

ACHIEVING A UNIFIED SYSTEM FOR MONITORING AND EVALUATION OF THE HEALTH SECTOR IN MALAWI

Principle Barriers and Opportunities for Investment

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EXECUTIVE SUMMARY

BACKGROUND

Malawi produces some of the best health data in the region, despite challenges with limited infrastructure and human resources for health. Though pockets of quality information are evident, data systems for monitoring and evaluation (M&E) are fragmented, preventing clinicians and decision-makers from fully using these data to improve service quality and make optimal use of limited resources. Recently a confluence of factors and interests—both internal and external—has created the necessary momentum to bring together key stakeholders, develop strategic plans, and coordinate investments to accelerate progress towards a unified M&E platform. These factors include:

- The pressing need to realize operational efficiencies
- A reaffirmed Government of Malawi (GOM) commitment to integrate and enhance data systems for health
- The introduction of the Sustainable Development Goals (SDGs) and need to map existing metrics or develop new metrics to effectively monitor progress
- The selection of Malawi as a “pathfinder” country to implement a Common Agenda and the 5-point call to action as defined by the global consortium at the Washington Summit of June 2015 on Measurement and Accountability for Results in Health (MA4H)
- Recent expansion of fiscal space earmarked for targeted M&E improvements, including the approval of the Global Fund concept note, approval of the President’s Emergency Plan for AIDS Relief (PEPFAR) Country Operational Plan, increased commitment from the UK through Department for International Development (DFID/UK AIDS), and a 4-year investment from the Bill and Melinda Gates Foundation—the Kuunika Project—specifically designed to strengthen routine data systems and capacity for data use in decision-making in the HIV/AIDS response

To leverage current momentum, Global Fund commissioned this report to assess the current gaps and barriers that impede realization of a unified platform and requested recommendations for strategic investments that would most effectively advance this important agenda.

METHODS AND STRUCTURE

A *Landscape Analysis* (Appendix 1) was conducted to frame recommendations for targeted investments that will both accelerate Malawi’s progress towards a unified M&E platform and strengthen the use of routine data for decision making at all levels of the health sector. Specific objectives of the *Landscape Analysis* were:

1. **Characterize the data governance structures** and current policies that should guide future investments in M&E and health data systems
2. **Inventory systems** for data collection, reporting, analysis, and feedback
3. **Identify training and capacity building efforts** for data capture and analysis
4. **Identify efforts to incentivize use of data** for decision making
5. **Describe the fiscal space** available for improvements to health data and associated systems

Information for this report was gathered through desk review of prior studies, reports, presentations, and policy documents; stakeholder interviews; direct review of data systems and elements; and ad hoc analysis of routine program data.

The report is structured to present results first, including **gaps in performance and limitations of M&E systems, barriers to data access and use, and barriers to systems integration**, followed by the **recommendations to address principle gaps and barriers**. The appendices contain the full **Landscape Analysis, data system component descriptions**, and a **malaria data use case study**.

RESULTS

Key findings from this investigation are grouped and listed below.

GAPS IN PERFORMANCE AND LIMITATIONS OF M&E SYSTEMS

- The **data collection and reporting burden** is excessive and inefficient considering human resource challenges, creating competition among health programs for scarce health worker time and placing strain on data quality across systems
- The mode of **data transfer** in Malawi is both a major bottleneck to timely reporting and an impediment to information access at all levels
- **Duplication and discontinuity** exist between existing systems, limiting the potential for efficiency gains
- Persistent **data quality** challenges limit use of data for decision support and erode confidence in the central repository—HMIS
- **Data visualization tools** are inadequate for drawing information from disparate systems and creating easy-to-digest data
- The **inability to link resources to results** prevents program managers from adequately measuring performance or monitoring efficiency

BARRIERS TO DATA ACCESS AND USE

- Health workers lack **actionable data at point-of-service**, and feedback provided from higher levels either lacks helpful context or is unavailable entirely.
- Health workers and program managers lack adequate **data skills**, and capacity building efforts often are not well-tailored, not based on technological or program realities, and lack ongoing support for sustainable application
- Decentralized planning is **disjointed with asymmetrical access to information**, limiting use of empirical data and participation of key stakeholders in developing district investment or execution strategies
- **Perceived data quality** is a disincentive to increasing access and use

BARRIERS TO SYSTEMS INTEGRATION

- **Semantics and standard definition** are a challenge to effective communication between stakeholders with differing viewpoints on the definition of a “unified platform” and strategic vision
- **Policies to graduate or retire artifact systems** are missing, leading to excessive duplication and process inefficiency
- The full **system capabilities of the DHIS2** software are underutilized

- The **CMED (Central Monitoring and Evaluation Division) staffing footprint and skill mix** is inadequate to address persistent gaps and barriers and facilitate substantial improvements to data access and use

RECOMMENDATIONS TO ADDRESS PRINCIPLE GAPS AND BARRIERS

- Programs need to **harness existing data to guide program investments**
- A concerted effort is needed to **streamline data systems and flow**, including fully describing data collection and reporting burden, developing consolidated plans for integration, developing policies for graduating or retiring artifact systems, integrating data from parallel streams into HMIS, and developing national registries to promote efficient exchange
- Steps must be taken to improve **data quality and confidence in HMIS**, including imposing data validation, programming routine data quality checks, developing data action plans, and maintaining a data help desk for system users
- **System documentation and the user experience** need to be addressed, including publishing tools and system specifications, developing a data dictionary, and improving dashboards
- Stakeholders must improve **coordination of capacity building efforts**, particularly through development of a standard inventory

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ACRONYMS AND ABBREVIATIONS

ART	Antiretroviral treatment
DHIS2	District Health Information System Version 2
DHO	District Health Officer
CBO	Community-based organization
CHAI	Clinton Health Access Initiative
CMED	Central Monitoring and Evaluation Division
DHA	Department of HIV/AIDS
DC	District Council
EID	Early infant diagnosis
HI	Health information
HMIS	Health Management Information System
HTC	HIV testing and counseling
HTSS	Health Technical Support Services
IP	Implementing partner
LTFU	Loss-to-follow-up
M&E	Monitoring and evaluation
MA4H	Monitoring and Accountability for Results in Health
MLGRD	Ministry of Local Government and Rural Development
MOH	Ministry of Health
NAC	National AIDS Council
NASA	National AIDS Spending Assessment
NHA	National Health Accounts
NMCP	National Malaria Control Programme
NSO	National Statistics Office
NTP	National Tuberculosis Programme
OI	Opportunistic infection
OPC	Office of President and Cabinet
PMI	U.S. President's Malaria Initiative
PMTCT	Preventing mother-to-child transmission
POS	Point-of-service
PR	Principle recipient
RBF	Results based financing
SCMgr	Supply chain manager
SOP	Standard operating procedure
SSDI	Support for Service Delivery Initiative
TA	Traditional authority
USG	United States Government
VHC	Village health clinic

GAPS IN PERFORMANCE AND LIMITATIONS OF M&E SYSTEMS

DATA COLLECTION AND REPORTING BURDEN	DATA TRANSFER	DUPLICATION AND DISCONTINUITY
DATA QUALITY	DATA VISUALIZATION TOOLS	LINK BETWEEN RESOURCES AND RESULTS

DATA COLLECTION AND REPORTING BURDEN

There is no doubt Malawi places high value on health information, and it was clear in the field visits that staff at all levels understand the importance of meeting reporting requirements. If community and health workers generally want to do well, why are reporting rates sub-optimal? What process or structural factors impede their ability to meet standards? The forthcoming baseline study from MHSP-TA/Options, calculated the completeness of registers, accuracy of reports, and timeliness of reports for a sample of 37 health facilities across 6 districts. Focusing on 4 registers and 4 associated reports, the study found that data registers were **97% complete**; however, only **21%** of reports were at least 95% **accurate**, and only about **22%** of health facilities reported all 4 reports **on time**¹. These results suggest **data integrity challenges** in moving data from register to report and **bottlenecks in the report creation and transmission process**.

HR CHALLENGES

The findings of the MHSP-TA/Options study were qualitatively reinforced in our field missions. Staff primarily reported a lack of time and human resources available to complete collection and reporting as required, in addition to challenges with stationary and transport (discussed in the next sub-section below). According to a Workforce Optimization Study completed by MOH in 2014 with support from CHAI²,

the **health worker vacancy rate in Malawi is 40%**, a figure evident in each facility we visited where management continually cited vacancy challenges. Many of the larger sites had data clerks on staff; however, all the work load for collection primarily fell on healthcare providers, and reporting burden far exceeded the time available for the 1 or 2 data clerks available. In the smaller, more rural sites, the full burden for collection and reporting often falls on 1 or 2 clinical staff that run most services in the facility.

This analysis attempted to quantitatively summarize the collection and reporting burden, including the number of registers, reports, data fields, etc.; however, specific numbers could not be obtained from HMIS or from the organizations interviewed. According to CMED, there are **more than 25 registers** across disease programs used daily and about **30 reports** that must be completed monthly and/or quarterly by facility and district staff. When asked specifically the number of registers and reports necessary to complete, none of the health workers interviewed could say confidently a specific number, which is concerning in and of itself. With finite time available, community and facility health workers have to choose between what is completed and prioritize if there is insufficient time to meet all demands. The continual proliferation of data requirements described in the *Landscape Analysis*

¹ Baseline Study on the Status of Planning, Partner Coordination and Data Management (2015 forthcoming). Malawi Health Sector Strategic Plan (MHSP), Technical Assistance Component. August 2015

² See [concept note on In-Service Training](#)

(Appendix 1) creates competition between health programs for scarce health worker time and attention. Those programs that invest more heavily in direct contact with sites—e.g., through supportive supervision—are more likely to have reporting requirements met.

REPORTING BURDEN

A [Massachusetts Institute of Technology Case Study](#) estimated the cost to the site of preparing for the DHA quarterly supervision visits. Based on staff report, it takes one person roughly **20** hours over **3-4 days** to prepare for a quarterly DHA visit—a figure confirmed in our own discussions with clinic staff. Using GOM pay scales, the MIT researchers assumed an average employee cost per hour of 2.98 (2009 USD). The resulting cost per site to prepare for a quarterly visit was 238 USD. Considering the number of sites visited by DHA last quarter (727), **the estimated annual cost for sites to prepare for quarterly visits would be 692,104 USD**. This does not include the cost to the GOM to conduct the visits. In terms of opportunity cost, the MIT team state the average clinic sees 70 patients per day³. If reasonably accurate, we can assume that 20 hours of time prepping for supportive supervision visits would equate to 168 foregone patient visits, or about **490,000 forgone patient visits annually across all sites**. Of course, this rough calculation is based on averages, does not take into account different staffing footprints and division of labor (i.e. data clerks would not be treating patients), and doesn't adjust for variability in patient flow, but it does demonstrate that **potential efficiency gains in data collection and reporting requirements are not insignificant** and can have a big impact on output in an HR-tight environment.

In addition to the burden required to prep for supportive supervision visits, one must consider the disruption to core clinical activities caused by the visits themselves. Based on DHOs interviewed, every district health program is required to visit all sites in their districts monthly. There are more than 25 health program offices at district level, and visits are rarely coordinated. We also know the malaria program is planning 100% central-to-site supportive supervision in fiscal year 2016, and DHA/NTP visits every site providing antiretroviral treatment (ART), every quarter. According to the last report, DHA spent on average 2.8 hours within each facility and up to 2 days at larger sites. If we assume site visits from all other health programs take about an hour to complete, that means each facility has supervisors on-site for at least 78 hours per quarter—translating to about **one full day per week required to devote to supportive supervision**, not including time to prepare. This also excludes visits from all other organizations, such as donors, implementers, and other GOM entities, which can be quite frequent.

Considering the above examples, it is not difficult to see how the burden placed on the clinic staff is potentially unrealistic, at least given the currently available human resources for health. That is not to say the data collected have no value to various stakeholders, but there does not seem to be an authoritative body within GOM that weighs the value of information against the burden to produce it and has the authority to manage expectations and requirements across health programs. Currently, the decisions about which data are most important to prioritize are left to the communities, sites, and districts, creating strain on data quality and inconsistency across the whole of the reporting system.

³ This figure has not been independently confirmed by this analysis or other data source.

The mode of data transfer in Malawi is both a major bottleneck to timely reporting and an impediment to information access at all levels. In Figures 5, 6 and 7 of the *Landscape Analysis*, the mode of transfer between levels (e.g., facility to district) is indicated by a motorcar icon or wireless icon. The bulk of data collection and reporting at site level (communities and facilities) is paper-based. Data from registers are manually tallied and aggregated into summary reports. These reports must be delivered **by hand** to district authorities, and are then keyed into electronic systems. Without exception, staff interviewed cited this process as a major hurdle to timely reporting. First, sites must have blank reports on hand, or a working printer and ink cartridge to generate their own. Next, sites must figure out how to get the reports to the district offices. Given discretionary facility budgets are small and insufficient for necessary clinical activities, often items such as fuel for data transport are not deemed essential. Facilities will rely on ambulances, or wait for district supportive supervision visits to transfer reports; however, both options are not as frequent or reliable as needed to ensure timely reporting.

Another example of multi-step, physical data transfer can be found in the submission protocol for logistics data. Key commodity information at facility level, such as stock on hand, is tracked manually on stock cards. The pharmacy officer (or proxy) at each facility will aggregate commodity data into paper summary reports that are physically transferred to the district pharmacy manager. The pharmacy manager keys the data into Supply Chain Manager (SCMgr)—a desktop program that is not networked. Standard reports are generated from SCMgr and must be sent via email to HTSS within the MOH, which are re-keyed into SCMgr at central level. At the same time, the pharmacy manager has to physically pass along summary data to the HMIS officer to satisfy district reporting requirements. **At each point in this process where data must be keyed or re-keyed, the probability for**

error increases. Despite having two electronic systems available (SCMgr and HMIS), the data exchange protocol is not automated, resulting in undue burden on health facility staff that are already pressed for time.

ELECTRONIC TRANSFER

Electronic data transfer does occur but is much more limited and not optimized where implemented. For example, as of 2015, EMRs were operational in 75 sites—67 using Baobab Out-patient Diagnosis (OPD) and ART modules and 8 using DREAM. Despite these data being housed electronically and stored in a central server, facility staff are **required to maintain paper registers and create hand written reports.** There are some cases where staff can use the Baobab EMR to generate “reports,” but this was demonstrated in one facility and did not appear to be very efficient. To generate a single aggregate data point (e.g., number of malaria cases under 5 years), staff must manually key report parameters (variable, time period, etc.) into the tablet used at point-of-service (POS)—the same devices as those used for patient visits. This process has to be repeated for every aggregate data point needed for the paper report. Routine electronic reports from EMRs that aggregate all necessary data points for a paper report in easily consumable fashion are not available. This represents a big efficiency gap, especially given the technology is already in place that could address the duplication of effort for data collection and reporting using EMRs.

COMMUNITY DATA

In terms of community data for HIV, the approach to submission using the Local Authority HIV and AIDS Activity Reporting Form (LAHARF) is excessively burdensome. All community organizations or non-government organizations (NGOs) supporting the HIV response are expected to supply LAHARF data, monthly and quarterly, on paper hard copy forms to

the District AIDS Council (DAC) in the district in which they operate. The DAC is then responsible for keying in data to the District Data Bank, LAHARS module. In most cases, funding is not provided to the organizations to print or physically transport the LAHARF. The form is 8 pages long, with data elements that are frequently not relevant to the organizations completing it. One DAC was asked how many of the data elements pertained to most of the organizations in his district; his response was **less than half**. Given the cost and time required to meet the requirement, matched with the limited relevance, it is not surprising reporting rates are lower than desired.

NETWORK ACCESS

Internet connectivity is a major challenge in Malawi. Not all components of data systems can or should be transferred to electronic platforms, especially given the electricity challenges faced by many health centres; however, facilities that are capable of linking to internet service providers often do not. Limited resources are most often cited. For example, the Salima District Hospital has been without internet for the past 4 months. The discretionary funds available for the District Health Office (DHO) have declined in recent years, and the management team had to choose between purchasing internet service and ensuring adequate resources are available for patient care (e.g., food supplements to the clinically malnourished). If facilities are required to prioritize patient services over internet connectivity, it is unlikely internet will be routinely available. In the case of Salima District, staff indicated they must travel to the District Council (DC) office to access email, send electronic data reports, or access networked data system (e.g., HMIS). Donor funded internet connection and airtime for cellular service has been provided ad hoc to support specific programs. Despite agreements for the GOM to pick up

the communication costs at the end of the projects, there are numerous examples of network access being lost when donor funds cease, highlighting a potentially unrealistic expectation.

The lack of access to internet creates additional steps in the process for data transfer, exacerbating delay and thwarting the potential for electronic systems to save time and effort. This challenge has an impact on data quality as well. Besides perpetuating the possibility for data recording and entry errors, 2 of the district hospitals visited stated challenges with the internet and HMIS. The national HMIS operates on the DHIS2 platform and data can only be transmitted when the system is connected to the internet. Though forms can be cached—stored temporarily on the computer hard drive and uploaded once connection is reestablished—there are numerous reports of the system losing data before it is uploaded. One district hospital noted that data for the entire month of February 2015 was lost and had to be re-entered. This issue has been flagged in other countries using DHIS2 without strong internet consistently available.

It should be noted that Baobab has developed a proprietary solution allowing the EMR data to be transferred to the central server via a “backbone” VPN. Rather ingeniously, the organization has built and installed light-weight, low-power equipment that effectively creates a virtual connection between EMR sites not reliant on telecommunications providers. Though sites using EMR are part of the virtual backbone, the VPN is only used for EMR data and nothing else. When asked why this system has not been further harnessed for transmitting other types of health data, GOM officials cited issues of ownership as the primary obstacle.

DUPLICATION AND DISCONTINUITY

A basic tenant of a unified M&E system is to collect data points once and use many times. The piecemeal development of electronic data systems, matched with the proliferation of parallel reporting processes (e.g., supportive supervision), has led to **excessive duplication in data collection and reporting** in Malawi. This is true of individual data points that must be tracked in multiple paper sources (registers, patient cards, etc.) and entry of the same data into multiple electronic platforms at various levels. Data for the same elements do not match across systems, likely due to the degree of manual entry and re-entry. Though CMED has been working to integrate all health program data elements into HMIS, they are not empowered to negotiate the content of the data collected or evaluate the expected overlap or duplication. Further, when new systems are introduced that should save time (e.g., EMRs), artifact or manual systems are not retired. As a result, the reporting burden grows without systematic review of duplication or a policy/process for older systems to be phased out.

As part of the system mapping completed for this analysis, efficiency gaps and potential opportunities for automating data transfer that would (in theory) reduce burden, streamline reporting, and improve data quality are listed below. It is important to note the technical feasibility and methods for data exchange between systems are being explored in the forthcoming Vital Wave report and are not discussed in detail in this document.

EMR AND HMIS

Facilities that currently run Baobab and DREAM EMR systems should have the ability to 'push' data directly from these POS systems to HMIS. This automation would free up staff time at facility and district level to focus on data validation and quality rather than manual data entry. It also would reduce the amount of paper needed and the number of physical transfer of

forms between sites. If implemented, resources would need to ensure access to (i.e., internet and equipment) and capacity to use (i.e., adequate training) HMIS in facilities with EMRs.

CMED and Baobab have discussed the technical exchange protocol for moving data from EMR to HMIS; however, this work has stalled and needs to be revived. There is funding allocated in the Kuunika Project to link DREAM software with HMIS.

EMR AND DHA MIS

Similar to the automation between EMRs and HMIS, linking the EMRs (Baobab and DREAM) to the DHA MIS would likely save considerable time compiling reports at facility level for both site staff and the centrally-based supervisors that travel to each site. Automating reports for sites with functioning EMRs could allow for more time in facility to be devoted to data review and clinical mentorship versus the time spent tallying source data (see description of supportive supervision in the *Landscape Analysis*).

The issue most concerning to HIV program managers is the quality of data compiled using the EMR versus the paper-based systems. This concept will need to be explored and addressed prior to system integration and highlights a typical concern about modifying current system processes. This issue is discussed in detail in the section on Barriers to System Integration below.

DHA MIS AND EPI INFO

Data collected in the integrated HIV quarterly supportive supervision visits currently is maintained in two fully separate access databases: the DHA MIS (HIV/AIDS) and Epi Info (TB). In addition to tracking and reporting data for the integrated supervision visits, sites and districts must also aggregate HIV/AIDS and TB data in paper summary reports which are eventually

keyed into HMIS. Generally, the data stored in the DHA MIS and Epi Info are considered higher quality and serve as the primary source of information for program data analysis, external reporting, and commodity forecasting. Given substantial overlap in data elements reported through supportive supervision and those reported through HMIS, it is not immediately clear why the duplication persists. A pilot was completed in the past that sought to integrate supportive supervision data into HMIS; however, data quality issues were flagged and the pilot was terminated. The reasons for failure of the integration need to be explored further, but in the meantime it is critical that HIV/AIDS and TB data can be accessed by practitioners and policy makers. Further, if DHA MIS and Epi Info data were 'pushed' into HMIS, elements that are duplicated in entry and reporting could be eliminated, freeing up time for data review and analysis at lower levels of the system.

The TB program currently is working with CMED to add data elements typically collected through TB coordinators at district level into HMIS (in Appendix 1, see *ETR* in data flow diagram). The first training of TB coordinators on the new forms in DHIS2 was completed in early March 2016. Though a necessary first step, there are no specific policies in place that would establish performance criteria enabling the artifact system to be phased out. This means in the near term, TB coordinators will need to add an additional reporting component (HMIS reporting) to their current workload, which already involves 3 data streams. Developing data exchange centrally between Epi Info and HMIS could significantly streamline this process and result in higher quality information accessible to more stakeholders through HMIS.

