assurance process for lab commodities was being drafted at the time of data collection. This quality assurance process will include the use of an external lab (KABS in Canada) in lieu of the NPHL. Presently, physical inspections of all shipments, regardless of the commodity, are conducted, and stock that does not meet standards is returned, and replacements are requested.

The NHF or MOH applies for the import permits. Tax exemption is in place for health products. The Supplier is sent a schedule for deliveries, which can also be on a staggered schedule. The average customs clearance is about 2 weeks. In instances where a vendor delay affects product accessibility, the second best supplier will be called upon.

Audits are conducted annually under The Global Fund grant, and some attempts were made to implement recommendations. The GOJ also conducts random audits. Internal controls exist. Internal processes are documented in the operations manual for grant funds. Ethics requirements are detailed in tender Documents and are based on GF and USAID guidelines. A staff person dedicated to health tenders is based at the contractor general's office and may randomly audit tenders. External audits occur under the GF grant. An audit report is required

after each mandated period. Recommendations suggested by the GF in the audit report are applied as much as possible.

PROCUREMENT CHALLENGES AND RECOMMENDATIONS SUMMARIZED

Challenges

- Procurement regulations lead to long lead times (Example: TLE procurement started in June 2015 was delivered in January 2016)
- Procurement lead times and less frequent shipments often lead to central level stock outs, which contribute to site level stock outs.
- Regular tenders are the most frequently late orders, while emergency, limited orders or direct contract orders are more frequently on time.
- Quantities of second and third line drugs are insufficient to have purchasing power with suppliers

Recommendations

The GoJ follows most best practices with regard to procurements. Recommendations to improve this good performance are the following:

- Use a procurement service agent (PSA) to increase purchasing power
- Analyze 2016 data (lead times and price) using KPIs to compare to WAMBO data and determine how a PSA could benefit Jamaica for specific products.
- Use this analysis to lobby stakeholders for use of a PSA for future small procurements.
- Create a standardized method to proactively monitor forecasting, supply planning and procurement
- Proactively manage data to drive timely decision-making
- Include KPIs such as procurement lead times and consumption rates
- Institute a system to monitor and evaluate the procurement process, using standardized KPIs, such as procurement lead times, consumption rates, on-time delivery and cycle time, enabling all parties involved to do continuous quality improvement.
- Establish a vendor performance management system also using KPIs.
- Begin tracking commodity pricing, as compared to the International Drug Price Indicator Guide (the PIG) then incorporate this practice into vendor qualification.
- Decrease the time required for internal tender evaluation (now up to six months) by selecting Evaluation and Procurement committee members who can block off sufficient time to review all proposals without breaks between reviews. Likewise, adding occasional Evaluation or Procurement Committee member to the job descriptions of colleagues may also prioritize undivided dedication.
- Empower the Permanent Secretary to approve procurements of higher value in an effort to reduce the time between RFP and award.
- Increase shipment frequency to the NHF, to decrease central level stockouts (see Warehousing and Inventory Management section).

WAREHOUSING AND INVENTORY MANAGEMENT

Table 12: Overall Warehousing and Inventory Management Scores

Warehousing and Inventory Management: CMM & KPI Scores	
Capability Maturity Score	68%
Key Performance Indicator	
Stock out rates (% of tracer commodities experience a stock out during the reporting period)	38%
Stock accuracy (%)	45%
Total stock expired (quantity)	27,606*

*This is the sum of all expired drugs collected for destruction in April 2016 (27,209) and those found at sites during the assessment (397).

Table 13: Warehousing and inventory management capacity by enabler

Warehousing and Inventory Management	Avg.	%
Process and Tools	3.4	67.1%
Management Information System	4.0	80%
Infrastructure	3.5	70%
Strategic Planning & Oversight	3.2	63.3%
Human Resources	3.9	77.1%

Central Level

The findings in this report are presented with a large caveat, which is that the central level warehouse scores will change soon, as the warehouse is currently under construction. Once construction is complete, most of these scores are expected to change, most likely improve, provided that plans, as they were described during data collection, are followed. Therefore, the scores at the central level should be accepted as temporary scores, which will change in the near future.

As a security check, the customs clearance team does a thorough check of stock against the invoice before it is officially received by the NHF. If a discrepancy is noted, the purchasing department is contacted before the goods can be accepted. After the count is done, the quantity is entered into the warehouse management system (WMS).

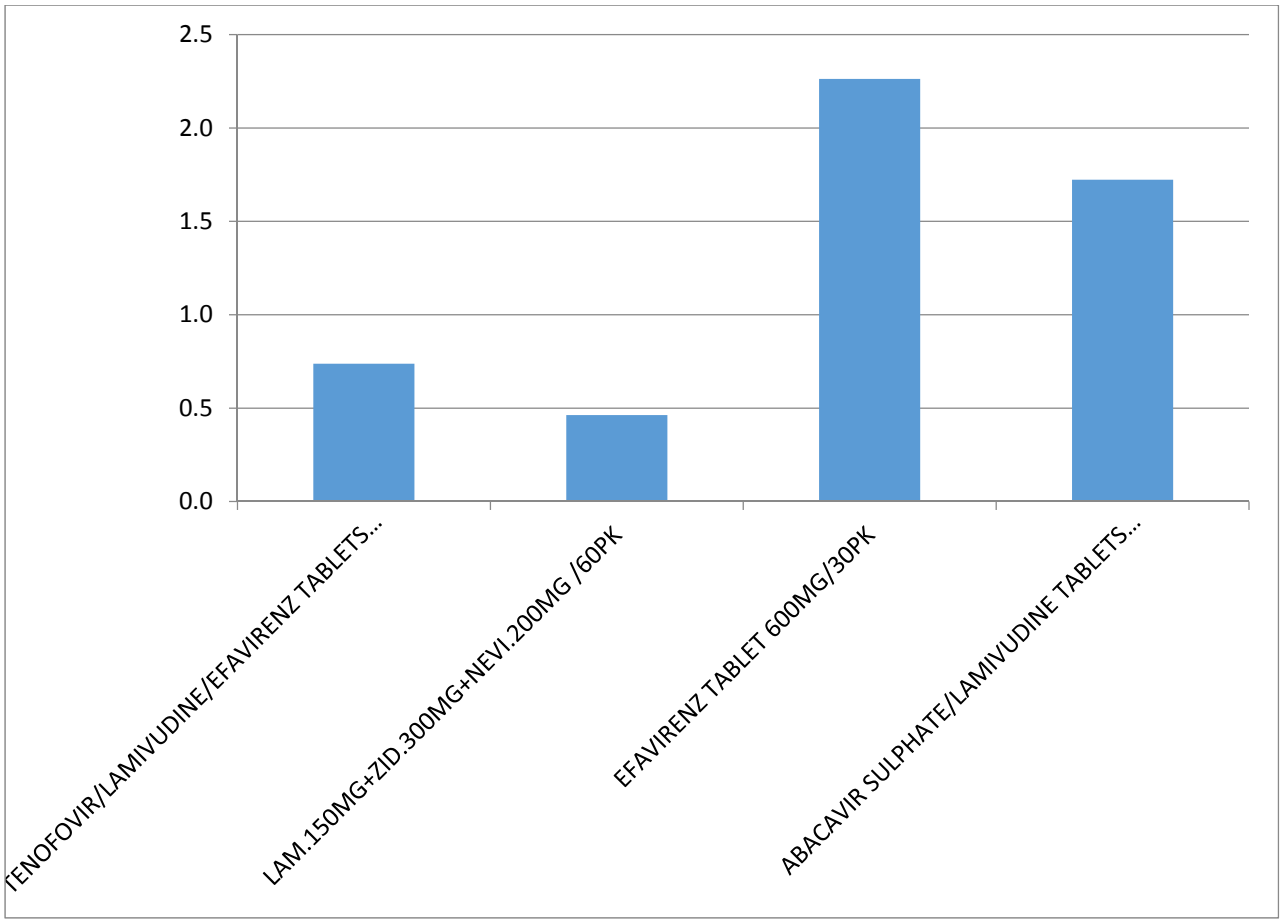
During construction, the NHF has utilized every available inch to store products as safely as possible. However, the current storage space is not sufficient. Most products are kept in the existing hallway on pallets. Boxes are stacked precariously high and the air conditioning for the hallway was broken on the day of visit. There is an understanding of proper put-away practices, but, based on the construction, the NHF does not have enough room to follow those practices. The put-away function always follows the First-Expired, First-out (FEFO) principle.

Image 7: Storage hallway at the NHF during construction

Inventory management is electronic using Great Plains as the WMS, but the tender process is underway to replace Great Plains. Barcoding is not included in the current WMS, but is part of the requirements for the new WMS.

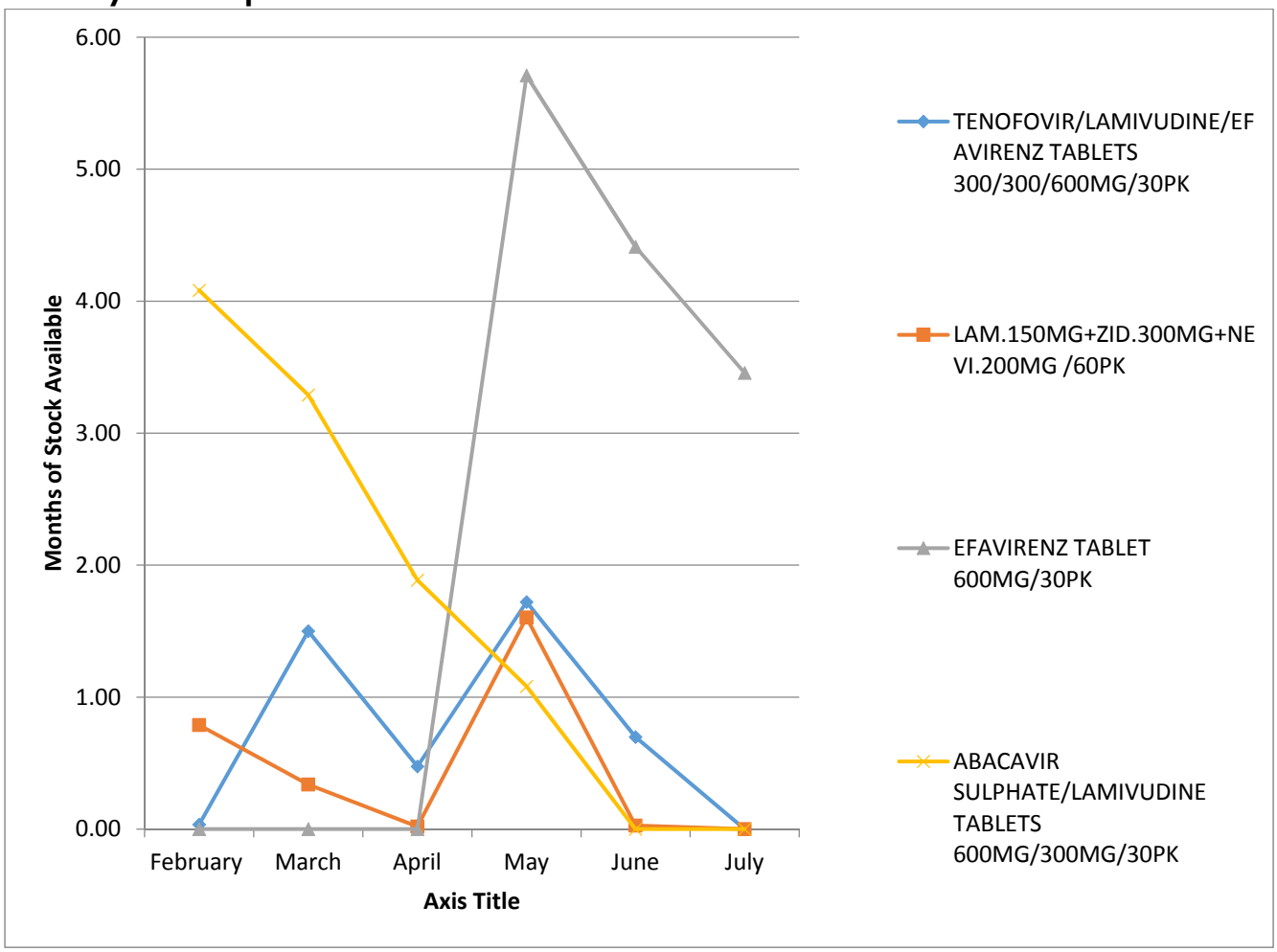
Lot and expiry dates are monitored in the WMS, and the software generates the pick list, using the expiry date as a selection criterion. Items are stored to be accessible; however, they are not divided into fast movers and slow movers (ABC). This may be due, at least in part, to the fact that many products are quickly consumed in Jamaica. The average number of months of stock at the beginning of the month was lower than one month of stock for two of the most commonly used first line ARVs. Meaning that, on average, even with frequent shipments, the NHF was risking stocking out of many commodities every month.

