

The Use of Pharmaceutical Information for Decision Making in Namibia's National ART Program: Assessment Report

December 2017



USAID
FROM THE AMERICAN PEOPLE

SIAPS 
Systems for Improved Access
to Pharmaceuticals and Services

The Use of Pharmaceutical Information for Decision Making in Namibia's National ART Program: Assessment Report

Tamara Hafner

December 2017



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

About SIAPS

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

Recommended Citation

This report may be reproduced if credit is given to SIAPS. Please use the following citation.

Hafner T. 2017. *The Use of Pharmaceutical Information for Decision Making in Namibia's National ART Program: Assessment Report*. Submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health.

Key Words

Antiretroviral therapy, electronic dispensing tool, HIV, HIVDR, dashboard, pharmaceutical information, decision making, Namibia

Systems for Improved Access to Pharmaceuticals and Services
Pharmaceuticals and Health Technologies Group
Management Sciences for Health
4301 North Fairfax Drive, Suite 400
Arlington, VA 22203 USA
Telephone: 703.524.6575
Fax: 703.524.7898
E-mail: siaps@msh.org
Website: www.siapsprogram.org

ABOUT THIS REPORT

This report presents the output of an assessment conducted by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) program to understand the extent to which pharmaceutical information generated from the electronic dispensing tool and the pharmaceutical information dashboard is used in making decisions for pharmaceutical services and the antiretroviral therapy program in Namibia. SIAPS engaged an external consultant for the assessment.

Contributors

Dr. David Mabirizi and Mr. Francis (Kofi) Aboagye-Nyame conceptualized the assessment. Dr. Mabirizi guided the assessment and, along with Dr. Evans Sagwa, provided management support.

Dr. Mabirizi and Dr. Dai Hozumi provided technical input on the assessment protocol. Mr. Greatjoy N. Mazibuko and Ms. Harriet R. Kagoya provided technical documents and information, identified relevant stakeholders, and scheduled the interviews in Namibia. SIAPS Namibia staff managed the logistics for the required field work. Anonymous respondents from Namibia's Ministry of Health and Social Services (MoHSS) Directorate of Special Programs (DSP), Directorate of Tertiary Health Care and Clinical Support Services, and Division: Pharmaceutical Services (DivPhS) and the US President's Emergency Plan for AIDS Relief (PEPFAR) implementing partner organizations provided valuable information, without which the assessment would not have been possible.

Tamara Hafner, SIAPS consultant, designed and conducted the assessment and prepared the final report with technical input from Dr. Mabirizi. Ms. Kagoya, Dr. Maheen Malik, and Dr. Sagwa reviewed drafts of the assessment report.

CONTENTS

About this Report.....	i
Contributors	i
Acronyms	ii
Executive Summary	iii
Background	4
National ART Program Outputs and Outcome	5
Conceptual Framework	6
Methodology	8
Tools, Types of Information, and Decisions.....	8
Data Sources and Analysis.....	8
Findings.....	10
Stakeholders	10
Flow of Data and Information.....	10
Demand and Use of Information.....	13
Determinants of Information Use for Decision Making	19
Limitations	30
Conclusions	31
Recommendations	32
Technical Training and Orientation	32
Address Human Resources and IT Constraints in DivPhS	33
Improve Management of Technology and Information.....	33
References	36
Annex A. Interview Guide	38
Annex B. Template Used by Facilities to Submit the Monthly ART Report to the Dashboard...	42
Annex C. Average On-time Reporting of Monthly ART Reports by Facility, June 2016–May 2017.....	45
Annex D. Peer-reviewed Publications using EDT Data	47

ACRONYMS

ART	antiretroviral therapy
ARV	antiretroviral
CDC	Centers for Disease Control and Prevention
CMS	central medical store
COP	country operational plan
DDIU	data demand and information use
DivPhS	Division Pharmaceutical Services
DSP	Directorate of Special Programs
EDT	Electronic Dispensing Tool
ePMS	electronic patient management system
EWI	early warning indicator
HIRD	Health Information and Research Division
HIS	health information system
HIVDR	HIV drug resistance
LMICs	low- and middle-income countries
LTFU	lost to follow up
mEDT	mobile EDT
MIS	management information system
MoHSS	Ministry of Health and Social Services
MSH	Management Sciences for Health
NARP	Namibia Adherence and Retention Program
NDB	national database
PEPFAR	US President's Emergency Plan for AIDS Relief
PMIS	pharmaceutical management information system
PRISM	performance of routine information system management
RM&E	Research, Monitoring & Evaluation Unit
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
SOW	scope of work
TWG	technical working group
USAID	US Agency for International Development

EXECUTIVE SUMMARY

The US Agency for International Development (USAID)-funded Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program and its predecessor programs have developed and implemented interventions that enhance the availability and visibility of pharmaceutical data in Namibia. The Electronic Dispensing Tool (EDT) maintains patient profile information, medicine history, and other data needed to effectively dispense medicines, particularly antiretrovirals (ARVs), and provide quality pharmaceutical services to patients. It also provides data for calculating pharmaceutical needs and informing management decisions. The Pharmaceutical Information Dashboard (dashboard) is a web-based tool, implemented in 2016, that enables the Ministry of Health and Social Services (MoHSS) to monitor the availability of essential medicines, vaccines, and clinical supplies at the central, regional, district, and health facility levels. SIAPS conducted this assessment to determine the extent to which pharmaceutical information generated from the EDT and dashboard is used by key stakeholders in the national antiretroviral therapy (ART) program in making decisions regarding the management of medicines and related services and, to the extent possible, identify potential influences on program outcomes. The assessment used a descriptive case study approach based on 28 interviews conducted with key stakeholders in the national ART program and a desk review of program-related documents and publications.

The findings show that the EDT is critical for understanding the HIV treatment landscape in Namibia. This is evident in the increasing requests for data from the EDT by the national ART program and other stakeholders working to ensure access to ART in Namibia. The quality and timeliness of the EDT data are key technical determinants of use. MoHSS managers use the information primarily for routine monitoring and reporting; implementing partners also use it for strategic planning and operational research. The EDT is one of the most reliable sources of data for monitoring patients' adherence to ART. The data are indispensable for tracing lost to follow up (LTFU) patients and for monitoring drug-resistant HIV early warning indicators (EWIs). The dashboard has become the primary source for data on ARV consumption rates and was used in the last ARV quantification in 2016. However, given that the dashboard was recently launched, stakeholders were still undergoing training and were yet to fully integrate the tool and its available information into their decision-making processes.

Adoption of the dashboard has reached a critical point, with the MoHSS permanent secretary promoting the training of MoHSS managers and their use of the dashboard. However, technical training needs to be complemented with a broader strategy in the MoHSS for promoting evidence-based decision making. There needs to be clarity in the roles and responsibilities of managers for using pharmaceutical information and ensuring compliance with reporting requirements at the facility level. Information availability is no longer a constraining factor in achieving the outcomes of the national ART program. Adequate information is available and is visible and easily retrievable through the dashboard. The ART program and the MoHSS need complementary systems and processes to ensure that the abundance of pharmaceutical information available informs effective decision making and action.

BACKGROUND

“A well-functioning health information system is one that ensures the production, analysis, dissemination and use of reliable and timely information on health determinants, health systems performance and health status” (WHO 2007, p.3). This facilitates evidence-based decisions regarding health policies and targeted health interventions to reduce preventable morbidity and mortality. Evidence-based decisions lead to more effective and efficient health systems and, ultimately, to improved health outcomes. Similarly, at the pharmaceutical system level, the collection and use of health and logistics data facilitates accurate quantification, procurement, and costing for medicines and ensures an uninterrupted supply of medicines (SIAPS 2016), thereby improving access to and appropriate use of medicines and enabling better health outcomes.

SIAPS and its predecessor programs, all implemented by Management Sciences for Health (MSH), have developed and implemented data collection and management tools in low- and middle-income countries (LMICs). These tools have enhanced the availability of accurate and timely pharmaceutical information and facilitated evidence-based decision making in the management of pharmaceutical products and services. In Namibia, three pharmaceutical information tools are of particular relevance: the EDT, the Facility Electronic Stock Card (eStock card), and the dashboard. The assessment largely focused on the EDT and the dashboard. In 2006, the RPM Plus program developed the EDT (initially the Antiretroviral Dispensing Tool), a computer-based medicine dispensing and tracking tool, to fill a critical data gap for inventory and patient management. The EDT helps maintain patient profile information, medicine history, and other data needed to effectively dispense medicines and provide quality pharmaceutical services to patients. It also provides data for calculating pharmaceutical needs and informing management decisions. The dashboard is a web-based tool, implemented in 2016, that enables the MoHSS to monitor the availability of essential medicines, vaccines, and clinical supplies at the central, regional, district, and health facility levels.

This report analyzes the extent to which pharmaceutical information generated from the EDT and dashboard is factored into the strategies and management decisions of Namibia’s national ART program and the resulting influence on program outputs and outcomes. There is a dearth of literature on the role of information use in evidence-based decision making in the management of pharmaceuticals and its possible effects on uninterrupted access to and use of medicines. The EDT and dashboard were designed specifically for the national ART program. Namibia is therefore a suitable case for understanding some of the constraining and enabling factors of pharmaceutical information use in program management decisions. The specific scope of work (SOW) included describing:

- How data are transmitted to the national database (NDB) at the MoHSS
- How data are reported and the frequency and distribution of reports among stakeholders in the national ART program
- The use of reports by key stakeholders in addressing quantification of commodities and procurement and how any decreases in wastage and uninterrupted availability of ARVs in

facilities across Namibia are attributable to the use of reported data

- How the data collected at the national level and managed in the pharmaceutical dashboard are used to guide decision making by MoHSS managers at the facility and national levels
- The use of the data in community ART programs to trace defaulters and patients who have poor adherence to ART
- How data have been used for the publication of scientific papers of significance in international journals

The findings were used to identify the enabling and constraining factors affecting the demand and use of pharmaceutical information and provide recommendations for enhancing evidence-based decision making in the national ART program and at the senior management level of the MoHSS.

National ART Program Outputs and Outcome

Namibia, like many LMICs, has a national strategy that provides a guiding framework for key stakeholders in developing and implementing strategies to mitigate the impact of HIV and AIDS on the Namibian population (Republic of Namibia 2010). A key objective of the ART program is universal access to care and treatment for the HIV-positive population. The specific strategies with respect to this objective include:

- Improving ART coverage and the service provision environment (human resource and infrastructure capacities)
- Encouraging adherence to treatment schedules to minimize defaulters and HIV drug resistance (HIVDR)
- Enhancing quality of care by maintaining treatment standards
- Strengthening linkages across key response areas for treatment, care, and support, particularly referrals to the ART program and the management of opportunistic infections
- Developing more reliable monitoring and tracking systems for ART patient management
- Strengthening the pharmaceutical supply system throughout all the levels of the supply chain

The priority actions associated with these strategies are expected to result in an increase in the number of people who are eligible for ART receiving the treatment, an increase in the number of health facilities and outreach clinics offering ART, and a reduction in stock-out rates. These outputs will lead to an increase in the survival and quality of life of people living with HIV (Republic of Namibia 2010). These objectives have increasingly evolved into the broader global

goal of achieving 90-90-90 (90% of HIV patients knowing their HIV status, 90% accessing ART, and 90% achieving viral suppression) and thus an AIDS-free generation. USAID, through SIAPS, has significantly supported the attainment of the second and third 90s in Namibia. This assessment comes at an important milestone in USAID support to Namibia to determine how to optimize the use of information from these tools in decision making.

Conceptual Framework

The conceptual framework for this assessment is grounded in the Data Demand and Information Use (DDIU) framework (Foreit et al. 2006); the Performance of Routine Information System Management (PRISM) framework (Aqil et al. 2009); and the Jacobson et al. (2003) framework for knowledge translation. The DDIU and PRISM frameworks provide a conceptual model for improving health information systems and the use of information in decision making in the health sector. The framework for knowledge translation guides knowledge producers in understanding their intended user group to facilitate better dissemination and use of knowledge in decision making. Together, these frameworks provide critical insight to understand the determinants of information use.

Data availability does not guarantee use or translation into programs and policies. At a minimum, data need to be analyzed and interpreted to become accessible and provide timely information relevant to the decisions being made. Demand—the value stakeholders put on information by proactively seeking or requesting it—is also an important prerequisite for evidence-based decision making (Foreit et al. 2006). This is conceptually distinct from and independent of use, which refers to “decision makers and stakeholders explicitly consider[ing] information in one or more steps in the process of policymaking, program planning and management, or service provision, even if the final decision or actions are not based on that information” (Foreit et al. 2006, p.7). It is clear from this definition that a final decision or action not reflecting a particular piece of information does not imply that the information was not used. Further, it is important to note that all decisions are made based on some kind of information. The actual information used will vary depending on the goal of the decision, the stakeholders involved, the extent to which they have competing goals or differ in their interpretation of a common goal, and how they differ in the value they place on what information is necessary for a given decision (Jacobson et al. 2003; Foreit et al. 2006).