LMIS TO HMIS

Logistics data housed in LMIS (SCMgr) at district level must be manually exported and rekeyed into HMIS. Though LMIS is not a networked platform, it should be relatively straight forward to develop a data exchange protocol that allows electronic transfer of data from

LMIS to HMIS (e.g., CSV export with bulk import). This small up-front investment would likely save time and improve data quality in the central repository. Some in the GOM have expressed a desire to wait for the OpenLMIS system currently being planned in Malawi prior to making any further improvements to LMIS; however, the funding for that effort was on hold as of February 2016 and it is not clear how long it will take for the OpenLMIS system to be piloted and become fully operational.

DHA MIS TO DATIM

DATIM is the software application currently used by the USG to collect and store all PEPFAR required data elements (see the Appendix for more information). Currently, many site-level PEPFAR indicators are derived from the DHA MIS database, yet no bulk option exists to exchange data between the two platforms. This creates excess reporting burden on DHA data clerks that could be avoided if the systems communicated. Further, both DATIM and the Malawi HMIS are built on the DHIS2 platform, so addressing the data exchange between DHA MIS and HMIS, matched with a data transfer from DATIM to HMIS, would likely obviate the need for direct communication between DATIM and DHA MIS.

CSTOCK TO HMIS

CSTOCK is the community-based logistics management system used by Health Surveillance Assistants (HSAs) to report and resupply commodities/drugs administered in village clinics. Currently, CSTOCK does not link to HMIS. Given urgent logistics challenges faced by the malaria response in Malawi, the capacity to triangulate data between HMIS (case data), LMIS (drug distribution to sites), and CSTOCK (drug distribution to village clinics) is crucial. CSTOCK is web-based and data are accessible with credentials provided by HTSS; however, obtaining data across sites and districts in a single data export that can easily map to congruent HMIS data is not possible, limiting the program from taking full advantage of available information to spot trouble areas and tailor

remediation efforts. CSTACK is developed by a technical firm, Dimagi, which also offers open source solutions for data exchange between products such as

CSTACK and [CommCare Supply](#) (the latest version of the software) and DHIS2.

In discussions with program managers, particularly at the central level, it became clear there is a fundamental mistrust of data available in the central repository, HMIS. Discussed at length in the *Landscape Analysis*, the challenges historically with accessing complete and accurate data using the core process has lead health programs to develop parallel streams. These streams are often donor supported and resources are more stable, producing higher quality information and crowding out investments to strengthen the routine data reporting infrastructure.

PERCEIVED VERSUS ACTUAL

A major challenge with HMIS currently is the ability to tease out perceived versus actual data quality issues. For example, in a recent national malaria data program review meeting, illustrative district-level data were presented to highlight the comparison between artemether-lumefantrine (LA) issued to sites and malaria cases. Estimating malaria cases at site level required summing across several data elements available in HMIS. When presented, a number of program managers in the room felt the data were nonsensical (unrealistically high) and as such, did not feel conclusions should be drawn. Spot checking the village clinic data for LA consumption from CSTACK confirmed there were values that did not triangulate with those pulled from HMIS. Upon further investigation by program staff, the pivot tables used to pull data from HMIS were drawing from the wrong data columns, producing incorrect information for the analysis. This is an example where there may not be quality issues with the underlying source data in the system, but because of technical challenges (yet unidentified), the conclusion was drawn that data in HMIS could not be trusted. The extent to which the pivot function incorrectly accesses other data points across health programs is not known, and does not appear to be systematically examined.

METADATA

In addition to possible technical errors within HMIS, the ability to interpret the information accessed is incredibly limited. There exists no standard data dictionary or method to investigate the source of data being reviewed. CMED recognizes this limitation and cited time constraints as the biggest limitation to incorporating a data dictionary into the documentation. Without the ability to trace origins, data in the system are perceived as “HMIS” rather than from a specific register or standard report, which in turn appears to affect attitudes of system users and program managers towards quality of information accessed.

METRICS

Even if the source of a data element in HMIS is known, it is challenging to quantitatively assess the quality of the information being reviewed. Data quality can mean many things, but at minimum, a system user would want to have some information on the relative completeness and accuracy before feeling comfortable with using specific data to make programmatic or policy decisions. Completeness could be measured in basic terms by the total number of expected data points, versus the actual data points captured—or in the case of site-level reporting, the percentage of sites which have provided information included in an aggregate data point. Accuracy is more difficult to measure using aggregate data alone, but building in routine ‘business rules’ into HMIS could go a long way in highlighting data points that may be nonsensical or represent aberrations from the norm. For example, an automated rule that checks the percentage difference of a reported value for a facility compared with historical reports could flag data entry errors, or conversely highlight an area that may need special attention (e.g., a spike in reported malaria cases).

It should be noted a *Data Quality Tool* supported by World Health Organization (WHO) is being tested in HMIS that includes space for dashboards outlining information on data completeness, consistency, and outliers. The tool also provides the ability to complete ad hoc analysis and the necessary structure for a data dictionary—all of which are quite promising. The tool will need work to maximize usefulness and accessibility, however. Exploring the tool for this report, I was unable to render the dashboards; the analysis function was difficult to navigate without additional onscreen instruction; the outputs were not well-labeled or easily interpreted; the documentation/instructions are insufficient; and the data dictionary lacks the information necessary to determine origin or interpretation issues (see screen shot below). Despite limitations in the current version, the application has a great deal of potential. The big challenge for developers will be how to integrate estimates of data quality created by the tool **into the routine reports and output from HMIS**. Not every program manager will have the time to run a data quality report on routinely reviewed information. The primary question should be, how can quality estimates become more automated and easily and routinely accessed?

VALIDATION

Finally, several of those interviewed suggested an inability to understand the quality of data in HMIS at a moment in time because the data are constantly in flux. In the purest form of open-source, open-access platforms—such as, DHIS2—all system users have access to all data elements, all the time. Though positive in principle, in practice a fully open system can create confusion for system users. High quality data needs to be reviewed and validated by program managers and data specialists at each level in the chain to incite confidence. The 'off-the-shelf' version of DHIS2 includes the ability for users to validate a particular dataset reported at lower levels in the hierarchy, adding a degree of confidence to those accessing the information that the data meet a basic quality

standard. Despite this functionality being available, it is currently impossible to determine if and by whom aggregate data have been reviewed and validated within the Malawi HMIS. In designing the PEPFAR instance of DHIS2 (DATIM) the USG took validation a step further to address this concern, building a workflow process that requires reviews at each step in the data chain before being "approved" by designated users. Data that has not been approved is not viewable by all system users nor included in aggregate totals. This approval process does create an additional layer that arguably slows access to data, but it also can pinpoint bottlenecks in data flow and can substantially increase confidence of system users that the data they review meet basic quality standards.

Screen Shot Showing Indicator Detail Provided in Data Quality Tool for HMIS



Data Quality Tool
TEST VERSION

Dashboard
Analysis ▾
Annual Report
About
More ▾

Data Dictionary

Data elements ✕ ▾

HMIS 15 ✕ ▾

death

HMIS Malaria under 5 years - new

HMIS Malnutrition under 5 years - inpatient death

HMIS Malnutrition under 5 years - new

HMIS Measles - new

HMIS Measles 1st dose at 9 months

HMIS Meningococcal Meningitis - newx

HMIS Neonatal tetanus - new

HMIS Nevirapine dose to baby born to ...

HMIS Malaria under 5 years - new

Short name	HMIS Malaria <5 - new	Code		UID	V5mkMCN2Rnf
Description					

Storage and Aggregation

Domain type	Aggregate	Value type	Unknown
Aggregation type	Unknown	Zero value storage	Yes

Source data sets

Name	Frequency	Expected reports
HMIS - 15	Monthly	657

Key data (MOH MALAWI Govt)

Name	Type	2014	2015	2016
HMIS Malaria under 5 years - new	Data element	2282535	2161775	376698
HMIS - 15	Data set	95.5	93.8	12.2

DATA VISUALIZATION TOOLS

High quality and complete data are limited in their application if tools do not exist that allow decision-makers at all levels to visualize and interpret information easily. Some dashboards have been programmed across the various electronic applications in use, including the Baobab EMR, CSTACK and HMIS, but the dashboards are reduced to select views, variably accessible, and are not adequately customizable to meet the specific and evolving needs of decision makers. The DHIS2 platform includes a “data visualizer” module that allows for ad hoc creation of aggregate data tables and charts; however, a number of limitations exist on this platform as the primary tool for analyzing key health data, principally that it is restricted by the data currently collected in the system. Without the ability to compare related data housed in other databases (e.g., SCMgr and CSTACK) the data visualizer has limited value to serve as a central access point. In addition, potentially valuable contextual information to layer aggregate reports, such as sub-national estimates of population, prevalence,

targets, or program coverage, are not currently available. This lack of integration requires a user to draw data from multiple systems, manipulate and shape information to a common format, and conduct analysis in a separate application (e.g., Excel). Such effort requires access to software and more advanced skills for data management and analysis.

Facilitating extensive use of data and creative application to address program concerns will likely require a web-based platform for bridging data elements across streams that focuses on the end user experience. CMED has received support from a number of sources to develop program-specific dashboards within HMIS; however, creating meaningful data visualizations should not require liaising with system developers. Alternative solutions to the data visualizer or significant improvements to the current functionality and available source data should be explored.

INABILITY TO LINK RESOURCES TO RESULTS

A challenge cited by several program managers interviewed was the lack of ability to access financial data in a format that could help to inform budgeting and future resource allocation decisions. Assessing performance of health programs requires a solid understanding of the resources consumed to achieve desired outputs, and current systems for tracking program expenditures in Malawi are disjointed and unable to map to program activities or outputs. The Office of the Accountant General within the MOF in Malawi indicated a sector-wide effort is underway to bridge this gap. Currently, the software used to manage payments and requisitions—the Integrated Financial Management Information System (IFMIS)—is also used to track GOM expenditures by line ministry and basic accounting categories. Due to system

technical limitations (e.g., character limits), IFMIS is unable to capture data on non-GOM expenditures, which represent the bulk of support for many health programs in Malawi. The MOF has commissioned a full revamp of IFMIS, including tendering a procurement for new software that is more user-friendly and capable of integrating data from donor/implementer systems for a more complete view of sector spending linked to program goals. In addition, MOF is updating the standard chart of accounts to be more program-based.

Though extremely promising, the sector engagement by MOF to date has excluded MOH. Both the USG (particularly PEPFAR) and the Global Fund (under the New Funding Model) have more explicitly linked health

expenditures and results. Such efforts have allowed for a deeper understanding of the resources devoted to specific program interventions and outputs, established a routine base of quality financial and cost data, and demonstrably improved the technical and allocative efficiency of field programs. Given the current momentum and political will to maximize the usefulness of financial data, MOH could benefit tremendously by adopting the lessons learned from

PEPFAR and Global Fund experiences with resource tracking and working closely with MOF as financial tracking systems are updated to better serve public programs. To date, no country has institutionalized a comprehensive, results-linked resource tracking platform that includes all sources of support for health. Malawi has an opportunity to be a leader in tackling this gap and may pioneer the way for other countries if due attention is provided.

BARRIERS TO DATA ACCESS AND USE

ACTIONABLE DATA

DATA SKILLS

DISJOINTED PLANNING AND
ASYMMETRICAL ACCESS

PERCEIVED DATA QUALITY

ACTIONABLE DATA AT POINT-OF-SERVICE

Given many health facilities lack electricity, equipment, tools/software, or skills to review aggregate data, health workers are unable to place the data they collect and report into context. This limitation precludes clinicians and managers from using the data to inform routine activities and discourages them from achieving intermediate goals for increasing performance and efficiency. There were a few examples observed of original data analysis or visualization in larger facilities with dedicated data specialists, but these examples were typically limited to monthly aggregate totals for select indicators. Smaller facilities reported that sometimes HMIS officers or supportive supervision staff bring printed graphics or data tables with them to post on the facility wall, but the distribution is not routine. In the examples observed hanging on the clinic wall (see example right), often aberrations—such as spikes or outliers—were identified. We asked the facility staff if they knew of any explanation for these data points. Rarely were contextual explanations offered (e.g., a mass testing campaign was conducted leading to a spike in HIV positives identified), and the source of the irregularity often was not known. If the sites visited for this analysis are representative, there appears to be a general lack of knowledge about what facility staff should do with the data feedback provided by higher levels. Further, the feedback data for clinic postings was reported to be infrequent, not delivered at regular intervals, and not always consistent in the information it portrayed. The distribution of information in this format hinges on resources being available for stationary, printing, and fuel for travel, so



it is unlikely facility staff would come to depend on these deliveries to provide inputs into routine decision making.

CONTEXT FOR RESULTS

Two data interpretation fundamentals were lacking from most examples of data analysis found in health facilities visited: the presence of meaningful denominators and a useful comparator. Denominators provide context and the ability to say

something about the performance of a particular indicator against a meaningful benchmark or target. For example, how should facility staff interpret a trend analysis depicting the number of HIV tests administered monthly over the last year? Perhaps they can see aberrations from the normal volume of tests, spot trends up or down, or potential data quality errors, but little can be determined about the site's actual performance and areas that need improvement. Did the percentage of positives identified go up or down last month? If so, how does this relate to community and clinic initiatives? How does it relate to efforts to improve quality of testing services? If data on the number of HIV tests administered were plotted next to the number of HIV positives identified in the same period, questions such as these could be addressed and may help to craft more effective clinical and community strategies going forward.

Similarly, Malawi has ambitious goals for expanding HIV combination prevention in the near term. Working with PEPFAR and other partners, targets for HIV testing, treatment, retention, and viral load suppression (among others) have been set at the district and even site levels. Despite the existence of targets in this level of granularity, facilities were not aware of their quarterly or annual performance goals for specific indicators. Targets serve as a useful reference point to assess performance, are not complicated to understand, and can affect how staff time and attention is directed to address performance gaps. Using the HIV testing example above, a simple chart on a clinic wall that provides (at least) quarterly data on HIV positives identified versus the target number of tests and positives identified in that same period could have a substantial bearing on operations. If goals aren't being met, facility and community workers could conceptualize and pilot activities to improve performance in a specific area. Or perhaps, the targets

set were not realistic given the catchment area for the facility and should be revisited. All of this information is exceedingly valuable to program planners and implementers and enables a more nimble and effective epidemic response.

In addition to meaningful denominators, data should have useful comparators to further contextualize performance. Many facility staff suggested that knowledge of how their site performed compared with other sites in the district and more broadly would be useful to understanding what they should be working more diligently to improve. This is true of both data reporting and clinical performance, and if provided, could help motivate behavior change. These data theoretically exist in current systems, but may not be easily extracted nor effectively presented by supervisors.

FEEDBACK TO COMMUNITIES

Finally, feedback to community support organizations is lacking. Members of one CBO interviewed expressed deep pride in meeting data reporting requirements historically; however, no feedback from the GOM has been offered on the quality of their submissions or how they could improve core efforts to support orphans and people living with HIV (PLHIV) in the community. Additionally, the organization lacks the ability to access information about epidemiologic, demographic, or program trends in their geographical area that may inform the activities upon which volunteers are focused. With targeted skills development, creative methods for disseminating information, or more formal channels for community involvement in data review, community organizations would likely contribute a more nuanced understanding of aggregate data and help tailor program interventions for specific populations and locations.

A principle and widely acknowledged barrier to increasing data use at all levels of the health sector is the persistent gap in skills necessary to manage, analyze, visualize, and interpret data. As evidenced by the discussions of in-service training and fiscal space, a substantial proportion of resources for health are consumed annually on staff capacity building; however, most individuals interviewed—from the community to central program level—expressed feeling they possess inadequate skills to effectively use the information at their disposal. For example, when discussing the mismatch between malaria case data (housed in HMIS) and drug consumption data (housed in LMIS and CSTACK), one District Pharmacy Manager stated that, despite having access, she had never compared data across the systems before, “but would love for someone to show her how.” A demonstration of this simple comparison and follow-up support could go a long way in fostering a culture of data use within districts and facilities who are best poised to explain aggregate data in practical context.

ANALYSIS SUPPORT

Targeted skills development does not require a multi-day training or extensive curriculum. It does require a mechanism by which data system users can access support when needed, which could not be found in the health sector in Malawi. Technical issues with DHIS2 software are resolved by CMED, but no formal help desk system exists to track questions/feedback, response times, frequent requests or common themes, etc. System support is thought of more in the context of software or ICT, and not envisioned to extend to content, data analysis, and interpretation questions. A support channel is necessary if the skills learned in data review meetings or other trainings are to be sustained. Further, knowing support exists and will be delivered in timely fashion would likely increase the propensity of staff to initiate their own investigations using data. PEPFAR has successfully installed help desk systems in the past to improve the

completeness and accuracy of routine data. Requests for assistance are completed using an online form by any system user; a central point of contact is designated to review requests and triage to the appropriate subject matter expert; and requests are flagged if follow-up has been delinquent by a certain amount of time. Malawi may find PEPFAR’s experience useful as a starting point for on-demand data support; however, technology and electricity challenges may dictate a multi-channel system that can be accessed in different ways (SMS, phone, etc.).

EFFECTIVE TAILORING

With respect to more formal training, a major challenge is ensuring the right capacity building efforts target the right beneficiaries. Donor investments in training and capacity building lack coordination and transparency, mostly because the full extent of these efforts is not known. After reviewing the proposed Global Fund activities slated for implementation this grant cycle, it was noted that up to 1 million USD had been allocated to training HSAs on use of DHIS2. In theory, it would be most beneficial if HSAs could access networked data; however, in reality, most HSAs operate in areas with extremely limited internet access and do not have access to a laptop or computer. It is not immediately evident how these new skills could be employed in the near term to address urgent program challenges or streamline reporting. Tailoring capacity building efforts to specific cadres and focusing on skills that will yield the highest dividends should be prioritized, and prioritization is predicated on development of a comprehensive training inventory and mechanism by which all donors and implementers are coordinated. Further, tailoring should hone in on specific data or programmatic challenges faced by specific sites and districts using preemptive data quality checks, built-in data flags (e.g., dramatic indicator fluctuations), and common issues identified through systematic tracking of assistance requests.

LOW-TECH APPROACHES

Access to technology is often regarded as a barrier to data access and use, though low-tech approaches are often sufficient for building fundamental data review and analysis skills. Advanced software, or even computers, is not always needed to deepen understanding of the information on hand. A solid example is the district malaria review meeting discussed in the section on training above in which participants from health facilities were provided their

own summary data in hard copy and asked to graph on paper the results and discuss. Of course, access to proper computer equipment, the internet, and software are all intrinsically valuable and should be expanded in Malawi; however, access to these tools is not a precondition for improving use of data for decision making. Tailoring and sequencing capacity building to align with technological access and adoption is essential to maximizing return on investment for these efforts.

DISJOINTED PLANNING AND ASYMMETRICAL ACCESS TO INFORMATION

To facilitate efficiency and sustainability in health programs, an ultimate goal of the GOM is to improve how empirical evidence is used to make funding decisions. The following discussion explores how data are currently applied in planning and notes barriers to access and use.

DECENTRALIZED PLANNING

Since the decentralization process began in 1994, district governance structures have been established and tasked with organizing resources to manage and deliver public services, including healthcare (see Figure 9 in Appendix 1). Despite the mandate to create periodic District Development Plans (DDPs) and District Implementation Plans (DIPs) with associated budgets, funding and resource allocation decisions are mostly determined centrally. According to an extensive qualitative study completed by Norwegian Agency for Development Cooperation (NORAD) on [Local Perceptions, Participation, and Accountability in Malawi's Health Sector](#), DCs are responsible for developing district plans and budgets primarily with input from the Village Development and Area Development Councils (VDCs/ADCs). Annual consultation meetings are also held with health facilities and communities to gather information on burden of disease and pressing needs; however, it is difficult to understand how these data are accessed or ultimately applied to inform resource allocation. In our

field visits, DC M&E officers and DHMT representatives indicated district plans often include some presentation of summary statistics of historical performance by sector; however, it is not evident hard data are used to advocate for additional resources to address a specific need (e.g., sub-national incidence rates for malaria used to advocate for additional ACTs). Further, in the NORAD investigation it seemed clear any data available to develop plans was not available routinely below district level. ADCs expressed frustration that information about spending or special projects within their areas was not routinely provided.

DC representatives and DMHTs interviewed for this report also vocalized a degree of apathy toward the planning process, largely because the assumption (rightly or not) is that funding decisions have already been made at central level. Budgets by sector are set centrally and are not fungible within the districts. Also, most districts do not have a substantial revenue base on which to draw discretionary public funds and rely on the allocation decisions made by ministries centrally. Most plans go underfunded and tough decisions must be made about what will get prioritized (such as, choosing between internet and food supplements). After submission to national level, plans are often returned with a prescribed budget reduction and a surprisingly short turn-around time to revise and resubmit (e.g., 24 hours), leaving little or no room for negotiation backed by specific data. DMHT

representatives were asked if they ever compare performance and disease burden with other districts to advocate for additional resources *or* appeal funding decisions made at central level, the answer to both questions was always no.

ACCESS TO INFORMATION

It is not clear if the primary impediment to increased use of data in district planning processes is lack of access, lack of value placed on empirical information, or lack of authority to make funding decisions. It is clear that only a few individuals within districts serve as gatekeepers to routine data systems (e.g., HMIS, LMIS) that could—if utilized more effectively—provide critical inputs into planning processes and decisions. Not all participants will be able to access a computerized dashboard or have the skills to abstract the pertinent information. Other methods for participatory engagement of all stakeholders jointly reviewing empirical data are needed to help tell the narrative and develop more compelling, evidence-based budgets. Lack of access to transparent data in formats available to Malawi's constituents leads to disempowerment from planning and undermines the importance of quality M&E to align programs to needs.