Figure 4: Average number of months of stock available at beginning of month at the NHF (Feb - July) First line ARVs



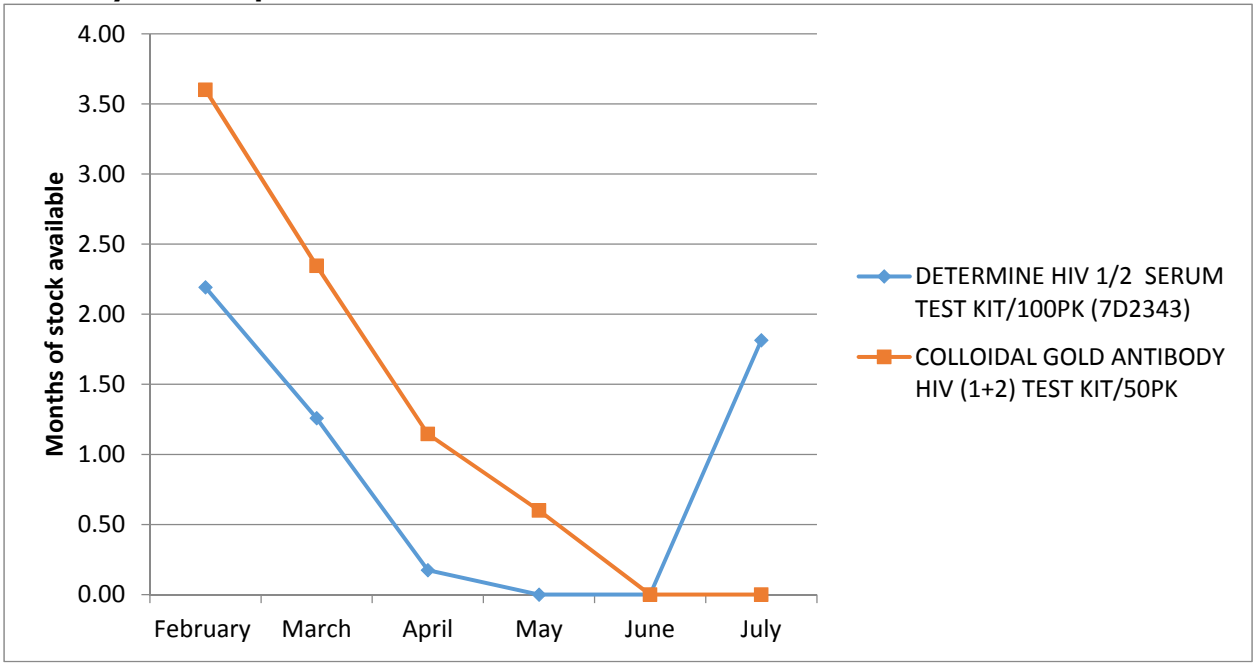
The problem becomes more pronounced if the relationship is examined over time. May was the only month during the six months examined when there was not a stockout of one of the first-line ARVs. Moreover, during the six-month period, there was never time when the two highest use formulations had at least two months of stock on hand.

Figure 5: Stock at the beginning of the month at the NHF divided by average monthly consumption for First-Line Adult ARVs



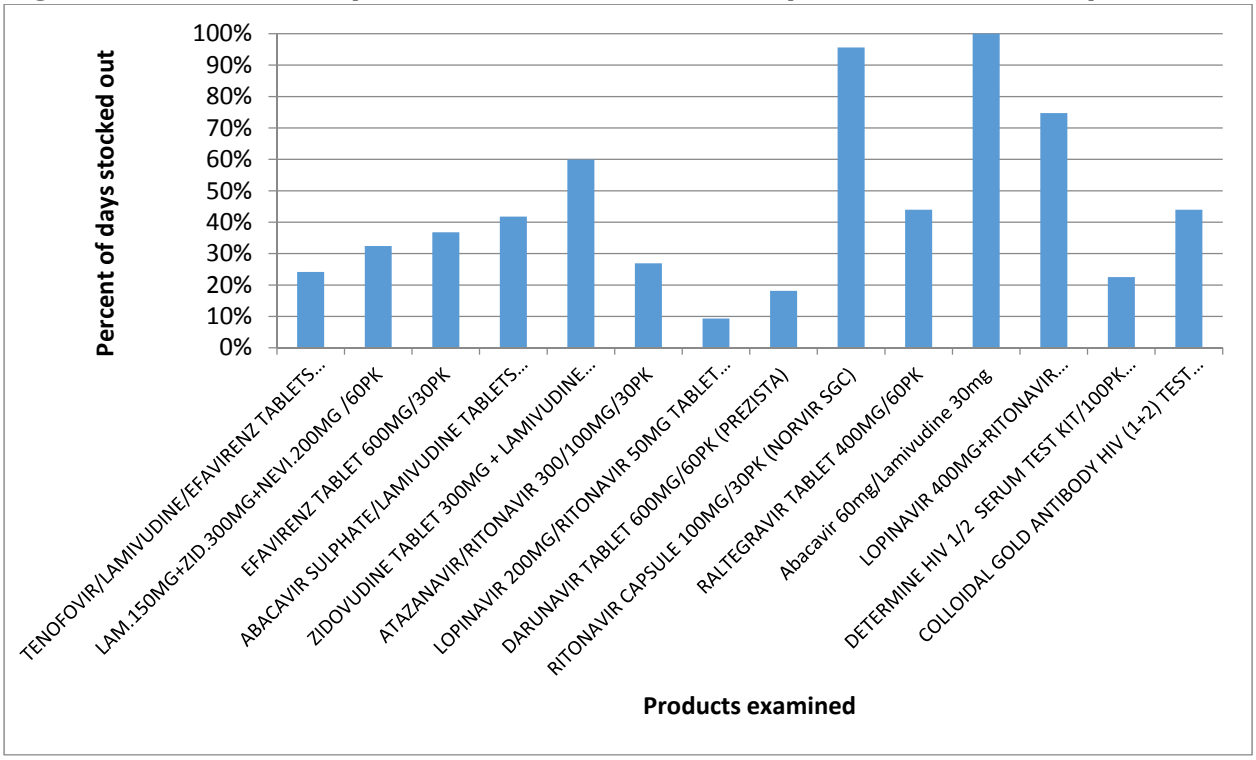
A somewhat similar relationship exists for HIV Rapid Test Kits (RTKs), although RTKs received fewer shipments during the period examined. Jamaica received one shipment of Determine RTKs during the period examined, which pulled the central level out of a two-month stockout. Similarly, a central level stockout of Colloidal Gold started in June and continued through data collection in early September. Despite the recent shipment of Determine, both products were stocked-out on the day of data collection at the central level.

Figure 6: Stock at the beginning of the month at the NHF divided by average monthly consumption for HIV RTKs



Another metric that illustrates the velocity of product use in Jamaica is that while Jamaica received frequent shipments of most commodities, the majority of the tracer commodities still experienced a central level stockout. Thus, more shipments are required to avoid stockout. The only tracer commodities that did not incur a stockout at the central level were: male condoms, Tenofovir/Lamivudine Tablets 300/300MG/30PK, and Zidovudine 60mg /Lamivudine 30mg /Nevirapine 50mg.

Figure 7: Percent of Days Stocked Out at the NHF by Tracer Commodity



At the very least, the tracer commodities included above were stocked out 10% of the days in the six month period (Lopinavir 200mg/Ritonavir 50mg) and at most one product (Abacavir 60mg/Lamivudine 30mg) was stocked out 90% of the days considered.

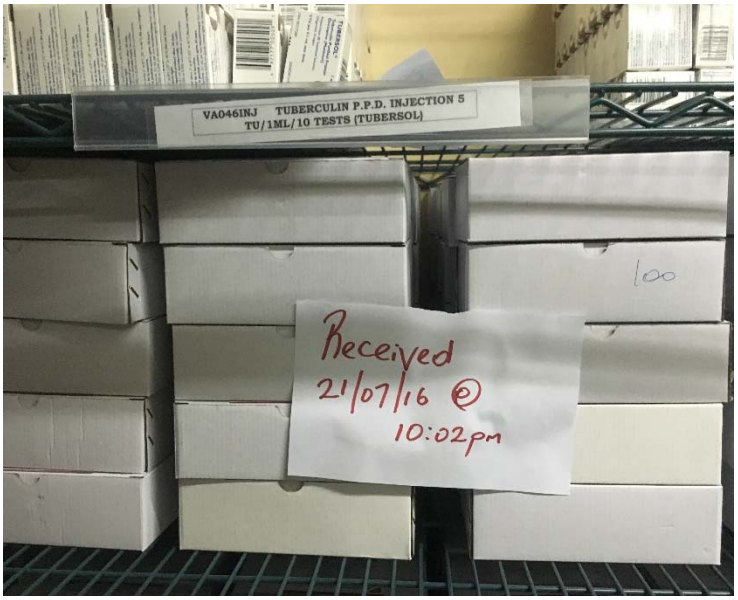
The majority of products that were assessed at the central level either experienced a stockout during the assessment period, or they were close to stocking out according to the historic data. The only outlier to this rule was the first-line pediatric regimen, Zidovudine 60mg /Lamivudine 30mg /Nevirapine 50mg (ZVD/3TC/NVP 60/30/50 mg) tablets, which had over 480 months of stock. This is a unique situation in an environment, which normally relies on strategically timed shipments considering the storage space available and consistent national consumption. At the time of the assessment, the average monthly consumption of Zidovudine 60mg /Lamivudine 30mg /Nevirapine 50mg (ZVD/3TC/NVP 60/30/50 mg) tablets was only 13 packs per month while the NHF was holding over 7300 packs of the same product. This situation represents a challenge for Jamaica on many fronts: storage space, prescriber practice, and future waste destruction. This product occupied scarce storage space that faster moving products like adult first line treatment or even test kits could have occupied. Prescribers are possibly unaware that this product is available, or they prefer to utilize the more bulky pediatric ARV syrups. Regardless, prescribers should be notified and encouraged to utilize this product. Since the product expires in May of 2017, Jamaica should investigate donating some of it to another country that will be able to consume it while also ensuring that a local waste disposal option is available to destroy what cannot be consumed. The resources associated with procuring and storing the syrups, which are used for the same population, are being inefficiency used; resulting in lost funds, storage space, and time, especially considering the pressure on the procurement system.

The NHF is preparing to be ISO certified by early next year. There has been an audit of the processes done by an ISO auditor and the NHF has sought outside assistance from the private sector (Grace Kennedy) to ensure their application for certification is successful. A risk management committee continuously reviews risks. PriceWaterhouseCooper did a risk review several years ago that the NHF has used, is updating, and is using to classify the risks and developing responses. The NHF generates service level reports that detail low stock or out-of-stock commodities at the NHF. There are targets for service level indicators, which were developed by reviewing internal and external operations to set a viable target. Each division owns certain KPIs, which are reviewed quarterly. Process owners also review performance within their processes then appraise their colleagues on the findings. Corrective actions are in place for KPIs. There is a five-year strategic plan, which includes the KPIs, and targets are reviewed annually. The five-year operational plan is aligned with MOH goals. All staff are viewed as contributors towards achieving the targets set.

Related to ISO certification are the very comprehensive SOPs developed and used by NHF, which are in place and continuously updated. Revision number, dates and original issue are all documented. Each staff member, particularly each process owner, receives the updated SOP related to his or her process. Process managers are part of the SOP updating process. It is the process owner's responsibility to train staff on the updated SOPs. On-the-job training, in-house workshops and off-site workshops are available. The core competencies needed for each position were available during data collection but revisions were being made to ensure that position descriptions were ready for the new warehouse.

The SOPs include processes regarding returns from the facility level. Returns from facilities happen very infrequently. However, if the products are in good condition and within shelf-life, they are returned to circulation, following a similar put-away process to the one used when new products are received, and using FEFO as a guide. This process does not apply for products that require cold chain. Cold chain returns are not returned to circulation, but rather isolated for destruction. Images 8 and 9 show cold room storage at the NHF.

Images 8 and 9: Cold Rooms Door with temperature report and cold supplies within on the shelf at the NHF



The NHF's cold chain consists of four cold rooms and two cool rooms. Products within are carefully labeled and put away, identified by the product, the date and time received and are organized by FEFO.

Generators are checked once a week, and service is conducted regularly. The cold room is temperature-monitored, and staff are alerted if the temperature falls outside of the acceptable range. Cold rooms are carefully labeled with guidance for staff and temperature logs.

There are currently 20+ stock keeping units (SKUs), and SKUs are counted monthly. Inventory officers print a particular report and give the inventory balance at a particular date. If a stock adjustment is needed, an auditor investigates and approves the adjustment with recommendations for future process improvements. External audits are done annually, and the implementer is determined through a tendering process. GFATM conducts their own audit annually. The MOH also sends auditors monthly to do stock counts. Expirations are managed through an expiry report, run every 6 months to determine what will expire and when. The inventory officer then writes up a stock adjustment form and removes expired stock from the stock inventory system and the item is meant to be placed in a quarantined area. Due to space constraints, some parts of the existing hallway storage is utilized for expired product. These expired products are labeled and often wrapped with plastic to ensure that they are separated from usable product.

General cleaning of the warehouse is done every two weeks. NHF utilizes a team of NHF staff who have cleaning as part of their job description. Pest control also has a schedule and is done at the end of every month. SOPs for cleaning are available and they detail which cleaning chemical to use and where.

The safety officer/facility manager keeps safety logs, and the necessary safety equipment is present. Security guards are posted at the gate, and bars protect the windows. Closed circuit TV is available. Panic buttons are also present. Locks are present on doors, and staff require ID cards to get in and out of the building.

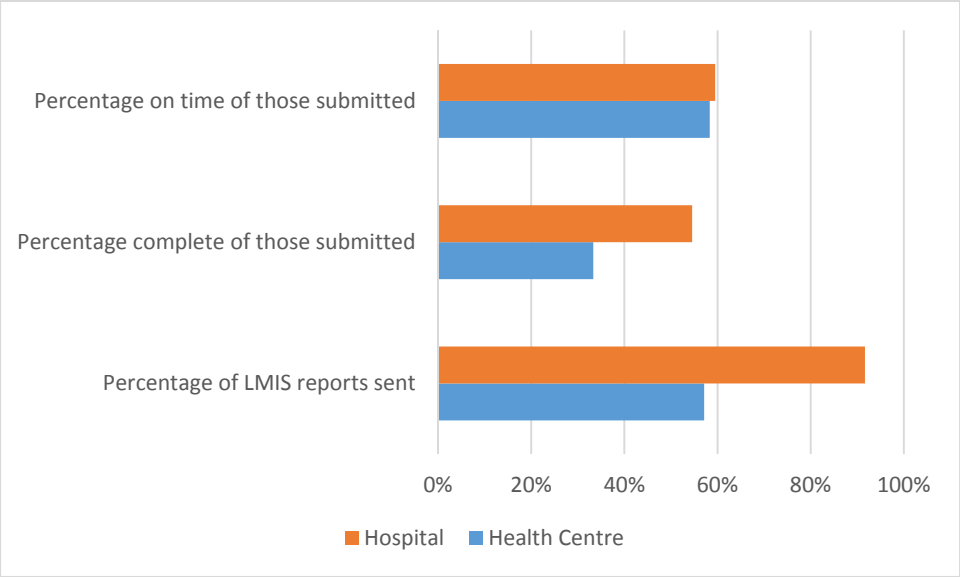
The dangerous drug officer manages dangerous drugs, and narcotics are kept in a vault. There are internal and external audits of these drugs, and the warehouse manager is licensed to handle narcotics. Likewise, hazardous/flammable products are stored in a separate room that is only accessible from outside the warehouse. Standards for handling these products are being reviewed due to a new policy.