In practice, it may be impossible to distinguish demand from use, but we can conceptualize the relationship between the two concepts as an amplifying loop. Positive experiences with using data contribute to the demand for additional data, which in turn reinforces the need to collect and analyze data and use the resulting information (Nutley and Reynolds 2013). According to the DDIU framework, the evidence-based decision making process is embedded in the data demand/information use loop and will ultimately lead to improved health outcomes (Foreit et al. 2006). Similarly, the PRISM framework postulates that data quality and use, a system output, influences health system performance and, ultimately, health outcome (Aqil et al. 2009).

The PRISM framework identifies three determinants of health information use: technical, organizational, and behavioral factors (Aqil et al. 2009). Foreit et al. (2006) posit that the three

determinants of information use are along a continuum as opposed to being discrete categories, and Aqil et al. (2009) depict them as part of an interconnected triangle. Technical determinants include technology and relevant training for staff to develop and manage health information system processes; the functionality and accessibility of the tools; and the quality, timeliness, relevance, and presentation of the data and associated analyses. Technical determinants are situated within the context of organizational determinants, which include the perceived value of the information provided by the tools, the systems and processes in place to ensure access to the tools and use of the information, and clarity regarding the flow of information and responsibility for its use (Foreit et al. 2006). The health system has to be structured in such a way as to facilitate information use. The motivation, attitudes, and values of decision makers are key behavioral determinants of information use (Jacobson et al. 2003; Aqil et al. 2009). Jacobson et al. (2003) postulate that users who view decision making as a political or value-based activity are less likely to incorporate evidence into decision making. Conversely, those who are familiar with research, have previously used it for decision making, and value the importance and usefulness of research and researchers are more likely to incorporate evidence (Jacobson et al. 2003; Shroff et al. 2015). Therefore, stakeholders who think the information from the tools is relevant, useful, and of sufficient quality are more likely to use it and may proactively seek the necessary information if it is inaccessible. Of course, these different determinants affect one another, and it may be impossible to isolate some of these effects. Both technical and organizational determinants affect behavioral determinants of information use (Aqil et al. 2009). The extent to which stakeholders use the pharmaceutical information from the tools for a given decision will partially depend on the type of decision being made, the stakeholders involved, and the extent to which evidence and rigor are demanded for making specific decisions.

METHODOLOGY

The assessment used a descriptive case study to answer the questions determined by the SOW. The following subsections describe the tools and information included in the assessment, data sources, and analytical strategy.

Tools, Types of Information, and Decisions

The assessment focused on decisions relevant to information generated by the EDT and the recently designed and implemented pharmaceutical information dashboard. The EDT is a pharmacy dispensing tool that enables patient management and the collection of information on pharmaceutical product consumption rates and ARV inventory. Among other things, the EDT maintains historical ART patient data and tracks ART appointments and ARV pick-ups, which allows for monitoring adherence to ART and HIVDR EWIs. The dashboard—an inventory management and early-warning tool for stock-outs—has three modules. The ART module provides standardized monthly reports with information on the ART patient population, ARV consumption, and potential ARV stock-outs. The pharmaceutical module provides stock status information for all essential health products at the central, regional, and facility levels. The pharmaceutical information management module tracks 22 essential indicators. Technical and program managers use these data to inform, among other things, quantification, procurement, and distribution of pharmaceutical products.

Given the data collected by these two tools, the assessment focused specifically on the EDT and the ART module of the dashboard and the information needs and decisions related to adherence monitoring, HIVDR monitoring, quantification and procurement, distribution, and other service delivery resource allocation in the national ART program. The assessment also gave limited consideration to the eStock card, an electronic stock management tool that health facilities are using to replace paper stock cards to manage their inventory of ARVs and other essential medicines. In addition to tracking stock levels, it generates stock status reports and supply requisitions and provides information about the availability of ARVs and other essential medicines around the country. Although the eStock card is used for all pharmaceutical commodities, its use at the facility level affects the quality of information available on the dashboard for stakeholders in the national ART program. It is therefore important to consider in understanding respondents' perception and use of the dashboard.

Data Sources and Analysis

The assessment relied primarily on 28 interviews conducted with key stakeholders in the national ART program during a two-week period (June 12–23, 2017) in Windhoek, Namibia. Among the respondents, 47.06% were affiliated with the MoHSS and 41.18% were affiliated with USAID or other implementing partner organizations (table 1). The SIAPS Namibia team identified respondents, scheduled interviews, and provided reports and other information relevant to the assessment. The interviews were semistructured and lasted between 30 and 120 minutes. Six

interviews included two or three respondents, so the number of respondents is greater than the number of interviews. Interview questions focused on respondents' familiarity and use of information from the EDT and dashboard in their decision making, how the information helped them achieve their objectives specific to the national ART program, and the factors that constrain or enable their use of the information (annex A). Respondents were informed that their responses would be treated anonymously and encouraged to be as candid as possible. Their permission was requested to record the interviews and cite their responses in the report. In instances where permission to record the interview was not given, extensive hand written notes were taken. Recorded interviews were transcribed and randomly assigned a unique ID number ranging from 1 to 40 to help anonymize the respondents cited in the report.

Table 1. Affiliation of Interview Respondents

Affiliation	No. of Respondents	Percentage of Respondents
MoHSS	16	47.06
SIAPS	5	14.71
Implementing Partner	9	26.47
Academia	2	5.88
Other	2	5.88
Total Informants	34	100

In addition, various publications (some of which respondents identified as relevant) from Namibia's national ART program, SIAPS, and other stakeholder organizations were reviewed. A literature search was conducted with Google Scholar and PubMed for peer-reviewed publications on HIV treatment and care that included analysis of data from the EDT. Keywords in various combinations included Namibia, antiretroviral (*ARV, ART), HIV, HIVDR, electronic dispensing tool (*EDT), and dashboard. Interview respondents who were authors of some of these publications were asked about the impact of their research on the national ART program and HIV treatment and care.

The interview transcripts were analyzed using Dedoose Version 7.0.23. Excerpts from the transcripts were coded according to themes from the conceptual framework. Root codes included collection and flow of information, information demand and use, determinants of use, and broader system issues. The frequency of the various codes guided the identification of the major themes. The themes from the transcript excerpts were triangulated among the interview respondents and with information from the reviewed documents. The analysis was used to develop a descriptive narrative regarding the flow of information collected by the tools, stakeholders' use of this information in their decisions, and the factors that enable and constrain information use. A causal loop diagram was developed to help understand the relationships among the various determinants of information use.

FINDINGS

Findings were categorized into collection and flow of information, information demand and use, determinants of use, and broader system issues. The following subsections describe the stakeholders, flow of data and information from the facility to national level, and demand and use of information from the two tools and discuss the determinants of use.

Stakeholders

The Namibian government, PEPFAR, and the Global Fund finance the national ART program. The DSP and DivPhS manage the clinical and pharmaceutical aspects of the ART program, respectively. They are the primary users of EDT data and receive technical support from SIAPS. The national ART program also receives technical support from the Centers for Disease Control and Prevention (CDC), IntraHealth, I-Tech, Project Hope, the UNAIDS and USAID Global Health Supply Chain Program, the Global Fund, and other organizations. As expected, these stakeholders vary in their demand and use of the information from the EDT and dashboard. There is limited use of data at the facility level, which guided the selection of key respondents for this study.

Flow of Data and Information

At the time of the assessment, Namibia had 51 main (or parent) ART pharmacies that used the EDT desktop application to dispense ARVs and manage ART patients who obtain their medicines from public facilities. In addition, pharmacy staff and/or nurses at primary health care facilities use the mobile EDT (mEDT) for ARV dispensing and ART patient management. However, at the time of the assessment, the mEDT could not register new patients or print prescription labels other than refills. Though not recommended, pharmacy staff at high burden sites may record dispensing information on paper forms and later add the information to the EDT. Namibia is decentralizing ART services to all primary health care facilities under the nurse initiated and managed ART initiative. The mEDT therefore plays an increasingly critical role in expanding patient management and data capture at decentralized sites. Data from the mEDTs are uploaded to the desktop EDT at the main sites. The frequency of these updates is partially determined by the remoteness of the sites.

Encrypted data from the EDT desktops at health facilities (ART sites) are synchronized to the NDB. For sites with cellular connectivity, the EDT desktops make a closed EDT network connected through 3G devices available through an arrangement with the local telecommunications provider, MTC. Previously, synchronization was an automatic and continuous process, but the costs became prohibitive. As a result, synchronization now occurs monthly or quarterly, to coincide with the preparation of the ART pharmaceutical management information system (PMIS) quarterly feedback report. The entire process may take up to two weeks. The SIAPS management information system (MIS) senior technical advisor in Windhoek uploads the encrypted files remotely. Data uploads may be delayed for several days if sites are disconnected from the network due to no availability or low internet/cellular coverage. In such

cases, the data are transferred to an encrypted USB stick and couriered to the SIAPS office in Windhoek for upload to the NDB. Figure 1 illustrates the flow of data from the facility to the national level.

Before the introduction of the dashboard, the main ART pharmacies would use an Excel template to generate a monthly facility report summarizing key patient-level data (number of active and new patients, regimen changes, number of ARV pickups, lateness for appointments, and pill counts) and the distribution of the ART regimens. The regional pharmacist would check the report and email it to the ART logistics pharmacist at the DivPhS. The logistics pharmacist would then collate and analyze the reports, liaise with the pharmacy coordinator in the DSP as needed to clarify anomalies, and supplement with data from the NDB as needed (e.g., data on 12-month retention and for facilities that did not submit or submitted an incomplete report) to compile the ART PMIS quarterly feedback report. The permanent secretary would sign the quarterly report, and the ART logistics pharmacist would circulate the report to the regional pharmacists, central medical store (CMS), DSP and other relevant MoHSS units, implementing partners, and other stakeholders. The regional pharmacists would further disseminate the report to the districts and health facilities.

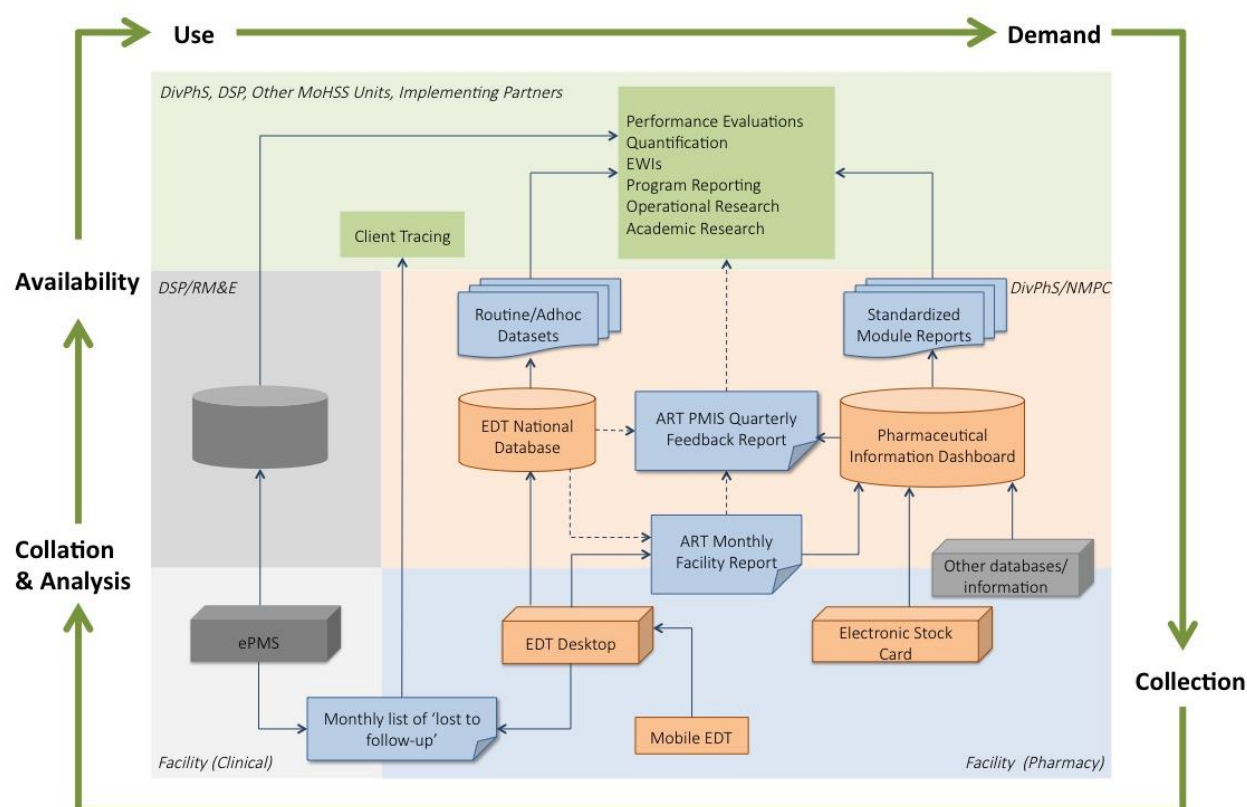


Figure 1. Collection and flow of information from the facility to the national level and select uses of the information

With the launch of the dashboard in 2016, the main ART facilities now submit a monthly ART facility report using a revised Excel template (annex B) and either upload it directly to the ART module of the dashboard or email it to the ART logistics pharmacist to upload. The submission deadline for the monthly ART reports to the dashboard is the 7th of each month. However, some facilities have not been able to meet this deadline. Reports for all reporting facilities are available on the dashboard for each month since the launch of the dashboard (table 2). However, there is much variation in the timeliness of these reports so the real-time reporting rates in a given month are lower (Interview (I)-3, I-9, I-19, I-22, I-25, I-32). The average timeliness (number of days past due date) across facilities ranges from 7 to 53 days past due, but reports have been published up to 153 days past due for individual facilities (annex C). Okahao, Oshikuku St. Martin, Outapi, and Katima Mulilo district hospitals and Oshakati intermediate hospital have the most consistent reporting times, not exceeding 26 days past due during that time period (annex C). The ART logistics pharmacist has developed a follow-up plan of reaching out to facility managers urging them to submit timely reports on a regular basis. However, the ART logistics pharmacist lacks the authority to impose any penalties or recommend reprimand.

