Information Revolution
Information Revolution
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As you all know, the information revolution was one of the four transformation agendas of the first Health Sector Transformation Plan and continued to be one of the major priorities in HSTP-2. It is well recognized that appropriate and timely use of health and health related information is an essential element in the process of transforming the health sector. Driven by the Information Revolution (IR) Agenda of the HSTP, the Ministry of Health (MOH) is committed to ensure a strong health information system (HIS) at national and sub-national levels. This is not something MOH can ensure in one go, but it is a continuous improvement process that should be done incrementally and measured meticulously for its appropriateness. While a lot has already happened over the last few years regarding the implementation of different initiatives to strengthen HIS in the health system, a lot needs to be done in terms of bringing that cultural transformation in data use and bringing behavioral changes on improving data quality.

The Policy, Plan, and M&E Directorate has been directly responsible for the Information Revolution to ensure that interventions are designed and implemented to make key data available for planning activities and at the point of service delivery, and to capacitate the health workforce to use this data for evidence-based decision making that will improve the quality and equity of care. Our team has also been working to ensure strategic alignment with health system strategies and direct harmonization of HIS interventions with the national HIS.

This booklet is developed to document our journey in the design and implementation of the information revolution agenda of the HSTP. It provides high level description of various initiatives of the IR, the long term goals and objectives, current implementation status, learnings, and future plan. This document provides messaging for various audiences who may be involved with or impacted by the Information Revolution initiatives launched by the Ethiopian Ministry of Health (MOH). The IR booklet is intended to be used by leaders and experts from MOH and partner organizations managing and supporting ongoing work for each initiative.

I would like to take this opportunity to thank all health system leaders at all levels, development partners, universities, and others who have direct and indirect stake on health information in Ethiopia. I believe we will continue to enjoy the necessary support from all our development partners and important stakeholders in the health sector in the next five years’ implementation of the HIS Strategic Plan.
I am sure that you all recall the main objective of the digitalization pillar of the information revolution is to develop an eHealth architectural vision, identify technical components, and ensure a successful implementation of the architecture against priority HISs. We have achieved significant milestones in this regard over the past few years. There are various digitization efforts at point of care and institution levels that presented opportunities for unprecedented impact on the foundation of Ethiopia’s public health system. The bold action of deploying DHIS2 in all woredas and health facilities, the development and implementation of eCHIS and expanding the healthNet across the country are some of the most important achievements of in the first HSTP. The HITD team aims to build on this innovative vision and to place a tool in the hands of the all health care worker to further increase their effectiveness and improve equitable health impact.

To mention a couple of the major shifts in the digital health systems development and implementation are avoiding fragmented support philosophies and building the government’s capacity to lead and own these initiatives so that unprecedented dependence on external support can be minimized. As a result, we have reached to a level where we can confidently ensure sustainability of results due to implementation of digital health tools.

The Ministry of Health is currently developing a national Digital Health Strategy, which is focused more on providing digital tools for health workers, administrators, and patients and dovetail very well with what is being proposed in the HSTP-2. We believe enormous progress has been made on the digitization initiatives of the information revolution and the newly developed digital health strategy will go a long way to continuing the trajectory of those achievements.

We are planning to assess current status of the use of digital technologies for health, and to prioritize, as appropriate, the development, evaluation, implementation, scale-up and greater use of digital technologies. We hope that we will continue to receive your usual support during the implementation of the national digital health strategy.
The Information Revolution is one of the four transformation agendas of the Health Sector Transformation Plan (HSTP), which addresses quality and equitable distribution of health service delivery in Ethiopia. The goal of the Information Revolution is to transform and enhance the culture of data use to positively impact population health and health-system performance through evidence-based decision making at all levels of the health system. Maximizing the availability, accessibility, quality, and use of health information will positively impact the quality and equity of healthcare delivery in the country.

To achieve this, FMOH has developed a national Information Revolution Roadmap (2016-2020) based on two pillars of focus with actionable and measurable interventions for each. Pillar 1 consists of interventions to enhance the culture of information use for decision making. This cultural shift is supported by Pillar 2, the implementation and scale up of prioritized health information systems and tools. The Information Revolution is cascaded down to the regional and woreda levels to allow the initiative to be implemented throughout all levels of the health sector. Each Regional Health Bureau (RHB) has developed a plan for implementation of the Information Revolution, ensuring alignment within the framework of the national HSTP strategy.

In terms of implementation, MOH has made a steady progress in the implementation of the Information Revolution (IR) agenda of the HSTP-I. Initiatives have been launched to improve health data quality and enhance data use at local level. Information revolution road map, connected woreda strategy, information use and data quality assurance guidelines were developed to facilitate the information revolution agenda. Under the leadership of the MOH, several health workers and health managers have been provided with relevant trainings; different components of the HIS have been digitized and deployed at health facility levels; and close follow-up has been put in place to ensure adequate implementation of the two pillars of the information revolution roadmap: digitization and culture of information use.

Information revolution will continue to be one of the transformation agendas of the HSTP II period, as most of the major initiatives initiated remain unfinished. It will address the critical gaps in cultural transformation for health data use and the digitalization and scale up of the overall health information system and a strong HIS governance as the foundation of sustainable National HIS.
Health Management Information System (HMIS) is the routine collection, aggregation, analysis, presentation and utilization of health and health related data for evidence based decisions by health workers, managers, policy makers and others.

In 2006, the health sector undertook Health Management Information System reform with Business Process Re-engineering (BPR) methodology, focusing on three main areas: data management, human resources and ICT.

Before the reform the HMIS, it was criticized for collecting too much data, with negative effects on both efficiency and data quality.

The fragmentation created redundancies in data collection and reporting which has overburdened health workers as they had to fill the same information on several different forms and as they have to report same content in different reporting channels.

Due to the multiplicity and lack of standards in collection and reporting, the compilation, comparison of data across periods and across geographic areas were impossible.

In general, the data burden was irrationally high that it imposed serious negative effects on the quality of data and the precious time of health workers i.e they spend more time collecting data than caring for their clients and patients.

In addition, there were lack of quantity and skilled human resource for HIS, ICT infrastructure and very minimal allocation of budget for HIS.

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<tr>
<th>HMIS AS-IS (Before the redesign)</th>
<th>HMIS TO-BE (After the redesign)</th>
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<tr>
<td>• Unstandardized recording and reporting procedures and tools</td>
<td>• Core Set of indicators with clear definition</td>
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<tr>
<td>• Fragmented systems with multiple recording &amp; reporting</td>
<td>• Standardized registers, patient cards, reporting forms…</td>
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<tr>
<td>• Too much data, mostly irrelevant</td>
<td>• Defined reporting flow, period</td>
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<tr>
<td>• Lack of information use</td>
<td>• Relevant data for decision esp at the point of data collection</td>
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<tr>
<td>• Poor linkage between data sources</td>
<td>• Integrated data system (recording and reporting tools)</td>
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<td>• Uncoordinated initiatives</td>
<td>• Harmonized efforts towards one reporting system</td>
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<td>• Lack of appropriate ICT support</td>
<td>• Electronic information systems</td>
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<tr>
<td>• Weak institutionalization</td>
<td>• M&amp;E Units and structures with trained manpower</td>
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<tr>
<td>• lack of budget, no use of technologies</td>
<td>• lack of skilled HIS expert</td>
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STANDARDIZATION

The country standardized indicators, recording and reporting forms, procedures, reporting channel and
calendar, so as to systematically measure and improve performance across locations or over time.