INCENTIVE ALIGNMENT

PERCEIVED DATA QUALITY

As discussed in the section on *Gaps and Limitations of M&E Systems*, perceived data quality can have a significant impact on data access and use. Mistrust in the data collected and stored in HMIS limits the desire of program managers and policy makers to factor routinely available data into decision making. A concerted effort is needed to evaluate data quality,

Finally, the NORAD study reports a lack of community involvement in developing NGO projects, resulting in misalignment of provision of goods and services with actual needs or recipient preferences. Though NGO projects are rarely refused and communities are asked about needs, it's often outside of the scope (or mandate) of the NGO to provide the requested services⁴. This misalignment is driven by a lack of access to necessary data, both on the community side and the donor side. If communities were more aware of the various earmarked streams of funding available through donor-funded health projects, and donors had better information about where specific needs and priorities are most prevalent, it is likely community projects would be more effective and increase beneficiary satisfaction. Though a bit more diffuse than other concepts in this paper, the importance of establishing a strong link with communities can't be overstated. Without it, the HIV/AIDS, TB and malaria programs will not realize efficiency and sustainability gains necessary in the current fiscal climate. Ensuring data housed within communities are accessed by the formal health sector and used to design programs that align incentives between stakeholders is a necessary first step.

provide metadata on the reports and datasets accessed the system, and improve confidence the system will pull the correct information when queried. Confidence in the system should also be measured and tracked over time to determine how future strengthening investments impact perceptions of data quality, ease of access, and ultimate usefulness for supporting routine decisions.

⁴ An example cited heavily in the NORAD report is clean drinking water.

BARRIERS TO SYSTEMS INTEGRATION

SEMANTICS

POLICIES TO GRADUATE OR RETIRE SYSTEMS

FULL USE OF DHIS2 CAPABILITIES

CMED STAFFING AND SKILLSETS

SEMANTICS

It was evident from the proceedings of the MA4H mission and subsequent discussions with system stakeholders that a communication challenge persists with the term, “unified platform for M&E.” Though most can agree that the principle is worth pursuing, differences in interpretation of what a unified system will actually look like in Malawi has led to some anxiety and reluctance to fully engage. Sources for this hesitation seem to fall into three categories: ownership, data integrity, and strategic vision.

OWNERSHIP

More than 10 electronic systems were identified in the system mapping for HIV/AIDS, TB, and malaria alone. Each of these systems took significant time and effort to develop and are maintained by a team of system experts. Given the amount of energy put into operationalizing these systems for their intended purpose, it is not surprising a feeling of ownership has emerged. Several stakeholders interviewed suggested that a “unified M&E system” might mean complete integration of all data and processes into a single software application, such as DHIS2, and voiced serious concerns about the ability of a one product to meet all program data needs. System users also have come to rely on current platforms to access necessary data in a particular and familiar way and expressed genuine concern that hastily abandoning existing systems would impact their ability to complete routine tasks, meet reporting requirements, and manage the program as desired.

DATA INTEGRITY

In addition to ownership, system stakeholders were appropriately concerned about the loss of data integrity if systems are streamlined. This is particularly true where parallel systems, such as DHA MIS and Epi Info, are regarded to contain higher quality information than core reporting processes and HMIS.

VISION

Finally, ideological differences exist in Malawi about how a unified M&E system should be implemented and which strategic vision should be adopted. For example, proponents of patient-level data systems, such as EMRs, believe investing resources to expand coverage of EMRs should be top priority. Others see the value of EMRs, but also believe aggregate data systems, such as the HMIS, should be accessible at all levels. Another example is the degree to which data exchange between systems should be linked using a fully open-source interoperability layer versus more selective data exchange protocols. With increasing, but still limited, resources available for M&E system strengthening, the definition of a strategic vision and stated system preferences have implications for what gets funded and the pace of unification (however defined).

The above issues identified are far from semantic in practice; however, the absence of consensus on operational definitions limits the productivity of planning and stakeholder engagement. At least leveling the conversation with a common understanding of core concepts could facilitate development of a well-defined and detailed strategic

vision that includes time-stamped, system-specific activities and goals.

POLICIES TO GRADUATE OR RETIRE SYSTEMS

As noted in other parts of this paper, proliferation of data collection and reporting requirements results in competition for data quality improvements among health programs. In somewhat self-perpetuating fashion, the lack of strong data in some areas results in additional, parallel structures, in turn adding strain on data users to produce high quality information across streams. In other cases, systems may be introduced (e.g., EMRs) that are designed to reduce data management and reporting burden, but ultimately create duplication of effort because artifact processes and systems are not retired. No sector-wide policies or practices could be identified that address this issue. What gets collected and reported is left up to each central health program office, who (appropriately) are most focused on their specific data needs. No GOM structure is set up or empowered to look across the sector, evaluate duplication or comparative value of information collected, and make binding decisions.

Of course, Malawi is not unique in this respect and many countries grapple with data system evolution. There is strong caution to phasing out artifact systems (e.g., paper-based registers) in lieu of new technologies, but often the same caution is observed towards eliminating duplicate reporting streams (e.g., merging registers). This hesitation is understandable, especially given donor funding is increasingly contingent on high-quality performance reporting; however, a process has to be put in place that allows for standards testing and eventual phase-out of data elements and systems that are duplicative or unnecessary. The absence of process creates avoidable drag on the system and challenges prospects for longer-term sustainability.

COMPARATIVE QUALITY

A primary issue observed in other countries looking to streamline systems is how to define a 'gold standard' for benchmarking data quality. Prior to phase-out of

systems or data elements, program managers want to be confident the proposed replacement is capable of producing (at minimum) the same level of data quality available in the current system. This is a typical dilemma for introduction of POS electronic systems at facility level. Programs are willing to pilot alternative methods, but rarely are criteria determined in advance for how they will measure success *in terms of transition*. When is data quality in the alternative approach good enough? Against what is data quality measured? The selection of the gold standard, or reference point, becomes a challenge. If the new approach (e.g., an EMR) is evaluated against the same data collected in the current approach (e.g., paper registers), the assumption is that the current approach produces 100% accurate information, which is known not to be true in most cases. In actuality, the new approach may produce comparatively higher quality data, but that conclusion could not be drawn using the current approach as the gold standard. This is a technical challenge Malawi will need to tackle if effective policies for phase-out of artifact systems and elements are developed and endorsed by program managers. International guidelines and standards are also lacking in this area, opening up an opportunity for Malawi to lead the way for other countries with similar questions.

PRIORITIZATION OF INTEGRATION EFFORTS

The lack of policy to guide streamlining also creates strain on current efforts to integrate existing data streams. As noted earlier, CMED has been working diligently to add data elements into HMIS that currently are captured only outside of the system. This effort focuses first on the core set of elements aligned with the agreed upon national indicators—i.e, those intended to be available externally versus those reported to central level but used internally by specific

health program managers. As time and resources permit, CMED staff work to integrate the program-specific data elements (not nationally reported) into HMIS so that most every data element collected in the health sector at minimum has a space in the central repository for storage and aggregation. The time and effort required for the DHIS2 development alone is substantial, not to mention it is only the first step. Creating the space for data storage does not mean programs will choose to use HMIS to collect prospective data or resources will be available to migrate historical data (limiting the usefulness of HMIS as an analysis and decision support tool).

The current CMED staffing footprint is composed mostly of statisticians, software developers, and system engineers, not subject matter experts in M&E or specific public health programs. As such, they are not able to negotiate content and volume of indicators with health programs. Without an effective governance structure in place to assess the value of information and streamline current systems and processes, it is not clear CMED staff time is used most efficiently to accelerate progress towards a unified M&E platform.

FULL APPLICATION OF DHIS2 CAPABILITIES

Development for the DHIS2 open-source platform—selected as the central repository for aggregate health data in Malawi—is coordinated by the University of Oslo and funded largely by a short-list of international development organizations, including PEPFAR, Global Fund, NORAD, and the Research Council of Norway. Development of new program datasets (often called modules at field level) and configuration of DHIS2 instances for a specific country or program, is typically completed by consultants or members of the Health Information System Program ([HISP](#)) network. A fundamental tenant of the DHIS2 software (and open-source solutions more broadly) is that the underlying system code is widely available and improvements are encouraged by anyone with the requisite skills. As software variations and additional functions are developed, the improvements are evaluated and tested by those that manage the core ‘trunk’ of the code (University of Oslo) and, if deemed valuable for other users, ‘pushed’ in future software updates. Developers are strongly encouraged to avoid configuration of individual instances that deviate—or ‘fork’—from the trunk, to prevent performance issues over time and ensure all users benefit from updates and improvements to the core software. (As of March 2016, Malawi was operating the most recently available version of the DHIS2).

UNDERUTILIZED CAPABILITIES

Many of the updates to system functionality of DHIS2 in the past few years have been driven by USG after PEPFAR selected the platform as the unified system for results reporting across all implementing partners and coordinating offices in 58 countries. PEPFAR requirements led to substantial modifications, including extension of the privilege hierarchy, a sophisticated data approval and submission workflow, tools for decentralization of user account management, and integration of a help desk ticketing system. All of the additional functionality resulting from build-out of the PEPFAR and other specific instances, in theory, should be available for access in any instance of the software. In principal the functional updates are not widely known or publicized. For example, CMED has expressed a desire to impose workflow on data submission, decentralize account management, and install a help desk system linked to HMIS. Though already in place in the PEPFAR instance, CMED was unaware of these system capabilities despite having developers on staff that are funded by the University of Oslo.

TRANSLATION AND TRANSPARENCY

The dissemination of information on software improvements (e.g., email updates) by University of Oslo does not fully explain the development that has been completed across instances, or more importantly, the issues that are being addressed by those improvements. This communication gap stymies system administrators, like CMED, from taking full advantage of the platform. It appears many of the items on the HMIS wish-list for GOM may already be available; however, information about these potential solutions or how they can be 'turned on' in the Malawi

version of the software is not readily accessible. Further, information is not readily available to funders on the current items in the backlog—i.e., the development being coordinated by Oslo that is intended to roll out in future versions. Without transparent information on development currently in process, system users are unaware of the potential capability to address country-level gaps, and donors are unable to coordinate their investments to maximize return and optimize system performance.

CMED STAFFING AND SKILLSETS

As the designated coordinating GOM entity for health data and systems, CMED must be adequately staffed with the appropriate skillsets for a unified M&E system to be fully realized and functional. According to CMED, support for HMIS has been provided piecemeal from various sources. Currently, there are 5 developers, including 2 supported with Global Fund resources via University of Oslo; however, the current sources of support are uncertain as agreements expire or funding dries up. CMED reported significant constraints with meeting the demand from programs, including the integration of data elements captured through parallel streams, as well as the creation of data visualizations to include on the system dashboard. As noted in the section above on graduating or retiring artifact systems, the burden placed on CMED could be alleviated to some degree if a governance structure were in place to prioritize data elements and information streams. Even so, the effort that will be required to construct and maintain a unified data architecture is substantial and CMED likely is not equipped given the current staffing level or sustainability of funding arrangements. Once technical feasibility of system integration is better described and an implementation plan developed by GOM, a full

analysis of required resources to adequately staff CMED should be conducted.

SKILL MIX

In addition to number of staff, CMED has to maintain the right skill mix to effectively meet program needs and negotiate with program counterparts. When interviewed, CMED noted the current skillsets are restricted to statisticians, programmers, and data scientists. Missing are the skills needed to interpret and evaluate program data and data quality. Having dedicated staff devoted to improving data quality based on systematic review and context, analyzing trends and creating interesting visualizations, and liaising with programs to conduct rapid analysis and negotiate content would go far in improving attitudes towards HMIS and facilitating routine use at all levels. In addition, CMED will need to be more versed in motivations for program data requirements, indicator definitions, and common interpretation challenges to supply the technical support necessary to sustainably improve data quality at the source (e.g., help desk solution).

RECOMMENDATIONS TO ADDRESS PRINCIPLE GAPS AND BARRIERS

HARNESS EXISTING DATA TO GUIDE INVESTMENTS

STREAMLINE DATA SYSTEMS AND FLOW

IMPROVE DATA QUALITY AND CONFIDENCE IN SYSTEM

IMPROVE SYSTEM DOCUMENTATION AND USER EXPERIENCE

IMPROVE COORDINATION OF CAPACITY BUILDING ACTIVITIES

HARNESS EXISTING DATA TO GUIDE INVESTMENTS

It was clear in discussions with CMED, donors/implementers, and program managers that adequate analysis of existing data to address major program challenges and priorities is lacking. Though questions of completeness and accuracy persist and should be addressed in tandem, effectively harnessing the information currently available can:

- focus attention on issues that need urgent remediation;
- help to prioritize investments and activities using objective information;
- identify relationships between performance and program design, management or context variables;
- better align resources with disease burden or need.

As outlined in the *Landscape Analysis* and findings for this report, lack of **time** and **inadequate skills** were most **frequently cited as barriers** to more extensive analysis and interpretation of routine information.

To better illustrate how existing data may be harnessed to guide program activities, a rapid analysis using malaria program data was conducted. Context, methods, results and brief discussion are presented in **Appendix 3**.

The malaria program data illustrative analysis shows how existing data can guide program activities and address pressing questions.

Recommendation: Similar analyses should be routinely explored in all health programs to maximize existing information using the following guiding principles:

1. Articulate questions that reflect current program challenges/priorities. Develop a data analysis plan that provides a logical framework for decisions based on results. To the extent possible, the analysis plan should draw from existing data sources and highlight crucial missing elements that—if available—would somehow change the decision calculus.
2. Execute data analysis plans in teams, comprised of subject matter experts, data specialists, system owners/administrators, and policy-makers across departments and organizations. This will help to fully realize the potential application, identify the most appropriate methods, and address limitations or caveats in interpretation.
3. Analyze the data using the lowest-level unit possible (e.g., site/community). This allows themes to emerge that may otherwise be missed when using aggregate national or even district-level data.
4. Document data limitations to provide context to results. The desire for perfect data should not preclude analysis of existing information.

5. Visualization should produce actionable information to target program interventions and management activities. It should more effectively compare program data with relevant denominators and target data not currently available within HMIS or other systems in Malawi.
6. Document results and share to stimulate cross-discipline and cross-program exchange. This can strengthen approaches employed by teams across the sector.
7. Technical assistance and support for conducting exploratory or more advanced analysis should be **coordinated by a central point in MOH,**

including provision of SOPs and tools when needed. In Malawi, CMED is the natural unit for this role given its mandate to coordinate health data across programs and departments. However, **current CMED human resources are not adequate and do not reflect the optimal skill mix for providing extensive analytical support.** This should be reviewed. The **M&E Task Force and/or Health Information Technical Working Group (HI TWG)** should serve as a **technical clearinghouse** for assembling teams/expertise, sourcing additional technical assistance when needed, validating methods, and providing a forum for sharing results and intended course of action across stakeholders.

Moving toward a unified Malawi M&E system requires streamlining tools, reporting processes, and electronic systems⁵. **Inefficiency and duplication** in data collection and reporting, matched with **rapid proliferation of requirements, creates competition for scarce health worker time**, particularly at the facility level. This in turn **creates drag on the health system, lowering data quality standards for all health programs** and detracting from core functions of health providers. Recommendations to alleviate burden and improve quality are outlined below. Implementing these recommendations presumes the institution and empowerment of a data governance structure that supersedes specific disease programs or individual departments within MOH.

1. FULLY DESCRIBE POINT-OF-SERVICE DATA COLLECTION AND REPORTING BURDEN

Core components of HIV/AIDS, TB, and malaria data systems for are outlined in Appendix 1. However, the **current facility and community level data collection and reporting burden is not known**.

Malawi should catalogue the full set of patient cards, registers, EMR modules, supervision forms, and reports (both paper and electronic) across all health programs and funders should be undertaken. This includes a full list of data elements, links to other source documents or reports by element, and identified duplicative entry requirements. Time and effort required by each cadre should be estimated (either through health worker survey or direct observation in a representative sample of sites).

Comprehensively describing the data collection and reporting burden would allow stakeholders to:

- identify the data activities that are **most labor intensive**,

- identify the system components or data elements that require the **greatest duplication of effort**,
- and **constitute a baseline** for measuring streamlining efforts going forward.

These are necessary inputs needed to streamline M&E systems.

The Kuunika Project includes two complimentary activities:

- a use case analysis that comprehensively describes the full set of data users within HIV data systems in a sample of sites across 3 districts; and
- an independent project evaluation—including a data quality and use baseline assessment in pilot sites.

Additionally, the World Bank has supported site and district level evaluating process efficiency (clinical, administrative, etc.). This ongoing activity should be leveraged as collected inputs will be useful to investigate data flow process efficiency.

2. DEVELOP CONSOLIDATED PLAN FOR SYSTEMS INTEGRATION AND STREAMLINING THAT MAXIMIZES EFFICIENCY AND VALUE

Section 1 (pages 13-14) identified specific system linkages to improve system performance and efficiency. More broadly, Malawi needs a health-sector wide vision for data systems streamlining and integration that includes detailed work plans by health program, funder, and system component.

Consolidated integration plans should :

- be developed in accordance with the current HIS Policy and relevant governance structures identified in the *Landscape Analysis* (Appendix 1);

⁵ Details in Appendix 1: *Landscape Analysis*

- be informed by evidence of primary bottlenecks and duplication identified in the quantification exercise described above;
- be prioritized by the value of linkages identified in more extensive analysis of existing data across systems and pressing program challenges;
- contain built-in milestones that periodically and quantitatively measure actual efficiency gains and improvements against expectations, with contingencies for course correction when necessary;
- be endorsed by an authority that supersedes individual health programs;
- and be monitored transparently by all sector stakeholders.

Stakeholder consensus on the strategic vision requires a common language for discussing systems. This helps avoid miscommunication and semantic challenges. **The M&E Task Force is best positioned to establish operational definitions and effective dialogue.**

Finally, **cost is a major factor** in selecting streamlining and integration approaches. The consolidated plan needs to balance achieving fully interoperable systems with practical and financial realities. The forthcoming Vital Wave assessment outlining technical feasibility of integrating electronic HIV/AIDS data systems serves as a valuable input to questions of cost and approach.

3. DEVELOP AND ENFORCE GRADUATION AND RETIREMENT POLICIES FOR ARTIFACT SYSTEMS AND COMPONENTS

Establishing effective policies that phase out duplicative components and systems is prerequisite for improving data quality and systems streamlining. Discussed in detail as a principle barrier in the section above, Malawi needs to grapple with technical and political challenges of designing a protocol for measuring the comparative advantage of an alternative system or process and implementing reforms. A data collection and reporting burden assessment (recommended above) is a useful,

objective starting point to focus attention on overlapping data elements and system components.

In terms of technical barriers, the M&E Task Force could provide (or source) input on accepted methods for measuring comparative data quality and their application to system graduation or retirement.

In terms of political challenges, consensus must be achieved about the technical approach. Furthermore, program managers must be willing to allow phase out of duplicative processes once standard criteria are met.

Similarly, data elements that are not often used for decision-making, that lack clarity, or that are overly burdensome with limited value should be phased out.

Determining ‘value’ depends on perspective, of course, but some **overarching process** must be put in place that **periodically** and **more objectively evaluates the usefulness of indicators as compared to all other health data being collected.** Recognizing human capital constraints exist, this process should prioritize indicators that are routinely used in decision making and address the most critical challenges.

Malawi must also establish a capacity threshold and compare cumulative burden of indicators. Those indicators further down the list that exceed the capacity threshold and create undue strain on data quality should be highly scrutinized to determine added value.

Note: Malawi currently lacks a structure tasked with developing and enforcing these policies, which is a requisite to adoption by health programs and managers.

4. INTEGRATE KEY PROGRAM INDICATORS INTO HMIS

From an operational perspective, an initial step for integrating data elements across disparate systems is to **create space for them in the central data repository—HMIS.** This effort does not presume the future strategy will rely on DHIS2 as the data collection

platform for all indicators; rather, it presumes that key information from health data systems across the sector should be readily accessible in the central repository.

As noted, CMED has been working for some time to integrate indicators for each health program that are currently collected in parallel processes, focusing first on those agreed upon in the nationally reported indicator list.

CMED should continue and extend the effort to capture data stored in the DHA MIS and Epi Info databases for HIV and TB data, respectively. However, **a smaller list of key indicators should be prioritized instead of fully integrating all elements of a system before moving on to other streams.** This will help to ensure there is space set aside in HMIS for the indicators that are most useful and need to be accessed most widely.

5. DEVELOP NATIONAL REGISTRIES TO PROMOTE EFFICIENT DATA EXCHANGE

Efficiently exchanging data between systems requires common metadata and predetermined exchange format accessed by each system. Two potential registries that would—if effectively maintained— increase communication potential between key data systems: **a master facility list (MFL)** and **patient ID register.**

For several years, Malawi has had a working MFL. The MFL serves as the basis for the HMIS hierarchy. Despite the existence of the MFL, at least two other reporting streams (PEPFAR integrated partners site list -iPSL, and

DHA MIS site list) maintain similar site lists, which must be reconciled if data are compared. In addition, different site lists are used by other systems: such as SCMGr, Epi Info, EMRs, iHRS, IFMIS, etc.

At minimum, **an accessible MFL registry is needed that** allows system administrators to map system hierarchies to the nationally ordained classification, names, and health facility IDs. This registry serves as a stepping stone towards automating data exchange between HMIS and other health data systems.