The ART logistics pharmacist continues to compile and distribute the quarterly reports. There are 50 standardized reports available in the ART module of the dashboard that users can customize for a given time period, facility, region, or commodity group.

Table 2. Percent of Monthly ART Reports from Facilities Available on the Dashboard, June 2016–May 2017

Month	% reports published
June 2016	91.2
July 2016	91.2
August 2016	93.0
September 2016	91.2
October 2016	93.0
November 2016	91.2
December 2016	84.2
January 2017	89.5
February 2017	89.5
March 2017	96.5
April 2017	94.7
May 2017	89.5

Source: Author's analysis based on data provided by G. Mazibuko, SIAPS Namibia.

Note: Annex C provides the average reporting times for each facility.

In addition to the monthly ART report, facilities are required to submit a monthly logistics report generated from the eStock card. The eStock card automatically generates stock orders for facilities based on current stock levels and average monthly consumption. However, getting facilities to use the eStock card consistently and report and order accordingly has been a challenge (table 3; I-2, I-3, I-9, I-19, I-25, I-28). Reporting rates have declined since March 2017 (table 3). Katima Mulilo, Omaruru, Outjo, Onandjokwe, Okahandja, Omuthiya, and Nankudu district hospitals and Rundu and Katutura intermediate hospitals did not submit reports to the dashboard between December 2016 and May 2017 (Mazibuko and Wolde, personal

communication, July 3, 2017). Windhoek central; Swakopmund, Mariental, Opuwo, Okahao, Oshikuku St. Martin, Outapi, and Tsandi district; and Oshakati intermediate hospitals all reported consistently during the same time period (Mazibuko and Wolde, personal communication, July 3, 2017). It appears staff transitions without proper skills transfer sometimes limit continued and effective use of the eStock card, as well as the EDT and mEDT.

Table 3. eStock Card Reporting Rates, December 2016–May 2017

Month	% reports published
December 2016	50.0
January 2017	52.5
February 2017	62.5
March 2017	51.2
April 2017	33.3
May 2017	32.6

Source: Analysis conducted by A. Wolde, SIAPS Namibia.

In addition to the quarterly ART PMIS feedback reports, EDT data are also distributed through routine and ad hoc NDB data abstraction requests. In an effort to facilitate coordination and oversight of data access, the MoHSS has mandated that all requests be submitted to and approved by the MoHSS permanent secretary (MoHSS memorandum, April 13, 2016). This instruction applies to internal MoHSS requests for information from the NDB. The MIS senior technical advisor has written standard query scripts for routine data requests, which means the ART logistics pharmacist can run routine queries and export the data to Excel for analysis.

Demand and Use of Information

EDT information is used primarily for managing ART service delivery at the facility level, which fulfills the original objective of the tool. At the national level, the increasing requests for data from the EDT/NDB clearly indicate a demand for very specific ART information and show that managers increasingly recognize the EDT/NDB as a reliable source for this information. The evidence suggests that MoHSS managers use the information primarily for routine monitoring and reporting. Implementing partners seem to use the information for strategic planning and operational research, in addition to monitoring and reporting. Information related to the number of ART patients, number of patients on each regimen, and ART adherence and retention in Namibia are based on EDT data (I-5, I-15, I-19, I-20, I-22, I-23, I-29, I-34). This underscores the importance of the EDT in evidence-based decision making in the national ART program. Use of the quarterly reports and dashboard are described below, followed by a description of stakeholders' specific uses of the information.

Quarterly ART PMIS Feedback Report

Prior to the dashboard, the quarterly ART PMIS feedback report was the primary means for disseminating summary information about the national ART program regarding the patient population, ART distribution, and EWIs for HIVDR. This is one of the few reports that the

MoHSS officially and routinely produces and disseminates. Implementing partners use the quarterly report to monitor the number of new patients enrolled on ART, total patients active on treatment and those LTFU, the distribution of ART regimens, and 12-month retention in care. Based on the quarterly report, partners, in coordination with the MoHSS, request specific EDT/NDB data, which they use to understand changes in the trends highlighted in the report, generate their own reports, or plan their program (I-5, I-6, I-20, I-23, I-29).

Clinical managers in the DSP use the quarterly report to inform decisions regarding adherence and treatment guidelines and decentralization of ART programs. Particular attention is given to the number of new patients, the number of patients LTFU, and the distribution of ART regimens (I-19, I-22, I-30). In cases where there are discrepancies, they follow up with queries to the regions and facilities for clarification. Managers use the ART distribution statistics to identify potential noncompliance with standard treatment guidelines, such as the number of patients maintained on failed treatments (I-30). They also use the new and total ART patient data to identify high congestion sites and inform decisions in the clinical mentor program and the decentralization of the national ART program (I-22, I-30).

DivPhS managers use the quarterly report to monitor ARV stock levels throughout the country (I-2, I-17, I-28). However, the quarterly report does not seem to be used strategically. For example, it reports ARV consumption trends, stock-outs, and distribution of the different ART regimens, but some facilities have been experiencing stock-outs (I-3, I-9, I-19, I-25, I-27, I-30) despite an adequate supply of ARVs to meet the country's needs (I-3). The managers at the national level, particularly in the DivPhS and CMS, were often surprised by these stock-outs (I-2, I-3, I-25, I-30). It appears that the summary information in the reports may not have been given adequate attention or used optimally to take proactive action. Similarly, the quarterly report highlights the facilities that have failed to submit their monthly ART reports regularly and on time. The ART logistics pharmacist routinely follows up with these facilities but lacks the authority to ensure compliance. It is unclear what management action this report routinely triggers at the national or regional level to ensure compliance with reporting requirements (I-10, I-21, I-28). A respondent cited the seemingly insufficient use of the report to monitor facilities as a sign of limited accountability, lamenting:

"Pharmacy store is small with millions of dollars in there. No one held accountable."
(I-21)

The same respondent lamented the unwillingness of some ministry counterparts to read the quarterly report:

"I was in a meeting...they were harassing the pharmacist. I told the pharmacist, tell them to go and read the report. They have the report collecting dust...go read. Then I pointed out to them that this is the only program that has a report, and [they] should be reading it, it has very good indicators." (I-21)

This unwillingness to read—and use—the reports in the MoHSS was also noted by other respondents (I-9, I-10, I-19, I-26, I-27, I-28, I-29). Another respondent described the situation as follows:

“You know what happens to paper reports...you send them and they get filed on a shelf. And when [an MoHSS official] has to answer questions [...they will request the same information from the quarterly report].” (I-32)

The Dashboard

The dashboard was introduced to enhance the visibility and accessibility of pharmaceutical information for decision making in the national ART program. Given that it is a fairly new tool, it is too early to fully assess how the dashboard has affected the use of information for decision making. MoHSS stakeholders are still being introduced to the tool. It is therefore not surprising that stakeholders in the national ART program had yet to fully integrate the dashboard into their decision-making processes (I-2, I-3, I-4, I-6, I-9, I-20, I-27, I-32, I-34). One notable exception is the dashboard’s use in the last ARV quantification, which is discussed below. MoHSS and implementing partner respondents highlighted the ease of access to relevant information on the dashboard and its potential to facilitate routine, evidence-based decision making (I-2, I-3, I-4, I-6, I-10, I-20, I-22, I-23, I-29, I-30, I-31, I-34). A respondent who was being introduced to the dashboard for the first time commented:

“The trouble we go through to compile some of these figures...we can now get with just the click of a mouse.” (I-6)

Several respondents note that adoption is reaching a critical point because the permanent secretary has become a champion of the dashboard, promoting the training of MoHSS managers and their use of the dashboard. For example:

“Recently, there was a stock-out of rapid testing kits. Someone demanded an answer...So, we took the information from the dashboard. Went and presented it. And then the [permanent secretary] was like, ‘So, this information has been available to all my managers in the ministry giving warnings that things are in the red? And no one did anything?’ He was very disappointed.” (I-27)

The MoHSS permanent secretary subsequently submitted a formal request to USAID for SIAPS to introduce the dashboard to MoHSS managers and demonstrate how to use the information from the dashboard. A two-day workshop was held in Windhoek July 19–20, 2017, to train regional directors, chief and senior medical officers, medical superintendents, and regional pharmacists on how to access and use information from the dashboard. HIV clinical mentors have also been trained on the dashboard at the request of the chief medical officer (I-30, I-32). The efforts by the permanent secretary and chief medical officer will likely spur adoption of the tool. However, it is not possible to determine at this point whether use will extend beyond routine reporting and monitoring to include more strategic and proactive decision making. To the extent the dashboard is currently being used by MoHSS managers in decision making, it seems limited to being a crisis management tool, usually to respond to stock-outs (I-2, I-3, I-4, I-28). As one respondent noted:

“I see that colleagues are happy that they can see availability and trigger a redistribution [of stock]. But this should be an exception and not the routine. We need to reinforce that

we can use this tool regularly to better manage stock and avoid stock-outs as opposed to [use] as a crisis management tool. So if we are in yellow or green let us find a way to stay there and if we are in red, can CMS propose an intervention that will shift the situation.” (I-4)

Prior to the dashboard, the CMS would have to call individual facilities for stock status or wait for the quarterly report. This information is now readily available through the dashboard, which allows the CMS to easily locate stock at the subnational level. In cases where there is a change in treatment guidelines, for example, the CMS uses the dashboard to locate existing stock, redistribute it, and use it up before the transition to the newly recommended regimen (I-2). However, there is no documented evidence as to whether the information available on the dashboard was used in updating the treatment guidelines.

Use at the subnational level has been inconsistent across facilities, but they are increasingly using the eStock card to manage and order stock (I-1, I-9, I-25, I-27, I-32). It was noted during the assessment that some facilities override the order amounts calculated by the eStock card, instead ordering above the suggested maximum (I-2, I-3, I-9, I-25, I-27). These issues make it difficult at the national level to get an accurate picture of stock status in the country (I-9, I-27). Regardless, the eStock card is helping pharmacy staff understand the value of their stock in terms of both the budget and patient treatment implications. As a respondent observed:

“Now, a pharmacist appreciates that he is holding this much worth of millions of dollars in the facility. So for example, it now means that when people say we need a fire extinguisher [there is no] delaying. [They understand] what a fire in the pharmacy would mean. Once the [eStock card] reports show the value in terms of dollars, attitudes change.” (I-25)

Some facilities have taken full ownership of the eStock card, not only submitting reports consistently but also using the reports appropriately to track stock status and order and receive supplies (I-9, I-32; SIAPS 2017a). At a milestone event held in the Oshana region marking the 50th facility installation of the eStock card, Oshakati hospital was cited for its successful and consistent use of the tool (SIAPS 2017a).

Reporting, Planning, and Operational Research

EDT data provide estimates of ART coverage, which are used for various internal and external reporting and planning purposes (see for example, MoHSS 2015, PEPFAR 2017).

MoHSS

The Research, Monitoring & Evaluation Unit (RM&E) in the DSP routinely requests EDT data on the number of patients on treatment by ART regimens (I-6, I-22, I-34). The RM&E uses EDT data to supplement the electronic patient management system (ePMS) data to respond to information requests from the Global Fund and PEPFAR, compile their quarterly internal reports, and inform performance evaluations (I-22, I-30, I-34). The DSP also uses the information to inform the national HIV strategy (I-34).

UNAIDS

UNAIDS Namibia and the RM&E use EDT and ePMS data to generate Spectrum estimates on HIV prevalence and incidence, total people living with HIV, HIV-related deaths, mother-to-child transmission rates, and ART coverage at the population level, which are disaggregated by age, gender, and region (I-6). UNAIDS Namibia uses the Spectrum estimates to track progress on UN Assembly commitments to HIV and includes them in the global AIDS monitoring report. They use the estimates in their strategic planning to identify focus population groups for expanding treatment and adherence at the regional and global levels (I-6). The current strategic plan identifies Namibia as a priority country in the Eastern and Southern Africa region for fast-tracking the regional response to reducing the number of people newly infected with HIV and dying from AIDS-related causes (UNAIDS 2016).