The standardization process resulted in 108 indicator list that are clearly defined with their level of disaggregation and source of data. Individual medical records, registers, tally sheets and reporting formats were developed with standard format and guidance. The indicator and their associated recoding and reporting formats were revised twice since then to answer the evolving needs and programmatic developments.

During BPR
- Parallel system unified
- Recording & reporting tools standardized & simplified
- Standard indicator definition
- 108 core indicators, 9 type of individual medical records, 16 registers, 13 tally sheets and 3 major report type

2014
- Electronic system already in place but siled
- Indicators and recording formats revised in line with HSDP IV and programmatic developments
- CHIS
- 122 indicators, 25 registers

2017
- Electronic system to a unified system DHIS2
- Indicators revised in line with HSTP and new developments
- 131 core indicators, individual medical

Future
- Interoperability between systems
- Regular need based update and review of core indicators and recordings
- EMR designed and implemented
- Improved quality of data and culture of data use of data for decision
- Urban, agrarian and pastoralist e-CHIS in action

System design, coordination, capacity building training and coaching and regular monitoring

Figure: HMIS life course in Ethiopia

INTEGRATION:
A single HMIS/M&E report which is shared by all programs and all partners, was a keystone of the BPR. During this process, data channels and tools, and the different M&E systems developed by different programs were integrated to form a unified system from which all consumers of HMIS information derive their data. This has drastically decreased the data burden on the data producers, saved health workers time and improved data availability and accessibility.

SIMPLIFICATION
There is no rationale for collecting data that is not used for decision. Content with this principle, the system was redeveloped to collect, analyze, and interpret only information that is relevant to performance improvement makes best use of scarce human and financial resources. The use of technology to ease and support the collection, compilation, analysis, quality control in the information flow was also an integral part of the simplification process.

As part of the broader HMIS reform, Community health information system (CHIS) was also designed and implemented within the framework of the Health Extension Programme. It is designed to assist in the management functions of health programs including collection of data on basic demographic statistics, health service delivery and utilization based on the health extension package in health posts. CHIS is implemented mainly using a unified data collection tool called family folder.

The reform also brought new HMIS Cadres namely Health Information Technicians (HIT) and MSc level M&E professionals to the health system that play critical role in HIS.

CURRENT STATE
- Information revolution, one agenda of health sector
- DHIS-2 online and offline versions support collection analysis and reporting
- Standardized indicator definition, disease classification, recording and report formats, reporting calendar and flow in place
- System still challenged by parallel recording and reporting requirements
- Quality of data and its use for decision improving but still sub optimal

FUTURE INVESTMENT/PRIORITIES
- Improving quality and use of data for decision at all levels, mainly service delivery points
- Improving interoperability among the different electronic systems
- Designing and Implementation of EMR
- System revision upon need and continuous capacity building to fill gaps
- Human resource for HIS development
COMMUNITY HEALTH INFORMATION SYSTEM (CHIS)

BACKGROUND

Ethiopia’s Health Extension Program (HEP) is a community-based strategy to deliver health promotion, disease prevention, and selected curative health services at the community level. It is a mechanism to provide health services in an equitable manner to all segments of the population in the country. The services are provided free of charge by health extension workers stationed at health posts.

Community Health Information System (CHIS), as part of the reformed health management information system, is designed to assist in the management functions of health extension programs through data collection on basic demographic data, health service delivery, and utilization based on the health extension package. As of 2012 CHIS has been implemented in all agrarian areas of the country using a family folder, which is a family centered tool, designed for rural health extension workers (HEWs) to manage and monitor their work in educating households and delivering an integrated package of promotive, preventive and basic curative health services.

Having the experiences gained from agrarian CHIS implementation and existing contextual differences in pastoralist and urban settings, customized tools were developed and initiated implementation in both pastoralist and urban areas. Accordingly, the pastoralist CHIS uses registers as recording tools with additional health service provision follow up tools named as ‘health service reminder card’ whereas urban CHIS uses community folder and other recording formats to manage and monitor their work in educating households and delivering integrated service packages.

ACHIEVEMENT

- Family folders that consists of afamily folder pouch, health cards (male & female), Integrat-ed Maternal and Child Care Cards are imple-mented in a total of 14,572 health posts found in Tigray, Amhara, Oromia, SNNP, Sidama, and Harari regions and the Dire Dawa City Administration. Field book, Master family Index (MFI), and Tickler file box are used in health service delivery.

Fig 1: Sample Agrarian CHIS Shelve

- An assessment was made in 2017 on the im-plementation of agrarian CHIS and a revision was made using the assessment findings as an input to accommodate 2nd generation HEP packages.

- The pastoralist CHIS registers that includes Ma-ternal and Newborn Health (MNH), Expanded Program of Immunization (EPI), Family Plan-nning, Growth Monitoring and Nutrition, and Curative Care have been implemented in Afar, some lowlands of Oromia and SNNP, and par-tially in the Gambela regions

- The community folder approach of urban CHIS was implemented in six cities, namely A.A, Bishoftu, Bahir Dar, Hawasa, Dire Dawa, and Harari.
AREA THAT NEED IMPROVEMENT

- Implementation of revised agrarian CHIS was delayed because of a lengthy printing process. Currently, up to half of the required number is printed.
- Pastoralist CHIS implementation has not yet been implemented in the Somali region.
- Skill gaps among implementers because of a limited number of trained manpower and a high turnover of trained HEWs.
- Limited supportive supervision to the health post from health center and woreda health office.
- Shortage of CHIS tools and absence of a tickler file box in most of the health posts.
- High workload of HEWs due to lack of clarity in their scope of work resulted in high workload which in turn contributed to data quality problem.

LESSONS LEARNED

- For the sustainability of CHIS, it is important to strengthen the community ownership of and demand for CHIS in general, particularly the family folders.
- CHIS improved the availability of programmatic data for monitoring and management decision-making.
- The use of tally sheets, which have a recording of the household number against the services provided by the HEW, were found to be very valuable in assuring data quality.
- The importance of translating the CHIS tools in regional working languages addresses language barriers and enhances proper utilization.
- The tickler file system ensures continuity of care by helping HEWs to track clients that need follow-up.