With respect to **patient IDs**, one big **challenge** is **linking patient-level data between systems to improve continuity of care and better identifying true LTFU versus mobility between sites.** As shown with a dotted line on the HIV/AIDS data flow diagram (Appendix 1), Baobab and CHAI have developed a data exchange protocol for moving patient-level records on viral load (VL) and EID between the Baobab EMR and LIMS.

This approach **should be extended or a similar platform identified that can link system patient IDs to a central registry.** In the short-term, this would allow the DREAM system to exchange patient-level data with other EMRs and LIMS, which could help address some questions about LTFU. Longer-term, new EMR modules or systems that employ patient-level data could access critical patient information (where appropriate) to improve continuity of care.

IMPROVE DATA QUALITY AND CONFIDENCE IN THE CENTRAL REPOSITORY

Real and perceived data quality concerns, particularly with respect to HMIS, undermine confidence in use of routine data for decision making. Three activities recommended below would increase or better characterize HMIS accessed data quality.

1. IMPOSE DATA VALIDATION PROTOCOL

Currently, designated users are able to enter or revise data elements at any point in time. This leads to flux and uncertainty for those accessing the data as to the completeness or accuracy of the information. Furthermore, an analysis based on data accessed one day might be outdated the next. Rectifying this issue means imposing certain data validation protocols or data work flows, similar to what PEPFAR has done in the DATIM instance of DHIS2.

In an ideal scenario, data are entered at the first point in the chain by users allocated entry rights for each dataset (e.g., district HMIS officers). Once these data are complete, they are marked 'approved' by the user and locked for future data entry (with the exception of updates that might happen periodically as data are checked and approved by others).

Datasets for each facility are then reviewed and marked 'approved' by health program managers at district level and ready for approval for the next level in the chain, i.e., zonal or central.

Malawi should **institute a validation and approval process** as described above, including **system statistics** that are readily accessible to all users accessing data at any point in time.

For example, in the malaria data analysis example (Appendix 3), it would be incredibly helpful to know for each data point employed, the proportion of data complete *and* the proportion of data elements reviewed and approved by key user roles. Such statistics could add confidence to the quality of the data

and/or highlight problem elements where data are lacking or insufficiently reviewed.

Operationally, imposing a data validation protocol in Malawi requires creative thinking about:

- **assigning user roles** to approve each dataset;
- the **periodicity** of revising data after it has been 'approved'; and
- **presentation** of validation statistics

Further, the process for acclimating data validators to their roles and the standard criteria used to evaluate the accuracy of the information needs to be well-described. In addition, it will take time to create a culture of data validation and data quality. However, strong examples of data quality auditing and established data work flows already exist in Malawi (e.g., those employed by NTP for TB data). **District-level and central-level supportive supervision visits provide an institutional vehicle for data validation** that could be reflected in HMIS at least on a quarterly basis.

In terms of system functionality, the **core DHIS2 software** has the **ability for designated users to validate data sets** for which they have been assigned those privileges. DHIS2 (through DATIM) also has **sophisticated, built-in data work flow and approval processes** that could be appropriated.

Once validation protocols are established in HMIS, metadata could be included for system reports and as additional fields in the data visualizer. For example, if we look at the monthly HMIS-15 report available in HMIS a separate table could be built into the report that summarizes the following information:

Percent of data elements reported compared with percent expected:	67%
District-level Validation	

HMIS Officer Approved	98%
ANC Officer Approved	43%
TB Officer Approved	75%
ART Coordinator Approved	10%
Malaria Coordinator Approved	55%
Other health program officers/coordinators as appropriate	..%
Central-level Validation⁶	
Zonal program officers/coordinators	..%
National program officers/coordinators	..%

All above percentages are hypothetical, but if available for each dataset report, they would greatly assist the user in gaging the quality of the information under review. It would also provide a process by which program and subject matter experts routinely review information reported and spot check for aberrations that might require intervention, either from a data quality or program perspective (e.g., trends in case notification or adverse advents).

Used in conjunction with more frequent and sophisticated data quality checks, these metadata might go a long way in improving the user confidence in the data accessed through HMIS and more transparently highlight data elements and reports that require the most effort to meet minimum reporting and quality standards.

Note: Approaches should first be piloted to fully understand the operational challenges and added value of imposing data standards.

2. DEVELOP AND APPLY AUTOMATED DATA QUALITY CHECKS

The core DHIS2 software already contains some quality check functionality, or ‘business rules,’ including the ability to set data entry parameters (e.g. percentage

⁶ DHA (with NTP) collates data on integrated site supervision report accuracy by validating figures with the actual patient cards and registers. The results produced are similar to what could be included in the data validation scores for

values not exceeding 100 or defining upper or lower bounds for data elements). However, the extent to which this functionality is employed in the Malawi instance is limited.

Further, CMED does not routinely review the data provided by health programs to assess the quality of the information. This is partially because to date this activity is viewed as out of scope and partially because the skillsets required to review and interpret program data against what is realistic or programmatically common are lacking.

The onus for reviewing aggregate data and following up on suspect data points or reports is left to districts and national program staff, who often lack to the time or data skills necessary to perform data quality routines. Routine data quality assessments would produce results that could be easily acted on as part of site-level data checks, supervision, or quarterly review meetings.

CMED should employ a full-time data quality analyst. This would help rapidly improve quality of data already in the system and preemptively address common data entry or reporting errors. This analyst should have:

- public health expertise;
- a detailed knowledge of the program indicators;
- the ability to liaise with health program staff across the sector to speak substantively about issues with specific indicators;
- ability to identify sources of common error;
- and ability to translate findings into routines that DHIS2 programmers can embed within HMIS.

Another value add of an in-house data quality analyst is in establishing a quality feedback loop between sites and national programs. The analyst could translate quality assessment findings or common pitfalls identified in collection and reporting to program

central/zonal level across health programs that engage in direct site or district supervision activities.

managers, who could in turn develop action plans for remediation discussed during supportive supervision visits and data review meetings. When implementing data action plans, supervisors could collect qualitative feedback on the challenges associated with providing the data in question. This feedback could be used to refine indicator definitions, reference sheets, data collection tools, system interfaces, and data flow processes in a way that is more intuitive to data providers and improves quality through structural adjustments at the margin.

Programmed checks may take the form of:

- additional business rules for data entry;
- canned quality reports that are easily accessible and digestible by other system users and program managers; or
- quality reports built into the data validation protocol described above.

The WHO-developed *Data Quality Tool* for DHIS2 (currently in beta testing in HMIS) is capable of generating these analyses; however, the tool is not user friendly for those that are not data or system savvy. Standard reports accessed in as few keystrokes as possible and linked to the validation process are necessary if the functionality is to be widely adopted.

As the tool is further improved and refined, having a full-time role dedicated to data quality will significantly accelerate progress and serve as a point-of-contact to programs looking to investigate specific issues and improve data processes/systems. In addition, the tool is currently relegated to HMIS data, whereas a data quality analyst can forge links with all sector systems and easily access information when needed to triangulate data points or conduct more comprehensive quality assessments.

3. DEVELOP DISTRICT- AND SITE-SPECIFIC DATA ACTION PLANS

As discussed above, data quality could be substantially improved by first focusing on critical data elements and the most challenging reports—i.e., least complete

and/or accurate. HMIS has the ability to track data system performance statistics, such as the percent of each element, data set, or report that is complete, as well as the percent submitted on time.

There is not, however, an easy-to-access solution to monitor these statistics in real time nor to generate reports. Again, the *Data Quality Tool* in testing likely has the ability to pull this information from transactional records, but presentation and information that is easily digested appears lacking.

Reports should be customized to include stats on completeness and timeliness (past month, past year on average, etc.) down to the data element. These reports need to be concise, creatively designed, and tailored to specific user roles and health programs. For levels besides central, reports should also provide data on comparative performance for other sites, districts, and zones to allow staff to benchmark their performance against similar units.

As evidenced in field visits, DHOs must track the required HMIS reports on a hand-written chart or other method, including the number that were submitted on time by facility. Automating this process using data already housed in HMIS could provide **easy-to-access tools to reinforce managers' ability to meet standards and identify problem areas.**

The goal of developing data action plans is to integrate them into existing supportive supervision and data review meeting schedules, not to create additional supervision or data validation activities.

Metrics for improving reporting could be customized for each site and district thus focusing health workers on elements that need substantial improvement. Performance improvement targets could also be tracked using HMIS. This would allow CMED and data specialists across programs to identify persistent bottlenecks and help programs link staff with appropriate training.

4. CREATE AND MAINTAIN A CENTRAL DATA HELP DESK

Currently, no central mechanism exists to offer routine and timely support to data system users. Software or technical glitches in HMIS are reported to CMED (via email or other non-standard channel) for support, but these requests are not systematically tracked. Support for other data systems appear to be managed by system administrators in a similar way.

Stimulating uptake of system access and routine use requires a more formal channel for users to access support, both for software or ICT issues, but also for assistance with **interpreting data elements** and **collecting feedback** to prioritize system improvements.

CMED should set up and manage a **central data help desk** with specific subject matter points of contact. Numerous open-source or low-cost solutions exist that can effectively integrate into the user experience for HMIS. Guiding principles for selecting these solutions include:

1. All users must be able to easily request support or report challenges **within** HMIS
2. Requests have predetermined fields that allow for triage to the appropriate technical resource and effective tracking of common themes
3. All requests are delivered to a single point-of-contact within CMED that reviews and assigns issues to points-of-contact across the sector
4. All requests are time and date stamped, with flags built in to track tickets that have not been adequately resolved within a specified time frame
5. Requesters are capable of tracking ticket ownership by point-of-contact
6. Multiple communication entry points are available, e.g., user interface in HMIS, email, SMS, telephone (if necessary); however, all entry points result in a standard ticket centrally that can be managed, triaged, and tracked
7. System performance and content questions for all data platforms should be supported, with triage to the appropriate system administrators or content leads as appropriate

In terms of user experience, system documentation is either lacking or not readily available for most manual and electronic data systems in Malawi. This makes it challenging to fully describe system components or comprehensively interpret the data produced. Additionally, data visualization tools are inadequate when comparing meaningful data relationships across streams and systems. Below are three recommendations to address these issues.

1. PUBLISH DATA COLLECTION TOOLS, REPORTS, AND SYSTEM SPECIFICATIONS IN A CENTRAL REPOSITORY

All GOM, external funder, and program implementer **instruments** used to collect or report health data should be **posted in a central repository accessible to all stakeholders**. Given electronic versions of most tools already exist, this effort should be minimal and would provide an excellent resource for those needing to cross-reference data elements or better understand the relationship between tools. Additionally, the underlying system specifications for all data systems should be provided in a standard format and included in the central repository. This information would be useful for political, program, and technical stakeholders working toward routine data exchange and harmonization.

2. DEVELOP AND PUBLISH DATA DICTIONARY

Currently, it is difficult for the user to interpret data elements being reviewed when accessing HMIS or other systems. CMED has expressed a desire to develop a comprehensive data dictionary for HMIS, but cited time constraints as the principle barrier. Developing and publishing a **data dictionary** should be **fast-tracked** to improve interpretation, add context, and build confidence in the quality of information. This effort should start with HMIS and be extended to include all data systems. Metadata for each data element in the dictionary should, at minimum, include:

1. Element name
2. Descriptive name
3. Requesting authority (program office or other)
4. Detailed indicator description
5. Original source(s) for collection (register, report, EMR, etc.)

Links to dictionary metadata should be available from report screens for ease of access. The *Data Quality Tool* appears to collect limited information on indicators and could be adopted for this purpose, but ease of access from commonly used pages is key.

3. IMPROVE DASHBOARDS

Currently, tools for visualizing data are insufficient. The Data Visualizer built into DHIS2 could be more effectively utilized; however, key data elements from other systems or sources (e.g., sub-national epidemiological data, targets, etc.) are lacking and the tool itself has a significant learning curve. CMED should recruit and maintain on staff **public health or M&E experts whose primary role is to liaise with health programs and create data visualizations** in HMIS that are easily accessible on the dashboard page and resonate with the intended audience. This effort should be informed by the deeper analysis of program data called for above and follow the same guiding principles. It may also require identifying data elements not currently housed in HMIS and identifying solutions for integration that are line with data exchange protocols established in the consolidated plan for systems integration.

Second, **GOM should compare alternative platforms for data visualization that can pull data across systems and produce the caliber of graphics that are most attractive to end users.** Aside from DHIS2, a number of open-source options for data visualization with interactive dashboards exist and may be better equipped to pull data from disparate sources for richer context and more meaningful interpretation.

IMPROVE COORDINATION OF CAPACITY BUILDING ACTIVITIES

As discussed in the *Landscape Analysis*, substantial resources are devoted each year to training and capacity building activities, including strengthening data skills. These efforts are not systematically tracked or well-coordinated, resulting in instances of overlap, duplication, and training that is not well tailored to the target audience.

Recommendation: Develop a **comprehensive inventory for capacity building activities** that include all MOH, external funder, and implementer activities and is widely available to stakeholders. At minimum, the inventory should describe:

1. The financial source of support
2. The administrative agent
3. The training facilitator
4. The intended audience and roles of participants
5. The duration and proposed geographic location of the training(s)
6. Tools, media, and reference materials employed
7. Description of training methods and activities

8. Expected outputs of the training
9. Expected impact on intermediate outcomes (e.g., data quality improvements by data element or set)
10. Expected link to primary program priorities and outcomes, including clinical, epidemiological, and financial

After an initial push to establish, the inventory should be updated continually as capacity building efforts are planned or executed. It should also serve as a monitoring tool that tracks actual number of attendees, duty location of attendees, and date(s) completed, with training materials uploaded for review. The logical repository for this information is HMIS and the effort to design and code the inventory data set should not be extensive.

It is also recommended the inventory be used to coordinate activities across stakeholders and could help facilitate M&E Task Force and HI TWG planning discussions.

APPENDIX 1: LANDSCAPE ANALYSIS

PURPOSE AND OBJECTIVES

This *Landscape Analysis* frames recommendations for targeted Global Fund investments that will both accelerate Malawi's progress towards a unified M&E platform and strengthen the use of routine data for decision making at all levels of the health sector. The purpose of this analysis is to outline current data systems, processes, and governance structures, and to describe major gaps and barriers that prevent more effective use of data from informing pressing program challenges. A number of recent publications, reports, policy briefs, and internal documents have described various aspects of health data systems in Malawi. This report builds on these efforts by consolidating useful findings and filling gaps in information where needed.

Given the size and complexity of data systems in Malawi, this analysis focused primarily on systems related to HIV/AIDS, TB and malaria programs. It is important to note that many of the findings and subsequent recommendations are applicable to the full set of programs within the health sector and would, if implemented, strengthen the underlying data architecture with benefits extending throughout the sector more broadly.

The specific objectives of this analysis include the following:

6. **Characterize the data governance structures** and current policies that should guide future investments in M&E and health data systems
7. **Inventory systems** for data collection, reporting, analysis, and feedback
8. **Identify training and capacity building efforts** for data capture and analysis
9. **Identify efforts to incentivize use of data** for decision making
10. **Describe the fiscal space** available for improvements to health data and associated systems

Methods for the *Landscape Analysis* are outlined below, followed by findings for each of the objectives listed. To contextualize data systems and priorities, the discussion of findings begins with a brief overview of the major programmatic priorities and challenges facing the national responses for HIV/AIDS, TB and malaria.

Research for and findings of the *Landscape Analysis* allowed for identification of primary gaps and barriers that currently limit realizing a unified system for M&E in Malawi and influenced the recommendations for future activities put forward in this report.

METHODS

Information for this report was gathered through desk review of prior studies, reports, presentations, and policy documents; stakeholder interviews (both in-person and over the phone); direct review of data systems and elements; and ad hoc analysis of routine program data.

Materials reviewed during the desk review have been stored in a [web folder](#) and are hyperlinked throughout this document for ease of access when referenced.

Most stakeholder interviews were completed during three field visits to Malawi between August 2015 and February 2016. Over the course of these visits more than 100 individuals were interviewed, representing 20 departments, offices, or committees within the GOM, 8 external donors and/or program implementers, 3 coordinating bodies, 5 technical partners, and 3 independent volunteer organizations. **Table 1** summarizes the full list of organizations interviewed and their affiliation or functional role in the health sector.

Nine health facilities were visited within 5 administrative districts: Dedza, Dowa, Lilongwe, Mangochi, and Salima. Sites were not randomly chosen or sampled; rather, they were selected in conjunction with GOM counterparts to reflect different staffing footprints, patient volumes, and typical reporting tools/methods. Sites were stratified by 3 tiers in accordance with the Kuunika Project plans:

1. Tier 1 (n=4): Facilities with electricity and currently using electronic medical record (EMR) systems
2. Tier 2 (n=3): Facilities with higher relative patient volume and electricity, but no EMR
3. Tier 3 (n=2): Facilities with lower relative patient volume and no electricity

Of the health facilities visited, 7 were public and 2 were privately operated.

In addition to health facilities, district visits included discussions with various authorities and organizations that engage routinely with health data, including District Health Officers (DHOs), program coordinators, M&E and HMIS officers, District Council (DC) offices, and Community-based Organizations (CBOs).

Empirical data for this report were obtained using the [Malawi HMIS](#) (DHIS2) and [CSTOCK](#) applications.

Table 1. Organizations Interviewed for Landscape Analysis, by Level of Health System and Affiliation

Level	Affiliation	Organization, Department, or Office
Central	GOM	Parliamentary Committee responsible for Health
		Parliamentary Committee responsible for HIV&AIDS
		Ministry of Finance (MOF)
		Office of the Accountant General
		Department of Economic Planning and Development (EP&D)
		National Statistics Office (NSO)
		National AIDS Commission (NAC)
	MOH	Director of Policy, Planning and Development
		Central Monitoring and Evaluation Department (CMED)
		Department of HIV/AIDS (DHA)
		Division of Nutrition, HIV and AIDS (DNHA)
		National Malaria Control Programme (NMCP)

		<p>National TB Programme (NTP) Information, Communication and Technology Department Health Technical Support Services (HTSS)</p>
	Donor and/or Implementer	<p>The Global Fund to Fight AIDS, TB and Malaria U.S. President's Emergency Plan for AIDS Relief (PEPFAR) U.S. Centers for Disease Control and Prevention (CDC) U.S. Agency for International Development (USAID) German Society for International Cooperation (GIZ) U.K. Department for International Development (DfID) Clinton Health Access Initiative (CHAI) World Vision</p>
	Coordinating Bodies	<p>World Health Organization (WHO) United Nations Joint Programme on HIV/AIDS (UNAIDS) Malawi Network of AIDS Service Organizations (MANASO)</p>
	Technical Partners	<p>Boabab Health Trust (BHT) DREAM Programme Village Reach Dimagi Malawi Health Sector Programme, Technical Assistance component (MHSP-TA)</p>
District	GOM	<p>Monitoring and Evaluation Officer, District Council (DC) District AIDS Council (DAC)</p>
	MOH	<p>HMIS Officer ART Coordinator Malaria Coordinator TB Coordinator District Health Management Team (DHMT) District Health Officer (DHO) Human Resource Officer Pharmacy Officer Accountant</p>
Facility	MOH	<p>Clinical Officer or Facility in-charge Nurse Pharmacy Tech HIV Testing Counselor Data Clerk</p>
Community	MOH	<p>Health Surveillance Assistant (HSAs) and Supervisor HSA Health Diagnostic Assistant (HDAs)</p>
	Independent or Volunteer	<p>Health Centre Advisory Committee (HCAC) Village Development Committee (VDC) Community-based Organization (CBO) to support orphans and PLHIV</p>

PRIORITIES AND CURRENT CHALLENGES IN HIV/AIDS, TB, AND MALARIA PROGRAMS

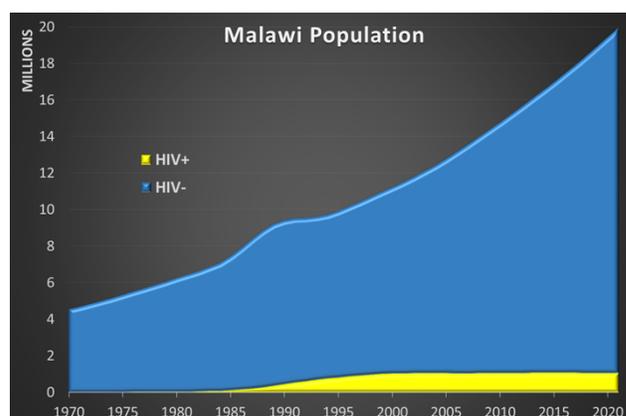
Priorities and challenges, both common and specific to each of the program areas considered for this analysis, are outlined below. Special attention is given to data needs and the ways in which higher quality and more complete information could help to target program interventions and accelerate mitigation efforts. Sources for the issues highlighted include the [Situation Analysis \(DRAFT\)](#) completed to inform the Health Sector Strategic Plan (HSSP) 2016-2021 (currently under development), key informant interviews, policy documents, program reports and presentations, and published statistics.

ISSUES AFFECTING PUBLIC HEALTH PROGRAMS IN MALAWI

Several population and health trends have been identified that present current and future challenges for all public health programs in Malawi, including the responses to HIV/AIDS, TB, and Malaria. These include:

- A **population experiencing rapid growth**, largely due to increases in life expectancy and the eighth highest fertility rate in the world (an average of 5 children per woman)⁷
- **Increased urbanization**, projected to increase by 4.2% annually between 2013 and 2030⁸
- The **lowest nominal GDP in world** (255 USD per capita in 2014), and over 70% of residents living below poverty line⁹
- Poor **quality of health services** with limited and unequal access¹⁰
- Persistent challenges with adequate **human resources for health** (HRH), with a current vacancy rate of 36% across all cadres (DRAFT Situation Analysis, 2016)

Figure 1. Population Growth Trends in Malawi



Source: Presentation by DHA, Dr. Andreas Jahn (September 2015)

In terms of disease burden, HIV/AIDS occupies the top position, with malaria and TB both in the top ten¹¹. Together HIV/AIDS, TB, and malaria account for **35.4%** of total deaths and **44.5%** of disability adjusted life years (DALYs).