USAID and CDC

USAID and the CDC used the Spectrum estimates to develop the PEPFAR country operational plan (COP) for 2016 and 2017 (PEPFAR 2016; 2017). They also used ARV refill data and the number of newly initiated ART patients to estimate ART retention for the COP (PEPFAR 2017). In addition, they use EDT data in assessing the performance of the national ART program, particularly with respect to adherence and retention. This helps inform performance assessment at the global level to identify sites performing suboptimally and resource allocation decisions regarding adherence support. They also use the data for operational research. For example, they are using EDT data to evaluate how the introduction of the differentiated models of care has affected adherence outcomes. This is anticipated to inform decisions regarding the scale up of differentiated models of care. The CDC is also awaiting access to EDT data (patient-level ART regimen history and adherence) to help evaluate the relationship among ART regimen, viral load suppression, and failing on treatment. The findings will inform decisions regarding HIV treatment guidelines.

Quantification

The USAID Global Health Supply Chain Program used the dashboard as the primary source of data for ARV consumption during the November 2016 ARV quantification, which reviewed forecasted ARV supplies for October 2016 to March 2019. Other stakeholders included the DivPhs, DSP, SIAPS, and CDC. Stakeholders have proposed a pharmaceutical quantification technical working group (TWG) to facilitate annual quantification and quarterly supply chain planning, and the dashboard will be used to inform discussions and decisions in this TWG. In addition, the chief medical officer has convened an HIV Treatment TWG, which meets monthly and brings all stakeholders together to discuss supply chain planning and other pharmaceutical issues related to the ART program. One result from the May 2017 meeting was the decision to use the upper-bound Spectrum estimates for forecasting ARV supply despite the statistics showing that the medium-bound estimates are sufficient for the situation on the ground (Minutes, HIV TWG meeting, May 2017). Again, these estimates and the actual consumption of ARVs in Namibia are all derived from EDT data.

HIVDR EWIs

EWIs are a critical output of EDT data (I-15, I-26, I-29). Namibia monitors the following HIVDR EWIs: on-time pill pick-up, retention in care, adherence by pill count, dispensing practices, pharmacy stock-outs, and viral load suppression and viral load completion at six months; the first four of those are derived from EDT data. Quarterly monitoring of these indicators without EDT data would have been more labor intensive, if not impossible. The monitoring of EWIs has led to public health recommendations and action on increasing defaulter tracing, improving ART record systems, and scaling up differentiated models of care (I-15, I-29; Mutenda et al. 2016). However, human resource constraints are limiting the timely data analysis and compilation of the annual EWI reports.

Adherence/Patient Tracing

Project Hope and I-Tech have been using the EDT and dashboard to extract information for reporting on the facilities and regions in which they work to track LTFU patients. Project Hope routinely uses EDT data directly from facilities (as opposed to the NDB) for the Namibia Adherence and Retention Program (NARP). Project Hope started the implementation of NARP in June 2013. NARP is funded by PEPFAR through USAID and aims to support the MoHSS to improve adherence to ART by tracing patients who missed appointments and bringing them back to care. Project Hope has community nurses and health workers based at the health facilities in the regions where they have implemented NARP. EDT, which tags a patient as LTFU three months after the last missed appointment, is the primary information source for patient tracing.

“The EDT is what we rely on for information on patients to do the tracing. Without the EDT, it would be difficult to do the tracing of the patients. Facilities appreciate the tool because it used to be difficult to trace back defaulters into care because of the workload.”
(Project HOPE’s Referrals & Sexual and Reproductive Health Programme Specialist, cited from SIAPS 2017b)

Community nurses contact pharmacy assistants monthly to get a printout of LTFU patients (patient’s name, ART number, and recent appointment history). The nurse attempts to contact the patient either by phone, with a home visit, or through community-based care providers to discuss reasons for the missed appointments. The outcome of the tracing is communicated to pharmacy staff so that the EDT data can be updated to reflect patient status (e.g., LTFU, transferred out, deceased). Part of the work also involves identifying the reasons why patients default, which has helped the Adherence TWG better support ART patients and prevent defaults. NARP has successfully traced 10,500 patients over a two-year period, and more than half of those patients have returned to care (Asefa et al. 2016). Project Hope is now working with the MoHSS, SIAPS, and other implementing partners to develop a standard operating procedure for tracing ART patients using patients’ appointment and LTFU data from the EDT. With assistance from pharmacy staff, Project Hope is also using the EDT to create patient groups for the community ART refill program (I-5, I-19).

Peer-reviewed Publications

The literature search identified 14 peer-reviewed publications using EDT data (annex D). Three additional publications are under review. The authors include staff from the MoHSS and PEPFAR implementing partner organizations and academics (annex D). Among the publications, several are linked to decision making in the national ART program. The findings from the assessment of EWIs by Mutenda and colleagues (2016) have led to changes in record keeping and the strengthening of adherence and monitoring. EDT data have also been used in several medicine adverse reaction monitoring studies. The MoHSS and researchers have used EDT data to investigate adverse reactions associated with zidovudine (Corbell et al. 2012), tenofovir (Kalemeera et al. 2015) and nevirapine (Kalemeera et al. 2016). The findings from the nevirapine study contributed to the MoHSS revising its treatment guidelines and stopping the use of nevirapine-containing ART to initiate treatment of pregnant women with high baseline CD4 cell counts (I-12, I-31; Kalemeera et al. 2016).

Determinants of Information Use for Decision Making

The technical, organizational, and behavioral determinants are discussed below and should be understood in the context of broader systems issues, some of which are also discussed. Figure 2 illustrates the interactions among some of these determinants.

Technical Determinants

The quality of the EDT data positively influences use, and technical capacity issues constrain use of the tools.

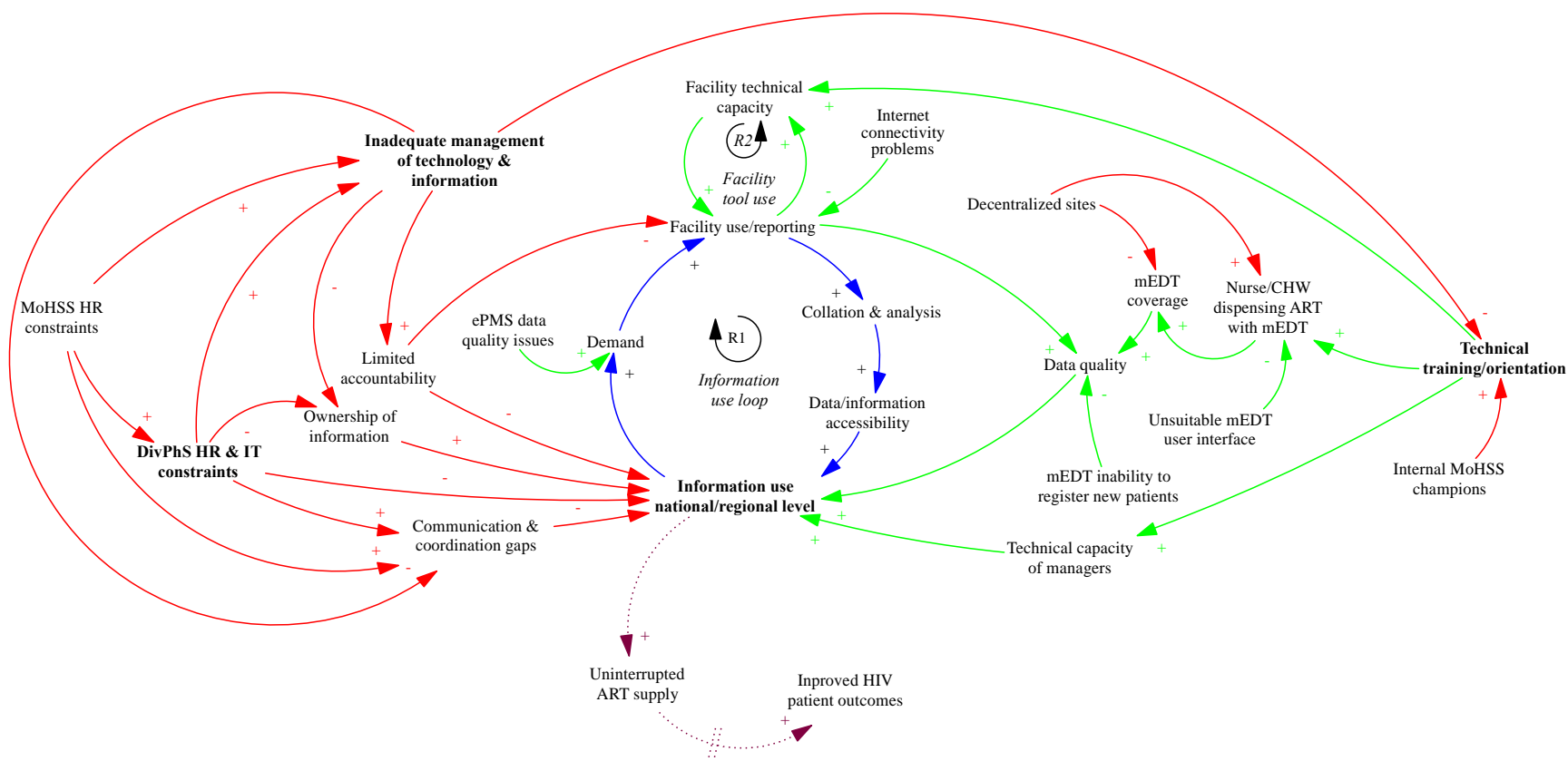
Data Quality

Stakeholders appreciate the timeliness and quality of EDT data (I-6, I-20, I-22, I-34). The EDT captures dispensing information at the point of service. The MoHSS and implementing partners routinely use EDT and ePMS data together. When faced with a choice between EDT and ePMS data, stakeholders increasingly choose EDT (I-6, I-10, I-15, I-20, I-23, I-29). One respondent stated simply:

“We are always at a crossroad whether to use EDT or ePMS. From our perspective EDT data [are] more timely and reliable.” (I-6)

Another respondent described it this way:

“We were required to track and report with ePMS but in [the] process of validating [we] found that ePMS was problematic. EDT was more complete and had the best proxy for adherence. Frankly, EDT is the only tool we have to measure adherence, no other reliable source.” (I-10)



Note: Green and red denote technical and organizational determinants, respectively; + and – denote positive and negative effects, respectively

Figure 2. Causal loop diagram illustrating determinants of information use

With respect to adherence-related data, the issue also relates to how the data are structured. Pharmacy visits are more frequent than clinical consultations, so the EDT identifies LTFU patients more quickly. The criteria for categorizing a patient as LTFU and the scoring of adherence in ePMS also contribute to a preference for using the EDT, which uses a more stringent and informative criterion and more reliably tracks in-transit patients (I-10, I-15, I-20, I-23, I-29).

Despite these strengths, there are two separate but related potential threats to data quality: limited coverage in newly decentralized sites and the inability to register new patients with the mEDT. Currently, EDT coverage in decentralized sites is suboptimal (I-10, I-19, I-23). The decentralization of ART services and Namibia's adoption of "test and treat" will likely increase the demand for mEDTs, which cannot be used to register new patients. This has the potential to exacerbate the problem of suboptimal coverage in decentralized sites.

Technical Capacity

The DivPhS has no IT personnel and limited technical capacity to manage the tools at the national and subnational levels. Notwithstanding budget constraints, there seems to be little attempt to hire or retain MoHSS staff with the required skills to manage these tools. Administrative changes have centralized some units in the MoHSS and as one respondent explained:

"[MoHSS management] think the central IT person in the ministry can do everything. But if you take someone from central to CMS they tell you they cannot do anything. And they cannot just come in and work with the EDT and the Dashboard. It is like you telling me you are a driver, ok here is the truck, go and drive...but not every driver can drive a truck." (I-17)

The lack of IT personnel in the DivPhS means that SIAPS continues to conduct all software programming functions for the tools. Despite a centralized IT department in the MoHSS, SIAPS supports all system administration related to the two tools at both the national and subnational levels. This includes routine tasks, such as printer installation, and more complicated hardware and software issues. Similarly, there seems to be limited capacity in the DivPhS to handle sophisticated data requests, so SIAPS supports EDT/NDB data abstraction (I-9, I-15, I-25, I-29, I-32). Data requests seem to be aligned with reporting cycles, and at the time of the assessment, SIAPS staff were inundated with requests. The SIAPS MIS senior technical advisor handles all MoHSS-approved EDT data requests and is critical for the functioning of the tool and availability of information (I-9, I-19).