FUTURE PRIORITIES

- Implementation of revised agrarian CHIS in all health posts.
- Initiating pastoralist CHIS in the Somali region and strengthening this system in Gambela, Afar, and some parts of Oromia through making CHIS tools available and capacity building.
- Strengthening urban CHIS implementation in cities that are already implementing and scaling-up to nine more cities (Wukro, Mekale, Dassie, Adama, Arba Minch, Hasosa, Gambela, Jigjiga, and Semera).
- Work on the capacity of health centers and woreda health centers on CHIS and ensure that they are providing the required support and follow-up to CHIS implementation.
- Including CHIS training in the integrated refresher training (IRT) module.
- Scale-up of eCHIS implementation in a phase-based approach.
The Connected Woreda is Ethiopia’s program to realize the “Information Revolution” (IR) at the woreda level and is an integral part of the Health Sector Transformation Plan (HSTP), which aims to provide quality and equitable service delivery for all. The Connected Woreda plan operationalizes data-use innovations through instituting a tiered pathway for facilities and woredas as a whole to achieve the highest standards in data quality and use. This pathway begins with a grading process where health facilities are evaluated and scored against a common set of criteria related to HIS infrastructure and capacity, data quality, and administrative and clinical data use. Facilities and woredas that meet the highest standards and are able to access and share data with higher levels through offline mechanisms, are recognized as “Model Facilities” and “Model Woredas”. Model facilities and woredas that take this one step further by enabling online data access and transmission are recognized as “Connected Facilities” and “Connected Woredas”.

The Connected Woreda is about connecting woreda-level health institutions and people with better information in order to improve health system performance and ultimately outcomes. It is the program to realize the IR at the woreda level. The Connected Woreda involves communities, patients, health workers, administrators, and decision makers — from communities and health posts, to clinics and hospitals, to administrative offices at all levels, all the way up to the Ministry and its directorates.
Within the Connected Woreda…

• Communities are connected with better information about services available and their own health
• HEWs and clinicians have access to better data about their patients and communities and use it to deliver better care
• Woreda administrators have information and tools to support resource planning and supervisory/mentorship within the PHCU and across the woredas
• Supervisors at health centers provide support to HEWs with supervisory and PMT processes to improve standard of care
• Doctors and nurses at higher levels have patient history, while HEWs know the care their patients are receiving.
• Decision makers at higher levels understand the state of health across the woreda and can effectively support policy and planning for equitable, effective, and safe health care delivery
• The woreda is able to demonstrate best practices and support sharing and knowledge transfer to other woredas

The Connected Woreda achieves this via the integration of innovative, relevant, and resource-appropriate interventions to support the development of a data use culture and the integration of effective data systems, including digitalization.

GOALS AND OBJECTIVES

The main goal of the Connected Woreda program is to bring the information use cultural transformation at woreda and health facility levels that is necessary to drive systematic data use for decision-making and improvement of the quality and equity of care. This goal will be achieved through deliberate investment to achieve the following key objectives of the Information Revolution.

• improve the quality and accessibility of health information at all levels
• improve the culture of using health information for decisions at all levels in the health system with a special focus on data use at point of collection
• strengthen HIS capacity and infrastructure through improved designing and implementing comprehensive capacity building programs at individual, system, and organizational levels and improving connectivity and digitalization of HIS tools

CURRENT STATUS (ACHIEVEMENTS AND CHALLENGES)

In the past five years, the eral Ministry of Health has made steady progress in the implementation of the Connected Woreda Strategy. As part of the Woreda Transformation, the MOH started to implement IR model woreda interventions to improve data quality and information use for evidence-based decision-making. The MOH has conducted a national dissemination workshop with participation from all the RHBs, donors, and major implementing partners. The Ministry has also developed different standard training manuals focused on improving information use, data quality, HMIS data recording and reporting, and HMIS indicator reference guide for capacity building of health managers and health workers. A Connected Woreda assessment checklist was revised by including the health post community health information system as part of the assessment for assessing and grading PHCU. Furthermore, MOH has provided a national Master ToT for experts from regional health bureaus, implementing partners, and the six CBMP universities’ experts to cascade the training down to all the selected woredas.

In 2019, the Ministry identified a total of 44 woredas for targeted investment and support to create model woredas on HIS. The woredas selected were aligned with eight woreda transformation integrated implementation woredas and 36 of the woredas that are part of the capacity building and mentorship program (CBMP). MOH has started to implement Connected Woreda interventions to improve data quality and data use for evidence-based decision-making. The interventions implemented ranged from creating shared understanding of the Connected Woreda strategy, to developing data quality and data use training
manuals, building data management capabilities at woreda and health facility levels, and measuring system performance improvement using the Connected Woreda assessment criteria.

In addition, MOH has given due attention to bring information culture transformation in 28 high caseload hospitals. To this end, MOH has customized the IR model woreda measurement tool in order to fit it to a hospital environment. Clinical data use and clinical audit measurements were added to the IR measurement tool. The initiatives implemented in these hospitals include identifying HIS performance gaps, developing tailored plans, conducting awareness creation workshops and training, and tracking IR implementation status. Accordingly, 123 hospital staff were trained on the IR model woreda concept, data quality, and information use, coupled with DHIS-2 data analysis features. Of 28 hospitals, 4.5% achieved model status and 77.3% reached candidate level.

LESSONS LEARNED

• The role of woreda and facility level leadership is critical to drive the implementation of the Connected Woreda program. It is difficult to bring the aspired system changes without the full ownership and leadership of the woreda health office. Therefore, it is imperative to conduct sensitization work at the woreda level to own and properly implement the program.

• An integrated approach for the implementation of all transformation agendas is vital to show the impact of the investment in the health information system improvement program on the performance of the health system and at the end, overall health outcomes.

• Mentorship is a great vehicle to bring sustainable change and comprehensively build capacity at woreda and health facility levels. The changes anticipated to come through implementation of the Connected Woreda program requires rigorous and multidisciplinary mentorship. Therefore, it is important to standardize the mentorship tools, identify, and build capacity of mentors from hospitals, universities, and health administration units and properly document the changes brought as a result of this intensive mentorship.

NEXT STEPS

• Revitalize the implementation of the connected: this includes motivating all levels of the health system participating and supporting the Connected Woreda program at their respective levels. Key activities include:
  » Assessment of Connected Woreda sites
  » Leadership and Coordination
  » Resource Mobilization and Allocation
  » Technical Support Provision
  » Coordination of Planning Processes
  » Supportive Supervision and Mentoring Evaluation
  » Grading of Connected Woreda Sites

• Properly analyze and document learnings from the implementation of the strategy in the 44 woredas and 28 hospitals, including identifying more effective interventions that resulted in the observed change

• Revisit the assessment tools and approaches for intervention planning

• Mobilize partners to support a meaningful number of woredas where the impact can be shown on health data and HIS improvement at the national level
BACKGROUND

To ensure proper implementation of all the Information Revolution (IR) initiatives, strengthening health workforce capacity and motivation to collect, analyze, and use information at the frontline and program level is one of the critical elements. Framed within the context of the Connected Woreda initiative, the MOH established a capacity building and mentorship program (CBMP) and formed partnership with six universities (Addis Ababa University, Haramaya University, Hawassa University, Jimma University, Mekelle University, and University of Gondar). Universities were made the focal point of the CBMP partnership because they have the capacity and experience to deliver quality training, mentorship, and research services and are a local and sustainable resource. The universities are expected to provide technical assistance to support the RHBs and zonal health departments (ZHDs) in creating model health facilities and woredas through improvements in data quality and use of health information for decision-making.