HIV/AIDS

Despite great progress in reducing incidence and prevalence over the past decade, Malawi continues to experience a high HIV/AIDS disease burden with a population of PLHIV hovering around 1.1 million (about 10% of the total population). The rapid population growth in Malawi, matched with increased life expectancy due to increased

⁷ National Statistical Office. 2015. Malawi MDG Endline Survey 2014. Zomba, Malawi: National Statistical Office

⁸ Unicef (2015) The State of the World's Children 2015. Reimagine the Future. Innovation for every child. New York

⁹ World Bank: http://data.worldbank.org/indicator/NY.GDP.PCAP.CD?order=wbapi_data_value_2014+wbapi_data_value+wbapi_data_value-last&sort=asc

¹⁰ Carlson C, Chirwa WC, Hall N / Ministry of Health (2015) Study of Health Sector Efficiency in Malawi. Lilongwe

¹¹ Bowie C, Mwase T (2011) Assessing the use of an essential health package in a sector wide approach in Malawi. Health Research Policy and Systems 2011, 9:4 <http://www.health-policy-systems.com/content/9/1/4> and separate BoD data sets produced by Bowie & Mwase (2011)

expansion of antiretroviral treatment (ART), has brought concerns of efficiency and sustainability to the forefront. In addition, the DRAFT Situation Analysis 2016 outlines the following program issues that need to be addressed in the next 5-year plan, including:

- Ensuring people on ART adhere to treatment regimen and are regularly receive follow-up
- PLHIV on ART who are lost to follow-up (LTFU) potentially increasing the risk of resistance development of first line ARVs
- Ensuring regular monitoring of treatment results using available diagnostic procedures (CD4 and viral load measurements)
- Early infant diagnosis (EID)

In terms of progress towards achieving the [UNAIDS 90-90-90 treatment targets](#) for dramatically curtailing the spread of HIV globally by 2020, the Department of HIV/AIDS (DHA) has identified a number of challenges in a recent [presentation to national stakeholders](#). These include:

- **Service Delivery Capacity**
 - Human resources
 - Increasing funding needs
 - Infrastructure
 - Labs
- **Uptake and Retention**
 - Treatment Literacy / Public Education
 - Low male support for PMTCT
 - Community support for adherence

With respect to program data, much of the data collection and reporting requirements are donor driven. To meet this need and improve completeness and accuracy in reporting, the DHA has established a parallel system for data collection that involves quarterly visits of centrally-based staff to every ART site. The Department has identified a number of areas in which the data system(s) could be strengthened to address current program issues. These include more **detailed information on HRH, training and mentoring activities, management and caseload for opportunistic infections (OIs), quality of service provision, and quality and accuracy of HIV testing and counseling (HTC) activities.**

With respect to community and non-health data on HIV/AIDS, the National AIDS Commission (NAC) sets the collection and reporting requirements for district/local authorities and CBOs, in addition to requirements from donors that provide funding directly to implementing organizations. Generally, there appear to be strong pockets of data existing at district and community level, but this information is not often reported or used in conjunction with the biomedical and health facility data. There is a strong desire across the GOM to improve the linkage between community/district-level information and health facility data, especially as ART provision becomes more decentralized and communities are engaged to support adherence and retention. For more information on the program and data priorities outlined to achieve 90-90-90 and strategy for bridging community and health data systems, see the [National Strategic Plan for HIV and AIDS 2015-2020](#).

TUBERCULOSIS (TB)

The number of reported TB cases in Malawi peaked in 2003 and 2005 at around 25,000 and has been on downward trend since 2009 due to enhanced TB control activities and expanded availability of ART¹². Malawi maintains one of the highest TB/HIV co-infection rates in the region. The National TB Program (NTP) has set ambitious strategic objectives, including cutting the TB mortality rate in half by 2020. Programmatic challenges identified in the DRAFT Situation Analysis for the upcoming HSSP include, the **need to improve case finding and diagnosis within facilities** (symptom screening alone is estimated to miss about 36% of confirmed cases), the **lack of facilities that can adequately diagnose and treat TB**, and the **need to reduce the time, intensity, and cost of confirmatory testing**.

NTP has for some time maintained a data collection process separate from HMIS using TB coordinators within districts to collect information from sites directly and report those data to zonal coordinators and NTP. In an effort to improve quality of TB data and foster enhanced collaboration between HIV and TB programs, NTP elected in 2015 to set up as additional system that leverages the quarterly supportive supervision site visits completed by DHA. TB data are also collected at sites, districts, and zones through the national HMIS, resulting in currently 3 streams of TB information. NTP has worked to integrate data elements captured through joint supportive supervision visits with DHA into HMIS; however, the process is ongoing and no clear plan exists for streamlining. Persistent data challenges include **better access to and triangulation with laboratory data and commodities (LMIS)**.

MALARIA

Malaria is endemic and stable in Malawi. Though seasonally variable and influenced by altitude, rainfall, and geography, the full population is at risk of developing malaria throughout the year. According to the DRAFT Situation Analysis 2016, an estimated 6 million Malawians were treated for malaria in 2015 in public and private facilities—about one-third of the total population.¹³

The pressing issue facing the National Malaria Control Programme (NMCP) is an overconsumption of artemether-lumefantrine (LA)—the nationally chosen first-line treatment for malaria. A [malaria commodity assessment](#) commissioned by the MOH in 2015 found that large discrepancies exist between amount of LA consumed and the number of malaria cases reported by data systems (both paper and electronic), even as stock-outs regularly occur at facility level. In 2013, an estimated 9.2 million LA doses were dispensed compared with only 3.9 million cases. Updated numbers for 2014 are even higher—10.5 million LA doses compared to 6.3 million cases. Both data quality and pilferage have been named as potential explanations, although the true extent of either cause is unknown. There have been efforts to identify sources of data quality errors or leakage; however, these efforts are evolving and comprehensive analysis using available data is lacking. The situation is increasingly becoming urgent. According to the United States Government (USG) President's Malaria Initiative (PMI), the current rate of LA distribution suggests the country is heading toward a shortfall of necessary drugs within the year. In response to

¹² Annual Report. National Tuberculosis Control Program, Malawi. 2014

¹³ For detailed profile of the epidemiologic profile and historical response to malaria in Malawi, see [a report completed by the INFORM project](#) in 2014

these challenges, the MOH has produced a [Drug Availability and Security Action Plan](#) that outlines a 10-point effort to strengthen logistics and data systems.

Surveillance data to monitor malaria data, including identified cases, diagnostic testing, treatment, and commodities are monitored through—at minimum—5 clinical registers, a mobile/web platform for drug distribution to community outlets, and two electronic data systems. Register data often produce conflicting results and the electronic systems are not linked, making a complete picture of the malaria program impossible. As such, the NMCP and donors have expressed a clear desire the **bridge systems, simplify and consolidate reporting, and pilot electronic systems** that will improve data quality and access.

DATA GOVERNANCE STRUCTURES AND RELEVANT POLICIES

Any efforts undertaken to bridge existing data systems/streams, improve efficiency in collection and reporting, or implement measures to address critical data gaps should be couched in the political and regulatory framework. Alignment with overarching strategic vision will improve coordination, increase sustainability, and maximize investment potential. Data structures and relevant policies are briefly described below.

According to the [State of M&E in Malawi](#) report published in 2014, the Ministry of Finance, Economic Planning and Development (MoFEPD), via the M&E Division, is the custodian of the National M&E Master Plan and sets policies and procedures that govern the development of data systems. Other key actors include:

- The **Office of President and Cabinet (OPC)**, which enforces performance of public sector agencies and their M&E plans;
- The **National Statistics Office (NSO)**, which assists sector ministries create and operationalize statistical registers and is responsible for executing surveys;
- The **Ministry of Local Government and Rural Development (MLGRD)**, which is tasked with building M&E capacity of local councils;
- The **Department of Human Resources and Development**, which provides staffing for M&E and planning positions;
- The **District Councils (DC)**, who prepare and implement district M&E work plans and manage district data banks; and
- **Sector Ministries/public sector agencies**, which act as secretariat to technical working groups, prepare and operationalize sector M&E frameworks and work plans, and collect data based on sector priorities.

Within this regulatory framework, the MOH in Malawi has developed a number of internal policies and guidelines for M&E systems, the most recent and relevant to this analysis being the [Malawi National Health Information Policy 2015](#). Key elements of the policy include a mandate that all program and partners that wish to collect health data will utilize a central data repository (HMIS) and the appointment of the Central Monitoring and Evaluation Division (CMED) as coordinator for data collection, consolidation, analysis, and dissemination. The policy also calls for the establishment of a Health Information (HI) TWG that will oversee the design, development, and operation of all health information systems.

Of note, the MOH is currently completing a strategic review and restructuring of existing TWGs. The plan is for the proposed HI TWG to replace the current M&E TWG, but the final structure has yet to be endorsed.

NATIONAL HMIS

CMED has selected the District Health Information System version 2 ([DHIS2](#)) as the preferred platform for the national HMIS and is in the process of developing standard operating procedures (SOPs) for integration and interoperability of sub-systems. In the role of coordinator, CMED has also been working with program area representatives for some time to integrate paper-based and parallel streams of data collection and reporting into the national HMIS. This includes the build-out of forms to accommodate *first* a core set of agreed upon core [national indicators](#) (DRAFT), *followed by* program-specific indicators as time and DHIS2 developer resources allow.

Of note, donors often maintain their own policies and systems with respect to data collection and reporting, yet are still required to report on national and program-specific indicators. These additional, parallel streams often result in duplicative reporting to meet requirements for various authorities and funders.

M&E TASK FORCE

Following the MA4H Summit and subsequent mission to assist Malawi outline plans to operationalize the Roadmap and 5-Point Call to Action, [terms of reference](#) for an M&E Task Force were proposed and approved by the Secretary for Health. The Task Force will seek to accelerate progress towards a unified M&E system and coordinate investment across donors to maximize efficiency and reduce duplication. The terms indicate the Task Force would be housed within the Health Information (HI) TWG.

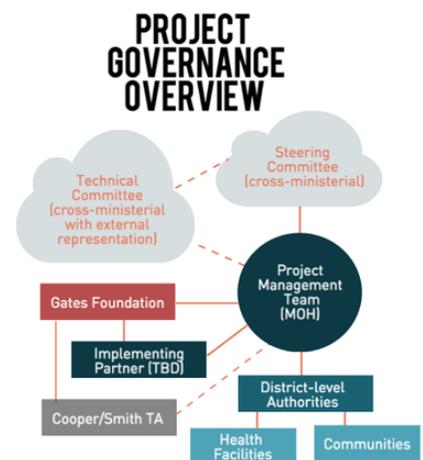
Of note, funding to support the Task Force Secretariat has been requested from the World Bank, yet not approved as of this report's submission date.

GOVERNANCE STRUCTURES FOR THE KUUNIKA PROJECT

An overview of the Bill and Melinda Gates-funded Kuunika Project governance is presented in Figure 2. Particularly relevant are the two identified committees that will guide project implementation and technical direction. The Steering Committee (SC) is comprised of cross-ministerial GOM representation and provides strategic direction, endorses work plans, and offers high-level policy support to the Project Management Team (PMT). The SC has yet to be formed, but is expected to convene the inaugural meeting in the next two months. The Technical Committee (TC) is comprised of cross-ministerial and departmental technical designees, donors, and civil society. This committee is envisaged to serve as an advisory group to inform project design, implementation, and monitoring.

The committees are intended to work hand-in-hand with the HI TWG and M&E Task Force to ensure activities and investments are in line with implementing the 5-point call to action set forth by the MA4H Summit.

Figure 2. Kuunika Project Governance Structures



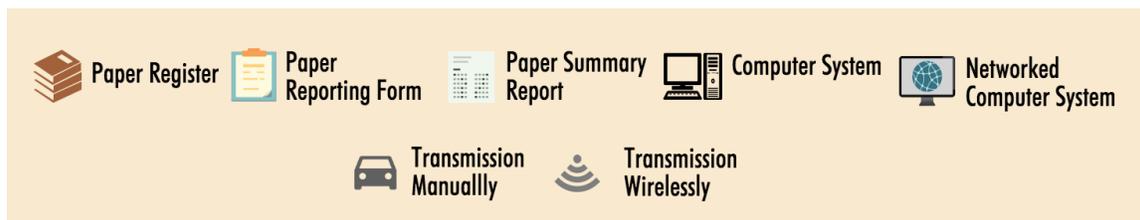
KEY SYSTEMS AND DATA FLOW

A detailed mapping was completed to describe relevant systems for data collection and reporting of health data. Where identified, data analysis and feedback was also included. *System* in this sense is more broadly used to describe the comprehensive set of users, tools, and processes for collection, transmission, and manipulation of health information and includes both electronic and manual conduits.

Figures 5, 6, and 7 on subsequent pages attempt to concisely and graphically depict the key components of HIV/AIDS, TB, and malaria data systems and flows. The focus of this investigation was primarily on GOM managed systems; however, when identified and substantially relevant, donor systems were also included. Given the size and complexity of systems used in each of the focus disease areas, a flow diagram was constructed for each; however, considerable overlap exists between components across streams. Components are categorized by type and each is indicated in the figures with an icon (see legend in Figure 3). Under each component, the primary use case and frequency of engagement is listed when known (e.g., *HMIS Officer/Daily*). Since the data entry and

Figure 3. System Mapping Icon Legend

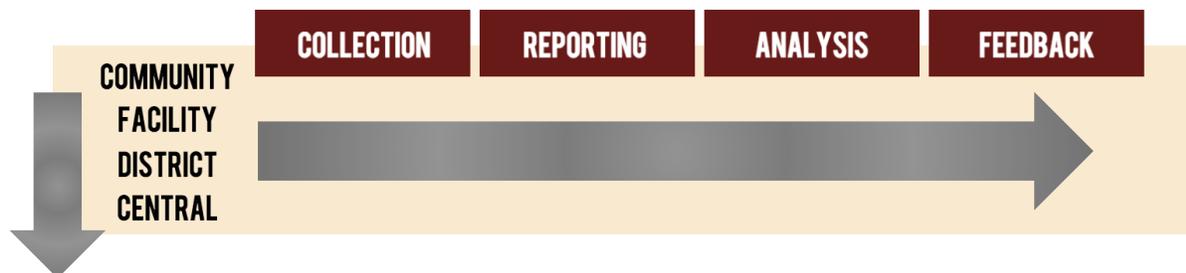
reporting burden is typically shared by a number of staff at the facility level, most components in use within facilities have been identified as *HCW*—health care worker.



The flow diagrams for each system are situated in a matrix with two dimensions (Figure 4), where the Y axis represents level of the health sector *where the component is first engaged* and the X axis represents primary use. Mapping each and every pathway by which data is collected or feedback is provided is not possible in the scope of this report. As such, pathways deemed most common or critical by informants and source documents have been selected for inclusion. As the state of M&E in Malawi is constantly evolving, this mapping should be viewed as a

Figure 4. Two Dimensions Used for System Mapping

snapshot in time and could be updated or augmented as new policies, procedures, and practices are developed.



To improve narrative flow, brief descriptions of each system component have been compiled in an Appendix at the end of this document. The Appendix outlines components common to HIV/AIDS, TB, and malaria, as well as those specific to each disease program. The descriptions for each component include (where known) the primary users, key information, data flows in and out, relationship to other system components, and how the component is managed and supported. Ideally, Appendix A is used side-by-side with flow diagrams in Figures 5, 6 and 7 below to easily cross-reference information when needed.

The diagrams depict what is known about how health information is typically collected, aggregated, exchanged, and analyzed. These diagrams do not highlight system failures, perceived or actual data quality issues, the volume of data exchange for each pathway, or the level of effort required to operate/maintain each component. These issues are addressed in the subsequent section, *Gaps in Performance and Limitations of M&E Systems*.