"...our programmer [oversees the EDT software]. He is overwhelmed. Whenever something goes wrong we have to get him wherever he is. He has to fix the problem. It all depends on [him]." (I-19)

Describing data access, one respondent noted both the indispensability and limitation of this role:

"I contact SIAPS/MSH and they link me to [the one MIS advisor]. And that is a limitation, in a way...I think if there were several [MIS advisors], it would be all right." (I-12)

The increased use of mEDTs in the decentralized sites and the implementation of the eStock card have more than doubled the number of calls for IT support. A recently hired IT specialist at SIAPS has helped to address this demand, but the staff seems to still have a tremendous workload. An additional programmer is needed to ease the workload (I-9, I-19). However, this will not address the inadequate technical capacity at DivPhS, which is a major threat to the sustainability of the tools (figure 2). It is unclear whether the MoHSS has an adequate plan for managing the tools beyond the period of SIAPS's technical assistance (I-19, I-26). The will seems to exist, but the requisite resources to ensure sustainability appear to be inadequate. SIAPS has been liaising with the MoHSS and USAID and has recommended hiring additional IT personnel. SIAPS is also engaged in ongoing capacity building through training and mentoring, including training of regional IT system administrators and on-the-job mentoring for pharmacy staff.

Dashboard Training and Orientation

Stakeholders, particularly those affiliated with implementing partners, consistently view the dashboard as a powerful tool. However, an equally consistent finding is the need for more training and awareness beyond what SIAPS has already provided. These statements by three respondents demonstrate the need for training at all levels:

"CMS has been given one training for dashboard, that is not sufficient [...] Ideally CMS should be able to track stock levels with dashboard but people are not adequately trained. There are widespread issues with regions not reporting, late reporting or erroneous reporting. We find that what [the facilities] are ordering is way above their maximum so they haven't quantified correctly." (I-2)

"At the sub-national level, one thing I observed [...] was that there was not enough knowledge about the availability of the information. For example, I presented this [dashboard] report at the TB workshop and the managers were like, 'So, I can tell whether a medicine is in stock at central medical stores?' They don't know that. That you are able to see [stock] for a particular medicine." (I-27)

"I guess we have not done enough to advocate for the information use part. It could be partly our shortcomings. But partly because people, they are sticking to the old ways that they [are] used to." (I-3)

SIAPS readily acknowledges the need for more training and mentorship, and works with facilities to support the appropriate use of the tools (I-19, I-25, I-27, I-32). SIAPS has also conducted a series of workshops at the request of the permanent secretary and chief medical officer to train regional managers.

“Our biggest headache initially up to this point was to make sure that data uploads are timely. But we didn't focus enough on the reporting. So, we had to go back and focus on the reporting to make sure that the data set is complete. Then now, the next challenge that we have been forced to confront now is – although the uploading is still a challenge, we need to make sure now that the data is used for decision making.” (I-27)

The information available on the dashboard is only as good as the data input by the facilities. As previously mentioned, there are issues at the facility level with reporting accurately and consistently. Incomplete and inaccurate information sent by facilities to the central level undermines the quality of the information on the dashboard and may limit its use for decision making (figure 2).

Organizational and Behavioral Determinants

The motivations, attitudes, and values of individual decision makers are important, but there are broader organizational determinants that constrain information use for decision making at both the individual and program levels. These organizational determinants include unclear expectations regarding the use of information for decision making, limited management capacity, and ownership of information.

Information Use Norms

Access to the dashboard and technical training regarding its use do not automatically translate into use of the information. Managers need to value this information and its utility and actively incorporate it into their decision making. Among partners and even some MoHSS respondents, MoHSS managers are generally perceived as being hesitant or overcautious to query and use data beyond the minimum required to fulfill monitoring and reporting requirements (I-9, I-10, I-19, I-26, I-29). The evidence suggests limited strategic use of information among MoHSS managers at the national level. One respondent used decentralization as an example in lamenting this limited strategic use:

[There is a failure] “to connect the dots in different places. Look at decentralization... They should be able to estimate the capacity of a given facility. But I don't see data being used to address capacity of [the] sites. When you go into a facility [there is] no one tracking phases of decentralization...No sense that it is being tracked.” (I-26)

Organizational norms affect and are affected by both human resource and analytical skills. Even if there are clear norms and responsibilities regarding the flow and use of information in the different MoHSS units or the national ART program, these can't go into effect if there is insufficient staffing and if staff are not adequately trained to analyze the information. As a respondent noted:

“I do not see any area in pharmaceutical services that cannot benefit from the dashboard...So much data but so little capacity. We may not know the appropriate methods for analysis to draw the right conclusions. Drawing the wrong conclusion from

the data is just as bad as not having data...Great data source but no benefit because of capacity and staff.” (I-4)

SIAPS has incorporated data management and use in its training curriculum for pharmacy staff to increase capacity for evidence-based decision making. For example, SIAPS has facilitated EDT and dashboard orientation sessions for pharmacy technicians being trained at the University of Namibia.

Management Capacity

Limited management capacity is evident in the suboptimal management of the flow of information to the national level, planning and advocacy for resources in support of the tools, and communication among the MoHSS units involved in the national ART program (figure 2). There is inadequate management or oversight to ensure that facilities comply with reporting requirements to the dashboard (I-3, I-9, I-10, I-19, I-25, I-26). Much progress is anticipated in light of the recent support from the permanent secretary. However, training has to be complemented by consistent and appropriate use by facilities. The quality and reliability of the dashboard information is determined by the data provided by facilities. If facilities do not use the tools appropriately, it limits the effectiveness of the tools at the facility level and compromises the quality of the information available on the dashboard. Some facilities appear to have struggled with the transition from a paper-based to an electronic system (I-3, I-9). One respondent described issues with the inconsistent use of the eStock card to post transactions and effectively manage and order stock:

“The system is recommending [that the facility] order 10. But [they] actually need 15 because that's what [they] believe is the correct thing. [They know the system is] not accurate because [they are] not posting some transactions. There's another level of discipline now required to ensure that all transactions are captured in the system for you to get the right output. So, we believe that we haven't reached that level of discipline and it's what we need to still work on for people to use the system appropriately.” (I-3)

The consistent and appropriate use of the tools requires managerial oversight in the higher levels of the MoHSS to ensure that facilities are using the tools as intended and complying with the associated reporting requirements. As a respondent noted:

“If we are saying that facility so-and-so has not reported for so long, surely someone else needs to now take it up. The region [management] needs to take it up and ask, ‘What is the problem? What is going on here? Why are we not getting reports? What is the problem that you guys are having that would make you not submit reports?’ I guess that is one of the missing ingredients.” (I-3)

And another:

“All these things can only happen if someone takes it serious. At least we know that if the management, that means the top management, the [permanent secretary], for example...or the minister has access to this information...they are the ones who have the

right to give some disciplinary action. At the lower level there, sometimes you can manage the pharmacy the way you want. Nobody really cares.” (I-9)

If managers routinely use the information available on the dashboard, this can reinforce demand and data collection at the facility level (figure 2). Effective use of the information would also require managers to actively monitor the quality of the reports and follow up with facilities as needed to ensure appropriate use of the tools for both facility-level functions and reporting to the dashboard. One respondent explains it as a management capacity issue, drawing the distinction between being technically and managerially competent:

“As much as we support providing technical assistance, we need to always build in management capacity. So, in terms of usage of information, these people can have access. People may know what to do. But can they do it? What is their capacity as managers, not as technical people?” (I-25)

Planning and advocacy also seem to be a problem. Beyond failed attempts seeking budget approval for IT staff (I-17), other avenues for advocating for resources seem underutilized. The DivPhS is a member of the Health Information Systems (HIS) TWG, which is chaired by the Health Information and Research Division (HIRD). However, one respondent cited DivPhS interactions with HIRD as an example of the need for the DivPhS to be a better advocate for the tools:

“They are not stating their needs at HIRD. So for EDT...they should be saying ‘this is what we have...this is what the partners are supporting but looking ahead, this is what we need’. The division needs to [...] equip itself.” (I-26)

A common observation is that there are communication gaps between the DSP, DivPhS, and CMS (I-19, I-23, I-26, I-29). A respondent cited the recruitment of IT staff and changes in treatment guidelines as examples of the critical challenges in coordination and communication between the two units:

“We heard that there’s an IT who was interviewed by DSP but we never saw the person. It brings confusion within the ministry. We used to have connection – if something comes up, then we call each other so we can discuss about that issue. But now, it feels [like we don’t] ...also, people are maybe not understanding.” (I-17)

And:

“You find people at Central Medical Stores is directed – there’s a change in the guideline – and now you have to stop this [regimen and] give this other. You say, ‘How many million we are going to lose here?’ CMS will say ‘We have a lot of stock of this ARV. You cannot just switch from this to that without exhausting this’.” (I-17)

Despite both units being members of the various TWGs, there have been changes in treatment guidelines with seemingly inadequate consultation regarding existing stock on hand (I-2, I-17).

Information Ownership

One apparent consequence of the management capacity issues is the seemingly low level of ownership of EDT information in the DivPhS (figure 2). A common perception among clinical programs and implementing partner respondents is that the DivPhS is not adequately engaged, often relying on partners to be the voice at the table (I-4, I-6, I-26, I-29). One respondent worried that the DivPhS was not being as responsive as it should be:

“When we first started ART, people at pharmaceutical were telling us about availability, now they have nothing to report...some times they don't even show up. They are not strategic in anyway when it comes to information. I want them to talk about EDT with authority and in a consultative manner...to say with evidence and authority what regimen is available where.” (I-26)

Even more telling:

“I have little interaction with [DivPhS. They are] not presenting data from the EDT or dashboard. Would like them to attend [meetings] but they seem to fall back on MSH. Ever since [a previous manager] left, we have not had consistent representation at meetings...ownership in the ministry is an issue. Example, we have the TAC advise on regimen changes, challenges, assist with stock-outs and find alternatives. It is very rare that they show up. Even when there are critical emergencies it is not uncommon for them to not show up.” (I-29)

Some respondents criticized the CMS in particular for its absence from important meetings both internal to the DivPhS and externally (I-4, I-29, I-30). For example, the chief medical officer complained about the absence of the CMS at the HIV Treatment TWG meeting in May:

“However the greatest setback was the absence of any CMS pharmacists, who are the principals as far as MoHSS supply chain, is concerned. In future meetings they must be present so that we can also hear their side of the story. The issue of having “surprises” is not good for smooth running of the HIV program.” (Minutes, HIV Treatment Technical Working Group Meeting: May 31, 2017)

Some of these issues are related to human resource constraints, which are discussed in more detail below.

Broader System Issues

Numerous issues and themes emerged from the interviews that relate to broader system issues that were not explicitly considered in the conceptual framework. There is, for example, the current financial crisis. Three issues in particular warrant more consideration with respect to the use of information for decision making and its effect on program outcomes: human resource constraints, pharmaceutical management capacity, and inadequate coordination among stakeholders in the national ART program.

Human Resource Constraints

Some of the technical and management capacity issues previously discussed are linked to issues surrounding insufficient human resources, particularly inadequate IT support staff and pharmacists at both the national and subnational levels (I-9, I-17, I-19, I-21, I-25). This is particularly noticeable at the CMS, which some respondents view as constantly being in crisis (I-2, I-3, I-4, I-28, I-30). Some stakeholders think the CMS is unable to meet expectations:

“CMS seems unaware of dashboard...should have access and be able to use it but there are serious stock monitoring issues. Stock-outs are a national embarrassment...a crisis...How can CMS be surprised by stock-outs? This shouldn't be happening. I am worried that such a good tool is not being used to guide timely ordering and distribution of resources. Not using the dashboard is like buying a car to park in your [driveway] and take pictures of instead of driving it.” (I-30)

However, as another respondent observed:

“Yeah, [CMS] needs someone to look at the data and properly evaluate and make decisions but [they] have no one checking to keep track of the big picture. Operations are suffering, [they] are constantly putting out fires. Everyone has to do many things and it is just impossible to do them all effectively.” (I-2)

The CMS has only four pharmacists on staff, which limits their use of the dashboard (I-2). Besides the human resource issues, the CMS is plagued by irrational orders from facilities ordering more stock than they need (I-2, I-3, I-4, I-28). However, the CMS has limited capacity—partially because of these human resource constraints—to review and query these orders with the facilities:

“CMS's role has always been to receive an order...facility needs ten of this product so you provide them ten of the product. But now, you're asking CMS to check. So, this facility needs ten of this product, but they actually have five. So why do you want to give them ten when maybe their average use is just one in a month? So, you are now shifting the burden of having to review the order and make sense out of it to the people at CMS. This is an additional role and the argument that I hear is that they have not been given the necessary resources to actually take up this additional role.” (I-3)

The CMS is also constrained by insufficient authority and structural issues (I-3, I-11, I-28). There are ongoing discussions about CMS's position in the management hierarchy and the need for it to be moved to the directorate level. The hope is that a higher position will facilitate direct and more effective interaction with the permanent secretary, its primary accounting officer. As important, it will be in a better position to advocate for resources and policy changes, such as procurement procedures to address some of the underlying issues regarding stock-outs (I-3).