As part of the CBMP, local universities offer HIS courses in pre-service and in-service trainings for health workers and managers to build their capacity to manage and use health information as well as to enhance HIS staff career opportunities. This partnership with local universities is not limited to individual capacity building via coursework or training; it also serves as a link between academia and program implementation (organizational capacity building), creates a center of excellence and demonstration site, and provides opportunities to conduct implementation research focused on health information and health systems strengthening initiatives.

CBMP GOAL AND OBJECTIVES

The overall purpose of this program is to support the MOH’s initiative of creating model health facilities and woredas through improvements in data quality and use of health information for decision-making at the administrative unit and health service delivery levels. CBMP aims to do so by integrating capacity building elements and digital tools through engagement and partnership with local universities. This includes:

- Improving data quality and the culture of using health information for decision-making at the lower levels in the health system
- Improving the capacity of health care workers and health managers to use health information for evidence-based decision-making
- Expedite the digitization process by creating awareness and building capacity of health workforce on eHealth implementation and management
- Building capacity of RHBs and woreda health office staff on data analytics and evidence generation

Implementation strategies

- Standardization and expansion of HIS pre-service and in-service training
- Mentorship and supportive supervision
- Establishment of eHealth application centers of excellence
- Implementation research
- Data triangulation and evidence generation

CURRENT STATUS

In the past four years, the MOH provided grants to the six universities to implement capacity building and mentorship activities initially in 38 woredas with a potential to scale-up to other woredas. From the 38 woredas, 11 of them are receiving intensive support to create learning and demonstration sites by implementing a fully functional HIS through improved data quality and information use for decision-making. The universities are implementing the CBMP in corresponding neighboring regions which are clustered into six catchment areas with a total of 255 sites – 181 health centers, 36 hospitals, and 38 woreda health offices.
In these woredas, universities provided support on baseline and follow-up assessments, onsite coaching and mentorship, supportive supervision, training, and other capacity building activities based on identified gaps during the baseline assessments. CBMP emphasized on high-impact interventions in the areas of data management, data quality, and performance monitoring teams (PMT) through quality improvement initiatives to increase the quality of healthcare data and its utilization. The program has begun to show promising progress and positive trends in performance — facilities and woredas are moving to candidate and model status in the Connected Woreda pathway. By the end of July 2020, half of the supported health facilities achieved ‘candidate’ status and 29% managed to reach ‘model’ level status.

To facilitate skill transfer from universities to woredas, MOH developed a mentorship guide that is used to provide targeted need-based mentorship visits by trained mentors. In addition, individuals who can serve as mentors were identified from the health system and received trainings, based on the mentorship guide, and are now able to conduct successful mentorship visits. Because of the mentorship support, health workers are able to identify root causes of poor HIS performance, prepare and implement tailored solutions, and measure improvements resulting from interventions.

The collaboration with universities also made possible the standardization and harmonization of the national health informatics training curriculum, including mainstreaming data quality and information use in the pre-service training. This effort ensures graduates are equipped with the knowledge and skills that correspond to the demand in the health sector. It also responds to the gap of trained HIS professionals in the country. In addition, ten computer labs were established in the teaching institutions. Each computer lab is set-up to accommodate 28 to 30 students at a time. The labs have helped to improve the quality and number of trainees as the country plans to upgrade more than 2,000 diploma-level health information technicians to a Bachelor’s Degree in Health Informatics so they can provide better service.

As a major component of capacity building in HIS, research opportunities are created for doctoral and master’s level students to apply scientific research methods learned in the classroom in researching and documenting learning from the IR initiatives. Six PhD students and close to 43 masters students from different tracks received the research grant.
LESSON LEARNED

• Bringing the needed capacity at the health facili-
ties and woreda level cannot be achieved through a one-time classroom training unless it is complemented with consistent on-the-job mentorship provided by trained professionals. It is important to strengthen the HIS mentorship by creating a pool of mentors at the RHB and woreda health office level.

• This program created a link between the health sector and academia ensuring sustainability and also providing practical learning opportunities to students.

• It is important to analyze and document the CBMP process and the effective interventions that resulted in observed change in the administrative units and health care delivery level.

NEXT STEPS

• Fully realize the Connected Woreda Strategy in currently enrolled CBMP health facilities and woredas and expand the program to other woredas across the regions.

• Improve sustainability and continue enhancement of selected eHealth applications by establishing Centers of Excellence and Academia within universities.

• Properly analyze and document learnings from the implementation of the program, including identifying more effective interventions that result in observed change. This includes conducting implementation research and document lessons learned in order to scale-up best practices and to inform health system improvement strategies/policies.

• Conduct a study to determine the impact of HIS interventions on improving the use of health information for decision-making and on improving maternal and child health service outcomes.

• Mobilize additional resources to expand the partnership to other universities to support the realization of the IR’s aspired systemic change at a large scale.
BACKGROUND

The Ethiopian Ministry of Health (MOH) introduced the five-year Health Sector Transformation Plan (HSTP) in 2015 which focuses on addressing quality and equitable distribution of health service delivery for all. Owing to the observed gap in the health sector, information use has been given substantial prominence in the HSTP I as part of the Information Revolution, which is one of the four transformation agendas.

Bringing cultural transformation in information use is one of the pillars of the Information Revolution agenda and it is the most challenging part as it requires addressing barriers that are linked to technical, organizational, and behavioral factors. The decision-making and problem-solving behavior of information users can heavily influence the ultimate use of data for service delivery improvements. Both data producers and users function in an organizational context that can support or hinder them to use information for action.

Performance monitoring meetings are one of the data use platforms institutionalized at all levels of Ethiopian health system, both at administrative health units and health facilities, from the MOH to primary health care unit level. The meeting is facilitated by a designated team called a Performance Monitoring Team (PMT), which is a team of multidisciplinary health workforce primarily responsible to improve data quality and information use to monitor progress and improve performance at all levels on a monthly basis. The meeting is chaired by the head of the institution at all levels.

OBJECTIVES OF PMT

- To improve data quality through application of different data quality assurance techniques
- Assure results-based monitoring and evidence-based decision-making to improve the health sector’s performance.