Figure 5. Key Data System Components and Flow for HIV/AIDS Programs in Malawi

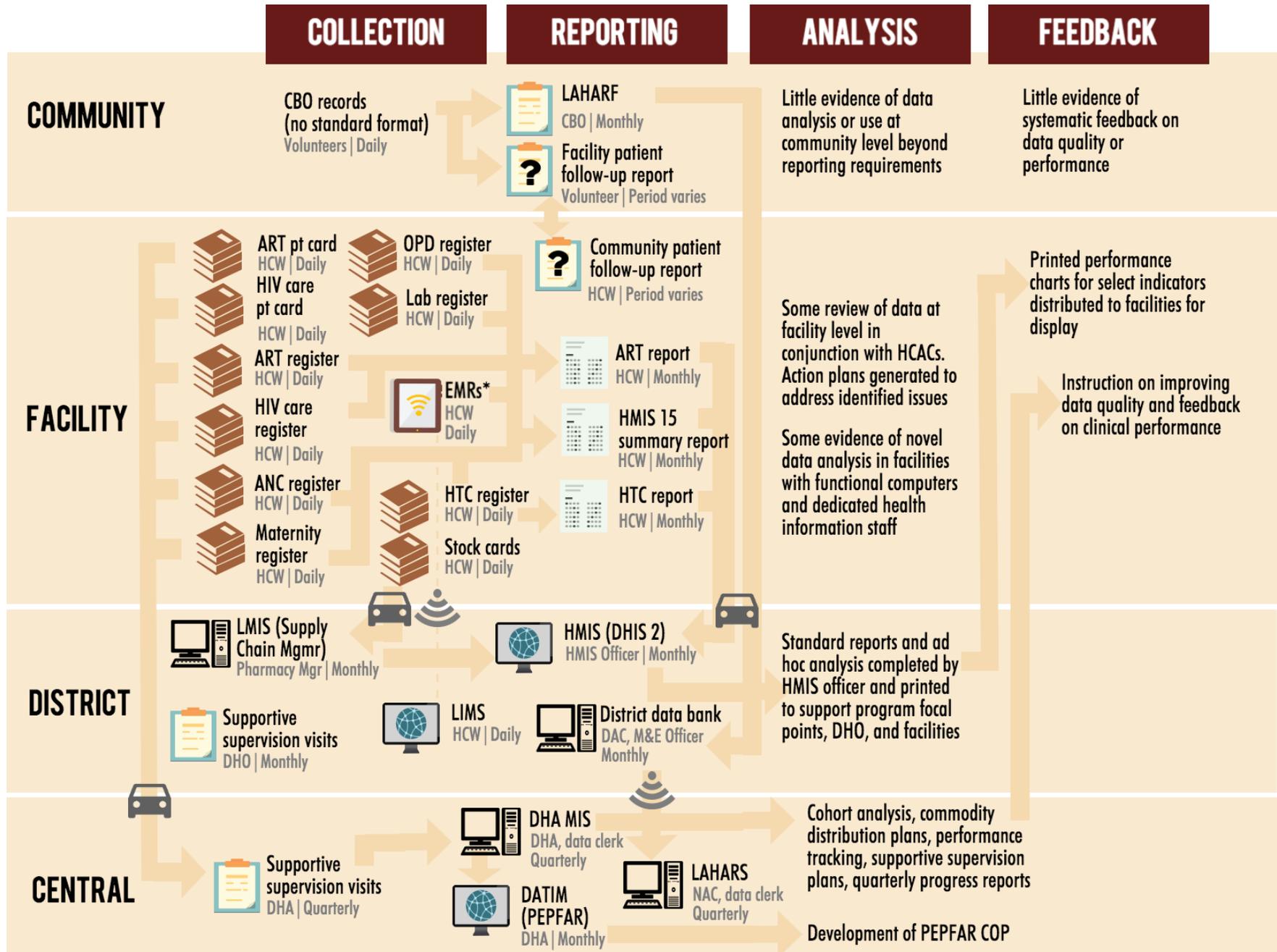


Figure 6. Key Data System Components and Flow for TB Programs in Malawi

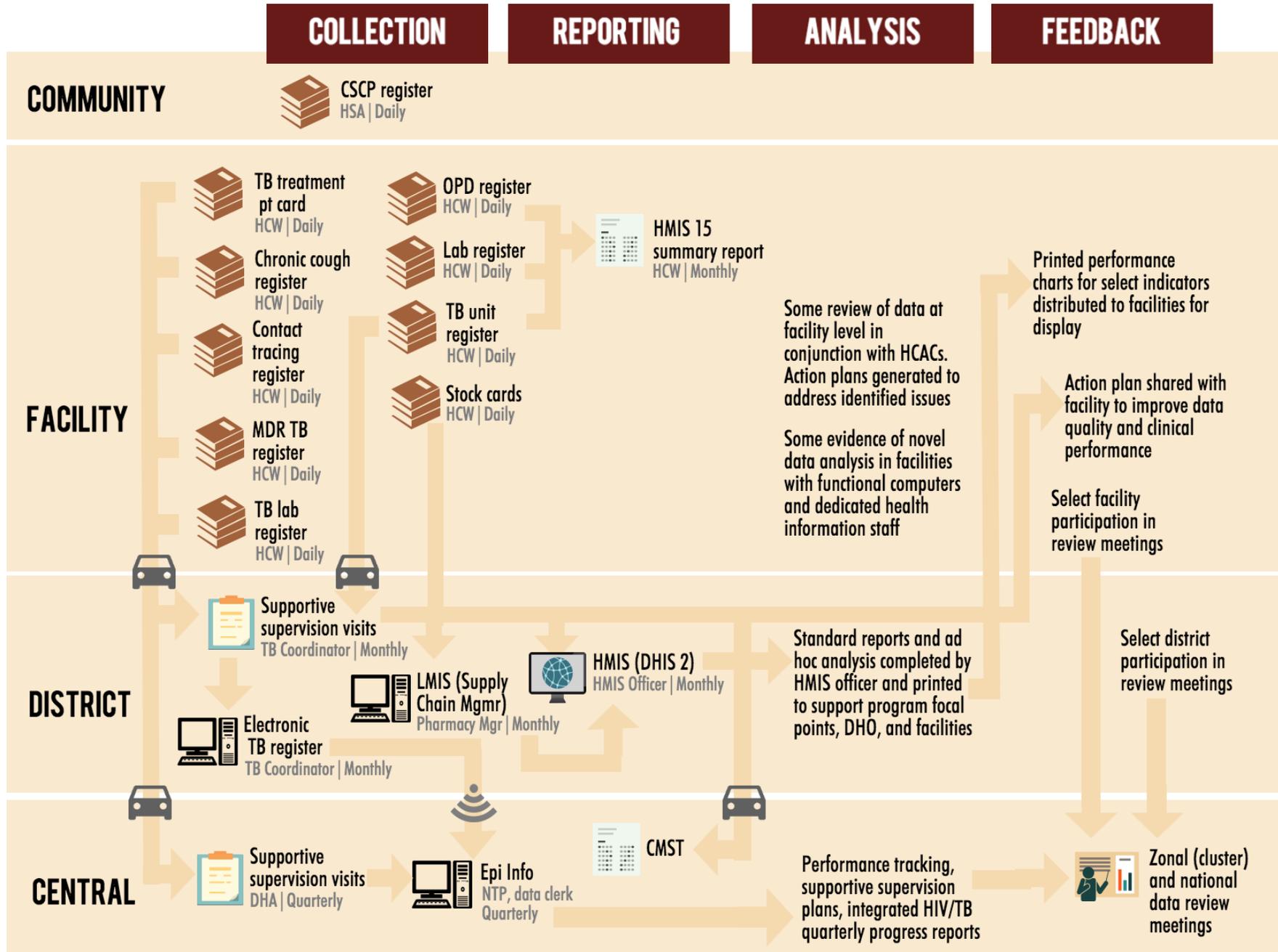
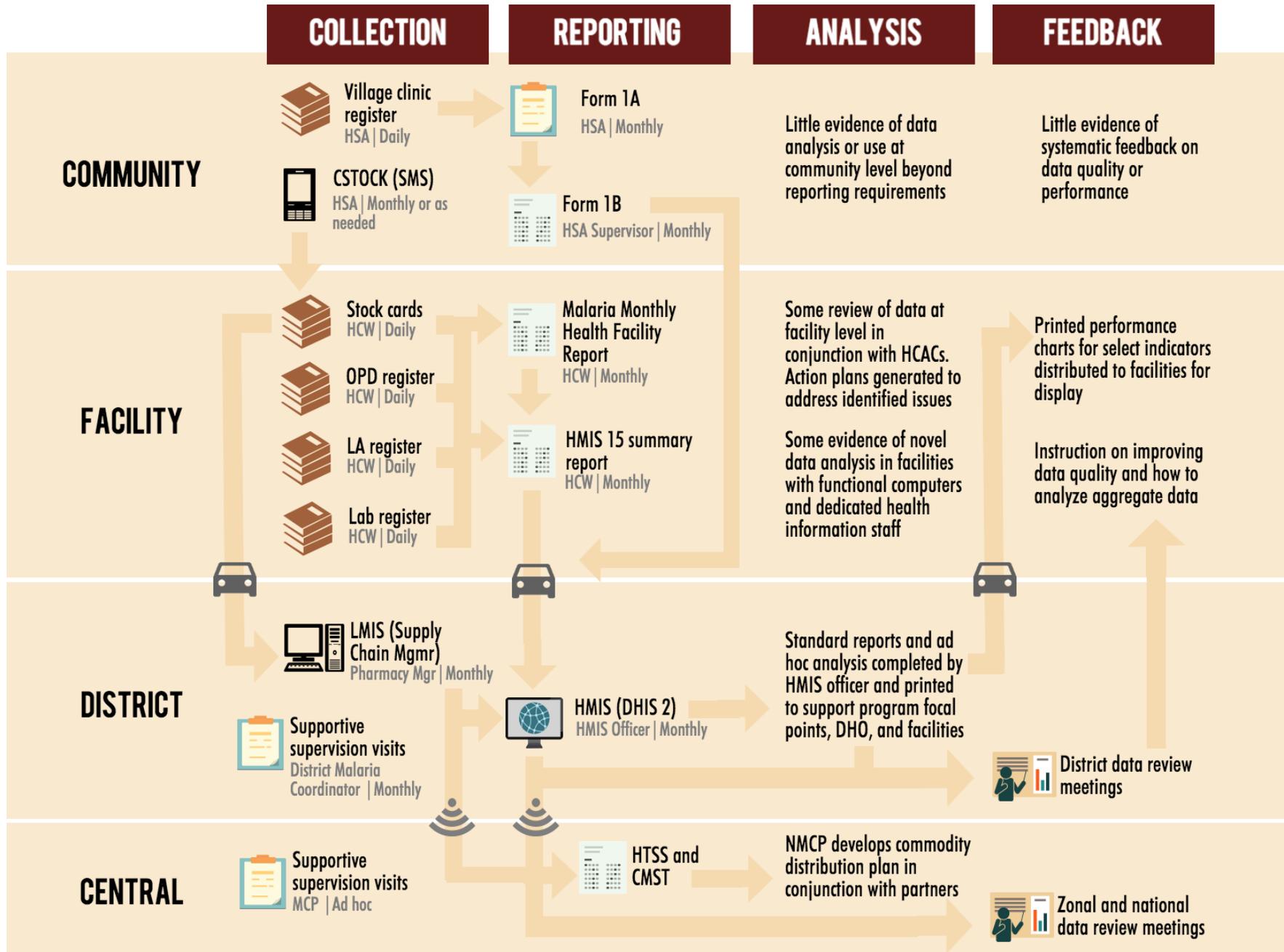


Figure 7. Key Data System Components and Flow for Malaria Programs in Malawi



KEY DATA USERS

When mapping users and organizations related to data flow, there are a number of lenses that can be applied. Determining which lens is most useful depends on your vantage point and target audience (e.g., health focus versus full national response, typical data handlers versus decision makers, etc.). Mapping existing data systems to *all* producers, consumers, practitioners, and decision makers with associated organizational affiliation is a substantial undertaking and not easily described in a single flow diagram. As referenced in the Executive Summary, the Kuunika Project will be exploring this further in a systematic use case analysis. As such, this investigation relied on existing mapping efforts to identify key users/organizations and frame the recommendations discussed in subsequent sections.

For context, 3 additional diagrams are presented below to outline information flows related to decision-making structures. Figure 8 was taken from the [Health Information Systems Assessment Report 2009](#), completed by the Health Metrics Network in partnership with GOM. This diagram outlines the information flow for health data through the decentralized health system in Malawi. An element missing from this picture is the role of zonal offices in reviewing data and providing feedback to districts. In addition, the diagram excludes the integrated supportive supervision, which effectively creates a direct link and flow of information between health facilities and national program offices for HIV/AIDS, TB and malaria. Finally, “Data Bank” below HMIS should not be conflated with the District Data Banks used at district level to store data across sectors.

Figure 8. Decentralized Health System and Data Flow

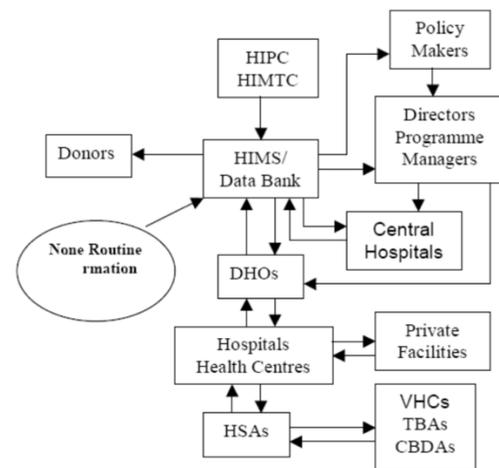


Figure 9. Decentralized Health System and Data Flow

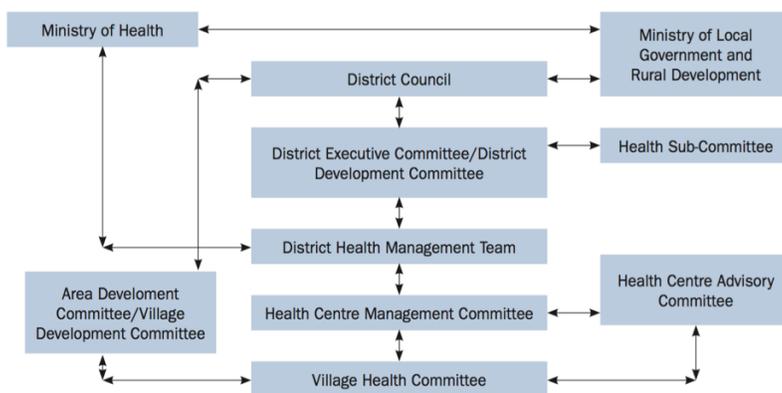
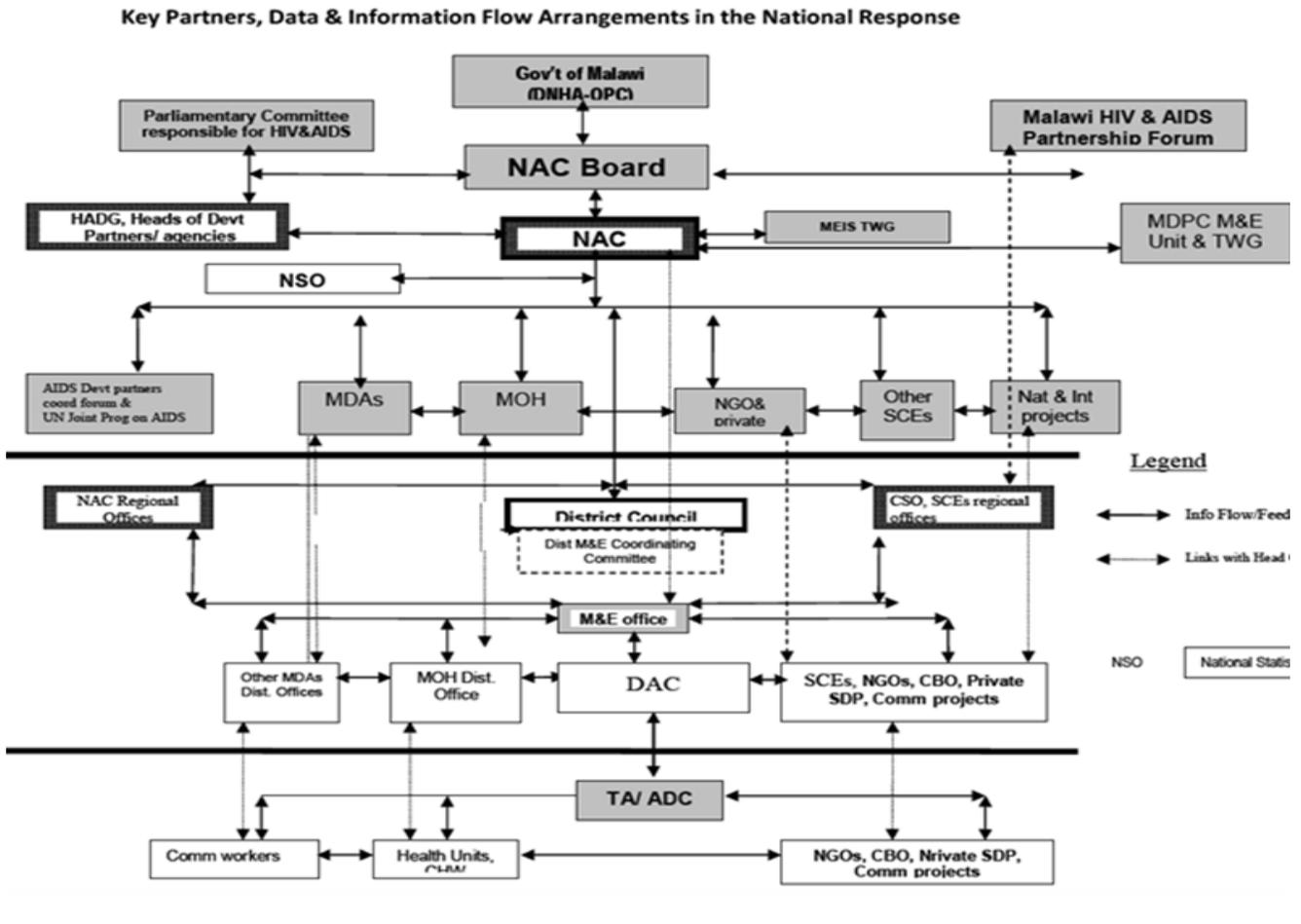


Figure 9, taken from a recent NORAD report¹⁴, outlines the district-level management and governance structures for health. Figure 10, supplied by NAC, outlines the stakeholders and flow of information for the full, national HIV/AIDS response. Routine health information flow is outlined in abbreviated fashion, with the addition of community elements and governing bodies. It is clear from the three diagrams that many organizational units play varied roles, depending on perspective, and even more so when individual actors represent multiple organizational units. For example, an HSA

¹⁴ [Local Perceptions, Participation, and Accountability in Malawi's Health Sector](#). February 2013.

may report to a specific facility, be a member of the village health committee, and a member of the health centre advisory committee (HCAC). A deeper understanding of the types of data users that belong to each structure and how they overlap will help to target efforts to build capacity and foster increased use of data for decision support.

Figure 10



TRAINING AND CAPACITY BUILDING EFFORTS FOR DATA CAPTURE AND ANALYSIS

Currently, no mechanism exists for systematic tracking of training and capacity building efforts in Malawi, yet capacity building maintains a central focus of support for most donors. According to [PEPFAR Expenditure Analysis \(EA\) data](#), the USG provided over 11 million USD for in-service training alone between 2012 (first year available) and 2014 (last year available), amounting to almost 9% of total PEPFAR country expenditures. Similar information on actual expenditure is not readily available from other donors or the GOM, but according to CHAI, approximately 650 in-service training activities were reported in the Resource Mapping activity for fiscal year 2014/15. A total of 24 million USD was allocated to support these trainings, the vast majority (22.8 million) coming from donors focused primarily on specific priorities and initiatives with roughly half funded by USAID. It is not clear from the information available what portion of the overall in-service training investments support developing data skills, and it is difficult to discern given many clinical or program meetings likely have data components (explicitly or implicitly). Similarly, no analysis could be located on the estimated return on investment for these training activities, although some have modeled the time saved¹⁵ and 5-year return on investment from implementing an EMR¹⁶, which includes training for system users. In the current Global Fund cycle, roughly 1 million USD has been approved for training or capacity-building related efforts linked to strengthening data skills.

Training tends to take the form of in-person meetings or workshops where participants are provided per diems to travel to a central or regional location for a period of time. Informally, many stakeholders communicated that without strong incentives, such as per diems and time off from daily duties, trainings would be poorly attended. A number of qualitative studies confirm persistent challenges with attracting participants as well as the complicated incentive structure created by years of donor competition amid lack of coordination.^{17,18,19} Evidence for capacity building efforts using remote solutions as the primary mode (e.g., mobile phones or web modules) or peer-to-peer exchange could not be identified. A number of training programs were billed as “train the trainer” (TOT), but there does not seem to be a process for measuring the extent to which information continues to spread past the principle attendee. In meetings with donors and implementers, a number of activities were identified that explicitly or plausibly have a data skills component. These include SSDI support for DHIS2 and DHIS2 mobile and USAID supply chain TA. By no means does the list exhaustively capture all training and capacity building efforts currently ongoing or planned, which is beyond the scope for this analysis.

In terms of systematic and routine efforts to improve skills for data capture and analysis, two ongoing efforts emerged as important means of engagement: supportive supervision and periodic, multi-stakeholder data review meetings.

SUPPORTIVE SUPERVISION

¹⁵ [Case Study on Point-of-Care Electronic Data Systems for ART Clinics in Malawi: Baobab Health Trust](#). MIT Sloan School of Management Global Entrepreneurship Lab: Global Health Delivery, Africa Project Deliverable. March 2009.

¹⁶ [Modeling return on investment for an electronic medical record system in Lilongwe, Malawi](#). J Am Med Inform Assoc. 2013 Jul-Aug;20(4):743-8. doi: 10.1136/amiajnl-2012-001242. Epub 2012 Nov 9.

¹⁷ [Interdependent Institutional Logics: The Case of Health Information System Restructuring in Malawi](#). Proceedings of the 12th International Conference on Social Implications of Computers in Developing Countries, Montego Bay, Jamaica, May 2013

¹⁸ [Analysis of Sub-District Drug Accountability Mechanisms in Health Centres in Malawi](#). Malawi Health Sector Strategic Plan (MHSP), Technical Assistance Component. May 2015

¹⁹ Baseline Study on the Status of Planning, Partner Coordination and Data Management (2015 forthcoming). Malawi Health Sector Strategic Plan (MHSP), Technical Assistance Component. August 2015

The term “supportive supervision” is used loosely to describe a set of activities in which representatives from GOM offices or program implementers are sent to lower levels of the health sector to collect and validate data, provide instruction or training for improving data quality, provide clinical or program intervention guidance, develop action plans for improving performance, and outline items for follow-up in subsequent visits. In most cases, supportive supervision visits are mandated, originate at various levels, and focus on specific health programs and elements of facility performance.

At district level, DHOs are required to visit all sites at least once per month. A standard checklist is used to evaluate performance across domains, such as governance, financial management, and routine health performance indicators (e.g., HIV/AIDS, family planning, malaria, etc.). Most DHOs focus on the program indicators; however, it’s not immediately clear that targets are set in advance for specific facilities or what criteria is used to determine “good” versus “bad” performance. One DHO interviewed stated, “We have to trust that the data provided to us are accurate,” and flags are only raised when huge discrepancies exist. Further, the DHOs are often unable to reach every site every quarter as prescribed. Reasons cited were fuel and time constraints. Another DHO suggested a challenge in determining which sites to prioritize if they are unable to get to them all; although, sometimes they use reporting rates as a trigger and sometimes they are instructed which sites should receive focus based on the supportive supervision visits originating from central level (see below). A promising practice identified was initiation of a “root cause” analysis when expectations for performance were not met. The practice was described as speaking individually with each of the clinic staff to get their views on the major challenges that were impeding meeting goals or standards. After the root cause analysis, an action is developed that includes items for follow-up the clinic will work on in the coming month.

Also within districts, program coordinators are expected to complete supportive supervision visits, independent of the DHO quarterly visits. Though a blanket policy document was not produced, several program coordinators interviewed stated they are expected to visit every site at least monthly. It seems the tools used and activities completed during the visit vary and are set by national program offices. For example, the TB coordinator in one district outlined the process required during a monthly site visit. First, he prints a checklist and carries it to the site to complete by hand, which includes items for follow-up from previous visits. He brings the checklist back to the district office and enters the data into an electronic system (ETR). He creates a summary report detailing performance on key TB-related indicators at the site (e.g., infection control, new cases, etc.) and shares it with the district TB team, including TB clinicians, nurses, pharmacists and lab officers. Together the TB team reviews the report and makes an action plan for the facility, which is provided in writing (if stationary is available) or verbally upon the next visit. In addition to the activities above, the TB coordinator must share data with the HMIS officer to enter information not currently in routine facility HMIS reporting and shares an electronic report directly with NTP for entry into the national TB data repository (Epi Info). The TB coordinator cited a number of challenges with executing the system as designed, including lack of funding for travel to sites monthly as required and the ETR terminal being down for the past several months.

Support for Service Delivery Integration (SSDI) program staff join DHO and program officers for monthly visits in the 15 districts supported by the project. The SSDI staff are split into two teams, one providing mostly clinical review and mentorship, and one providing support focused on data, including standard operating procedures for monthly reports and training on data management. SSDI will validate reports against registers and, if errors are found, take the time to train (or retrain) staff.

Supportive supervision visits are also completed by teams from zonal and central offices, pioneered by and often modeled on the quarterly DHA supervision to all sites providing ART beginning in 2004. Methods, tools, and outputs for the integrated HIV quarterly supervision visits are described elsewhere in this report and can be found in the [latest quarterly report issued by DHA](#). Since implementation of PMTCT Option B+ and decentralization of ART to all ANC sites in 2011, the 100% site supervision mandate resulted in 727 facilities (public and private) visited in the quarter ending September, 2015. This effort required 166 supervisors divided into 32 teams clocking 1,989 hours at site level. In stark contrast to the challenges described with supportive supervision carried out by district authorities and program coordinators, the quarterly supervision visits are broadly considered a well-oiled machine—providing timely and complete data each and every quarter. Perhaps the most important feature discerning the DHA-led effort is adequate and stable funding, necessary for a comparatively intensive model for data collection.

In 2015, NTP integrated with the DHA supportive supervision process and now conduct joint visits. NTP uses the data collected to augment and triangulate data provided by TB coordinators and HMIS. In addition, in the [Drug Availability and Security Action Plan](#) put forth by NMCP proposes 100% site supervision beginning in 2016, although the effort is scaled back to 50%, 25%, and 15% in future periods. Tools and systems for the malaria supportive supervision effort are currently being developed. Table 2 below taken from a DRAFT M&E Plan provided by NTP concisely outlines the schedule for supportive supervision visits to support the TB program. It is assumed NMCP will design a supervision model for malaria that looks somewhat similar.