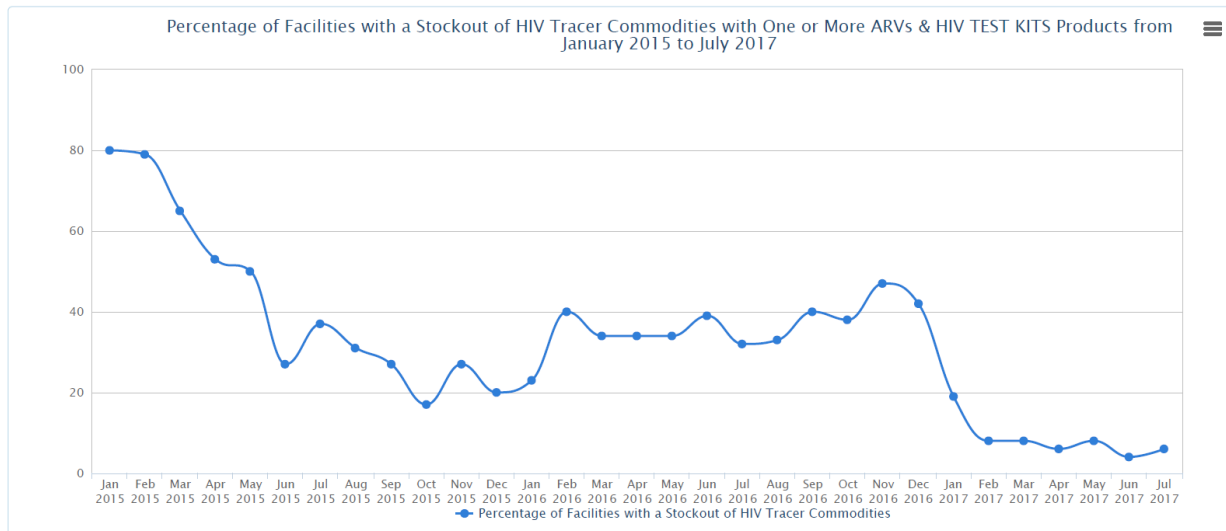
Pharmaceutical Management-related Constraints

A striking observation from the field visit was the sense of a stock-out crisis, with numerous respondents referring to consistent problems with stock-outs. However, this sense of a crisis appears to be overstated. The percentage of facilities with a stock-out of HIV tracer commodities or HIV test kits has been decreasing since 2015 (figure 3). Most of the persistent stock-outs seem to involve rapid test kits and some pediatric formulations:

“We found that the picture is not as bad as people would think out there. There was a crisis sometime in 2015, the beginning of 2016. But we've been having actually a very steady supply system for ARVs for the last 12 months or so. The trend in stock-out rate has been falling...But there are some ARVs which are used in very small quantities especially by children and even adults. And just getting them in the market is not always easy...And perhaps we also have a stock-out of one of the rapid test kits. But the genesis of those stock-outs, part of it is a change in guideline which people are not following according to how it was envisioned.” (I-3)

These stock-outs can be traced to policy changes regarding HIV testing guidelines and the procurement process. The transition from one testing algorithm to another did not go smoothly and the system has since been in a state of flux, with the program yet to decide which testing approach and brand of test kits to fully adopt. This in turn has caused havoc in the supply chain because test kits are still needed but it has been difficult to quantify the amount and which kits to supply. This has contributed to the overwhelming sense of a stock-out crisis. Most references to these stock-outs often also cite the CMS's failure to adequately monitor and procure stock. Indeed, the CMS appears to be performing suboptimally but an important underlying problem seems to be changes in the procurement process.

The perception of a stock-out crisis may lead to the simplistic conclusion that the dashboard is failing at the objective of helping to ensure an uninterrupted supply of ARVs. The assessment cannot attribute the actual decrease in stock-out rates solely to use of the information tools (figure 3). However, the gap between perception and the available evidence on the dashboard suggests that some stakeholders are not using the available information on the dashboard and may not understand how well Namibia is doing in ensuring the availability of ARVs at its facilities. This perception gap also demonstrates the value, but also the underutilization, of the dashboard to clearly observe data trends and gain a long-term perspective on the ART program's performance and outcomes.



Source: A. Wolde, SIAPS Namibia.

Figure 3. Screenshot of dashboard report on trends in stock-outs of ARVs and HIV test kits at facilities, January 2015–July 2017

Issues of Coordination and System Interoperability

The EDT and dashboard operate in a very crowded field. There are 61 HIS tools, with varying degrees of functionality, operating in the Namibian health system (Khan and Edwards 2012). The HIS is highly fragmented, with most of the systems unable to share data. Granted, there are only two pharmaceutical information systems specific to the national ART program. Regardless, it is critical to monitor the wider field as it has implications for the distribution of resources and inefficiencies associated with health information systems in the health system. The ePMS and EDT are not interoperable. They were developed and implemented by two different implementing partners for different purposes. There is great need to match patient and in some cases facility-level data, but this currently requires significant effort to accomplish (I-10, I-12, I-15, I-20, I-29). As one respondent noted:

“The biggest challenge for my work is that the data are not linked. I spend an inordinate amount of resources trying to connect data that you would think could be automatically connected.” (I-20)

This lack of interoperability makes it particularly difficult to fully understand the extent to which in-transit patients are being incorrectly counted as LTFU (I-20, I-29). The evidence indicates a strong need for better sharing of information because the tools are often used together to gather information about the national ART program.

The proliferation and fragmentation of information systems has caused some MoHSS stakeholders to periodically advocate for one harmonized information system (I-9, I-21, I-32). A single HIS is not technologically feasible or desirable because it would create a variety of insurmountable challenges, as evident from a previously failed attempt (I-21). A more feasible approach would be better data sharing or system integration. The recently established HIRD and

the HIS TWG represent a significant effort by the government in this direction. Worryingly, HIRD only has 12 of its 117 positions filled and faces significant budget constraints, so it is unclear how this effort will proceed. Plans are under way for a unique patient ID number, but discussions seem to still be in the preliminary stage and focused on the best approach and whether this patient ID number should also serve as a national ID. SIAPS participates in the HIS TWG and is working on this unique identifier initiative.

Limitations

The assessment has several limitations. The national ART program is embedded in the national health system and includes a complex array of interrelationships and factors influencing the demand and use of pharmaceutical management information. The limited scope of this assessment cannot account for all of these relationships and factors.

The assessment relied heavily on interviews with stakeholders at the national level. The findings therefore reflect points of view at the national level, which may differ from those at the subnational level. Although some informants provided information regarding the use of the tools and associated challenges at the facility and regional levels, the assessment did not adequately probe some of these issues. It is therefore unclear what information and determinants of use stakeholders at the facility, district, and regional levels deem as important for the national ART program. For example, pharmacists routinely use a WhatsApp group to locate and redistribute stock among facilities. It would perhaps have been helpful to better understand how information on the dashboard factors into their discussions in the group, if at all, and the extent to which this group could help promote the adoption of the dashboard and its value for pharmacists at the subnational level. Similar factors and other determinants of tool and information use, as perceived specifically by stakeholders at the subnational level, were not fully accounted for, which may bias the findings.

Another limitation relates to the conceptual and practical distinctions between general use and use for decision making. For example, using the information to generate reports or for routine monitoring and evaluation indicates use but not necessarily decision making. It was difficult to trace some of these uses to actual decision making. As a result, the assessment documents numerous examples of use with less specific examples linked directly to decision making, particularly regarding program strategies and policies within the MoHSS. All decisions are based on some kind of information, and the particular information used may not be reflected in the decision or action taken. It is likely that some major decisions based on information from the tools were not adequately documented. This is particularly the case for program-related decisions over a longer recall period for which associated documents were not available or respondents were not directly involved in the decision making. Regardless, the findings of the assessment clearly show the need for more proactive and strategic use of the information available from the tools.

CONCLUSIONS

Namibia has an abundance of pharmaceutical information available about its national ART program. The EDT and PMIS dashboard have enhanced the availability and visibility of this information, which has been used for reports, monitoring and evaluation, strategic plans, client tracing for ART adherence, and research. The EDT has gone a long way toward enabling the Namibia National HIV/ART Program to achieve its outputs and outcome as planned in the national strategic plan to mitigate the impact of HIV and AIDS on the Namibian population (Republic of Namibia 2010). The increased availability of data has contributed to four of the six national objectives, including monitoring adherence to treatment schedules to minimize defaulters and HIVDR, strengthening linkages across key response areas for treatment, developing a reliable monitoring and tracking system for ART patient management, and strengthening the pharmaceutical supply system throughout all the levels of the supply chain.

Clearly, information availability is not a constraining factor in achieving the outcomes of the national ART program. However, data availability does not automatically guarantee use and translation into programs and policies. The use of this information in decision making has to be encouraged and facilitated. There is currently little oversight and accountability, and therefore limited motivation, regarding the use of the available information for decision making. The MoHSS needs to clarify roles and responsibilities for pharmaceutical information use and actively promote the use of information in decision making. Evidence-based decision making needs to be incorporated into training and performance reviews, and managers need to appreciate the value of using information to inform decisions. Having information available for decision making is important. However, the best tools are useless if other systems and processes are not in place to facilitate effective decision making and action.

RECOMMENDATIONS

Information from the EDT is critical for understanding the HIV landscape in Namibia, and stakeholders in the national ART program increasingly value the reliability and timeliness of this information. This is evident in the various uses of the information documented in this report. In the past, stakeholders had to obtain much of the needed information from quarterly feedback reports or through EDT/NDB data requests. The recently launched dashboard makes much of the information visible and accessible for all stakeholders in the program. The dashboard now has a champion in the permanent secretary, which will likely serve as a catalyst for greater adoption and use. However, as scale-up continues, there are some key challenges that warrant further attention. Analysis of the causal loop diagram points to three key leverage points for reinforcing information use from the tools: technical training and orientation, addressing human resources and IT constraints in the DivPhS, and improving management of technology and information (figure 2). Specific action points are discussed for each of these leverage points below.

Technical Training and Orientation

Current issues with underreporting can undermine data quality and therefore use of the dashboard, particularly among those stakeholders who struggle with information use. Training and orientation that simultaneously target consistent reporting and use at the facility level and managers' technical capacity have a direct effect on reinforcing the information use loop and can indirectly improve data quality (figure 2). Further, training and orientation at the facility level helps to reinforce the "facility tool use" loop, which further builds technical capacity and improves data quality. A clearly articulated two-prong strategy that simultaneously targets consistent reporting and use at the facility and national levels is therefore needed. SIAPS seems headed in the right direction with such a strategy and is currently engaged in training and scaling up access to the dashboard. However, the following should be given specific consideration:

- *Determine the criteria for access to the dashboard and the level of access.* Despite the intuitive user interface, the wealth of information on the dashboard may overwhelm some users. Two critical questions to be redefined in the strategy are: Who gets access to what information? What criteria determine this level of access? Clearly articulating the level of access for different stakeholder groups can help provide some direction for prioritizing orientation for the dashboard.
- *Develop clear criteria for determining which stakeholders should have priority in orientation/training for the dashboard.* Considering the workload involved in training the different stakeholders, especially with the eStock card at the facility level, it seems there should be greater clarity about which group gets priority. The criteria can then be used to plan and cascade orientation and refresher training throughout the different levels of the system.
- *Formalize collection of feedback on the tools.* SIAPS needs a more formal means for getting feedback on the EDT and dashboard. For example, some stakeholders worry that the reports available on the dashboard provide disaggregated ART data that do not align

with the level of disaggregation needed for their reports, and they are unable to customize reports to their needs. This is the kind of crucial feedback that could help improve the utility of the dashboard for some users.

SIAPS continues to engage in training for the mEDT, EDT, and eStock card with pharmacy staff, and for the dashboard with managers. However, as discussed below, the impact of training will be constrained by the extent to which there is adequate management and oversight to ensure that facilities use the tools and comply with reporting requirements (figure 2).

Address Human Resources and IT Constraints in DivPhS

Inadequate technical and human resource capacity, particularly in the DivPhS, seems to be a critical problem (figure 2). It directly constrains the ability to use the dashboard for both routine and more strategic purposes and threatens the sustainability of the tools beyond the period of SIAPS' technical assistance. Strengthening technical and human resource capacity with respect to IT support and data analysis in the DivPhS directly affects the management of technology and information and ownership of the information and indirectly affects the accountability mechanisms in place to ensure information use (figure 2). These can all help to reinforce the use of information from the tools. The DivPhS needs to be empowered to not only manage the tools effectively but to take full ownership of the information from the tools, promoting its evidential value and use. For example, MoHSS stakeholders vary in their perception of ARV stock-outs as an ongoing crisis. There seems to be little understanding of how well Namibia is doing in terms of availability of ARVs at facilities despite available information on the dashboard showing a general decline in stock-outs. This can distort perceptions of the program's performance among MoHSS stakeholders and possibly lead to ill-informed strategies. The DivPhS owns the tools; they should also actively own the information and promote its use at the various TWGs and other forums to inform discussions and decisions.