ACHIEVEMENTS

- According to HSTP I midterm review report, in some regions the PMT is fully functional with recorded minutes
- Establishing a PMT at all levels of the health system is becoming a norm. The assessment done in 2019 at 129 selected health centers across the country showed that 91% of facilities had established PMTs according to the national standards
- PMTs are contributing to improving the data use practice in the health system. A qualitative study to explore the Drivers and Barriers to Improved Information Use for Decision-Making in 2020 reported the PMT platform as among the major drivers that improve the data use practice at the point of health care delivery

AREAS THAT NEED IMPROVEMENT

- The output of strengthened HIS is measured by data quality and data use. Even though facility level PMTs reported that they are doing LQAS before reporting to the next level, verification during the HSTP mid-term review showed that the reported results did not always reflect the correspondence between the data on paper and computer-based systems. Furthermore, during routine desk review analysis, there is a chronic problem on internal consistency of the data.
- Most facilities reported establishing their respective facility PMT. However, frequent meetings were not common. In facilities where they meet regularly, they usually focus on coverage indicators, and do not conduct root cause analysis for observed performance gaps nor do they develop interventions to address identified gaps.
• The HSTP midterm review and health extension program assessment reported limited information use in general. Even though information utilization was observed particularly in the areas of planning, resource allocation, and performance measurement, it was not systematic and uniform across the board.

• Limited leadership engagement on strengthening PMTs at different levels of the health system.

• A data use culture has been defined as values, beliefs, and continuous practice among members of an organization for collection, analysis, and use of information to accomplish its goals and mission. However, data collection, analysis, and use are not perceived as everyone’s task in the country health system.

• Limited synergy and alignment between facility level PMT and quality team. Each of them considers themselves as a separate entity.

LESSONS LEARNED

• In places where PMT are fully functional there is improvement in data quality as well as the demand to use data for decision-making.

• Facility level data use platforms are not communicating and complimenting each other as required.

FUTURE PRIORITIES

• Generate evidence on factors affecting functionality of PMT at the different levels, document lessons and best practices on the contribution of PMT in ensuring data quality, data use, and service delivery improvement.

• Work to change health worker and leadership’s unfavorable attitudes toward data, create an accountability mechanism and link data with performance-based incentives.

• Harmonize PMT with other facility level data use platforms, such as quality team, weekly data day, clinical review session, and other data review forums.

• Establish data use as everyone’s tasks at all times for decision-making in the country’s health system.

• Strengthen institutionalization of the five-step approach to improved data use.

5-STEP APPROACH TO IMPROVING DATA USE

Supportive Supervision

STEP 1
IDENTIFY
Problems or performance gap or areas of improvements

STEP 2
PRIORITIZE
Problems or performance gap or areas of improvements

STEP 3
INVESTIGATE
The causes

STEP 4
INTERVENTIONS
Develop action plan/solutions

STEP 5
IMPLEMENTATION
Problems or performance gap or areas of improvements

Performance Review Teams
ETHIOPIAN HEALTH SECTOR PLANNING

HEALTH SECTOR STRATEGIC PLANNING

Ethiopia has completed a 20-year plan in four successive phases of health sector development plans (HS-DPs) since 1997 to 2015. These plans were followed by a long-term health sector transformation plan which shifts the strategies from access to quality and equity. Currently, implementation of the first phase of the plan (HSTP I) is completed, and development of the second round (HSTP II) is close to be finalized. During the development of strategic plans, the following considerations were taken into account: global priorities, series of consultations with relevant stakeholders, alignment of the plan with the country’s macro-economic development framework, successes and challenges during previous plans.

These strategic plans were also developed at sub-national levels, including health facilities, in a coordinated and aligned manner.

Ethiopia has now more than a decade of experience with this planning process, and every year more than a thousand districts/woredas are coordinated to develop their annual plans in a participatory way.

Using the “One-Plan, One-Budget and One-Report” principles of harmonization and alignment as a foundation, the woreda-based planning process employs both at up-down and bottom-up approach in order to link national and local level priorities.

In the top-down process, indicative priorities and targets are prepared at the sector level and are cascaded to lower levels, considering their levels of performance. Parallelly, resources mapped from all partners for the year are communicated down the hierarchy of the health system.

Woredas then develop their own evidence-based plan using the cascaded targets and priorities but very importantly, considering their local context, situation, and capacity. This process is the actual plan development cycle where a panel of experts sit together to define their high-impact interventions and set SMART goals.

The use of concrete and reliable evidence to prioritize high-impact interventions is the most prominent element of the process. Based on the available information, root causes of health and health system problems are identified and appropriate solutions/interventions are analyzed to tackle the hurdles.

In the bottom-up process, the actual plans (targets) are aggregated bottom-up to formulate zonal, regional, and national level plans. In each level, reconciliation of actual targets with the indicative plan occurs to maintain the balance.

THE WOREDA-BASED HEALTH SECTOR PLANNING PROCESS

In order to operationalize the strategic plans, Ethiopia uses an annual woreda-based health sector planning process, which pinpoints the woreda as a center piece of implementation.
As part of the planning process, public hospitals also prepared their annual plan while considering the five-year health sector strategic plan and the indicators and initiatives specifically designed for hospital level.

Annual plans are developed in two stages: the core plan which is about mainstreaming priorities and setting national targets; and the comprehensive (detailed) plan which is the core plan plus other activities of local importance.

Different planning frameworks, such as strategic planning management (SPM) and Balanced Scorecard (BSC) have been utilized. Moreover, different target-setting and costing tools, such as marginal budgeting for bottleneck analysis (MBB) and OneHealth tool (OHT) were used in different occasions.

LESSONS LEARNED

• Sub-national capacity and ownership in plan development and implementation has improved
• Efficiency and effectiveness has improved by avoiding fragmentation and designing cost-effective planning processes

• Supporting the planning process with simplified target-setting and costing tools encourages planners at all levels
• The woreda-based planning will remain the major platform for using evidence for decisions
• Planning is becoming more participatory and interactive at all levels.

FUTURE INVESTMENT/PRIORITIES

• Digitalizing the planning tools
• Improving the quality and use of the plan for budget negotiation and performance review at all levels
• Refining standard operating procedures for strategic and operational plan preparation
• Exploring and introducing simplified target setting and costing tools for the annual planning process
DATA QUALITY ASSURANCE MECHANISMS/INITIATIVES

DESCRIPTION OF THE INITIATIVE

Improving data quality and promoting the culture of information use is at the center of the Information Revolution agenda. It is widely recognized that quality data leads to better clinical and health admin decisions that result in better health outcomes and health system performance for the country. The Federal Ministry of Health (MOH) has been working towards continuously improving data and information quality within the health sector.

The Ministry reformed the health management information system in 2008 with the core principles of simplification, standardization and integration. It also pinpointed improving quality of data to enable better decisions and thus better health outcomes at the heart of the reform. The reform registered significant improvements in the availability and completeness of source documents and report accuracy. However, overall data quality is still not at the required level and a lot has to be done if the data is to be relied upon so as to inform decisions on health policy, health programs, and allocation of resources.

OBJECTIVE

The main objective here is to improve the quality of routine data that is generated at all levels of the health system thereby creating acceptable level of trust on the data in order to inform evidence-based decisions.

DATA QUALITY DIMENSIONS

Data quality dimensions can be categorized as those measured at facility level (site level) or above site level based on the level where they are monitored. They can also be classified as those determined at design stage (precision) or those that can be monitored at implementation level.