Inventory officers fill orders on a first come first serve basis, while taking into account the delivery schedule. Orders received and pick lists are generated from WMS. The items are picked and then double-checked against the pick list by the Warehouse manager. When an order is picked, three checks are performed to ensure that lot/expiry dates are correct. An inventory officer, a senior officer, and a security guard using the gate pass as a guide, perform checks to ensure that lot/expiry dates are correct.

Facility Level Analysis

Health centers and hospitals send orders to the NHF or the NHP exclusively electronically. This represents an advance in capability, but did, in some cases, made data collection more challenging, as some sites could find the electronic record while others could not. Overall, hospitals reported data more frequently than health centers. However, once these data were disaggregated into on-time reporting and complete reporting the difference between the two types of sites and the quality of reports submitted was not as stark.

Figure 8: LMIS reporting by health centers and hospitals



One reason for the disparity between reports submitted by health centers verses reports submitted by hospitals may be explained by the presence of the PIMS system. Sites with PIMS are larger hospitals and the ability to report electronically, over the PIMS system. PIMS

participants often reported to data collectors that PIMS could be cumbersome and some felt that while it made reporting easier it took them away from their work dispensing to patients. Moreover, data collectors witnessed some PIMS participants struggling to utilize PIMS effectively, having difficulty pulling their own data and experiencing frustration. This represents a system-wide challenge, particularly if PIMS is rolled out to more sites. Finally, one PIMS participate seemed to have mastered the system, saying that she had made it her business to do so as she felt it would enable her to improve within her job performance. This type of individual would be an excellent PIMS champion.

Another reason for the report disparity between health centers and hospitals could also be explained through the supply chain map (page 9 of this report). The flow of products between pharmacies, hospitals and health centers is frequent and represents a substantial risk mitigation strategy to avoid stock outs and patients going off their prescribed regimen. In fact, based on proximity and relationships, some facilities may more readily reach out to each other before ordering from the central level. Moreover, stock transfer records, particularly for RTKs, would indicate that many larger sites order for themselves and for the sites around them. Data collection teams documented hospitals and large health centers ordering and receiving large quantities of RTKs (40 packs of 100 RTKs) and distributing through facility or privately owned vehicle 35 of the 40 packs to six or more different facilities within a few days of receipt.

This informal system of supplying or borrowing stock may have mitigated some of the downstream effects of the central-level stock-out of numerous commodities. The first step to determining stock out rates was to determine if the facilities carried each of the tracer commodities. Thus, data collectors asked each facility if they carried each tracer drug. Not surprisingly, all of the sites reported that they carried the most common treatment medications; however, the first and second line pediatrics and all of the adult third-line ARVs were significantly harder to find, and in the case of two second line pediatric, impossible, as it was not managed at any of the facilities visited. The lowest results are highlighted in the table below.

Table 14: Management of Tracer Commodities

Tracer Products	Percent of Facilities Managing	Commodity Type
Abacavir 600mg/Lamivudine 300mg (ABC/3TC 600/300mg), Bottle of 30	91%	First Line Adult
Abacavir 60mg /Lamivudine 30mg (ABC/3TC 60/30mg)	0%	Second Line Pediatric
Atazanavir/Ritonavir 300/100mg, Bottle of 30	100%	Second Line Adult
Colloidal Gold Test Kit	91%	HIV Test Kit
Darunavir 600mg, Bottle of 60	36%	Third Line Adult
Determine Test Kit (Box of 100)	91%	HIV Test Kit
Efavirenz 600mg (EFV 600mg) Bottle of 30	100%	First Line Adult
Lopinavir 100mg/Ritonavir 25mg (LPV/RTV 100mg/25mg), Oral solution	0%	Second Line Pediatrics

Lopinavir/Ritonavir 200/50mg, Bottle of 120	100%	Second Line Adult
Raltegravir 400mg, Bottle of 60	18%	Third Line Adult
Ritonavir 100mg, Bottle of 30	36%	Third Line Adult
Tenofovir 300mg /Lamivudine300mg (TDF/3TC 300/300mg), Bottle of 30	100%	Second Line Adult
Tenofovir 300mg/Lamivudine 300mg /Efavirenz 600mg (TDF/FTC/EFV 300/300/600mg), Bottle of 30	100%	First Line Adult
Zidovudine 300mg /Lamivudine 150mg /Nevirapine 200mg (ZVD/3TC/NVP 300/150/200 mg), Bottle of 60	100%	First Line Adult
Zidovudine 60mg /Lamivudine 30mg /Nevirapine 50mg (ZVD/3TC/NVP 60/30/50 mg) Tablet	18%	First Line Pediatric
Zidovudine/Lamivudine 300mg/150mg, Bottle of 60	100%	Second Line Adult

Stockout data from the day of visit show that there is still a challenge in getting the commodities to the treatment sites, particularly for adult third line treatments. Moreover, none of the sampled sites managed second line pediatric commodities, making those products harder to find.

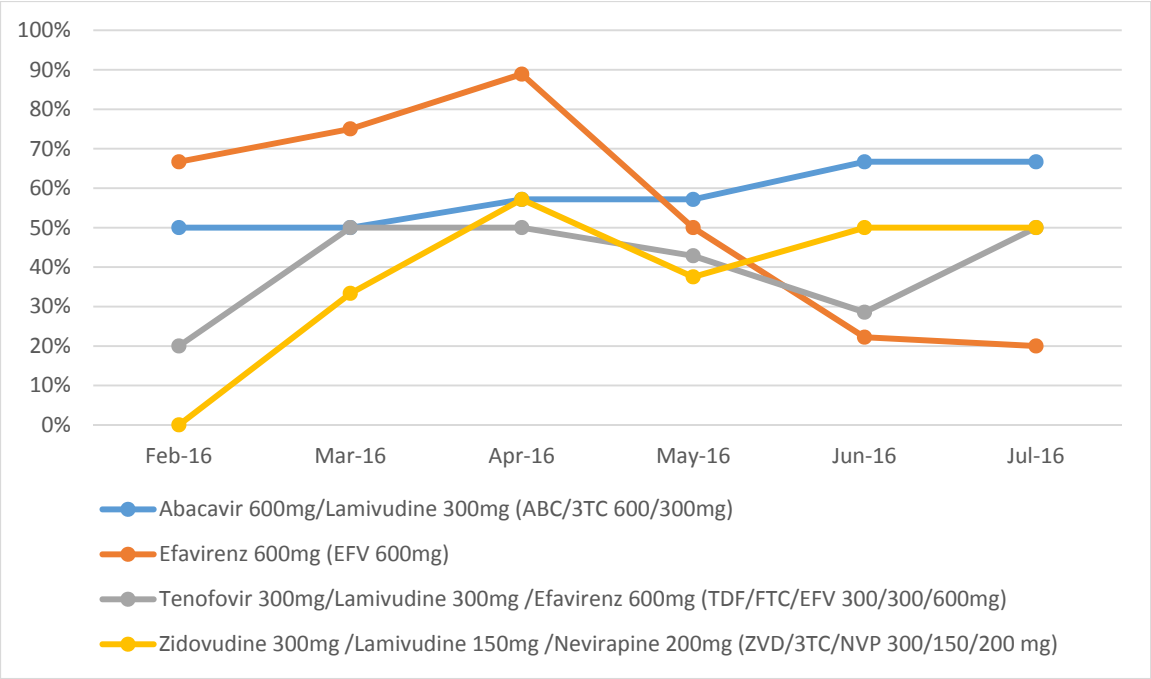
Table 15: Stock outs on the day of visit by tracer commodity

Tracer Products	Percent Sites Stocked-Out	Commodity Type
Abacavir 600mg/Lamivudine 300mg (ABC/3TC 600/300mg), Bottle of 30	60%	First Line Adult
Abacavir 60mg /Lamivudine 30mg (ABC/3TC 60/30mg)	*Not Managed in Sample*	*Second Line Pediatric*
Atazanavir/Ritonavir 300/100mg, Bottle of 30	0%	Second Line Adult
Colloidal Gold Test Kit	38%	HIV Test Kit
Darunavir 600mg, Bottle of 60	0%	Third Line Adult
Determine Test Kit (Box of 100)	13%	HIV Test Kit
Efavirenz 600mg (EFV 600mg) Bottle of 30	0%	First Line Adult
Lopinavir 100mg/Ritonavir 25mg (LPV/RTV 100mg/25mg), Oral solution	*Not Managed in Sample*	*Second Line Pediatrics*
Lopinavir/Ritonavir 200/50mg, Bottle of 120	0%	Second Line Adult
Raltegravir 400mg, Bottle of 60	100%	Third Line Adult
Ritonavir 100mg, Bottle of 30	100%	Third Line Adult
Tenofovir 300mg /Lamivudine300mg (TDF/3TC 300/300mg), Bottle of 30	55%	Second Line Adult
Tenofovir 300mg/Lamivudine 300mg /Efavirenz 600mg (TDF/FTC/EFV 300/300/600mg), Bottle of 30	18%	First Line Adult
Zidovudine 300mg /Lamivudine 150mg /Nevirapine 200mg (ZVD/3TC/NVP 300/150/200 mg), Bottle of 60	27%	First Line Adult

Zidovudine 60mg /Lamivudine 30mg /Nevirapine 50mg (ZVD/3TC/NVP 60/30/50 mg) Tablet	0%	First Line Pediatric
Zidovudine/Lamivudine 300mg/150mg, Bottle of 60	18%	Second Line Adult

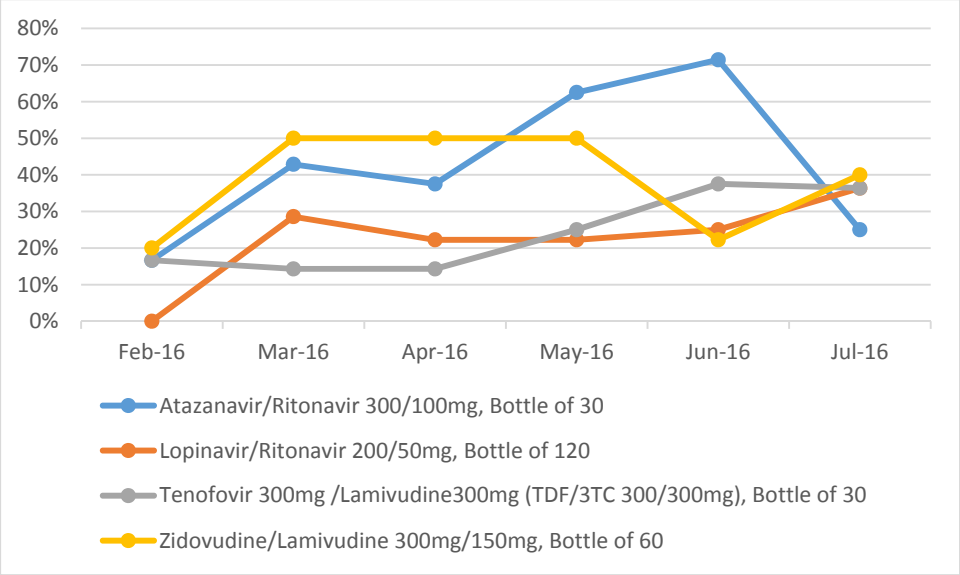
Shown in a different way, the percent of stockouts at the facility level by product category, over time is presented below. Over the six months when data was collected, there was not one month when all first line adult ARVs were available every day at the facility level.

Figure 9: First line adult stock outs



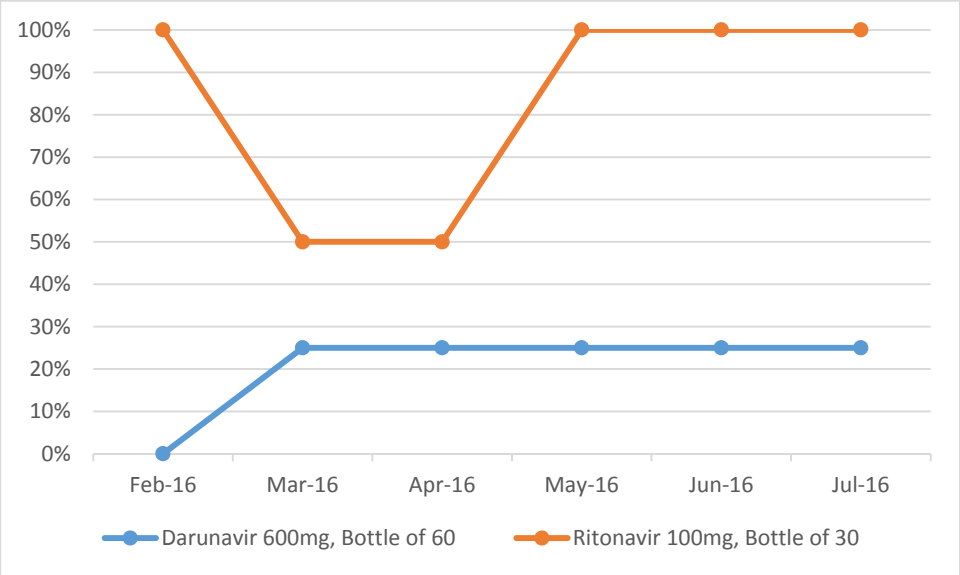
Likewise, second line adult ARVs had a range of stock out data, starting at zero sites sampled stocked out to approximately 75% stocked out.

Figure 10: Second line adult stock outs



Third Line Adult stockouts are high, especially for Ritonavir.