Improve Management of Technology and Information

Inadequate management of technology and information is perhaps the most critical leverage point, where even small changes can have a significant effect on the use of the information from the tools (figure 2). While directly related to human resource constraints in the MoHSS, inadequate management of the technology and information in turn negatively affects accountability and oversight mechanisms for tool use, the DivPhS's ownership of information from the tools, technical capacity at various levels, and coordination among stakeholders. These factors all directly or indirectly affect the use of information from the tools. Developing managers' technical proficiency will help strengthen demand, but the impact will always be constrained by the quality of information available on the dashboard and the extent to which managers actually use the information. Regardless of how much information becomes available, it will not be used for decision making if it is not valued or if the system is not designed to facilitate its use. The MoHSS therefore needs to have discussions and build capacity with a focus on generating and using information at the different levels of the system. This will help to build ownership of the information at multiple levels of the system and reinforce the relationship between data collection and information demand and use. Specific considerations include:

- *Strengthen management capacity for the collection and use of information:*
 - Clarify roles and responsibilities regarding the collection and analysis of data and the use of information for decision making
 - Managers need to ensure adequate skills transfer for the tools during staff transitions and continued training of new staff, which will help ensure effective and appropriate use of the tools at the facility level
 - Facilities need to use the eStock card consistently to manage their stock and to comply with reporting requirements for the monthly ART and logistics reports
 - Managers need to ensure that their facilities are complying with these requirements and following up with appropriate action to incentivize compliance
 - Managers need to routinely incorporate the available information into their decision making, including the various management forums and TWGs
 - Managers should also be held accountable when major problems, such as stock-outs, occur and information/early warnings were available on the dashboard
 - Incorporate the use of information for decision making as an item in management trainings and performance and promotion reviews
- *Improve communication and coordination between the departments and directorates:*

Better communication and coordination can reduce inefficiencies and help sustain the program's achievements, particularly as Namibia aims to achieve 90% coverage. Its resources can be better coordinated. For example, the IT resources at the DSP could potentially support the DivPhS and CMS. Inadequate IT coverage across departments can perpetuate the problem of inaccurate, late, and incomplete data. Further, the current inadequate use of information and coordination gaps lead to unnecessarily reactive (versus proactive) decision making, which creates inefficiencies. Having a regular forum to discuss the dashboard data and associated risks and strategies could help facilitate better communication.
- *Improve communication and coordination among all stakeholders with respect to the different information systems and the use of information:*
 - The DivPhS needs to actively engage in ongoing discussions regarding system integration/interoperability to ensure that any recommended policy or technology changes do not undermine the functionality and achievements of its tools
 - A forum, such as the HIS TWG at HIRD, is needed to inform stakeholders about new initiatives and facilitate discussions about possible synergies to ensure that new systems provide additional value and do not duplicate existing systems

Three additional action points for consideration include:

- *Improve mEDT coverage in decentralized sites.* Suboptimal EDT coverage—which is likely to worsen as decentralization and the treat all approach progress—threatens the quality of EDT data (figure 2). More mEDTs are needed. Further, as more nurses and community health workers use the mEDT, consider adapting the mEDT to make it more suitable for those users who lack pharmacy training. This should be complemented by adequate training of lower-level health facility and community health workers to use the mEDT for dispensing.
- *Automate data collection.* Inconsistent reporting threatens the quality of the data and the use of the dashboard. The EDT has a built in, cost-effective capability to automatically synchronize to the NDB, from which data can be automatically uploaded to the dashboard. This functionality should be supported and enhanced to ensure that the MoHSS does not depend on individuals submitting monthly reports. This reduces the staff's reporting burden and addresses a major data quality constraint. Staff can instead concentrate on providing services to patients.
- *Promote information availability.* Given the nascent stage of the dashboard, stakeholders may be unaware of some of the information available despite being trained on dashboard use. Provide users with updates on the availability of new reports using a mailing list and/or the dashboard's homepage. Depending on the level of effort, these updates may be tailored to the needs of different user groups.

REFERENCES

- Aqil A, Lippeveld T, Hozumi D. 2009. PRISM framework: a paradigm shift for designing, strengthening and evaluating routine health information systems. *Health Policy and Planning*, 24(3):217–28.
- Foreit K, Moreland S, LaFond A. 2006. *Data Demand and Information Use in the Health Sector. Conceptual Framework*. MEASURE Evaluation.
- Jacobson N, Butterill D, Goering P. 2003. Development of a framework for knowledge translation: understanding user context. *Journal of Health Services Research & Policy*, 8(2):94–9.
- Khan T, Edwards D. 2012. Assessment of National Health Information Systems. Ministry of Health and Social Services, Republic of Namibia. Available at: http://pdf.usaid.gov/pdf_docs/pnadz063.pdf
- MoHSS. 2015. The Namibia AIDS Response Progress Report 2015. Reporting Period: 2013–2014. Available at: http://www.unaids.org/sites/default/files/country/documents/NAM_narrative_report_2015.pdf
- Mutenda N, Bukowski A, Nitschke AM, Nakanyala T, Hamunime N, Mekonen T, et al. 2016. Assessment of the World Health Organization’s HIV Drug Resistance Early Warning Indicators in Main and Decentralized Outreach Antiretroviral Therapy Sites in Namibia. *PLoS One* 11(12): e0166649. doi:10.1371/journal.pone.0166649.
- Nutley T, Reynolds HW. 2013. Improving the use of health data for health system strengthening. *Global Health Action*, 6:1, 20001.
- PEPFAR. 2016. Namibia Country Operational Plan (COP) 2016. Strategic Direction Summary. Available at: <https://www.pepfar.gov/documents/organization/257636.pdf>
- PEPFAR. 2017. Namibia Country Operational Plan (COP) 2017. Strategic Direction Summary. Available at: <https://www.pepfar.gov/documents/organization/272019.pdf>
- Republic of Namibia. 2010. *National Strategic Framework for HIV and AIDS Response in Namibia 2010/11–2015/16*. Windhoek: Directorate, Special Programmes, Ministry of Health and Social Services.
- Shroff Z, Aulakh B, Gilson L, Agyepong IA, El-Jardali F, Ghaffar A. 2015. Incorporating research evidence into decision-making processes: researcher and decision-maker perceptions from five low-and middle-income countries. *Health Research Policy and Systems*, 13(1):70.
- SIAPS. 2016. *Systems for Improved Access to Pharmaceutical Services Annual Report: Project Year 5*, October 2015–September 2016. Submitted to the US Agency for International

Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health.

SIAPS. 2017a. *U.S. Ambassador visits Namibia clinic to unveil new SIAPS e-health innovation*. Available at: <https://goo.gl/oqfXtf>

SIAPS. 2017b. *Using the Electronic Dispensing Tool to Retain Patients on Antiretroviral Therapy in Namibia*. Available at: <https://goo.gl/JLKAGr>

UNAIDS. 2016. *UNAIDS 2016–2021 Strategy. On the Fast-Track to end AIDS*. Available at: http://www.unaids.org/sites/default/files/media_asset/20151027_UNAIDS_PCB37_15_18_EN_rev1.pdf

WHO. 2007. *Everybody's Business—Strengthening Health Systems to Improve Health Outcomes: WHO's Framework for Action*. Geneva: World Health Organization.

ANNEX A. INTERVIEW GUIDE

Interview questions are organized by SOW item. The interviews will be semistructured and not all questions will apply to all informants.

SOW A. Describe how data are transmitted to the national database at the Ministry of Health and Social Services.

- Who oversees/manages the data collection process? Who is responsible for compilation and analysis?
- Are there any relevant tools beside the EDT that you think are critical for the national ART program? Can you name them?
- What is the scope of the pharmaceutical information dashboard (in terms of items or categories of items captured by the dashboard)?
- How are these various tools integrated?
- Can you describe the mechanism/process for the flow of data from the facilities to the national database?
- Has this process evolved/changed over time? If so, can you describe the changes?
- Have you encountered any specific challenges with the design of the system? If so, please describe.
- Can you think of any specific factors that enable the flow of information through this system?
- Can you describe any specific advantages of the system for collecting and using information related to ART or pharmaceuticals in Namibia?

SOW B. Describe how data are reported and the frequency and distribution of reports among stakeholders in the National ART program.

- Describe what reports are routinely generated using data from [EDT or dashboard]. At what level of the system (facility/district/regional)? How frequently?
- Who generates/writes these reports?
- For each type of report, who is the target audience? What is the intended purpose of the report?
- Focusing specifically on reports covering the distribution of ART, how frequently are these reports generated? Can you describe how these reports are compiled and distributed?
- Are there separate formal or informal requests for specific data (separate from these reports)? Who makes these requests? How frequently? Please describe the nature of the request.
- Describe any changes over the years in the way these reports have been generated or distributed. For any change, can you recall the impetus for the change?
- How does your department prioritize the production of these reports?
- What specific measures has your department/organization taken to support access to these reports and their use?
- Compared to other MoHSS information systems, how would you describe the availability of ART data? Their relevance?

- Do you think the collection and use of ART data are sustainable beyond SIAPS? Why, in what way?

SOW C. Describe the use of reports by key stakeholders in addressing quantification of commodities and procurement and how, if any, decreases in wastage and uninterrupted availability of ARVs in facilities across Namibia are attributable to the use of reported data.

SOW D. Describe how the data collected at the national level and managed in the pharmaceutical management dashboard are used to guide decision making by MoHSS managers at the facility and national program levels.

- What reports or other types of information does your staff/department routinely produce? Who are the intended audience/stakeholders?
- What are the main decisions related to ARVs that you make in your department/unit/division?
 - Who are the primary participants/stakeholders involved in these decisions?
 - What information do you rely on for making these decisions?
 - What are your primary sources for this information?
 - Can you provide two illustrative examples of how you have used this information to make these decisions?
 - Can you think of an instance when making a relevant/related decision where you did not use this information? Please describe.
 - Was there any information that you needed but did not have in order to make any of these decisions? How common is this problem?
 - What was the outcome of this decision in terms of information flow? How were the findings/decisions communicated and to whom?
 - Can you describe the anticipated effect of any of these decisions on the program outputs?
- Focusing on the [quantification/procurement/distribution] process in your department/unit:
 - Can you briefly describe your [quantification/procurement/distribution] process? How has this process changed over the years?
 - Who are the primary participants involved in the decisions that your department/program routinely makes in your [quantification/procurement/distribution] process?
 - What data/information do you routinely rely on for making decisions regarding [quantification/procurement/distribution]?
 - What are your primary sources for these data/this information? Have these sources changed over time?
 - What specific measures has your department/organization taken to support access to this information?
 - What specific challenges, if any, have you or your staff experienced in accessing these data/this information?
 - How does your department/organization support the prioritization and use of this information in decisions regarding [quantification/procurement/distribution]?
 - Describe any challenges you or your staff has had in using these data/this information to make decisions regarding [...]

- Now I want to ask you some questions specific to the pharmaceutical management dashboard and whether it meets your information requirements with respect to ARV and related medicines management.
 - How frequently do you access information from the pharmaceutical management dashboard?
 - Can you describe a typical/routine scenario when you need to access the dashboard? Please describe the process for access.
 - Can you describe any specific efforts by your department/program to prioritize and routinize use of the dashboard?
 - How has the availability of this dashboard affected your decision making in [quantification/procurement/distribution process]?
 - Can you describe the effect of your use of information from the dashboard on program outputs?
- How has data generated [from the EDT and/or dashboard] been used to monitor trends of patients starting treatment, active patients on treatment, regimens used for treatment, and other parameters necessary for managing the ART program?
- How has the development of the dashboard improved the way commodity and patient data are captured in non-HIV programs in the MoHSS?
- Thinking more broadly, describe the effect of your use of information [from the EDT and/or dashboard] on the outcomes of the national ART program?
- How can you improve the use of evidence in pharmaceutical/ART-related decision making in Namibia?
- What can SIAPS do to improve the use of data/evidence from the pharmaceutical dashboard for ART- and non-ART-related decisions?

SOW E. Describe the use of the data in community ART programs to trace defaulters and patients that have poor adherence to ART.

- Can you describe your approach to monitoring ART adherence in Namibia?
- How has this approach evolved over the years?
- Can you describe the actual process of tracing defaulters?
- What criteria do you use for identifying defaulters? What specific information do you use to track these patients and bring them back to care?
- What sources of statistics/data/information are important for you?
- What decisions do you use this information to make? How do you use this information in decisions related to your ART adherence efforts? Please provide an example how you use this information in making decisions related to tracing defaulters or other adherence monitoring process.
- In your opinion, what effect have these data sources had on your (program's/department's) ability to track adherence? Approach to adherence? Trends in adherence over time?
- What specific challenges have you or your staff encountered in using data or information when making decisions about your adherence-related efforts?
- Have you experienced any other challenges in using information to make decisions?

SOW F. Describe how data have been used for the publication of scientific papers of significance in international journals.

- With respect to your research on HIV/ART in Namibia, how did the research project(s) come about?
- What was the funding source? Who were/are the main collaborators? [Probe regarding multiple research projects if applicable.] Are there mechanisms in place to incorporate research into the local institutions' agendas?
- Have you encountered any specific challenges in accessing these data? [Probe regarding data quality/technical capacity.]
- Can you describe the mechanism or process for accessing the data?
- How did this process affect your ability to use the data?
- Are there any relevant forthcoming publications in which you use these data sources? Please describe.
- Has any of your past or forthcoming research in this area been presented at any conferences? Please describe.
- Thinking a bit more broadly about the role/impact of your research on HIV/ART in Namibia, what specific knowledge gaps did your publication(s) address?
- How did the availability of these data allow you to fulfill your research objectives/address this gap?
- Are you aware of any instances in which your findings have been used to improve management of Namibia's ART program? Please describe.