The data quality dimensions that MoH identified are:

- Completeness (Representative and content: Recording and reporting)
- Timeliness
- Accuracy & Validity
- Consistency (Internal and External)
- Legibility
- Accessibility
- Confidentiality
- Precision
- Integrity
- Relevance

DATA QUALITY ASSURANCE TECHNIQUES

The major data quality assurance techniques implemented at service delivery and intermediate health administration units to bring continuous improvement of data quality are listed below:
Major data quality assurance Techniques

<table>
<thead>
<tr>
<th>At administrative level</th>
<th>At Health Facility Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>» Data quality desk review</td>
<td>» Visual scanning (eye Balling)</td>
</tr>
<tr>
<td>» Routine Data Quality Assessment (RDQA)</td>
<td>» Consistency check using Lot Quality Assurance Sampling (LQAS)</td>
</tr>
<tr>
<td>» Data Quality review (DQR)</td>
<td>» Cross checking registers with medical records</td>
</tr>
<tr>
<td>» Performance of Routine Information System Management (PRISM)</td>
<td>» Cross checking medical records with registers</td>
</tr>
<tr>
<td>» Visual scanning</td>
<td>» Other health facility assessments (system assessment part)</td>
</tr>
<tr>
<td>» Community verification</td>
<td>» Community verification</td>
</tr>
<tr>
<td></td>
<td>» Data quality desk review</td>
</tr>
</tbody>
</table>

MAJOR INITIATIVES IMPLEMENTED TO IMPROVE DATA QUALITY

• Advocacy against falsification
• Implementation of the connected Woreda strategy
• Capacity building (Onsite and offsite trainings) for Managers; health workers; monitoring and evaluation experts; and health information technicians
• Regular mentorship and supportive supervision
• Digitalizing the data collection and aggregation systems
• Regular data quality check and feedback mechanisms
• Improving the culture of use of data for decision at all levels
• Shifting from incentivizing merely performance, which may promote falsification, to a data quality assured performance

CURRENT STATUS

• MOH has achieved various major milestones that directly or indirectly contributed to improved data quality (capacity building, system design, Standardized tools and process, guidelines etc).

FUTURE PRIORITIES

MOH will maintain providing extra attention to improving the quality of primary data from collection through all steps of the data management cycle to utilization. The following will be the major areas on intervention:

• Institute sustained and comprehensive implementation of data quality assurance techniques at all levels of the health system and by all parties involved (Health care workers, M&E experts and Managers)
• Intensified capacity building training on data quality augmented by continuous mentorship and coaching
• Strengthen initiatives to improve the culture of use of data for action at point of service delivery and administrative levels
• Continue implementation of the connected woreda strategy at scale
• Conduct regular data quality reviews and provide feedback at all levels
• Undertake regular data quality related assessments and studies to inform existing strategies
• In place accountability system for poor quality data
• Further emphasize on digitalizing the system and optimizing the existing system with additional data quality apps and metrics
DATA ANALYTICS AND INFORMATION PRODUCTS

DESCRIPTION

Defining data requirements, deploying a robust health information infrastructure, standardizing data collection and reporting formats, having good health information system governance in place, and routinely collecting high quality data may be the necessary conditions, but are not alone sufficient to transform the practice of data use in the health system. Transforming data to valuable information products by performing simple to advanced analytics is a vital component of the information system that generates evidence for the provision of quality and equitable health services to the public.

Since 2007/8, the Ethiopian health management information system (HMIS) underwent a series of reforms and revisions, responding to identified gaps and the emergence of new initiatives. As a result, the country has the most stable, standardized, integrated, and responsive system for an ever-growing data demand by different health intervention programs. In 2016, Ethiopia developed the Information Revolution roadmap (IR) that focused on strengthening HIS digitization and improving the practice of information use for decision-making in the health sector at all levels. As a result, a move to newer and open source technologies to capture, analyze, and transmit HMIS data become mandatory. The nationwide implemented digital platform to automate the routine health information system, DHIS2, has several features enabling users to perform data quality checks and various analytics work. The dimensional architecture of the database and its online capabilities has made the system a choice of technology to produce and share information products in real time, ranging from routine to ad-hoc reports and simple to advanced analyses, using its reporting and analytics tools.

However, the practice of generating routine reports and evidence to monitor program performance, ensure quality and equitable health, understand and follow trends of disease distribution, determine the required health commodities and human resources, and perform data triangulation by program experts using DHIS2 and its capabilities was at its infancy stage. One of the main reasons for the creation of such a data rich but information poor situation was the lack of a continual effort to build the capacity of program experts at national and sub-national levels. In addition, there was limited effort to use the existing data use platforms to enhance data analytics work as a routine practice.

Cognizant of this issue, the Planning and Policy directorate, in collaboration with relevant stakeholders, developed a data analytics concept note and implemented the plan to intervene in the aforementioned data analytics work challenges by leveraging the existing infrastructural and human resources.

OBJECTIVE

The main objective of implementing the data analytics activities was to enhance the practice of information use at national and sub-national levels, using DHIS2 analytics tools through increasing the level of knowledge and skills of program experts and creating access to the data and the system’s analytic features.

IMPLEMENTATION APPROACHES

As part of the development of the data use concept note, a quick gap assessment was conducted to formulate the appropriate interventions. Based on the observations, limited competencies of DHIS2 data use, lack of a monthly data review practice, and little to no access to the DHIS2 system were the major factors halting the practice of data analytics and evidence generation by program experts. Therefore, the following interventions were implemented at national and sub-national levels. The PRISM framework was the foundational base for the theory of change of these interventions.
• Capacity building through hands-on computer training
• Revitalizing the practice of a monthly data review at the program level
• Leveraging existing display tools for data visualization; and
• Improving the access to DHIS2 through reducing its down time using cloud technology

With the support of the University of Gondar and JSI/DUP, advanced DHIS2 analytics training was given to higher-level PPMED experts. On-site cascaded training was conducted for all directorates and case team program officers and experts, focusing on the basics of DHIS2; data quality checks; custom and pre-defined report generation; and analytics tools, such as pivot charts, maps, dashboards, and scorecards. MCH, Disease Prevention, Control, and HRH were some of the directorates involved in the tailored training for the respective program experts/officers. For each case team, a DHIS2 expert was assigned as a mentor from PPMED.

On the other hand, DHIS2 specialists from HITD have created user accounts for each user with adequate privileges to access and manipulate routine data collected by DHIS2. This team has also built and shared a dashboard for key performance indicators that can be accessed publicly. To improve the system availability for DHIS2 users, HITD has moved the server from local to cloud based technology. The result was tremendous, increasing its availability from 67% to 99% in 24 hours. PPMED also took the lead to revitalize the monthly data review at case team/program level and provide technical support on data quality check techniques, root cause analysis, and generating information products such as reports and program specific bulletins.

Alongside the routine practice of data analytics, and in response to the rising need of monitoring the effects of the COVID-19 pandemic on the essential health services, the directorate has started to perform in-depth analysis of data for selected program indicators on a monthly basis. Similar efforts have been initiated at the regional level.