Figure 11: Third line adult stockouts



Thinking about the data for availability slightly differently allows a different view. On the day of visit, Table 16 presents the raw number of sites, which could provide any of the drugs in question. Flipping the question to look at availability instead of stockouts reveals that none of the sites in the sample could have provided second line pediatric commodities on the day of data collection. Furthermore, Darunavir was the only adult third line ARV available in from the sites in the sample.

Table 16: Number of sites that could provide the tracer commodity

Tracer Products	Sites in the sample with this commodity on the day of visit	Commodity Type
Abacavir 600mg/Lamivudine 300mg (ABC/3TC 600/300mg), Bottle of 30	4	First Line Adult
Abacavir 60mg /Lamivudine 30mg (ABC/3TC 60/30mg)	0	Second Line Pediatric
Atazanavir/Ritonavir 300/100mg, Bottle of 30	11	Second Line Adult
Colloidal Gold Test Kit	5	HIV Test Kit
Darunavir 600mg, Bottle of 60	4	Third Line Adult
Determine Test Kit (Box of 100)	7	HIV Test Kit
Efavirenz 600mg (EFV 600mg) Bottle of 30	11	First Line Adult
Lopinavir 100mg/Ritonavir 25mg (LPV/RTV 100mg/25mg), Oral solution	0	Second Line Pediatrics
Lopinavir/Ritonavir 200/50mg, Bottle of 120	11	Second Line Adult
Raltegravir 400mg, Bottle of 60	0	Third Line Adult
Ritonavir 100mg, Bottle of 30	0	Third Line Adult
Tenofovir 300mg /Lamivudine300mg (TDF/3TC 300/300mg), Bottle of 30	5	Second Line Adult
Tenofovir 300mg/Lamivudine 300mg /Efavirenz 600mg (TDF/FTC/EFV 300/300/600mg), Bottle of 30	9	First Line Adult
Zidovudine 300mg /Lamivudine 150mg /Nevirapine 200mg (ZVD/3TC/NVP 300/150/200 mg), Bottle of 60	8	First Line Adult
Zidovudine 60mg /Lamivudine 30mg /Nevirapine 50mg (ZVD/3TC/NVP 60/30/50 mg) Tablet	2	First Line Pediatric
Zidovudine/Lamivudine 300mg/150mg, Bottle of 60	9	Second Line Adult

Comparing the stock level on the date of data collection between the facilities and the NHF shows some of the tracer commodities that are stocked out at the facility level are also stocked out at the NHF. This was not always true for the historical data, implying that while some facility level stockouts can be avoided through stock transfers that longer central level stockouts affect the facilities quickly.

Table 17: Stock Availability on Day of Visit

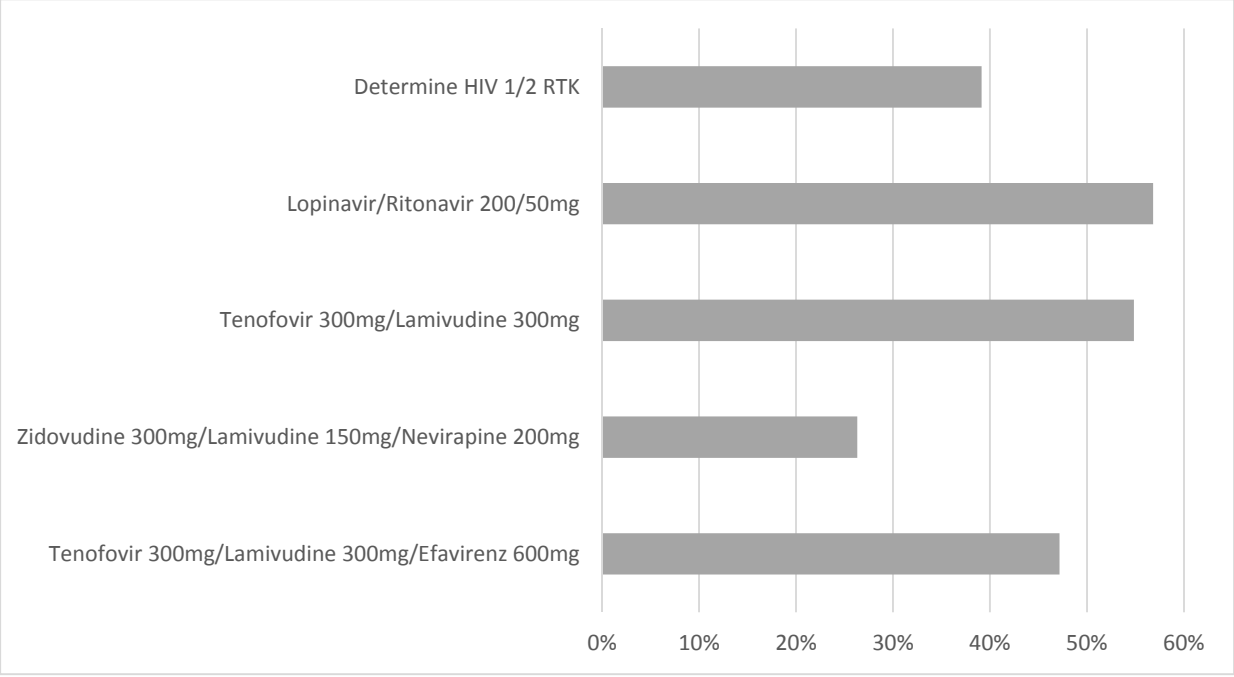
Tracer Products	Percent Sites Stocked-Out	NHF with stock	NHF Months of Stock on hand	Commodity Type
Abacavir 600mg/Lamivudine 300mg (ABC/3TC 600/300mg), Bottle of 30	60%	Stocked Out	0	First Line Adult
Abacavir 60mg /Lamivudine 30mg (ABC/3TC 60/30mg)	Not Managed in Sample	Stocked Out	0	Second Line Pediatric
Atazanavir/Ritonavir 300/100mg, Bottle of 30	0%	Yes	3.3	Second Line Adult
Colloidal Gold Test Kit	38%	Stocked Out	0	HIV Test Kit
Darunavir 600mg, Bottle of 60	0%	Yes	7.1	Third Line Adult
Determine Test Kit (Box of 100)	13%	Stocked Out	0	HIV Test Kit
Efavirenz 600mg (EFV 600mg) Bottle of 30	0%	Yes	0.26	First Line Adult
Lopinavir 100mg/Ritonavir 25mg (LPV/RTV 100mg/25mg), Oral solution	*Not Managed in Sample*	*Yes*	*60 in stock, AMC unknown due to long stockout*	*Second Line Pediatrics*
Lopinavir/Ritonavir 200/50mg, Bottle of 120	0%	Yes	4.9	Second Line Adult
Raltegravir 400mg, Bottle of 60	100%	Yes	4.5	Third Line Adult
Ritonavir 100mg, Bottle of 30	100%	Stocked Out – *mostly stored at MOH*	0	Third Line Adult
Tenofovir 300mg /Lamivudine300mg (TDF/3TC 300/300mg), Bottle of 30	55%	Stocked Out	0	Second Line Adult
Tenofovir 300mg/Lamivudine 300mg /Efavirenz 600mg (TDF/FTC/EFV 300/300/600mg), Bottle of 30	18%	Yes	12.2	First Line Adult
Zidovudine 300mg /Lamivudine 150mg /Nevirapine 200mg (ZVD/3TC/NVP 300/150/200 mg), Bottle of 60	27%	Yes	1.1	First Line Adult

Zidovudine 60mg /Lamivudine 30mg /Nevirapine 50mg (ZVD/3TC/NVP 60/30/50 mg) Tablet	0%	Yes	473.9	First Line Pediatric
Zidovudine/Lamivudine 300mg/150mg, Bottle of 60	18%	Yes	0.33	Second Line Adult

Examining these data in conjunction with the longitudinal stock data begins to identify the products that move quickly through the system and are quickly consumed. For example, the NHF received a shipment of Determine Test Kits in July and supported distributed of RTKs for approximately six weeks before it started to experience stock outs in early September. At the same time testing sites were starting to stockout of Determine, meaning that, when the NHF stocks out of this particular product, treatment sites are affected within weeks of the stockout. Conversely, some sites may believe they are not meant to manage a product due to long-term non-availability at the NHF, specifically the two second line pediatric regimens in the tracer list and a third line adult treatment, Rategravir.

Comparing these data with order data show the attempt to ration stock from the central level to avoid stockouts at the facility level. Below is the average order fill rate over the six months reviewed by product. This shows that first line ARV orders were filled between a quarter to almost half of the time. Likewise, determine test kit orders were filled less than half the time.

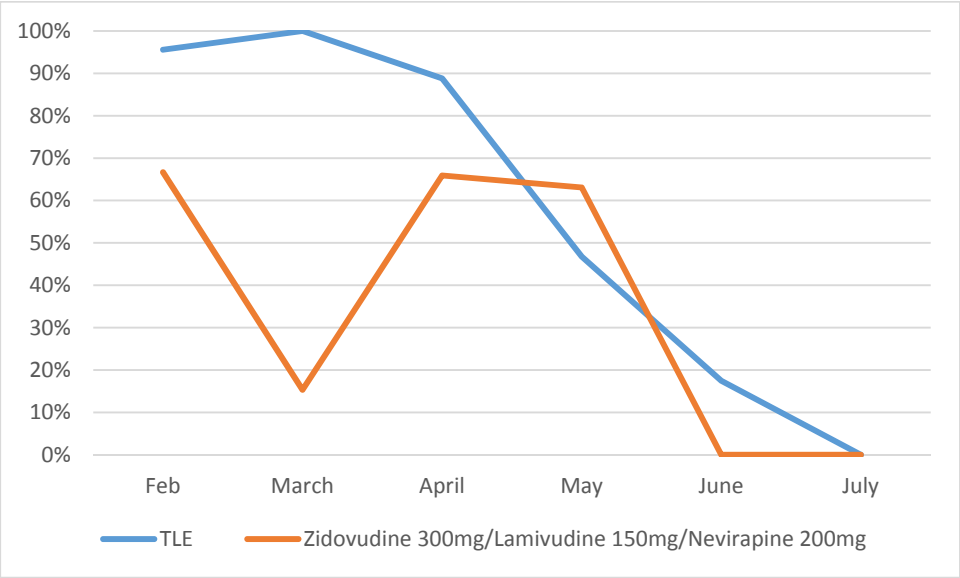
Figure 12: Percentage of orders filled, by commodity Feb – July 2016



A deeper dive into the order fill percentage for first line ARVs only with month to month observations illustrates the affect stock level at the NHF can have. Almost 100% of requests were filled for Tenofovir 300mg/Lamivudine 300mg/Efavirenz 600mg (TLE) from February to March, then the percentage dips as the stock level at NHF approaches zero. Likewise, the

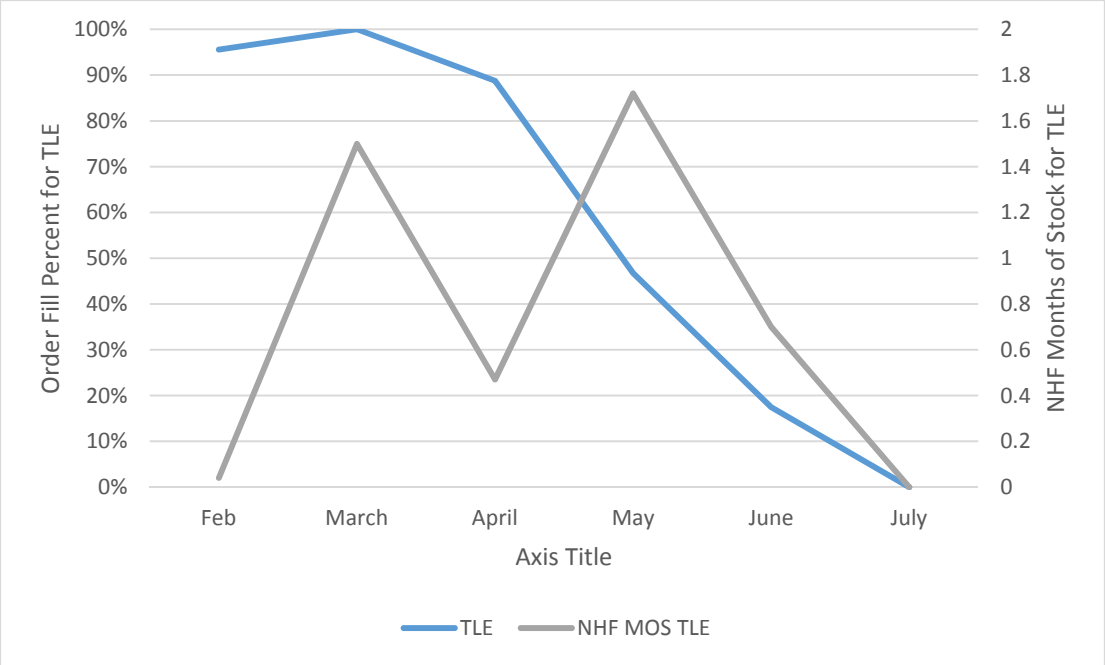
percent fill for Zidovudine 300mg/Lamivudine 150mg/Nevirapine 200mg never increases beyond 70% and shows that while NHF sought to provide this product to all sites, it was restricted by its own stock shortage.