Table 2. Supportive Supervision Schedule for National TB Program in Malawi

Level of Supervision	Organization of the TB care delivery system in Malawi			
	Zone	District	HF	Community
Integrated TB/HIV SS	All facilities			
National level (NTP)	All Zones (100%)	Randomly selected Districts at least 20% of the districts in the Zone	Randomly selected HFs at least 30% of the HFs in the district	Selected Community sites (CSPC, treatment centers and ambulatory MDR patients)
Zonal level (Zonal TB officer)		All districts in the zone (100%)	Randomly selected HF at least 30% of the HFs in districts	Selected Community sites (CSPC, treatment centers and ambulatory MDR patients)
District level (DTO)			All HFs in the district (100%)	Selected Community sites (CSPC, treatment centers and ambulatory MDR patients)
Registration centers/HFs (TB officer)				All Community sites (community, sputum collection points, treatment centers ambulatory MDR patients)

The Support for Service Delivery Integration (SSDI) project also provides quarterly supportive supervision to districts and sites independent of the DHO and DHA activities. A team comprised of SSDI staff, CMED staff, zonal M&E officers, and district HMIS officers particularly adept at DHIS2 visit all 28 district hospitals to support DHIS2 users and gather feedback on how the system can be improved. In addition, select village sites are visited to gather feedback on the DHIS2 mobile pilot currently underway.

Considering frequency of interaction, supportive supervision offers an unmatched opportunity to engage directly with those on the front line to build capacity for data management and use. In practice, a variety of factors prevent visits from being used to their full potential. First, costs are prohibitive to meet protocol requirements with currently available resources. This is particularly true for district-level supervision efforts, but extends to the sustainability of

continuing to expand central-to-site supervision activities. The latest figures found state that about 110,000 USD is spent each quarter to complete DHA visits. These figures are from 2011 when 650 sites existed and 75 supervisors were in rotation; there are now 727 sites and 166 supervisors, so the cost is likely significantly higher. Second, supportive supervision streams are often independent and uncoordinated. A district TB coordinator indicated that he joins the quarterly visits from central level (NTP/DHA), but monthly visits are rarely completed with other program staff or the DHO. There are likely gains in process efficiency being missed as a result. Finally, the visits appear mostly focused on data collection and validation rather than skill building or mentorship (the notable exception being SSDI support to HMIS officers). Researchers from the Massachusetts Institute of Technology, Sloan School of Business, conducted a [case study of POC EMR systems in Malawi](#) in 2009 during which they joined DHA quarterly visits. They found that 80% of time at sites was devoted to data collection and validation. Applying this figure to the 1,989 hours spent at site level last quarter, on average each site received only about 55 minutes per quarter to discuss findings and work on building staff capacity.

PERIODIC DATA REVIEW MEETINGS

Both NTP and NMCP have laid out plans to conduct more routine (quarterly) data review meetings at district, zone, and national levels. These meetings have occurred in the past as funding permitted and, depending on level, included key representatives from health facilities (e.g., data clerks, In-Charge, and pharmacy officers), District Health Management Teams (e.g., program coordinators, DHOs, and HMIS officers), zonal offices, national program representatives, donors, and implementing partners. Several DACs also indicated quarterly review meetings are convened by District AIDS Committees, but these are contingent on resources and it is not clear how involved the national HIV/AIDS (e.g., DHA, Department of Nutrition, HIV and AIDS, and NAC) are in the process. Without reservation, each person interviewed for this report that had participated in a periodic data review affirmed the value of forum. As opposed to the supportive supervision visits, the data review meetings are not intended to collect or validate source data. They are generally intended to gather stakeholders across disciplines, organizations, and levels of the health sector to review results and provide context to aggregate information collected in the HMIS. The meeting provides a forum to investigate systematic data quality issues, assess progress towards projections and program goals, and make plans for improving data quality going forward.

In terms of training and capacity building, it is likely the review meetings are variable in the amount of time devoted to developing data management and interpretation skills. It is also likely that the benefit proposition for attendees is largely dependent on the skill of the facilitator. As part of the field work for this analysis, two review meetings were observed—one at national level and one at district level. Both were convened by NMCP and focused on malaria data.

The quarterly district malaria data review meeting represents a best practice for building capacity of facility staff to use data: low-tech approaches that effectively link daily activities with the outputs decision makers need. Though tedious to complete, the facilitator's extended focus on the source of information for each data element allowed the meeting participants to connect the dots on their own and proved to be the most crucial part of the meeting. According to a Baseline Study by MHSP-TA/Options on the Status of Panning, Partner Coordination, and Data Management at District Level (forthcoming) data utilization is very poor in health facilities, with a focus primarily on reporting and not use. Fewer than 30% of facilities sampled retained copies of data reports²⁰. The focus on

²⁰ It is worth noting that the full set of reports is substantial and in our investigation several facilities reported insufficient means to print reports rather than a lack of desire.

reporting requirements was confirmed in our own engagement with site staff. When asked what data they would like to have on hand if resources were not an issue (blue sky scenario), answers were always related to adequate materials to meet reporting deadlines (data clerks, stationary, etc.) *not* specific types of information that are missing. This suggests the importance of data has effectively been imprinted on health staff in Malawi, but primarily in the context of reporting. Crystalizing the link between data collected and program improvement will be critical to enhancing data use at all levels and program data review meetings appear to provide a strong forum to accomplish this task.

BEST PRACTICE

In the context of the potential LA shortfall facing the malaria response, the national meeting focused on policy and procurement issues, missing data or conflicting estimates, and challenges of bringing the right data together across systems to focus remediation efforts. The district meeting attended brought together 2-3 facility representatives from each site in the district, as well as the District Malaria Coordinator, HMIS Officer, IMCI (MOH department responsible for managing HSAs), and SSDI, among others. A representative from NMCP strongly and effectively facilitated the meeting, spending a considerable amount of time walking through a single bar graph that plotted summary district data from HMIS for several key variables. For each and every variable he asked participants to tell him the source and how it fed into reports, HMIS, and eventually to the graph on screen. Hesitant at first, the crowd opened up after some time and offered their perceptions. Once the facilitator was satisfied everyone was in agreement on the source, each facility separated into groups and were asked to draw a similar bar graph using data for the same variables from just their facility. The engagement of facility staff and rich discussions observed during this meeting were impressive, and the participants seemed to genuinely learn more about the relationship between the program data they handle and urgent program challenges.



EFFORTS TO INCENTIVIZE USE OF DATA FOR DECISION MAKING



Few examples could be found of institutional efforts to incentivize use of data to improve routine decision making in HIV/AIDS, TB, or malaria programs. Facilities and districts are sometimes recognized for meeting data reporting standards with certificates of excellence. Certificates are distributed through supportive supervision visits (see example of certificate issued by DHA through integrated quarterly supportive supervision left). By all accounts, the incentives are designed to foster improvements to data reporting, not reward facility or district staff for creative analysis, sharing

important findings with peers, changing resource allocation to better align with disease burden and/or performance, or changing clinical or management processes to improve quality, coverage, or efficiency in service delivery.

There is an on-going pilot of results-based financing (RBF) in Malawi focused on improving the quality and coverage of maternal and child health services operating since 2012. The activity has a well-described evaluation component²¹ and has shown promise on improving key indicators²². The HIV/AIDS, TB and malaria programs could look to lessons learned from this effort to inform possible RBF initiatives in the future.

The Kuunika Project is expected to include a large capacity building component that will pilot innovative methods for incentivizing increased use of data in decision-making. Currently, a literature review is underway that will inform the design of approaches tested.

²¹ [Design of an impact evaluation using a mixed methods model--an explanatory assessment of the effects of results-based financing mechanisms on maternal healthcare services in Malawi](#). BMC Health Serv Res. 2014 Apr 22;14:180. doi: 10.1186/1472-6963-14-180.

²² [Results from Norway and Germany's collaboration on a pilot project practicing results-based financing for maternal and child health indicate improved health delivery](#). April 2015.

FISCAL SPACE AVAILABLE FOR IMPROVEMENTS TO HEALTH DATA AND ASSOCIATED SYSTEMS

As a starting point for understanding the fiscal space available in the near term for M&E system investments, the Round 4 CHAI Resource Mapping (RM) data was analyzed. RM is a survey of all financial sources, agents, and implementers that seeks to capture planned and executed budget data for a multi-year period²³. Round 4 was recently completed however not finalized due to “reprogramming of Global Fund resources.” As such, Global Fund data related to M&E activities have been excluded and described in greater detail later in this section. Data in Table 3 below summarize the projected expenditure for the cost category, “Research, M&E, and Supervision,” across all programmatic interventions associated with HIV/AIDS, TB, and malaria (excluding Global Fund).

Table 3. Funding Committed to Research, M&E, and Supervision Activities in Malawi by Source and Fiscal Year (Source: CHAI Round 4 Data)*

Financing Source	Malawi FY 2016-17 (USD)	Malawi FY 2017-18 (USD)	2-year Total
Centers for Disease Control & Prevention	\$2,306,350	\$1,587,913	\$3,894,264
DoD	\$96,990	\$98,930	\$195,920
Ministry of Health	\$135,251	\$139,952	\$275,203
Other	\$425,609	\$149,828	\$575,437
UNICEF	\$200,000	\$150,000	\$350,000
USAID	\$2,548,634	\$1,849,832	\$4,398,466
WHO	\$73,021	\$73,021	\$146,043
World Bank	\$816,005	\$816,005	\$1,632,011
DFID/UKAID	\$288,200	\$280,199	\$568,399
Germany	\$0	\$0	\$0
MSF	\$0	\$0	\$0
Total	\$8,449,800	\$5,661,834	\$14,111,634

*Excludes Global Fund

There are several caveats to the data presented in Table 3. First, RM is not compulsory and data may not be fully representative of the full funding available for M&E systems and programs more broadly. Second, many funders and implementers are often not capable of accurately estimating the funding available beyond the current budget cycle that has been approved, and further, funding in future years is subject to reprogramming based on program needs. As such, data for the next Malawi fiscal year (2016/17) is likely a more accurate estimation than data for future periods (2017/18). Third, both Germany (through GIZ) and the UK (through DFID/UKAID) are currently in the process of developing multi-year investment strategies, which will include substantial investments in M&E systems, so the figures presented above are likely quite understated. According to contacts at DFID, the UK has authorized up to 5 million British pounds per year the next five-year strategy, which will include data systems strengthening for health. Fourth, the estimates likely do not include special initiatives that are currently in development, such as the World Bank support for the M&E Task Force Secretariat or the Bill and Melinda Gates Foundation-funded Kuunika Project, which will provide roughly 10 million USD over the next four years for strengthening health data systems and use. Finally, the table only includes those investments categorized in RM as research, M&E, and supervision. In the context of funding available for building capacity to manage and use data in decision making, resources are likely available that have been allocated to other categories, such as in-service training and supply chain management. For fiscal year 2016/17 alone, in-service training across funders totals about 6.1 million USD in the RM dataset.

With respect to Global Fund investments, data were provided on the latest approved budgets for the two principal recipients most involved in M&E activities: MOH and World Vision. These activities were categorized according to

²³ For more information, see a [presentation overview of RM](#) and a [case study](#) describing RM in Malawi.

common themes emerging from the *Landscape Analysis* and presented in Table 4. Over the life of the grant, about **6 million USD** is slated to support M&E activities, with the bulk being used to support roll-out of EMR, training, data review meetings, and supportive supervision.

Table 4. Global Fund Investments in M&E Systems by Category, Current Grant Cycle

	Malaria	HIV/TB	TOTAL
Data review meetings	\$538,942	\$272,084	\$811,026
Data collection tools and reporting support	\$202,653		\$202,653
Training	\$949,775	\$5,422	\$955,197
Supportive Supervision	\$294,127	\$200,637	\$494,764
Operational support for data systems	\$128,992	\$2,004,952	\$2,133,944
Electronic medical records	\$1,054,326	\$197,557	\$1,251,882
Other	\$246,749		\$246,749
TOTAL	\$3,415,564	\$2,680,650	\$6,096,215

APPENDIX 2: DATA SYSTEM COMPONENT DESCRIPTIONS

DATA SYSTEM COMPONENTS COMMON TO HIV/AIDS, TB AND MALARIA



Paper Registers

Outpatient Department Register (OPD)

The OPD register is used by health facilities for patient tracking and as a source of data for summary reports, including information on diagnosis and treatment of HIV, TB, and malaria. The registers are designed and printed by CMED with support from the USG-funded SSDI project. In sites using the Boabab EMR, the OPD information is captured electronically; however, the extent to which the electronic data is used for reporting is limited.

Laboratory Register (Lab)

The lab register is used by health facilities for patient tracking and as a source of data for summary reports, including information on diagnostics ordered and their result. Pertinent data for each disease area include CD4 and viral load (VL) for HIV, microscopy for TB, and microscopy and RDT for Malaria. Lab data for HIV and TB are often recorded on multiple forms, other registers, and reports and captured in some electronic systems, e.g., Boabab EMR and LIMS. The registers are designed and printed by CMED with support from the USG-funded SSDI project.

Stock Cards

Stock cards are used by health facilities to track all commodity and drug supply information and used as a source of data for summary reports and supportive supervision visits. Summary data from stock cards are entered into Supply Chain Manager (SCMgr) at district and national levels, which in turn is used to create distribution plans for most essential drugs and commodities. Distribution plans for ARVs, HIV test kits, and condoms are created by DHA using stock data gathered during quarterly supportive supervision visits.



Paper Summary Reports

HMIS-15

The HMIS-15 summary report form is used at facility level to capture aggregate data across most clinic activities, including HIV/AIDS, TB, and malaria. HMIS-15 forms are distributed by the DHO, completed monthly by facilities, and sent back to the HMIS Officer at district level for entry into HMIS. The HMIS-15 is a primary source of data for the NMCP, but not relied on by NTP or DHA. The information produced by HMIS-15 often conflicts with information collected by other means, e.g., supportive supervision visits. See a sample output from HMIS [here](#).



Computer Systems

LMIS (SCMgr)

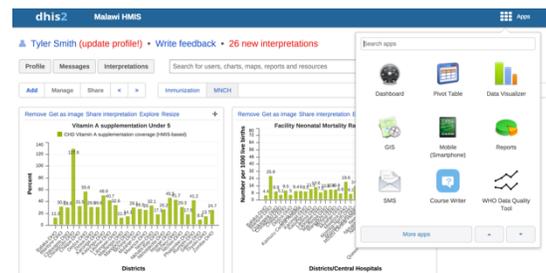
The Logistics Management Information System (LMIS), otherwise known as Supply Chain Manager (SCMgr), is a data system used at district and national levels. Aggregate data on commodity usage and stock on hand are transcribed into summary reports at facilities, sent to district level, and entered by the pharmacy manager (or proxy) into SMCmgr. The system is not web-based, but capable of producing standard reports (Excel) that are emailed to (at least) one central point in the MOH, typically Health Technical Support Services (HTSS). Requisitions for commodities are made to the Central Medical Stores Trust (CMST) by HTSS for many essential drugs and commodities (paper copies). Malaria and TB drugs are procured and managed in multiples chains, but ultimately SMCmgr data is used to determine resupply and create distribution plans in conjunction with NMCP and NTP. SMCmgr tracks key HIV commodities (ARVs, test kits, and condoms); however, data from supportive supervision visits trump SMCmgr as the primary source for creating distribution plans. Data from SMCmgr are also used to enter commodity information into HMIS at the district level and aggregated into summary reports (e.g., HMIS-15).



Networked
Computer Systems

HMIS (Health Management Information System)

HMIS is the nationally selected central repository for health information. The system is web-based and built on the open-source [DHIS2 platform](#). The HMIS is continually updated with the latest version of the software and is maintained by CMED and the Malawi Health Information Systems Programme (HISP)—a network of professionals supported by the University of Oslo. DHIS2 can be used to collect, aggregate, report, and visualize data in charts, graphs, and spatially. In Malawi, its current primary function is collection/aggregation.



Paper Registers

ART and HIV Care Patient Tracking Cards

All facilities providing HIV care and ART must track patient data using cards provided by DHA. These cards serve as primary source data for quarterly supportive supervision visits to health facilities and supply critical information, such as CD4, ART regimen, and pill counts to monitor adherence. Each patient seen has a card on file with the facility. There are four cards in total: ART-adult formulation, ART-pediatric formulation, HIV care-adult/child, and HIV care-exposed infant. Sites that use EMRs to track patient-level data must also use patient cards at point of service. Cards are completed by HCWs as patients are seen (i.e., daily).



ART and HIV Care Registers

In addition to patient cards, facilities are required to track patient-level information in the ART and HIV care registers provided by CMED. These registers are used to aggregate data for summary reports submitted to the DHO for entry into HMIS. Cards are completed by HCWs as patients are seen (i.e., daily).

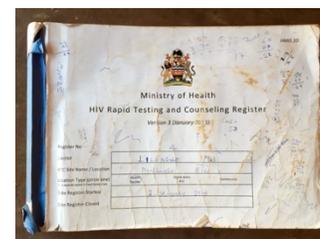


Antenatal Care (ANC) and Maternity Registers

Given the pioneering effort of Malawi to initiate all pregnant women living with HIV on ART (Option B+), DHA tracks pregnant women presenting to health facilities using the ANC and maternity registers. Key elements for review include new entries into ANC, patient HIV testing record/status, and new deliveries. These data are checked for consistency by the DHA supportive supervision teams and ultimately used in the cohort analysis and quarterly reporting. The registers also serve as source data for relevant HMIS reports. Cards are completed by HCWs as patients are seen (i.e., daily).

HTC Register

The HTC register is used as a triangulation point for data quality checks by the DHA supportive supervision teams and for abstracting data used for the quarterly progress reports. In addition, the register is used for aggregating data reported to the DHO for entry into HMIS. Cards are completed by HCWs as patients are seen (i.e., daily).



Paper Reporting Forms

LAHARF

Non-biomedical data on HIV services and support is captured using the Local Authority HIV and AIDS Activity Reporting Form (LAHARF, see [here](#)). The form is generated by NAC and all organizations supporting the HIV response in communities (typically CBOs) are expected to complete the form. No support is provided centrally for accessing forms (i.e., printing or distribution) outside of small, competitively bid operational grants, although some CBO network support organizations or district authorities may assist in physical collection of completed forms. CBOs are expected to print, complete, and return the LAHARF each month and quarterly to the DAC. The data are entered into the LAHARS module in the District Data Bank (where functional).

Facility and community patient follow-up forms

In several of the facilities visited, the In-Charge referenced data exchange that happens between CBOs/volunteers and HCWs in treatment sites. Volunteers are sometimes provided the details of patients that miss visits or have trouble with adherence so the volunteer can follow-up with individuals in the community. Similarly, the volunteers provide information to the facility on individuals who may be sick and need medical support. It is not clear if there is a standard form or tool used beyond verbal exchange or how often the information exchange happens.

Supportive Supervision DHO

All program offices within the DHO are expected to visit facilities monthly to provide data quality checks, assess data and clinical challenges, and help develop and monitor facility action plans. Given the extensive supportive supervision that takes place for all facilities by the DHA team centrally, it is not clear to what degree the HIV program is further assessed by DHO staff or what format this support takes.

Supportive Supervision DHA

The DHA makes quarterly visits to every site in the country providing ART care and support (717 sites at time of this draft). The purpose of these visits are to improve the completeness and accuracy of clinical data collected to more effectively monitor the HIV response, improve clinical outcomes, improve provider performance, and ensure uninterrupted availability of key commodities, such as ARVs. Standard paper tools and methods are used by a team of 160 roving DHA staff, including a quality service checklist, follow-up action points from previous visits, physical drug stock level assessments, and semi-structured feedback and performance ratings. Data from patient cards and the registers identified above are used to complete M&E reports for entry into the DHA MIS. For a complete list of methods and output from the visits, see the latest [Integrated HIV Program Report](#).



Paper Summary Reports

ART and HTC Summary Reports

Facility staff are required to complete summary reports for ART and HTC that are submitted to the DHO for entry into the HMIS. It is not clear how these reports are ultimately used since the system of record for HIV clinical data appears to be the supportive supervision visits and DHA MIS. A number of other reports available in HMIS may also require use of HIV registers and source data (e.g., TB-HIV, ANC, exposed child, etc.) so the full extent of paper summary reporting for HIV is not known, but likely extensive.



Computer Systems

District Data Bank

The District Data Bank is an Access-based computer system developed and maintained by Ministry of Finance, Economic Planning and Development (MoFEPD). The aim is to collect data at district level across all sectors for performance monitoring. In practice, the module most active is the LAHARS (system for collecting LAHARF summary data). DACs enter data directly into the LAHARS module

(when computers are available and functional). Data are accessed by the district M&E Officers and Standard reports are generated for submission to NAC. MoFEPD is currently looking to move to a web-based platform for the Data Banks that will likely result in community HIV data being more amenable to data exchange and more easily integrated with other systems.

LAHARS

Data collected on non-biomedical HIV interventions is captured using the LAHARF, aggregated at district level by the DAC, and submitted to NAC for compilation/entry into the LAHARS. The system is either Access- or Excel-based and used to monitor elements of the national response. These data are also used by NAC to create quarterly service coverage reports for each district (see example [here](#)). There has been a desire for quite some time to upgrade this system, consistent with MoFEPD plans to upgrade the District Data Banks.