IMPLEMENTATION STATUS

Despite the fact that transforming the culture of data use to the next level is a long process, the observed changes in the practice of generating program level reports and other analytics products and performing data quality checks using DHIS2 since the implementation of those interventions (after November 2019) was highly encouraging. These days, most program experts have access to DHIS2 data and are capable of producing their periodical HMIS and KPI reports; developing and using program specific dashboards; creating scorecards for performance comparison against the target and across specific catchment areas; conducting monthly data review meetings; and providing feedback on data quality issues. The role of leaderships, especially at the directorate level, for creating a data demanding environment and system buy-in was paramount.
<table>
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<tr>
<th>WHO/ZHD</th>
<th>Institution Type</th>
<th>Contraceptive acceptance rate (CAR)</th>
<th>% of Premature LAFP removal</th>
<th>Antenatal care (ANC) coverage first visit</th>
<th>ANC1-4 Drop out rate</th>
<th>Antenatal care (ANC) coverage four visits</th>
<th>Proportion of pregnant women tested for syphilis</th>
<th>Early postnatal care (PNC) coverage</th>
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<td>97%</td>
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</tr>
</tbody>
</table>

**LESSON LEARNED**

- Enhancing the end users’ knowledge and skills was the key to improve program experts’ data use practice.
- Increasing the practice of data use, using the data captured by the routine system, has greater contribution to data quality improvement.
- Improving access to DHIS2 drastically changes system buy-in by program experts/officers.

**FUTURE PRIORITIES**

So far, the focus of the data use activities is mainly dependent on descriptive and exploratory types of analytics work. Given the availability of big data, and the growing demand to generate evidence to solve health problems, deploying advanced data analytics techniques, such as predictive data modeling, data mining, and machine learning is the future priorities.
IMPROVING LOCAL CAPACITY AND INCREASING EVIDENCE FROM IMPLEMENTATION RESEARCH TO SCALE-UP DATA USE INTERVENTIONS

BACKGROUND

Health information system is crucial to achieving better health and a key information source to monitor the overall progress in a country's development. Revolutionizing the availability, accessibility, quality, and use of health information for decision-making processes, through the establishment of an information culture and the appropriate use of information communication technology, can ultimately impact the access, quality, and equity of healthcare delivery at all levels in Ethiopia.

The Information Revolution (IR) is not only about changing the techniques of data and information management; it is also about bringing fundamental cultural and attitudinal change regarding the perceived value and practical use of information. To achieve this, the Ministry of Health (MOH), in collaboration with donors and partners, has embarked on an initiative for embedded implementation research, which adopts an implementer-led approach to identify best interventions to improve data quality and information use, how they will be implemented, and the challenges around at-scale implementation. In this initiative, decision makers and implementers have a substantive role in identifying research questions, working in collaboration with local researchers to collect data and conduct analysis, and translating findings into recommendations for program and policy changes. In this regard, it is an excellent platform to link researchers and implementers and build bridges. Hence, relevant staff from the Ministry of Health, regional health bureaus, local universities, and selected partner organizations are participating in this activity.

This research will be linked to the data use interventions in demonstration sites in order to generate evidence on successful implementation and scale-up of evidence-based interventions to strengthen health systems and improve health outcomes.

WHY IS IMPLEMENTATION RESEARCH NEEDED FOR THE INFORMATION REVOLUTION?

Despite improvements in HIS functions over the past decade, there is little evidence on successful behavior and cultural interventions on perceived value and use of information for decision-making and how to deliver those interventions effectively in diverse settings and within the wide range of the Ethiopian health systems. The IR roadmap defined a monitoring and evaluation plan with indicators and targets to measure achievement toward the IR interventions. The implementation research agenda will be a level above such granular measurement of indicators and results.

The embedded implementation research initiative has the following objectives:

- To build a body of evidence around successful data quality, data use, and digitization interventions
- To channel evidence, knowledge, and learning from implementation research directly into the important work of implementers and policy makers, accelerating the introduction, adoption, spread, and scale-up of new or refined data use interventions, innovations, and practices
- To improve capacity of researchers and implementers to contribute to and benefit from implementation research on the IR
- To support collaboration between researchers and implementers to facilitate understanding of the implementation research process with regard to HIS performance and health service improvement.
The findings from these researches will enable the Ethiopian health sector to address real concerns of data users and managers, leading to action to alleviate implementation barriers, develop a learning cascade to share and disseminate to others as insights are gained and discoveries made, and contribute to the country’s and global evidence base on improving data use in the health sector. Ultimately, the implementation research agenda will help the health sector and other stakeholders understand what systems, interventions, and strategies contribute most effectively to improving data quality and information use and thereby improving key health outcome.

CURRENT STATUS

In order to ensure rigor in documenting processes and learning around data use and digitization interventions, collaborative research teams comprised of staff from MOH, RHBs, and faculties from lead universities are established. These research teams are tasked with conducting implementation research around data use interventions on selected priority eHealth applications e.g. DHIS2, eCHIS, EMR, etc.

In November 2019, an implementation research agenda setting and capacity building workshop were conducted. More than 30 participants from six local universities, all regional health bureaus, MOH, and selected woredas successfully completed the training. The workshop helped to identify a list of prioritized learning questions that when answered will help guide implementation of the IR and make better, more informed decisions.

Following the implementation research capacity building workshop, the collaborative research teams have defined their research areas. The research topics covered include: testing a data use incentive package, strengthening performance monitoring teams for better data quality and information use, strengthening data quality assurance mechanisms, the role of effective mentorship and supportive supervision for improved HIS performance, and strengthening HIS governance (leadership commitment and engagement) for better results.

Currently, most research teams finalized their research proposals, obtained IRB approval, and are ready to collect preliminary data that will be used to design the interventions (the model to be evaluated).

NEXT STEPS

• In FY20/21, the first phase of baseline data collection and report write-up is expected to be accomplished along with defining and implementing the model to be tested.

• The research teams will document lessons learned at each phase of HIS improvement interventions (i.e. Frame, Make, Design, Scale) to ensure lessons are captured and disseminated across learning sites.

• More training opportunities for implementation research need to be made available to program staff or implementers. Thus, building implementation research courses into universities’ postgraduate training programs, such as an MPH, is seen as an important next step.
CAPACITY BUILDING FOR THE INFORMATION REVOLUTION

BACKGROUND

In the Ethiopian health system, the utilization of information for policy and strategy formulation, planning, and decision-making is not widely practiced, especially at the lower levels. One of the main reasons for the low usage of information for decision-making is the limited capacity of the health system for data management and information use. Capacity is understood in the most comprehensive way, involving individual, organizational and system capacity. Not only do human resources lack the required skills and competency, but also the health system as an organization lacks the capacity to support the health staff in better using information. Further, the existing health information systems (HIS) are weak and fragmented. The whole HIS processes in the Ethiopian health system involve staff engaged in data entry, data management, information system planning, implementation, and management as well as program monitoring and evaluation. These activities, along with planning and implementation of other major flagship initiatives of the Information Revolution, require a mix of professionals with basic and advanced training in different HIS competencies. However, the educational qualifications of staff assigned in the positions tasked with the above roles are not at the required level from national to health facility levels. The majority of the human resources engaged in health information management are found to be either technicians or supporting staff with inadequate skills in HIS functions. The problem is further compounded by the lack of retention mechanisms of capable and experienced personnel. Consequently, along with other barriers, human resources have been one of the major challenges to implement robust e-health services and to bring the aspired cultural transformation in health information use. This challenge needs a broader capacity building exercise at facility, woreda, regional, and national levels. The Ministry of Health (MOH) has also recognized the need for building adequate human resource capacity to effectively manage the routine health information systems.