Figure 13: Order fill percentage for first line ARVs



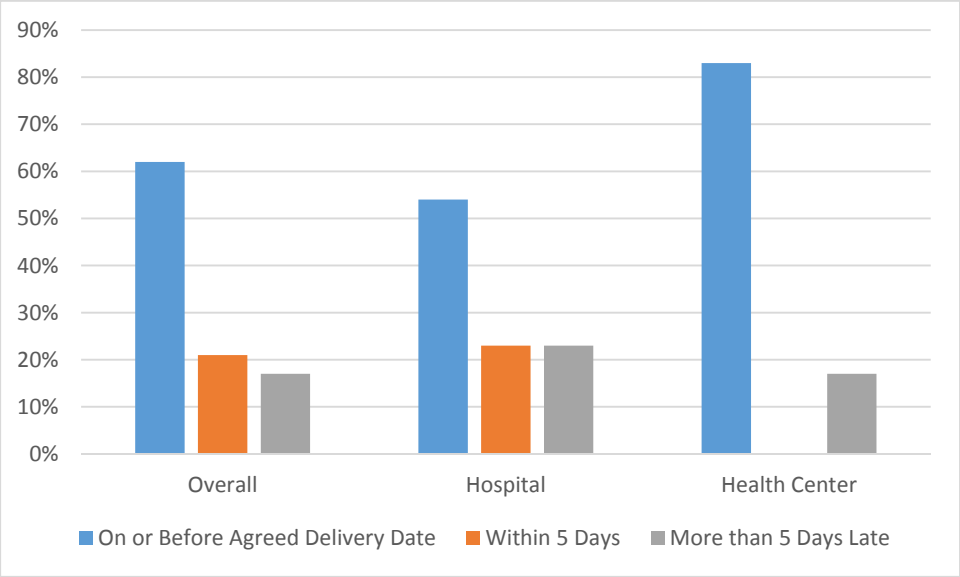
Examining the order fill percentage by the months of stock on hand at the NHF for TLE further demonstrates the interconnected relationship between the NHF being appropriately stocked and the treatment sites receiving the commodities in the quantities requested. NHF filled close to 100% of orders just before it received stock in February. It then filled 100% in March, after which, stock levels dipped to only two weeks of stock, and the order fill percentage dropped to 90% in April. Regardless, rationing appears to begin, and the system did not recover from this and ultimately experienced a system-wide stockout of TLE. This example further demonstrates the system-wide effects of well- or poorly-timed shipments. A well-timed shipment in April or June could have avoided more facility level stockouts.

Figure 14: Order fill rate over time for TLE compared to NHF months of TLE in stock



NHF deliveries to treatment sites were received largely on time, especially at health centers, which reported that NHF implemented an early or on-time distribution over 80% of the time during the six months examined.

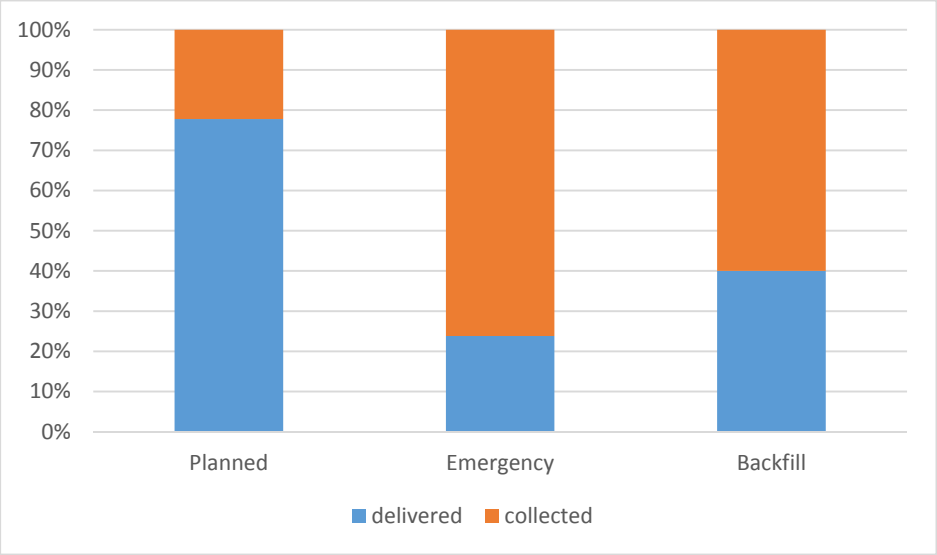
Figure 15: Order timeliness between Feb – July 2016



When a site requested an emergency or backfill order, that site was expected to arrange order collection. While the majority of emergency orders were collected from NHF, approximately 25% of them were distributed to the site. However, the NHF does the vast majority of distributions, because there are many more regular distributions than emergency or backfill

orders. While there may be incomplete order fill, the NHF remains responsive and monitors the requests of treatment sites, filling them as much as possible with frequent distributions.

Figure 26: Distribution by order type



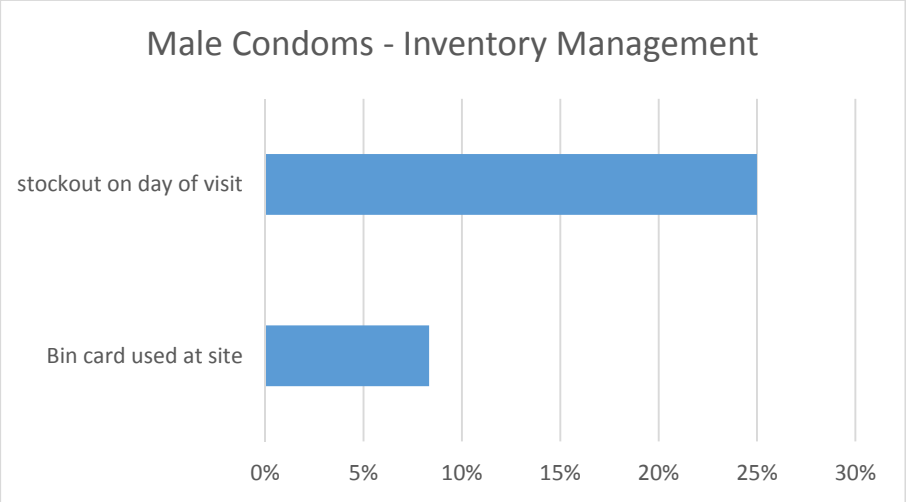
The NSCA also considered inventory management of condoms at the site and central levels, in addition to ARVs and RTKs. Despite continuous central level availability of condoms, sites did report stockouts of condoms and a number were stocked out on the day of visit. Since none of the sites assessed did formal inventory management of condoms there may have been recall bias when sites reported that they had experienced a condom stockout in the previous six months. However, considering the proportion of sites that were stocked out on the day of visit, it would be expected that others had stocked out during the previous six months.

Only a few of the sites had taken it upon themselves to do informal inventory management using notebooks. Those sites that had adopted this method could provide data on numbers of condoms issued to patients on a daily basis since they had adopted this system. What the sites lacked was some information on an emergency order period, which may have helped them avoid a site level stockout. Of the treatment sites visited, all of them managed male condoms within the site, but only one managed female condoms. This one site did not perform any inventory management for female condoms and was stocked out on the day of visit. The stock status for male condoms was slightly different, as figure 17 illustrates.

As can be seen in Figure 17, a quarter of the sites assessed were stocked out of male condoms on the day of visit and only 8% maintained any inventory management records. Due to the lack of data, further analysis could not be done, which leads to one of the NSCA recommendations: begin male condom inventory management through bin cards or other documentation at the site level. Institutionalizing or formalizing the process of condom inventory management could further mitigate site-level stockouts.

An additional challenge to the male condom supply chain during this assessment was the presence of Love condoms. Many users felt that they produced an unpleasant odor when used and thus patients then sites would request male condoms but not Love condoms, saying that they would rather not have condoms that receive Love condoms. This challenge is hopefully jut a temporary one, but could have affected the stockout figure below through sites rejecting Love condoms and then stocking out.

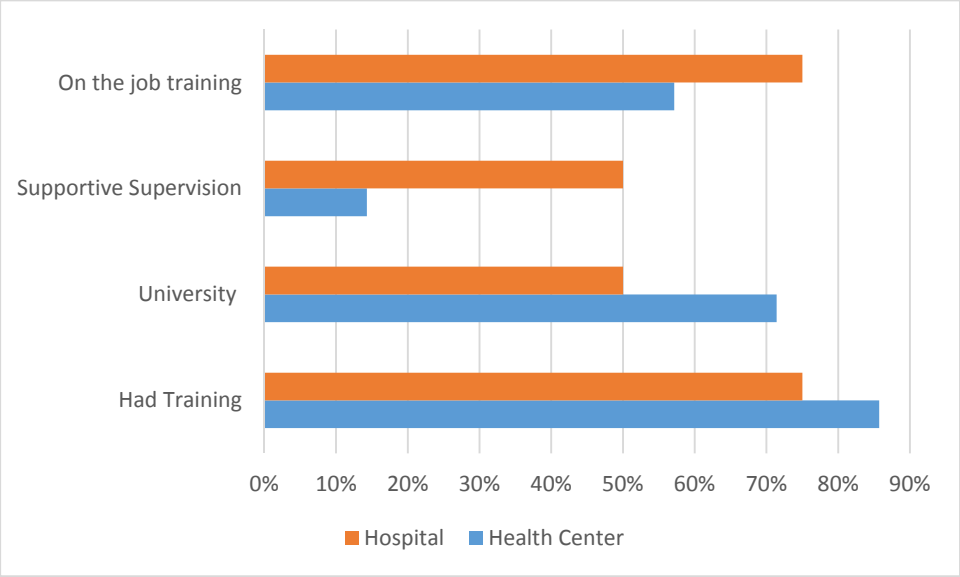
Figure 17: Male Condom Inventory Management



The supply chain map on page 9 of this report identifies that the condom supply chain is supported by the NFPB. Correspondingly, at the site level, condoms are managed within the family planning or family health ward. Providing stock cards and training on how to use them to each site to support condom inventory management may empower the facility staff and increase the perceived importance of condoms in HIV prevention.

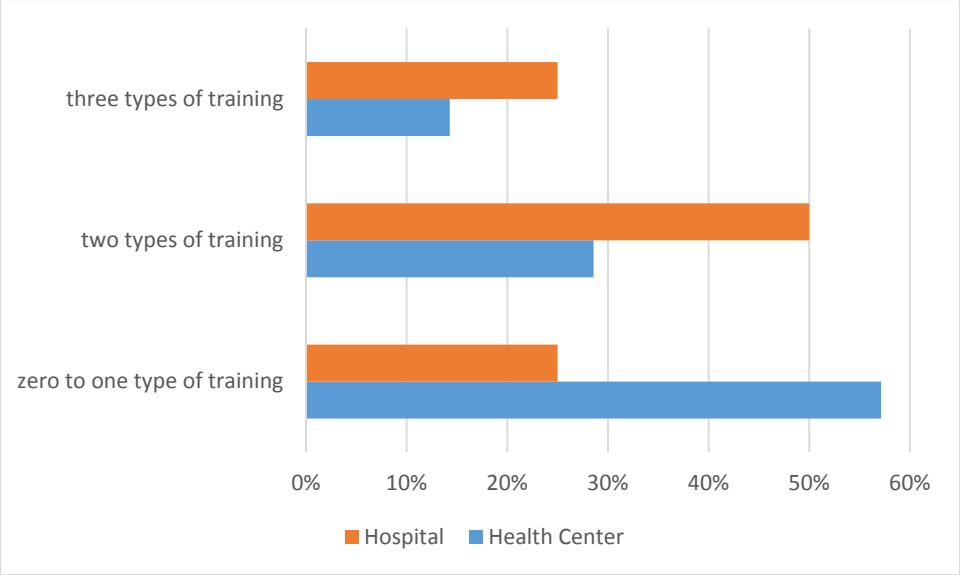
The majority of personnel at the treatment sites received training enabling them to perform the tasks required to successfully perform their jobs. Respondents reported a variety of training types as well as frequency of trainings.

Figure 38: Training type, by health center and hospital



The frequency of training to perform supply chain functions was heterogeneous, with some sites reporting more proactive but organic efforts to train. Health centers were more likely to have fewer types of training for staff, while hospitals most commonly supported at least two types of training.

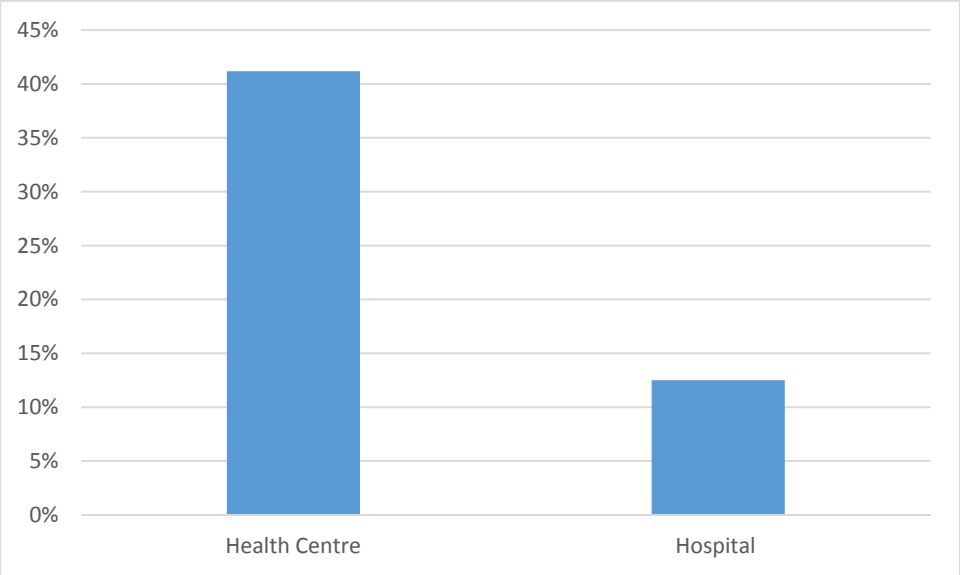
Figure 19: Frequency of training types, by health center and hospital



The disparity in training opportunities between health centers and hospitals may be in part be due to staff turnover. The percentage of staff turnover was substantially different between hospitals and health centers, with the staff turnover percentage being three times greater at the

health center, meaning that staff stay longer at hospitals than at health centers. Therefore, the longer staff members stay the more opportunities they will have to either have on the job training with a colleague and/or participate in more training opportunities provided to them during their tenure.

Figure 20: Percentage of staff turnover



WAREHOUSING & INVENTORY MANAGEMENT CHALLENGES AND RECOMMENDATIONS SUMMARIZED

Treatment Site Challenges

- Insufficient knowledge of PIMS functionality at treatment centers (available reports) or potential user access rights deficiencies
- Treatment center staff complaints that using PIMS was slowing down their dispensing
- Site level stockouts of all HIV commodities
- Site level stockouts of male and female condoms

Treatment Site Recommendations

- Find a PIMS champion (someone from the site level who uses PIMS effectively) to positively influence change among other PIMS sites.
- Provide on-site training to ensure that personnel at treatment sites become more fluent in PIMS.
- Support the informal system of redistributing products from overstocked to understocked or stocked out sites.
- Continue and expand waste management processes.