DHA MIS

The DHA MIS (management information system) is an Access database housed at the central DHA office and is used as a repository for the data collected through the quarterly DHA supportive supervision site visits. The system is maintained by two IT support staff and data is entered quarterly by a team of data clerks. DHA uses the system to calculate summary statistics, conduct cohort analyses, monitor drug/commodity availability, and develop commodity distribution plans. Results of the quarterly visits are compiled and disseminated in Integrated HIV Program Reports. The system is not currently interoperable or linked with the HMIS or EMRs. DHA is looking to expand the capability of the back-end system components using SQL architecture.



Electronic Medical Record (EMR)

Two EMR systems are currently in operation in Malawi and used to support HIV programs: the Boabab EMR and DREAM electronic health record (EHR). Both capture patient-level data at point of service and are used to track registration, demographic data, laboratory tests and results, treatment regimens, clinical outcomes, and follow-up.

The Boabab EMR was developed and is maintained by the [Baobab Health Trust \(BHT\)](#)—a Malawi-based technical services organization—with support from PEPFAR. It is currently operational in 77 sites and is the nationally selected/endorsed platform for future EMR installations per the GOM. The EMR uses specially designed tablets installed in ART clinics accessed by facility staff and is equipped with barcode scanners to identify patients using special cards called “health passports.” BHT has designed the system to run on less power than typical machines, and it can transmit data using a virtual private network (VPN) “backbone” so it does not need to rely on spotty internet connectivity. The ART and OPD modules are most frequently used; however, the BHT is working with MOH to pilot modules for TB and malaria as well. The table below outlines Baobab EMR implementations to date (source: [2015/16 BHT Update](#)). Facility staff can use the EMR to generate summary statistics that are sometimes use for completing paper-based summary reports. BHT has developed an exchange protocol for patient data to allow interaction between the EMR and the LIMS system managed by CHAI. No routine data exchange solution exists for communicating with other critical data systems, such as the HMIS and DHA MIS.

EMR Module	2014 to 2015 Status	2015 to 2016 Target
OPD & ART	67	9
ANC	36	6
HTC	0	22
LIMS	1	0
EBRS	4	15
CCC (NCD)	4	2
EVR (TA Mtema, LL)	25	80
Demographic Data Exchange (DDE)	3	73

The DREAM EHR is a fully independent system operated by the [DREAM project](#) of the Community of Sant'Egidio, based in Rome, Italy. The system collects and analyzes data on patients receiving care in 13 private facilities throughout Malawi and is linked to a central repository (Rome). The system is currently limited to ART programs and is not currently linked or capable of exchanging data with other key systems, such as the Baobab EMR, HMIS or DHA HIS. Within the system, data are available on the full range of HIV care activities, including laboratory and pharmacy services and community follow-up.

LIMS

The Laboratory Management Information System (LIMS), is a system developed and maintained by the Clinton Health Access Initiative (CHAI). Currently, the system only captures patient-level data on early infant diagnosis (EID) and viral load (VL). The system is capable of exchanging patient-level data with the Baobab EMR (pushed daily).

DATIM

The Data for Accountability, Transparency, and Impact Monitoring (DATIM) system is the primary collection tool and data repository for PEPFAR. The system operates on the DHIS2 platform. Data are stored on servers in the US and accessible via the web for users in Malawi. There are a number of special system configurations that distinguish DATIM from other instances of DHIS2, such as more extensive privilege hierarchies for data access, enhanced approval process for data submission approval, and capture of non-facility and non-health indicators (e.g., community prevention interventions). Though the HMIS and DATIM are built on the same platform, they currently are not capable of data exchange, meaning similar data elements must be entered in both systems. Further, a majority of data elements needed for PEPFAR reporting come from the DHA MIS. This system also is not linked, resulting in yet another duplicative data entry each quarter. DATIM is the primary source of information used to monitor PEPFAR performance in country, and outputs are further analyzed to develop the annual Country Operational Plan (COP) that—among other things—outlines funding decisions by program intervention.



Paper Registers

Many paper forms and registers used by the TB program can be found in the [Malawi National TB Programme Manual \(Seventh Edition\)](#), Annex 2.

Community Sputum Collection Point (CSCP)

No additional information available.

TB Treatment Patient Card

No additional information available.

Chronic Cough Register

Register completed by HCW at facility level. The form tracks patient-level data, including demographics, lab results, and HIV test results. Data reviewed and collected during integrated HIV/TB supportive supervision visits and during district TB officer routine monthly collection.

Contact Tracing Register

Register completed by HCW at facility level. The form tracks demographic and diagnostic data on potential contacts of known index cases. Data reviewed and collected during integrated HIV/TB supportive supervision visits and district TB officer routine monthly collection.

MDR-TB Register

Register completed by HCW at facility level. The form tracks demographic and diagnostic data on potential cases of multi-drug resistance TB (MDR TB). Data reviewed and collected during integrated HIV/TB supportive supervision visits and district TB officer routine monthly collection.

TB Laboratory Register

Register completed by HCW at facility level. The register records patient-level data on lab services and results of microscopy diagnostics. Data reviewed and collected during integrated HIV/TB supportive supervision visits and district TB officer routine monthly collection.

TB Unit Register

No additional information available.



Paper Reporting Forms

Supportive Supervision TB Coordinator

The district TB Coordinator is responsible for supervising health facilities on all TB activities. They are required to visit every facility in the district monthly to collect data and provide support. They print a checklist (Excel based) to fill in by hand and re-key at district level in the Electronic TB Register (ETR). The checklist includes review of clinic data and activities, such as infection control, case detection and notification, treatment outcomes, sputum collection follow-up, lab services, isoniazid preventive therapy (IPT), MDR TB, and community involvement. The visit results in a paper report that is shared with the district TB team for review. The team identifies challenges and develops an action plan for each facility that is shared in hard copy (if stationary is available) or verbally in the next visit. Electronic reports are generated from the ETR and emailed to zonal officers and NTP centrally.

Integrated HIV/TB Supportive Supervision

For the past year the TB program has been utilizing the 100% quarterly site supervision process to collect and validate data and provide additional support to clinic staff. (For a description of the DHA supportive supervision visits, please see the HIV system component descriptions above). Data collected during the integrated supervision visits are entered by data clerks at the central level NTP office directly into an Access database—Epi Info.



Paper Summary Reports

A number of reports are available through HMIS, including TB-HIV, TB case findings, and universal access to TB diagnostics; however, some have data for the last quarter and some do not. It is not immediately clear how many summary reports are required to be completed by facility staff that pertain to TB. TB coordinators at district level provide data to the HMIS officers, presumably to populate at least some of these reports. Given the transfer happens electronically, the summary paper reports (with the exception of HMIS-15) are excluded from the diagram.



Computer Systems

Electronic TB Register (ETR)

The ETR is a computer-based application housed at district level. The primary user is the TB coordinator and coordinators are instructed to contact NTP when IT support is needed. The system is Access-based (Epi Info platform) and is not networked to other systems or the web. The TB coordinator prints forms from the systems (Excel format) and fills them in manually when collecting data during site visits. The data are then re-keyed into the ETR. Electronic reports can be generated using the ETR and are emailed (when connectivity available) to zonal TB officers and NTP for storage in the central Epi Info data warehouse. In addition, the TB coordinator works with HMIS officers to enter data stored in the ETR into HMIS. It is not clear what format the exchange uses (paper-based report, hand written data, etc.).

Epi Info

[Epi Info](#) serves at the central data repository for NTP. The software is an open-source basic statistical software package that runs on Visual Basic and Access. The system is not networked or web-based, therefore data must be re-keyed at central level when delivered electronically (email) or by hand (paper) to the data clerks at NTP. Data collected during the integrated HIV/TB supportive supervision visits is also returned to NTP and keyed into the system manually. The system is used to monitor program performance, analyze data, and develop supportive supervision plans. NTP has expressed a desire to upgrade to system to a more sustainable solution that easily interoperates or exchanges data with other critical systems (e.g., HMIS and DHA MIS).



Paper Registers

Village Clinic Register

Village clinic registers are kept by community health workers, known in Malawi as Health Surveillance Assistants (HSAs). HSAs serve the under-five age group in the community with decentralized health services for typical and uncomplicated medical conditions, such as fever. HSAs keep track of patients seen, the presumed diagnosis (based on decision tree provided by MOH), and medication remaining in their treatment kit. Data are aggregated every month on the Form 1A by the HSA and submitted to their HSA supervisor.

LA Register

The LA register is used by health facilities for tracking patient-level dispensation of artemether-lumefantrine (LA). Treatments are provided in blister packs and come in 4 formulations. HCWs are expected to complete the LA register each time a treatment is dispensed and record patient demographic data and dose provided. The register also provides data on drug orders and stock on hand. Aggregate data from the LA register are used by facility staff to complete summary reports at facility level, including the Malaria Monthly Health Facility Report and HMIS-15.



Paper Reporting Forms

Form 1A

Form 1A is a paper form provided to HSAs working in communities as a tool for aggregating data held in village clinic registers. The forms are collected by HSA supervisors monthly, reviewed and aggregated again into Form 1B.

Form 1B

Form 1B is a paper form provided to HSA supervisors to aggregate data provided by HSAs in Form 1A. Form 1B is tied to a specific facility and captures summary data monthly from village clinic registers for all HSAs working at community level in the clinic's catchment area. The forms are submitted to the health facility In-Charge for review and sent to the district HMIS officer to be entered into HMIS. Data from Form 1B can be accessed using a standard report in HMIS. A particularly relevant data point for the malaria program is the number of fever cases reported, as these are presumptively treated with artemether-lumefantrine (LA).

Supportive Supervision District Malaria Coordinator

No additional information available.

Supportive Supervision NMCP

One-hundred percent site supervision is desired by NMCP. According to the [Drugs Availability and Security Action Plan](#), "The data collection tool will be developed to systematically review and validate primary records (outpatient registers, LA dispensing registers, malaria monthly report, malaria laboratory registers and stock cards) at all sites. Data will be analyzed at the site by the health facility staff as guided by the visiting supervisors." The tool has yet to be developed and it is not clear how the data will stored, managed, analyzed, and disseminated.



Paper Summary Reports

Malaria Monthly Health Facility Report

This monthly report is a paper form required to be completed by HCW staff in all health facilities. It captures aggregate data on key indicators for the malaria program, including suspected and confirmed malaria cases, lab tests and results, patients treated, and LA dispensed by dose. Data sources include the OPD, lab, and LA registers.

HTSS and CMST Commodity Form

Each month the pharmacy manager or proxy at district level uses SCMgr to report on LA issued and stock on hand at each health facility. The format of the reports is not known; however, they are transmitted electronically to the HTSS unit within MOH, who then works with the NMCP to develop a commodity distribution plan.



Networked Computer Systems

CSTOCK

[CSTOCK](#) is an open-source logistics management information system that uses SMS via mobile device to communicate with users. The system is primarily used by the HSAs to transmit via text stock on hand at specified intervals, typically monthly unless an emergency resupply is needed. The system automatically calculates the amount for reorder and notifies the health facility to which the HSA is linked. Once the order is complete, the HSA is notified via text to retrieve the supplies. The system also provides a user interface accessed over the web which includes stock data disaggregated by HSA, facility, and district, and a dashboard to review summary statistics, such as reporting rates and stock outs. Data from the system are exportable, but only for selected reports. The system is supported by John Snow, Inc. (JSI) with USG funding, but managed by HTSS. Financial support is intended to transition to World Vision with Global Fund resources in the near future. The system does not currently collect or manage any data outside of select commodities used in village clinics and does not exchange information with other key systems, such as HMIS.

APPENDIX 3:

MALARIA DATA ANALYSIS CASE STUDY

Context: Malawi is facing a major challenge with over-consumption of LA—the primary treatment for malaria—evidenced by 10.5 million doses of LA distributed compared with only 6.3 million cases of malaria reported in 2014. In an effort to identify the source of the discrepancy and intervene quickly to prevent future misalignment, NMCP and country stakeholders have developed a [Drug Availability and Security Action Plan](#) that outlines a 10-point effort to strengthen logistics and data systems. The plan includes the roll-out of 100% central-to-site supervision visits in FY 2016/17 and district-level data reviews. Also, during data review meetings, stakeholders have proposed that one driver of over-consumption is distribution to village clinics. This rapid analysis sought to use facility-level data to test assumptions and better understand the nature of the discrepancy across sites and determine how this information could be used to target site or district support activities.

Methods: Annual data on the number of LA doses issued to each health facility²⁴ were compared with annual data on the total number of malaria cases reported²⁵ using site as the unit of analysis. Data for the year 2015 were accessed using HMIS. Original data sources included the OPD register, village clinic (VC) register, and drug data from SCMgr. Sites without all necessary data points were excluded from the analysis (282). The difference between the actual number of LA doses issued and expected number (based on cases) was calculated and ordered by magnitude (highest to lowest). For the purposes of this analysis, sites were defined to “over-consume” when LA doses issued were higher than cases reported; conversely, sites that “under-consumed” reported more cases than LA issued. For sites that over-consumed, a correlation analysis compared percent of doses unaccounted for with percent of doses issued to village clinics to determine if relationship exists.

²⁴ Facility registers that track actual LA dispensation are thought to be poor quality or incomplete. For community consumption, the web/SMS platform used for re-supply to HSAs—CSTOCK—could not produce facility level data in bulk format across all sites in Malawi. Ultimately, data on the number of LA issued to each site served as a proxy for consumption. LA issue data are derived from SCMgr, available by site within HMIS, and generally accepted as the most accurate estimate of actual drugs that exit the system (either by patient dispensation or otherwise).

²⁵ It should be noted that fever cases recorded in village clinic registers are all estimated to be malaria cases since they are treated presumptively in most cases.

Results: Data on a total of 589 sites were analyzed. In the Figures (right), each point on the horizontal axis represents data from one site, and the percentage from left to right shows the cumulative percent of sites as data are summed. Figure 11 shows the total number of LA doses issued without matching case data. Roughly **50%** of sites (in red) had more LA issued than cases reported; **40%** of sites (in blue) had less LA issued than reported cases; and about **10%** of sites have reasonably well-matched LA doses and cases (10% margin of error). Based on conversations observed in malaria data meetings and the sizable national overage, it was surprising to see that so many sites (40%) *under-consumed* LA. The distribution of *over-consumption* across sites was also interesting, ranging from about 416,000 to 37 excess doses per site. These data suggest that the national overage in drug consumption compared with cases is not emblematic of all sites and some health facilities disproportionately contribute to the discrepancy.

Figure 11. Total number of LA doses issued without matching case data

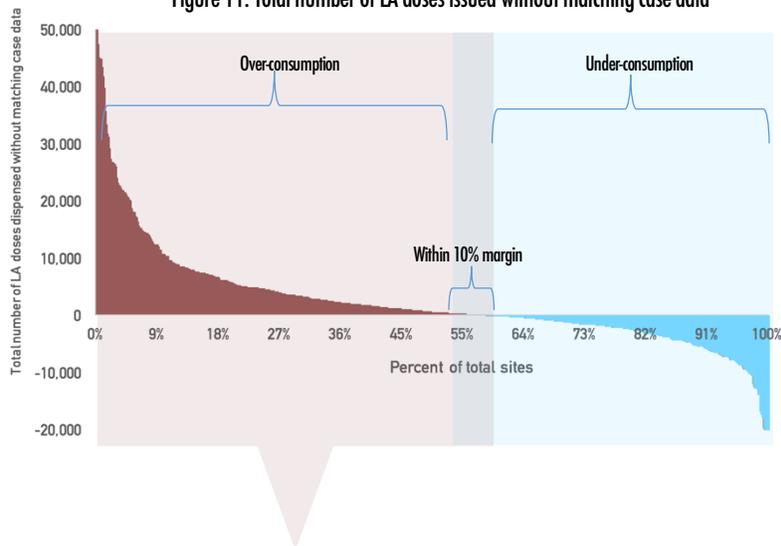
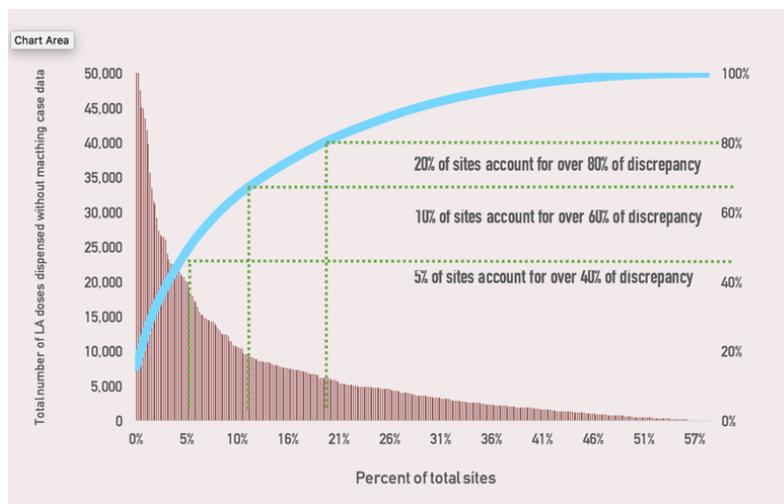
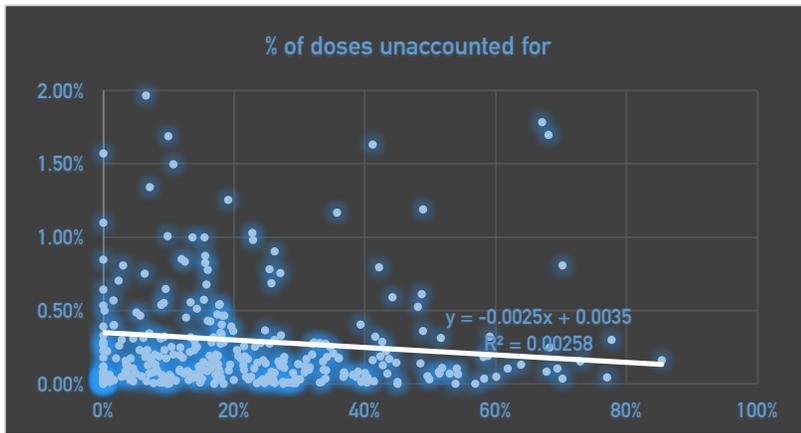


Figure 12. Total number and cumulative percent of LA doses issued without matching case data



To investigate this concept further, Figure 12 enlarges the picture for just the 50% of sites with over-consumption. The light blue line represents the cumulative percent of LA not accounted for with matching cases as data are summed across sites from left to right. This type of data visualization allows for important observations that could help to focus management efforts. Tracing the percent of total sites (x axis) to the cumulative blue line, we can infer that **5%** of sites account for over **40%** of the *total number of LA doses over-consumed*; **10%** of sites account for **60%**; and **20%** of sites account for **80%**.

Figure 13. Correlation between percent of LA unaccounted for and percent of village clinic issued doses by site



For only sites with over-consumption, there appears to be no relationship between the percent of doses unaccounted for and the percent of doses issued to village clinics (Figure 13, correlation coefficient of -0.05), indicating the anecdotal evidence and hypothesis that the leakage or data quality challenges that primarily drive the discrepancy occur at village clinic level may not be accurate and additional analysis is required to target efforts.

Discussion: The results of this quick analysis have strong implications for how NMCP should focus remediation plans. First, it appears that a small percent of sites explains a large percent of the *estimated* over-consumption. Of course, data quality issues are likely present, but currently there is not a way to ascertain what proportion of the discrepancy might be explained by data quality versus over-consumption and both should warrant substantial scrutiny for different reasons. Given the expense that will be incurred to implement 100% central-to-site supervision, developing a schedule that prioritizes sites contributing the most to the total drug overage will yield the greatest return for this investment in the shortest amount of time—particularly important when considering the looming prospect of treatment shortages. Focusing first on the 20% of sites that account for 80% of *over-consumption* equates to direct supervision visits for 115 sites out of 871 site records in HMIS²⁶. Using the latest estimates found on the cost to DHA for quarterly integrated site supervision visits (page 23), we can assume about 150 USD is spent per site for central supervision visits as a rough guide. Visiting 115 sites is 17,250 USD per quarter, whereas visiting all 871 sites listed in HMIS would cost 130,650 USD per quarter. . In terms of opportunity costs, and given the primary motivation for the activity, the program must ask if the additional 113,400 USD per quarter to visit the sites with the *least* or *no over-consumption* is the best use of those resources in the near term.

Secondly, these results could be used as a starting point to inform the design of supportive supervision visits and data quality review meetings. It seems a 'one-size-fits-all' approach may not be most effective to address the specific challenges faced by each site or district. For example, those that represent the most *over-consumption* warrant more intensive data quality and stock audits by a team of highly trained staff from the central office, whereas those sites that represent the greatest *under-consumption* warrant review of the supply chain allocation plan and more intensive mentoring for clinical management of malaria.

When conducting a full analysis, there are a number of limitations that should be noted before drawing definitive conclusions from these results (data quality issues, absence of complete data, etc.); however, absolute precision is not the intended purpose or the value of this type of analysis. More important are the additional questions generated that will focus attention on specific data or program challenges, lead to more targeted and relevant analysis, and highlight how program interventions should be tailored to maximize the desired effect. For example,

²⁶ Of the 871 records pulled from HMIS, 196 had no data for any of the variables of interest. It's unclear if these entries are duplicate/incorrect or fully operational sites without complete reporting.

we might want to triangulate these results using metrics available in other systems (e.g., SCMgr and CSTOCK), investigate the 282 sites with incomplete data, and run additional analysis to better hone in on site attributes that are related to a greater discrepancy of LA doses to cases. These additional analyses would further refine and target urgent efforts to course correct and increase the value of investments in supervision and data review meetings.