ANNEX B. TEMPLATE USED BY FACILITIES TO SUBMIT THE MONTHLY ART REPORT TO THE DASHBOARD

Ministry of Health and Social Services

ART Monthly Report

Division: Pharmaceutical Services

Name of Facility: _____

Reporting Month/Year: _____

Instructions for Completing this ART Monthly Report

- Most of the data required to run this report can be obtained from the EDT reporting module; the report numbers are indicated next to each parameter below.
- Accurate data on outreach & IMAI patients can only be obtained from the EDT reporting module if the "Outreach" field in the EDT is appropriately filled out for all patients seen at outreach and NIMART sites.
- If you have some patients on regimens that do not appear on the lists on Part III below, enter the total number in the "Others" row.
- Please ensure that you enter details of all short dated and expired ARVs in the stock summary section of this report.
- After compiling this report, the pharmacy staff should compare the following statistics (that are expected to be uniform for any given facility) with the data clerk's summary report and investigate any discrepancies: New Patients; Transferred Out; Transferred In; Deceased and Stopped
- After process (5) above the report should be uploaded to the MoHSS Pharmaceutical Information Dashboard website at www.pmis.org.na or if not accessible, be emailed through the respective regional pharmacist to the ART Logistics Pharmacist at the Division of Pharmaceutical Services in Windhoek: e-mail: reports@nmpc.com.na
- Pharmacy staff should regularly review and identify key findings from this report (especially relating to adherence, on-time pill pick up and retention/ LTFU rates on ART) and share with the rest of the ART team to identify possible areas for improvement.

All ART monthly reports be uploaded on the Dashboard at www.pmis.org.na on or before the 5th of every month

Part I: Facility Summary: Main, Outreach & IMAI Sites

Number of decentralised sites		Outreach	IMAI	Total	#CBART Groups	
		Paediatric		Adult	Total	
		Male	Female	Male	Female	Grand Total
No. of ACTIVE Patients - EDT Report 03	Main Site:					
	Outreach Sites:					
	IMAI Sites:					
	CB-ART Groups:					
	Total:					

Part II: Patient Summary Information

Fill Only the Unshaded Areas		Paediatric		Adult		Total		
		Male	Female	Male	Female	Male	Female	Grand Total
New Patients (Starting this month) - EDT Report 01								
Number of ARV pick ups this month - EDT Report 02	Routine Refills:							
	In Transit:							
Number of Active Patients - EDT Report 03								
Number of Regimen Switches/ Changes - EDT report 05								
Number of patients whose status changed this month - EDT Report 06	LTFU:							
	Transferred Out:							
	Stopped:							
	Deceased:							
	Restarted:							
	Transferred In:							
Cumulative this month (Active + Transferred In + Restarted)								

Lateness for Appointment (EDT Report 18)		On Time	1-3 days	4-10 days	11-19 days	20-29 days	>29 days	% on time
Adult:								
Paediatric:								
Total:								

Adherence by pill count (EDT Report 21)		95-100% A	75-95% B	<75% C	>100% D	Not calc'd E	>75% adherence (d=A+B+C)	>75% adherence (assessed)	>75% adherence (all)
Adult:									
Paediatric:									
Total:									

Annex B. Template Used by Facilities to Submit the Monthly ART Report to the Dashboard

Ministry of Health and Social Services

ART Monthly Report

Division: Pharmaceutical Services

Part III (a): Distribution of Regimens - Adults

#	Regimen	Active this month	New this month	Restarted this month	Transferred In	Cumulative this month
		(a)	(b)	(c)	(d)	= (a+c+d)
	EDT report Number	3	1	6	6	
	Adult Regimens					
1	TDF/FTC/EFV					
2	TDF/3TC/EFV					
3	AZT/3TC/NVP					
4	TDF/3TC/NVP					
5	AZT/3TC/EFV					
6	AZT/3TC/TDF/LPV/r					
7	ABC/3TC/EFV					
8	TDF/3TC/LPV/r					
9	AZT/3TC/TDF/ATV/r					
10	AZT/3TC/ABC/LPV/r					
11	AZT/3TC/LPV/r					
12	TDF/3TC/ATV/r					
13	ABC/3TC/NVP					
14	d4T/3TC/NVP					
15	TDF/FTC/AZT/ATV/r					
16	TDF/3TC/ABC/LPV/r					
17	TDF/FTC/ATV/r					
18	d4T/3TC/TDF/LPV/r					
19	ABC/3TC/LPV/r					
20	AZT/3TC/ABC/ATV/r					
21	TDF/FTC/NVP					
22	d4T/3TC/EFV					
23	AZT/3TC/ATV/r					
24	TDF/FTC/LPV/r					
25						
26	Others-Adult					
	Total For Adults					

Part III (b): Distribution of Regimens - Paediatrics

#	Regimen	Active this month	New this month	Restarted this month	Transferred In	Cumulative this month
		(a)	(b)	(c)	(d)	= (a+c+d)
	Paediatric Regimens					
1	AZT/3TC/NVP					
2	ABC/3TC/EFV					
3	ABC/3TC/LPV/r					
4	AZT/3TC/ABC/LPV/r					
5	AZT/3TC/EFV					
6	AZT/3TC/LPV/r					
7	TDF/FTC/EFV					
8	ABC/3TC/NVP					
9	TDF/3TC/EFV					
10	d4T/3TC/NVP					
11	TDF/3TC/NVP					
12	AZT/3TC/TDF/LPV/r					
13	AZT/3TC/ABC/ATV/r					
14	d4T/3TC/LPV/r					
15	AZT/3TC/ATV/r					
16	AZT/3TC/ABC					
17						
18						
19						
20						
21	Others-Paediatric					
	Total For Paediatrics					

ANNEX C. AVERAGE ON-TIME REPORTING OF MONTHLY ART REPORTS BY FACILITY, JUNE 2016–MAY 2017

On-time reporting measured as number of days past due the report is published on the dashboard. Table is sorted by mean number of days past due.

Facility	Number of days past due date			Number of reports
	Minimum	Mean	Maximum	
Okahao District Hospital	2	7.1	22	12
Oshikuku St. Martin District Hospital	2	7.2	22	12
Outapi District Hospital	2	8.2	22	12
Oshakati Intermediate Hospital	3	8.3	22	12
Katima Mulilo District Hospital	5	10.9	26	12
Opuwo District Hospital	2	11.7	42	12
Usakos District Hospital	5	11.8	42	12
Katutura Health Centre	3	12.3	39	12
Karasburg District Hospital	2	12.5	42	12
Tsandi District Hospital	5	12.5	38	12
Luderitz District Hospital	7	12.8	42	12
St. Mary's Rehoboth Hospital	7	12.9	42	12
Gobabis District Hospital	1	13.0	58	12
Mariental District Hospital	2	13.1	38	12
Keetmanshoop District Hospital	7	13.6	42	12
Ondangwa Health Centre	7	14.6	42	12
Okongo District Hospital	7	14.7	38	12
Aranos Health Centre	2	15.8	41	12
Swakopmund District Hospital	7	16.8	65	12
Walvis Bay District Hospital	3	17.3	70	12
Outjo District Hospital	6	17.5	32	12
Windhoek Central Hospital	7	17.5	55	12
Eenhana District Hospital	9	18.5	42	11
Ongha Health Centre	5	19.3	86	12
Rundu MRMD	1	19.7	41	12
Andara District Hospital	2	19.8	64	11
Central Medical Store	3	19.8	55	12
Rosh Pinah Clinic	7	20.7	79	12
Okuryangava Clinic	3	21.0	54	12
Tsumeb District Hospital	2	22.0	80	12
Otjomuise Clinic	3	24.5	92	12
Nankudu District Hospital	7	25.5	87	12
Katutura Intermediate Hospital	5	25.6	69	12
Oshakati MRMD	6	25.7	75	9
Rundu Intermediate Hospital	7	25.7	84	11
Robert Mugabe Clinic	7	26.1	79	12
Omaruru District Hospital	9	28.4	80	12
Okahandja District Hospital	3	29.8	86	11
Engela District Hospital	9	31.1	88	12
Omona Watjihozu Health Centre	6	31.3	153	12
Khorixas District Hospital	7	31.6	80	12
Nyangana District Hospital	6	31.8	85	9

The Use of Pharmaceutical Information for Decision Making in Namibia's National ART Program: Assessment Report

Nkurenkuru Health Centre	8	32.5	66	11
Grootfontein District Hospital	10	33.6	70	7
Odibo Health Centre	9	33.8	86	9
Onesi Health Centre	7	34.1	80	11
Oshivelo Clinic	3	35.1	96	12
Okalongo Health Centre	3	35.2	143	12
Khomasdal Health Centre	12	35.4	83	12
Otjiwarongo District Hospital	12	37.6	69	12
Eloolo Clinic*	23	38.5	54	2
Ongwediva Health Centre	7	39.8	108	12
Onandjokwe District Hospital	11	41.1	96	12
Okakarara District Hospital	17	46.7	81	7
Omuthiya Hospital	14	47.9	96	8
Hakahana Clinic*	23	53.7	84	3
Maxwilili Clinic*	0	0.0	0	0

*Eloolo, Hakahana, and Maxwilili were added as main sites in April 2017, hence the low number of reports available.

ANNEX D. PEER-REVIEWED PUBLICATIONS USING EDT DATA

Asefa W, Tsegaye D, Dalebout S, Ahmed E. 2016. Improving adherence to antiretroviral therapy In Namibia. *Health Affairs (Project Hope)*, 35(12), 2348.

Corbell C, Katjita I, Mengistu A, Kalemeera F, Sagwa E, Mafirizi D, Stergachis A. 2012. Records linkage of electronic databases for the assessment of adverse effects of antiretroviral therapy in sub-Saharan Africa. *Pharmacoepidemiology and Drug Safety*, 21(4), 407–414.

Hong SY, Fanelli TJ, Jonas A, Gweshe J, Tjituka F, Sheehan HM, Jordan MR. 2014. Household food insecurity associated with antiretroviral therapy adherence among HIV-infected patients in Windhoek, Namibia. *Journal of Acquired Immune Deficiency Syndromes* (1999), 67(4), e115.

Hong SY, Jerger L, Jonas A, Badi A, Cohen S, Nachega JB, Pereko D. 2013. Medication possession ratio associated with short-term virologic response in individuals initiating antiretroviral therapy in Namibia. *Plos One*, 8(2), e56307.

Hong SY, Jonas A, DeKlerk M, Shiningavamwe A, Desta T, Badi A, Lau K. 2015. Population-based surveillance of HIV drug resistance emerging on treatment and associated factors at sentinel antiretroviral therapy sites in Namibia. *Journal of Acquired Immune Deficiency Syndromes* (1999), 68(4), 463.

Hong SY, Jonas A, Dumeni E, Badi A, Pereko D, Blom A, Barbara R. 2010. Population-based monitoring of HIV drug resistance in Namibia with early warning indicators. *Journal of Acquired Immune Deficiency Syndromes* (1999), 55(4), 27.

Jonas A, Gweshe J, Siboleka M, DeKlerk M, Gawanab M, Badi A, Jordan MR. 2013. HIV drug resistance early warning indicators in Namibia for public health action. *PloS One*, 8(6), e65653.

Jonas A, Sumbi V, Mwinga S, DeKlerk M, Tjituka F, Penney S, Hong SY. 2014. HIV drug resistance early warning indicators in Namibia with updated World Health Organization guidance. *PloS One*, 9(7), e100539.

Kalemeera F, Mbango C, Mubita M, Naikaku E, Gaida R, Godman B. 2016. Effect of changing from first- to second-line antiretroviral therapy on renal function: a retrospective study based on data from a single health facility in Namibia. *Expert Review of Anti-infective Therapy*, 14(8), 777–783.

Kalemeera F, Mengistu AT, Gaeseb J. 2015. Tenofovir substitution in Namibia based on an analysis of the antiretroviral dispensing database. *Journal of Pharmaceutical Policy and Practice*, 8(1), 14.

Kalemeera F, Mengistu AT, Gaeseb J. 2016. Assessment of the nevirapine safety signal using data from the national antiretroviral dispensing database: a retrospective study. *Journal of Pharmaceutical Policy and Practice*, 9(1), 5.

McQuide PA, Kolehmainen-Aitken RL, Forster N. 2013. Applying the workload indicators of staffing need (WISN) method in Namibia: challenges and implications for human resources for health policy. *Human Resources for Health*, 11(1), 64.

Mutenda N, Bukowski A, Nitschke AM, Nakanyala T, Hamunime N, Mekonen T, et al. 2016. Assessment of the World Health Organization's HIV drug resistance early warning indicators in main and decentralized outreach antiretroviral therapy sites in Namibia. *PLoS One* 11(12): e0166649. doi:10.1371/journal.pone.0166649.

Sagwa E, Ruswa N, Musasa JP, Mantel-Teeuwisse AK. 2013. Adverse events during treatment of drug-resistant tuberculosis: a comparison between patients with or without human immunodeficiency virus co-infection. *Drug Safety*, 36(11), 1087–1096.