- Incorporate inventory management practices, such as bin cards, into the condom supply chain for all sites. Set an emergency order level for each site to avoid future stockouts.

NHF Challenges

- Stock piles of waste.
- Lack of storage space at present.
- Stockouts of high demand products
- Support to sites with large demand, which stockout often when the NHF itself stocks out regularly.

NHF Recommendations

- Expand waste management program to include the NHF for all products (see Waste Management section).
- Support the informal system of redistributing products from overstocked to understocked or stocked out sites.
- Increase shipment frequency to the NHF, to decrease central level stockouts (see Procurement section).

TRANSPORTATION

Table 18: Overall Transportation Scores

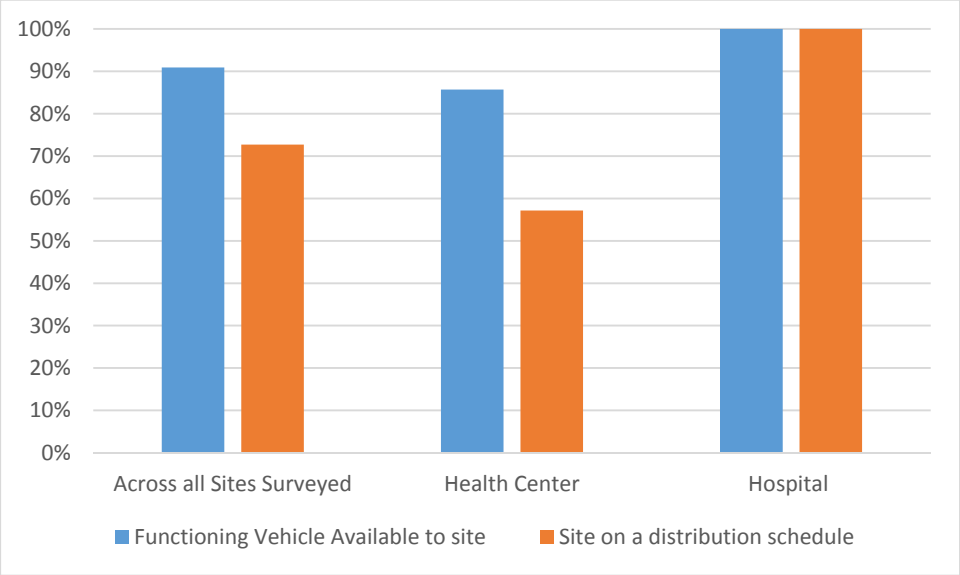
Transportation: CMM & KPI Scores	
Capability Maturity Score	59%
Key Performance Indicator	
On-time delivery rate (NHF to sites)	62%

Table 19: Transportation capacity by enabler

Transportation	Avg.	%
Process and Tools	2.9	58.5%
Management Information System	3	60%
Infrastructure	3	60%
Strategic Planning & Oversight	2	40%
Human Resources	3.3	66.7%

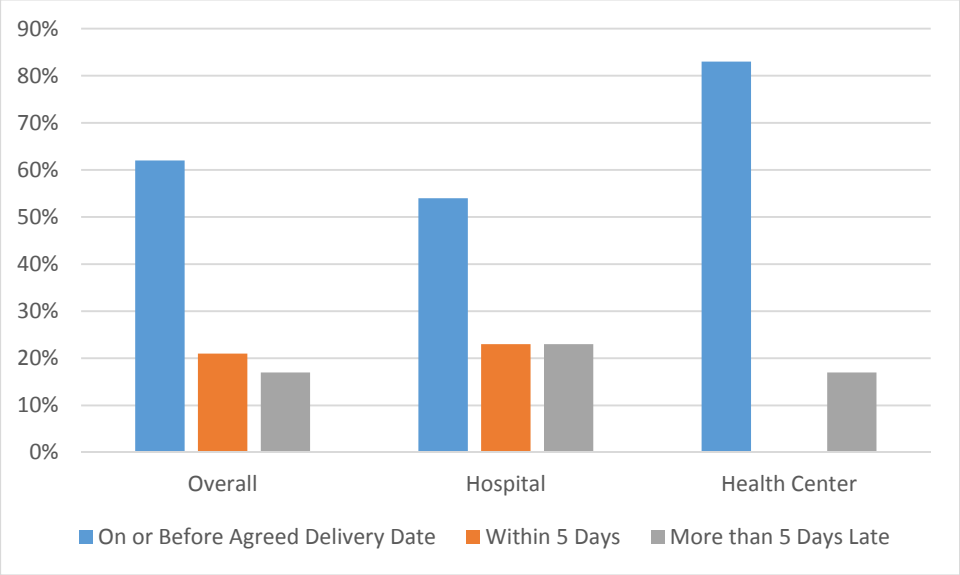
The majority of ART sites have access to either a facility or privately owned vehicle. The only facility that did not have access to a vehicle was within walking distance to a hospital, which often provided supplies. All hospitals and a little more than half of the health centers knew their distribution schedule from the NHF or NHP.

Figure 21: Transport for treatment sites



Responsibility for transport of commodities is divided between the NHF and the treatment sites and is determined in large part by the type of order. If orders are scheduled, the NHF delivers. Off-schedule orders that the NHF could not transport were normally picked-up by the treatment site. Likewise, sites with access to a vehicle supported more frequent commodity pick-ups from the NHF, regardless of the type of order (regular, backfill, emergency). Sites documented largely on-time delivery of ordered commodities from the NHF or the NHF's transport contractors (3PLs).

Figure 22: On-time delivery, by site type



The private hospitals and health centers in the sample always used their vehicle and arranged for commodity pick-up from the NHF. These sites ordered commodities then scheduled the pick-up with NHF staff. These same sites also budgeted for transportation and vehicle maintenance in their site budget. The NHF normally delivered regular orders to public ART sites. Public institutions are aware of the delivery schedule and that any order must be submitted seven business days before the scheduled delivery.

Transport contractors (3PLs) are occasionally utilized when needed, like when an NHF vehicle is out of service or when the number of vehicles within the NHF fleet cannot transport to all sites which ordered products. When transport contractors are engaged, they charge by urban miles and rural miles. These costs for transport are not factored into the national strategic plan, but the Finance Department does look at the costs related to transport.

Transportation is included in the five-year operations plan. The transportation schedule, which was under review at the time data were collected, divides months into weeks, and sites that get a delivery every two weeks could receive excess orders on the fifth week of a month. A monthly report documents the deliveries and tracks all deliveries that were in compliance with the delivery schedule.

Transportation SOPs are updated regularly and stamped with the issued date, revision date, and revision number. Any time a change is made the staff are notified. Moreover, all staff must read and sign that they have read the revisions. Training and workshops are available to build understanding among drivers on protocols, and the rationale behind processes in place.

Vehicles have daily checks done by the drivers who fill out a standardized form to show the check was done. The Administration department manages trucks, and the warehouse manager oversees deliveries.

There is one cold truck, and the need for more cold trucks is being examined and extended. The MOH is requesting that the cold truck deliver vaccines instead of delivering vaccines in igloo containers. The cold truck belongs to NHF not the 3PLs. Presently, cold goods are packed in igloos, so if the truck goes outside the specified temperature then the igloo maintains the temperature for a time; however, the igloos are not advanced enough to notify the driver if the internal temperature increases above a safe threshold. There are specific drivers for cold chain products. Price Waterhouse Coopers helped the NHF assess cold chain risk, which is substantial given the high cost of cold chain commodities.

A new customs system, ASYCUDA, was recently introduced. Information is entered into ASYCUDA before items can be cleared by the Customs Clearance Agent. ASYCUDA is very time consuming, and since the introduction of ASYCUDA, there has been an additional one to two-week delay in receiving orders. There is an active IT support team, and drivers have access to computers as needed.

The NHF claims responsibility for all transportation processes, and has received external assistance from private sector consultants to ensure well-documented processes and identify and reduce risk. Presently there are an insufficient number of drivers, which is part of the reason behind the occasional use of 3PLs.

TRANSPORTATION SUMMARIZED

Challenges

- Insufficient number of drivers without 3PLs.
- Cold Chain challenges considering the igloo containers currently used.

Recommendations

- Add drivers if possible, if not, maintain relationship with 3PLs.
- Reschedule existing cold truck to better utilize that resource.
- Determine if a product exists which monitors its internal temperature for limited cold chain capabilities.
- Explore if procuring a second cold truck is possible.
- Maintain current distribution system, which is working well.

WASTE MANAGEMENT

Table 20: Overall Waste Management Scores

Waste Management: CMM & KPI Scores	
Capability Maturity Score	63%
Key Performance Indicator	
Total stock expired and collected by the Central Level	27,209*
Total stock expired at the sites selected during the assessment	397 or 1.4%**

*NHP in Jamaica sponsored a waste collection drive in April of 2016 during which time, over 27,000 items were collected and destroyed. This stock was not at the central level, but rather destroyed by the central level during the period assessed.

**Expiries at the site level were calculated using consumption for May, June and July as the denominator, and the quantity of expiries found at the site level (397) during the assessment as the numerator.

Table 21: Waste Management capacity by enabler

Waste Management	Avg.	%
Process and Tools	2.9	57.5%
Management Information System	4	80%
Infrastructure	3	60%
Strategic Planning & Oversight	5	100%
Human Resources	3	60%

Strategic Planning and oversite of waste management in Jamaica is an example of a best practice. Waste management for HIV is led by the NHP, which has accepted responsibility for HIV commodity waste management. Moreover, Waste Management SOPs are in place and are supported by NHF and NHP. The SOPs are maintained in the same fashion as all NHF SOPs, stamped with the issued date, revision date, and revision number. Any time a change is made the staff are notified. Moreover, all staff must read and sign that they have read the revisions. Staff are trained upon employment and re-trained in the event of a breakdown of procedures. SOPs are updated on an as needed basis. Personal protective equipment including masks, respirators, and coveralls are available for those who must handle expired commodities.

The MOH, the NHP and the NHF are responsible for various processes within waste management. Regardless of the product, expired products are separated from the remaining inventory and stored on site both in the NHF and in the treatment sites. Disposal exercises for HIV commodities began last year and take place every 6 months and had been done recently in April 2016. The site implementing destruction in Spanish Town adheres to WHO guidelines and is able to achieve the temperature necessary for pharmaceutical destruction.

Regional processes for expired products that are not HIV commodities vary, but there is no defined schedule for the pickup of expired product. Test kits are disposed of at each site using the same method that is used for other lab products. Government health waste management

facilities then incinerate the product. Infectious waste is sent to a separate facility for destruction.

For HIV expiries, each treatment site separates the expired or unusable products either in a separate space or in a closed box. Then the site maintains a form, which lists the products in the box or room, the quantity of tablets or bottles expired, and the date when they expired. This form is cross-referenced with regular reporting forms and the contents of the box before destruction. Expired products to be disposed are evaluated by an inspector to ensure the type and quantity match expiration reports. If the expired products do not match the expiration report then an investigation is done, and, ultimately, an adjustment is made.

The waste management process used by NHP is relatively new, but it does seem to have an effect on the quantities of expired HIV commodities stored at the site, which is low. There has not been a formal data analysis conducted to determine which commodities were destroyed most frequently or if national and facility orders could be adjusted based on that destruction. Expired product disposal data has not been used in decision-making, but has been used to determine the cost of destruction.

External auditing of the waste management practices has not taken place at present and would be difficult since practices vary across commodity types and system levels. Overall, within the NHF there is a need for waste management technical expertise and possibly an extra colleague who could specialize in this area and manage Jamaica's waste management system.

The NHF and treatment sites have already adopted many best practices for waste management including: separating waste from usable products; maintaining a waste management SOP which ensures a clear chain of custody; performing an environmental assessment which informs the waste management SOP. The system could benefit from having a waste management expert who owns the national process, updates and distributes the SOP, and shares waste management data and analysis with all stakeholders, helping them understand the data and improve the process.

The April 2016 disposal exercise included only HIV treatment sites and HIV commodities and did not include the NHF. Expanding that process to the NHF and to other commodity types would reduce the storage burden experienced system-wide. Marrying waste management processes would have an immediate impact on the available storage space at all sites, especially the NHF, which stores a large quantity of waste, as, can be seen by the Total Stock Expired metric.

Similarly, waste management data should be used to regularly calculate a specific set of key performance indicators, which will inform system improvement. These metrics should be both process and outcome metrics, which can be used to benchmark performance among sites. Regular KPI calculation should result in the development of an action plan for system improvement.

Moreover, if the NHP and the NHF could collaborate on a waste pick-up method, most efficiently as a reverse logistics process, the system would work with even less waste storage.

Thus, the NHF would distribute commodities and pick up expired or unusable commodities from sites then bring them back to the NHF when trucks returned from deliveries. The NHF could hold these products until they can be destroyed. This would represent a minor burden in the short term while quantities would most likely be more plentiful, but would ultimately become smaller as pick-up becomes more frequent and the reverse logistics system matures and system-wide SOPs are adopted.

While personal protective equipment (PPE) is available to all staff and treatment sites separate unusable products from usable ones, the new NHF facility should have a well-ventilated area where expired products can be safely separated and stored for destruction. At the presently existing facility, which is under construction, products are separated and labeled as expired, but they are not in a dedicated location, designated for expiries. Plans should be made to ensure that the future site will include such a site.

WASTE MANAGEMENT (MOH)

Challenges

- Waste management at sites and the stockpile of waste at the NHF
- NHF has quantities of expiry awaiting destruction on their property

Recommendations

- Due to the April waste management drive, data collection teams did not find a large quantity of ARV expiry at sites, expand waste management services coordinated by the MOH to other products at sites and all products within the NHF.
- Use PIMS to standardize expiry data collection, leveraging existing adjustment form capabilities
- Destroy NHF's current stockpile of expired/unusable products (See Warehousing and Inventory Management Section)
- Institute a monthly reverse logistics system, maximizing the existing NHF distribution capabilities.

LABORATORY ISSUING

Table 22: Overall Laboratory Issuing Scores

Laboratory Issuing: CMM & KPI Scores	
Capability Maturity Score	74%
Key Performance Indicator	
No Lab Issuing metric utilized	

Table 8: Laboratory issuing capacity by enabler

Laboratory Issuing	Avg.	%
Process and Tools	3.8	75.6%
Management Information System	3.7	73.3%
Infrastructure	3.6	72%
Strategic Planning & Oversight	4	80%
Human Resources	N/A	N/A

A written SOP related to supply chain processes is in place and is compliant with local and national regulations. The detailed SOPs are updated every 3 years. Service agreements are in place for all machines and are managed by the MOH and reviewed annually. Contracts are currently in place with Becton, Dickenson and Company (BD) for preventative and corrective maintenance. An engineer is on-site to fix machines as needed. Point of care machines are placed in labs to manage late sample arrivals, and an SOP governs that process as well. The above service and maintenance agreements represent a best practice for laboratory operations.

Log books are used to track samples lost, and data is submitted in a monthly report to MOH. Lab performance, including some supply chain related KPIs are reported monthly to the MOH. Corrective actions and progress are tracked in a monthly report to document system improvement.

Contracts are in place with MOH waste management unit for lab-generated waste. Waste is picked up daily from the lab and decontaminated. PPE is available for staff handling hazardous or flammable products.

Lab staff informally adhere to a "First In First Out" inventory management system, which is not formalized by the warehouse at NPHL. Staff within the laboratory monitors expiry dates in the reagent log and the monthly performance report includes details. Inventory management at the storeroom is ad hoc, without bin cards or the use of PIMS or the laboratory electronic system. At the treatment sites inventory management is done minimally. Often there is a ledger, which contains some of the inventory data for RTKs, but very little inventory management for any other lab commodity. Pharmacies often maintain more inventory data than the lab, particularly for HIV commodities.

At the time of data collection, storage space appeared insufficient. The storage rooms were organized by shelving, but no inventory management tools are in place to monitor stock movement or issuing.

Internal audits are done quarterly by the quality office at NPHL. External audits are conducted once or twice a year. The MOH conducts a stock count/supervision quarterly. Logistics data is integrated into the lab information software program and used for the monthly report, but a logistics module is also planned for future updates.

Main storeroom has two cold rooms. Temperature is monitored twice daily, and a log book was present on the door to each cold room. It was unclear if there was an alarm linked to the two rooms. Safety cabinets and all necessary safety equipment are in place and properly maintained. Alarms are present on exterior doors, security guard are stationed at entrances, and there are bars on windows.

Presently the laboratory detailed SOPs are updated every three years. It is recommended that the SOPs are updated whenever a procedure or system changes. This could be every three years, but seemingly, there must be some change that would affect the laboratory issuing more frequently. A master SOP list should be available and an implementation policy, with a staff member who is responsible for implementing the policy should be in place and should ensure that employees review the SOP. Copies of the SOP should be available at all sites. Likewise, training on hazardous chemical standards should be in place, and staff should be trained annually on these standards with the training documented in personnel files.

While the lab follows a "First In, First Out" inventory management system informally, there should be a formal system which adopts "First Expired, First Out," or FEFO. This will ensure that products nearing expiry can be utilized, reducing waste. Reducing waste may help reduce the need for storage, but even if this operational change is made, the lab may require more storage space. Also, staff should regularly monitor, either through a system or personally checking the inventory, which commodities are nearing expiration, then report that information monthly. Finally related to inventory management, an annually updated plan to manage reagents and redistribution to maintain service continuity should also be in place. Also, while temperature is regularly monitored in the cold rooms, a best practice would be that the temperature is monitored automatically and a complete temperature monitoring history is documented.

The audits which occur regularly are a strength of the lab issuing system and ought to be maintained. The laboratory also has an electronic data management system. A logistics module is planned as an update to the system. This module is recommended and may assist, in some cases automatically, with implementation of the recommendations (FEFO, monthly report of products soon to expire).

Human resources data was not available during data collection. However, it is worth noting that any supply chain positions should be clearly defined and documented within the organizational structure. Staff should have strong supply chain competency, and should understand how the supply chain system operates in Jamaica. Finally, all supply chain positions, or responsibilities should be recognized as professionals or professional tasks that require training and respect.

LABORATORY ISSUING CHALLENGES AND RECOMMENDATIONS SUMMARIZED

Challenges

- National Public Health Lab
  - Inventory management in storeroom is ad hoc. Bin cards do not exist and FIFO principles are being implemented by lab staff
  - Storage space is insufficient at the lab, although there are two cold rooms.
- Treatment Centers
  - Teams only found minimal inventory management in place at treatment center labs in the form of ledgers that were often incomplete

Recommendations

- National Public Health Lab
  - Plan to have the logistics management upgrade to the lab information system include a module for inventory management at the main store and the labs
- Treatment Centers
  - Integrate test kit storage into the main storeroom and have the lab order test kits as needed to allow for better tracking of consumption

Final Considerations with regard to Test and Treat and Multi-Month Scripting

To prepare for Test and Treat as well as Multi-Month Scripting (MMS) Jamaica will need to increase the stock it holds at the NHF. This may be a challenge considering the construction schedule. If possible, the NHF should hold at least one to two months of stock in addition to its normal holdings. The exact amount of stock needed will depend on how quickly MMS is phased-in.

The Pre-ART list should be cross-checked and patients included in it should be notified that regardless of their CD4 count, they will start ART as Test and Treat commences. Likewise, sites will also need to be stocked accordingly to expect a new number of HIV positive patients on treatment. In some cases, this may increase the number of HIV positive patients on treatment by between 10% to 53%. This number will be fine-tuned through the updated Pre-ART list. The Pre-ART list as well as the rate of found HIV positives at any ART site should be utilized in the calculation of the quantity of pre-positioned stock at each site. The dramatic change in the number of patients on treatment may cause increased emergency orders to the NHF if the stock pre-positioned is not sufficient. Further meaning that the NHF may need to prepare their vehicle fleet as well as their 3PL to satisfy emergency orders.

Moreover, the Government of Jamaica must prepare for Test and Treat and MMS through more frequent and larger scheduled shipments of ARVs, especially first line ARVs. However, if viral load testing will also be scaled up, then second and third line treatments will also need to be held in anticipation of patients moving from a no-longer effective ARV to a second or third line ARV. Stock levels at NHF and at ART sites will need to be monitored closely. Likewise, the supply plans for all commodities will need to be updated on a regular basis, at least quarterly to support accurate quantity and scheduled of shipments. After Test and Treat as well as MMS are successfully phased in supply plans will need to continue to be updated based on consumption from facilities, which will change based on: newly found positive patients, viral load testing requiring patients to move from first or second line treatment to second or third line treatment and mortality.

The ARV reports and PIMS will prove very helpful in supply plan updates. Moreover, the colleagues within the health system will be among Jamaica's greatest resources during this period of transition. All colleagues were found to be dedicated and good at their responsibilities. Finally, it is believed that Jamaica's health system, staffed as it is, will be able to tackle this programmatic challenge with professional fortitude.

Annex 1: Supply Chain Mapping Workshop Participants List

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Annex 2: Key Performance Indicator Data Dictionaries

The following core key performance indicators (KPIs) are designed to provide a comprehensive picture of supply chain performance. Stakeholders requiring more indicators, including process-specific indicators, may reference any of the following publications that detail health supply chain KPIs:

- World Health Organization (WHO)
  Harmonized Monitoring & Evaluation Indicators for Procurement and Supply Management
  http://www.who.int/hiv/pub/amds/monitoring_evaluation/en/

- USAID | DELIVER
  Measuring Supply Chain Performance: Guide to Key Performance Indicators for Public Health Managers
  http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/MeasSCPerf.pdf

STOCK AVAILABILITY INDICATORS

1.1 Stockout rates by facility	
Definition	This indicator measures whether facilities experienced a stockout of one or more tracer commodities at any point during the reporting period being assessed.
Formula	$\left(\frac{Number\ of\ facilities\ experiencing\ a\ stockout\ of\ one\ or\ more\ tracer\ commodities}{Total\ number\ of\ facilities\ dispensing\ tracer\ commodities}\right) \times 100$
Required data	• Stockout occurrence (yes/no) for each month in the identified reporting period • Number of days for a stockout • Identifying information: product type, geographic location, facility type, facility name
Potential data sources	• *Day of visit*: Physical inspection/stock count • *Historical*: Stock cards/inventory management system • *Secondary data*: logistics management information system (LMIS) reports
Collection and analysis tips	• Historical data should be taken from stock cards. Assessment teams should look at all stock cards for each tracer commodity for the time period in question. Each tracer commodity will usually have its own stock card; depending on the reporting period, multiple stock cards may encompass the whole timeframe. Stockouts will be indicated by zero quantity on the stock cards. • Number of days can be determined by counting the number of days between when stock quantity is zero and the next receipt (also recorded on the stock card). • If site visits are not feasible, stockout data can come from a secondary data source. Assessment teams can use LMIS reports if they capture stockouts. Data quality of this secondary source should be considered if assessment teams choose this option.
Related indicators	• Average number of days of tracer commodity stockouts • Percentage of tracer commodities experiencing stockouts during the reporting period
Where to implement	• All warehouses and health facilities that are part of the site-visit sample

1.1 Stockout rates by tracer	
Definition	This indicator measures the percentage of tracer commodity observations with a stockout during the reporting period
Formula	$\left(\frac{Number\ of\ tracer\ commodity\ stock\ observations\ experiencing\ a\ stockout\ during\ the\ reporting\ period}{Total\ number\ of\ tracer\ commodity\ stock\ observations}\right) \times 100$
Required data	• Stockout occurrence (yes/no) • Number of days for a stockout • Identifying information: product type, geographic area, facility type, facility name
Data sources	• *Day of vi*sit: physical inspection/stock count • *Historical*: stock cards/inventory management system • *Secondary data*: LMIS reports
Collection and analysis tips	• Historical data should be taken from stock cards. Assessment teams should look at all stock cards for each tracer commodity for the time period in question. Most tracer commodities will have their own stock card and, depending on the reporting period, multiple stock cards may encompass the whole timeframe. Stockouts will be indicated by zero quantity on the stock cards. • Number of days can be determined by counting the number of days between when stock quantity is zero and the next receipt (also recorded on the stock card). • If site visits are not feasible, stockout data can come from a secondary data source. Assessment teams can use LMIS reports if they capture stockouts. Data quality of this secondary source should be considered if assessment teams choose this option.
Related indicators	• Average number of days of tracer commodity stockouts • Percentage of facilities experiencing a stockout of one or more tracer commodities during the reporting period
Where to implement	• All warehouses and health facilities that are part of the site-visit sample

1.2 Stocked according to plan	
Definition	This indicator measures the percentage of facilities with tracer commodities between the established minimum and maximum stock levels.
Formula	$\left(\frac{Number\ of\ tracer\ commodity\ observations\ with\ months\ of\ stock\ between\ established\ minimum\ and\ maximum\ stock\ levels}{Total\ number\ of\ tracer\ commodity\ observations}\right) \times 100$
Required data	• Stock quantity on hand at a point in time for each month of the reporting period • Consumption (or issues) data • Established minimum/maximum levels for each facility type visited • Identifying information: product type, geographic area, facility type, facility name
Data sources	• *Stock on hand*: day of visit: physical stock count, historical: stock cards • *Consumption/issues*: historical: dispensing records (consumption) or stock cards (issues), secondary data: LMIS reports reporting stock on hand and consumption/issues • *Minimum/maximum levels*: Ministry of Health
Collection and analysis tips	• To calculate issues data from stock cards, assessment teams should add the total number of units of the tracer commodity issued each month. • Stock-on-hand data will be the total units of stock at the point in time determined by the assessment team. Assessment teams should ensure that teams are collecting stock-on-hand data at the same point each month, often the beginning or end of each month. • Months of stock (MOS) will be calculated using stock on hand and consumption. MOS should be the value considered when determining whether a facility is between the minimum and maximum levels. Data collection forms should automatically calculate this data point.
Related indicators	• Stockout rates
Where to implement	• All warehouses and health facilities that are part of the site-visit sample

PRODUCT SELECTION INDICATORS

2.1 Percentage of product batches tested meeting quality standards	
Definition	This indicator measures the percentage of product batches tested by a quality laboratory that meet established standards.
Formula	$\left(\frac{Number\ of\ product\ batches\ passing\ quality\ testing}{Total\ number\ of\ product\ batches\ tested}\right) \times 100$
Required data	• List of product batches tested • Quality testing results • Identifying information: product type, place of test, product supplier/manufacturer, location of supplier/manufacturer
Data sources	List of product batches tested and quality testing results • Quality assurance unit • Quality testing laboratory
Collection and analysis tips	• If quality testing is outsourced, results may be self-reported on a tracking sheet to assessment teams. If possible, data collectors should view the records from the laboratory as well to ensure data quality. • This indicator is calculated for each individual batch that is tested. If a product has several batches tested during the reporting period, the assessment teams should consider each batch tested as one within the denominator. • Although this indicator does not use tracer commodities, assessment teams should capture the product type for each batch tested in order to conduct analysis by product type.
Related indicators	N/A
Where to implement	Central-level quality testing facility or unit that manages outsourced quality testing

2.2 Percentage of products procured listed on the National Essential Medicines List or other similar document	
Definition	This indicator measures the percentage of procurements that are made based on the National Essential Medicines List (NEML).
Formula	$\left(\frac{Number\ of\ products\ procured\ on\ the\ NEML}{Total\ number\ of\ product\ procured}\right) \times 100$
Required data	• List of products procured • NEML • Identifying information: product type
Data sources	List of products procured • Procurement unit records • Inventory management system NEML • MoH or other responsible entity
Collection and analysis tips	• Assessment teams may find that the way products are described in records of orders and the NEML may differ. • When comparing the two lists, assessment teams should take notice of the form (e.g., tablet, capsule, vial, powder) and dosage of each commodity ordered to ensure that it matches the NEML. • Someone with a pharmacist background may be of assistance in this exercise, as he or she can identify whether the two lists are identifying the same or different products. Although this indicator does not use tracer commodities, assessment teams should capture the product type for each procured commodity in order to conduct analysis by product type.
Related indicators	Percentage of products procured on the standard treatment guidelines (STGs)
Where to implement	Central level. Data should be retrieved from procurement and policy or regulatory agency that maintains the NEML.

FORECASTING INDICATORS

3.1 Forecast accuracy	
Definition	This indicator measures how accurate forecasts of demand are compared with the actual consumption (or issues) of the product by patients.
Formula	$\left(\frac{(1-(forecasted\ consumption-actual\ consumption))}{Actual\ consumption}\right)\times 100$
Required data	• Forecasts (for each product group being considered) • Consumption/issues data of products that are forecasted • Identifying data: product type
Data sources	Forecasts • Unit responsible for forecasts • Programs supported by donors Consumption/issues • Logistics management information system (LMIS) reports (issues), health management information system (HMIS) reports (consumption) • Issues data from warehouses warehouse management system (WMS)/inventory management tools
Collection and analysis tips	• This indicator requires 12 months of data to be calculated. • Assessment teams may want to consider choosing a separate group of tracer commodities based on available consumption data. The focus should be on available data for each product group and may be shaped by the LMIS. • Consumption or issues data should be extracted from the supply chain level closest to the patient where data is available. • Make sure to calculate the numerator as an absolute value. • This indicator should be calculated on a product-by-product basis and can then be averaged for a product group.
Related indicators	Supply plan accuracy: This indicator compares consumption/issues data with supply plans and can be calculated quarterly, provided that supply plans are updated on that timetable as well.
Where to implement	Central level. Data should be retrieved from LMIS or HMIS reports for issues/consumption data and forecasting unit.

PROCUREMENT INDICATORS

4.1 Percentage of orders placed as emergency orders	
Definition	This indicator measures the percentage of orders placed during the reporting period that were emergency orders.
Formula	$\left(\frac{Number\ of\ emergency\ orders\ placed\ in\ the\ reporting\ period}{Total\ number\ of\ orders\ placed\ in\ the\ same\ period}\right) \times 100$
Required data	• List of orders placed • Classification of orders as planned, unplanned or emergency
Data sources	List of procurements • Procurement unit tracking records (paper, Excel or automated) • Purchase orders Identifying information: Product type, order month, supplier information
Collection and analysis tips	• Emergency orders will need to be defined by the assessment teams in collaboration with in-country stakeholders. • Data collection should include all orders planned, unplanned and emergency, with clear definitions for these categories. Terminology may change, but the definitions should be commonly understood across all data collection teams. For example, if "emergency" is politically charged, the term "unplanned" could be substituted. • Data collectors should include product type and order time period for each order to facilitate analysis, comparing performance by product type or at each time period (usually months). • Supplier information helps determine sources for emergency order needs versus planned order needs and can be useful for in-depth analysis.
Related indicators	N/A
Where to implement	Central-level procurement entity Intermediate-level warehouses conducting procurement (i.e., tendering, purchase orders directly with non-Central Medical Store (CMS) suppliers)

4.2 Vendor on-time delivery	
Definition	This indicator measures the percentage of orders that vendors deliver within the agreed-upon delivery window.
Formula	$\left(\frac{Number\ of\ orders\ delivered\ according\ to\ the\ contract\ aggreement\ with\ supplier(s)}{Total\ number\ of\ orders}\right) \times 100$
Required data	• Promised delivery dates • Actual delivery dates
Data sources	Promised delivery date • Historical data: purchase orders, vendor contracts, other order documentation • Secondary data: procurement unit tracking records (paper, Excel or automated) Actual delivery date • Historical data: delivery notes • Secondary data: procurement unit tracking records (paper, Excel or automated) Identifying information: product type, order month
Collection and analysis tips	• If using procurement unit tracking records, data collection teams should validate the quality of the data provided by spot-checking the dates listed on the tracking sheet and the primary records where the data can be found. • Data collectors should include product type and order time period for each order to facilitate analysis, comparing performance by product type or at each time period (usually months).
Related indicators	• Average customs clearance time • Supplier lead-time variability • Supplier fill rate
Where to implement	Central-level procurement entity Intermediate-level warehouses conducting procurement (i.e., tendering, purchase orders directly with non-CMS suppliers)

4.3 Percentage of international reference price paid	
Definition	This indicator measures the percentage of the international reference prices paid for each product line procured
Formula	$\left(\frac{Average\ price\ paid\ for\ a\ product}{International\ reference\ price\ of\ the\ same\ product}\right) \times 100$
Required data	• Unit price paid for procurements • International reference prices (Global Price Reporting Mechanism for antiretrovirals and Management Sciences for Health (MSH) International Drug Price Indicator Guide)
Data sources	Price paid for procurements • Historical data: purchase orders, vendor contracts • Secondary data: procurement unit tracking records (paper, Excel or automated), units versus pack sizes, sampling methodology International reference price paid • MSH International Drug Price Indicator Guide Identifying information: product type, order month
Collection and analysis tips	• If using procurement unit tracking records, data collection teams should validate the quality of the data provided by spot-checking the dates listed in the tracking sheet and the primary records where the data can be found. • Assessment teams may find that the way products are described in records of orders and the reference guides may differ. • Make sure to capture the data in units, or if the data is presented in packs, then also collect information on the pack size. • Liquid presentations will need to be compared to the reference price by single milliliter.
Related indicators	N/A
Where to implement	Central-level procurement entity Intermediate-level warehouses conducting procurement (i.e., tendering, purchase orders directly with non-CMS suppliers)

WAREHOUSING INDICATORS

5.1 Percent of total stock that expired during a reporting period	
Definition	This indicator compares the expired stock to the total stock during the reporting period. It can be looked at by the quantity or value of the stock
Formula	$Quantity: \left(\frac{Total\ quanitity\ of\ product\ unusable\ due\ to\ expiry}{Total\ quanitity\ of\ product\ available\ during\ the\ reporting\ period}\right) \times 100$ $Value: \left(\frac{Total\ value\ of\ product\ unusable\ due\ to\ expiry}{Total\ value\ of\ product\ available\ during\ the\ reporting\ period}\right) \times 100$
Required data	Product: • Name • Form • Pack size • Batch number • Date of expiry • Unit quantity expired • Value expired
Data sources	Quantity and/or value of expired product • Day of visit: count of expired product • Historical: stock cards/automated inventory management system or WMS • Secondary: LMIS forms Opening stock balance • Historical: stock cards/automated inventory management system or WMS
Collection and analysis tips	• Be sure to consider any political sensitivities with any in-country stakeholders before implementing this indicator. • Poor storage practices at health facilities may complicate data collection for this indicator. Even if expired stock is countable, records may not indicate the date of expiry, which is required to calculate this indicator. • If data collectors cannot attain a comparative quantity of product available, it is still possible to report on the volume and value of expiry throughout the system.
Related indicators	N/A
Where to implement	All warehouses and health facilities that are part of the site-visit sample. Feasibility within the country-specific context should be carefully considered when choosing where to implement this indicator.

5.2 Stock accuracy	
Definition	This indicator compares the stock quantity on a stock card and/or in an inventory management software with the quantity of a physical inventory conducted during a site visit.
Formula	$\left(\frac{Total\ quantity\ of\ product\ on\ stock\ card\ or\ inventory\ management\ software}{Total\ quantity\ of\ the\ same\ product\ from\ physical\ inventory\ conducted\ during\ a\ site\ visit}\right) \times 100$
Required data	• Stock card quantity (or LMIS quantity) • Quantity counted during physical inventory
Data sources	Stock card or LMIS quantity • Day of visit: stock cards • Historical: stock cards/automated inventory management system (collected from the system on site) • Secondary: LMIS forms (submitted to a higher supply chain entity) Physical inventory quantity • Day of visit: stock count
Collection and analysis tips	Be careful to ensure that you are comparing unit quantities to unit quantities or pack quantities to pack quantities. Either is sufficient for this indicator but unit quantity is preferred.
Related indicators	N/A
Where to implement	All warehouses and health facilities that are part of the site-visit sample

5.3 Order fill rate	
Definition	This indicator compares the quantity ordered to the quantity received. Comparisons can be made for specific commodities or aggregated for all commodities.
Formula	$\left(\frac{Total\ quantity\ received}{Total\ quantity\ of\ product\ ordered}\right) \times 100$
Required data	• Quantity ordered • Quantity received (or issued) • Identifying information: product type, month of receipt or order
Data sources	Quantity ordered: • Historical data: orders or requisitions Quantity received: • Historical data: delivery notes (receiving or issuing facility). Other data sources such as picking/packing lists could be substituted but delivery notes at receiving facility are preferable.
Collection and analysis tips	• Data on both the order quantity and receipt quantity between each level of the supply chain being analyzed is required. • Capturing quantity ordered and quantity received for each product in an order is preferable, but total quantity ordered versus received can be calculated, as this is often more feasible. • Ensure teams are collecting data in the same units (either units or packs). • Provide a standard sampling methodology to select orders for analysis to ensure that this indicator is feasible to collect. • Make sure that the ordering process is understood; capture intermediate steps such as pro formas or corrections to initial ordering quantities. Capturing all these steps allows for robust analysis. • Overfilling an order will lead to an order fill rate percentage above 100%.
Related indicators	N/A
Where to implement	Central level, intermediary warehouses (intermediate-level facilities provide documentation on central-intermediate and intermediate health facility levels)

TRANSPORTATION INDICATORS

6.1 On-time delivery	
Definition	This indicator measures the percentage of shipments that arrive on or before the scheduled delivery date.
Formula	$\left(\frac{Number\ of\ orders\ delivered\ within\ the\ time\ window\ specified\ in\ the\ distribution\ plan}{Total\ number\ of\ deliveries}\right) \times 100$
Required data	• Scheduled delivery date • Actual delivery date • Identifying information: month of receipt of order
Data sources	Scheduled delivery date: • Delivery schedule Actual delivery date: • Delivery notes, often in the stamp or next to the signature
Collection and analysis tips	• Data can be collected only in systems where an issuing facility delivers to its receiving facilities and a delivery schedule is in place. • Actual delivery dates may vary from the expected dates printed on delivery notes. Refer to signs and stamps to look for the actual delivery date. • Be careful to consider if the scheduled delivery date falls on a weekend. • Analysis will likely require an agreed-to delivery window (e.g., within five days of agreed-to date) that is considered on-time.
Related indicators	• Order turnaround time • Average delivery time
Where to implement	Central level, intermediary warehouses (can retrieve data for orders delivered to health facilities at this level as well)

DATA AND INFORMATION INDICATORS

7.1 Facility reporting rates on-time	
Definition	This indicator measures the percentage of facilities submitting their LMIS reports to the receiving facility on time.
Formula	$\left(\frac{Number\ of\ facilities\ submitting\ report\ on\ time}{Total\ number\ of\ facilities\ required\ to\ report}\right) \times 100$
Required data	• Scheduled report submission date • Actual report submission date • Identifying information: facility name, facility type, geographic location (product type in nonintegrated LMIS)
Data sources	Scheduled report submission date: • Reporting schedule Actual report submission date: • Historical data: submitted LMIS forms with sign/stamp, electronic LMIS system • Secondary data: LMIS submission tracking sheet
Collection and analysis tips	• Data can be collected from a tracking sheet or original submitted LMIS forms. If using a tracking sheet, be sure to spot-check with actual records to validate data quality. • If LMIS is not integrated, data collection forms should note the product type of the LMIS report being evaluated. • Data on this indicator could be collected at the issuing and receiving facility.
Related indicators	N/A
Where to implement	All warehouses and health facilities that submit LMIS reports and are part of the sample

7.1 Facility reporting rates complete	
Definition	This indicator measures the percentage of facilities submitting complete LMIS reports to the receiving facility.
Formula	$\left(\frac{Number\ of\ facilities\ submitting\ complete\ reports}{Total\ number\ of\ facilities\ required\ to\ report}\right) \times 100$
Required data	• Reports to review for completeness • Identifying information: facility name, facility type, geographic location (product type in nonintegrated LMIS)
Data sources	• LMIS reports • Secondary data: LMIS submission tracking sheet
Collection and analysis tips	• Data can be collected from a tracking sheet or original submitted LMIS forms. If using a tracking sheet, be sure to spot-check with actual records to validate data quality. • If LMIS is not integrated, data collection forms should note the product type of the LMIS report being evaluated. • Data on this indicator could be collected at the issuing and receiving facility. • Data on whether each element of "completeness" is in each LMIS report should be included in data collection forms. Data collection teams should determine these elements with in-country stakeholders. The three traditional elements are 1) stock on hand 2) losses and adjustments and 3) consumption. Countries may choose elements for their specific context.
Related indicators	N/A
Where to implement	All warehouses and health facilities that submit LMIS reports and are part of the sample

HUMAN RESOURCES INDICATORS

8.1 Staff turnover rate	
Definition	This indicator measures the percentage of supply-chain-specific staff leaving their posts during the reporting period.
Formula	$\left(\frac{Number\ of\ staff\ who\ vacated\ their\ position\ during\ the\ reporting\ period}{Total\ number\ of\ staff\ employed\ by\ the\ organization\ in\ the\ same\ reporting\ period}\right) \times 100$
Required data	• Number of employees vacating their posts • Total number of employees • Identifying information: facility name, facility type, geographic location
Data sources	• Interview • Human resources (HR) records
Collection & analysis tips	• A simple interview with a health facility manager or HR department can be sufficient for data collection of this indicator. In larger facilities, data collection teams may verify these results by looking at HR forms. Be mindful of any political sensitivities in accessing these records.
Related indicators	• Percentage of key positions filled
Where to implement	• All facilities visited
Related indicators	N/A
Where to implement	All warehouses and health facilities that submit LMIS reports and are part of the sample