GOALS AND OBJECTIVES

The main goal for building capacity of HIS staff from the federal all the way to the facility level are twofold. On one hand, the capacity building program, if designed properly, can enhance data systems and improve using HIS results as a driver for decision-making and health system performance improvements. In this line, the HIS staff at all levels have to be capacitated in order to implement and manage a robust health information infrastructure as well as capabilities in data management, and use for evidence-based decision-making. On the other hand, the current human resource situation at all levels in the health system is challenged by multifaceted problems including:

- Shortage of skilled human resources, high turnover, and absence of motivation and retention schemes
- Shortage/lack of health information officers at woreda levels
- Limited capacity (shortage and poor professional mix) in core health information sciences
- Limited capacity building activities at national and regional levels
- The conventional capacity building programs in the past has not always achieved its intended results of producing and retaining qualified staff
The above opportunities and challenges call for an extensive and innovative capacity building program, through which the sector’s HIS personnel will be engaged in a training program. The plan is to produce and deploy an adequate number of skilled HIS professionals, required at all levels in the health system, in a short period of time through the strengthening of existing programs and support for the opening of new programs.

**CURRENT STATUS**

MOH has been implementing strategic capacity enhancement activities, which created local capacity focusing on building skills in data analysis, interpretation, and use among data users for service delivery, planning, and policy making within the health system and local universities. The capacity building efforts are focused on providing training, developing and standardizing pre-service and in-service training curriculum and manuals, HITs curriculum revision, and introducing academy level trainings and CoEs for major HIS.

In collaboration with local universities, MOH developed a nationally harmonized Bachelor’s Level Health Informatics curriculum for a generic and advanced standing program. The curriculum was approved by the Ministry of Education and it was distributed to all universities throughout the country. To date, about eight universities have begun offering pre-service health informatics programs using the newly harmonized curriculum. Other universities are expected to launch programs in the next academic year. The advanced standing curriculum, which is also approved, allows Health Information Technicians (HITs) to upgrade their qualification to a bachelor’s level.

A joint team composed of MOH, University of Gondar, and other universities developed eight standardized pre-service training modules for major health informatics courses. This effort ensures that graduates are equipped with the knowledge and skills corresponding to the demand in the health sector. It also responds to the gap in trained HIS professionals in the country. Work will continue to further improve the pre-service teaching quality within partner universities.

Similarly, in-service training manuals have been standardized based on the national in-service training guideline. Accordingly, the HMIS recording and reporting, health data quality, and information use training manuals were developed and disseminated to all woredas and health facilities. In order to sustainably support the efforts of MOH to locally support and innovate on digital health tools, a national digital health innovation and learning center has been established. Likewise, DHIS2 and eHealth architecture and interoperability academies have been opened at Gondar and Mekelle universities respectively.
The MOH has also developed a ten-year HIS human resource development roadmap (2020–2030), which provides guidance on the future need of human resources in numbers and professional mix to properly support the various national HIS. The roadmap also documents the existing and future demand for human power and plan for human resource development, as well as the knowledge and skills needed at all levels of the health system.

LESSONS LEARNED

- A detailed capacity assessment of the HIS is required not only to identify appropriate interventions, but also to establish a baseline so as to be able to measure the results of the capacity building interventions.
- In order to build sustainable capacity that will ensure country ownership and leadership in HIS development and implementation, a more comprehensive capacity building strategy for the Information Revolution is required rather than focusing only on improving individual staff capacity. Improving the system components required for HIS functionality and creating an organizational environment conducive to the use of information for decision-making are equally important system and organizational capacity building components that require adequate attention.

NEXT STEPS

- Build HIT personnel capacity by standardizing the training curriculum and build capacity of health science colleges on major HIS implemented in Ethiopia, linking education with practice, and introducing standard online courses
- Build capacity of health professionals to use data by mainstreaming HIS courses in the pre-service and in-service health professional programs
- Build capacity of staff at all levels to enter, report, analyze, and use data from different points of care and institution-based HIS
- Build capacity of staff at federal and regional levels on advanced data analytics techniques
- Expand academy level training across different HIS in all universities for sustainable capacity building and support
INTRODUCTION

Health and health-related data are generated by multiple institutions, and the process of evidence generation and decision-making in the health sector comprises all sources of information, including surveys and surveillances. The objective of surveillance and surveys is to improve evidence-based decision-making at the individual, household, and community level in addition to all levels of the health system through generating, sharing, analyzing, synthesizing, and using quality data for priority setting, planning, and evaluation of health policies, strategies, programs, and interventions.

The below are among the major surveys and surveillances that play a substantial role in providing evidence for action in the health sector.

Census: Population data is the foundation of the health information system. The availability of up-to-date population figures at different administrative levels is crucial to plan health services and measure changes. Ethiopia has conducted three censuses in its entire history: the first in 1984, the second in 1994, and the third and last in 2007. The 2007 census is the most recent and showed that Ethiopia has had 74 million people in 2007. Since vital statistics is at its infancy, in 2012, the Central Statistics Agency (CSA) produced long-range population projections for Ethiopia using projections from the 2007 census, and the 2017 planned census has been postponed due to security and more recently, due to COVID-19 concerns.

DEMOGRAPHIC AND HEALTH SURVEY (DHS)

The Demographic and Health Survey (DHS) is one of the major sources of population data on health outcome and impacts indicators. CSA is mandated to carry out DHS every five years. Four Ethiopia DHS have been conducted (in 2000, 2005, 2011, and 2016). The Ethiopia Mini Demographic and Health Survey (EMDHS) has been designed to measure progress of selected indicators between series of major DHS. The first EMDHS was conducted in 2014 to obtain current information on: contraceptive prevalence; maternity care indicators, including at least one antenatal visit, and skilled birth attendance at delivery; and data to measure specific MDG indicators. The 2019 EMDHS is the second of its type in Ethiopia. It was implemented by the Ethiopian Public Health Institute (EPHI) at the request of the Ministry of Health (MOH) to provide updated information on key health indicators since the EDHS 2016 and to measure the progress of the health sector goals set under the GTP, which is closely aligned to the SDGs.

HEALTH AND DEMOGRAPHIC SURVEILLANCE SYSTEMS (HDSS)

Health and Demographic Surveillance System (HDSS) — HDSS is a complete and repeated registration of the resident population, as well as births, deaths, and migration, in a geographically defined population. The HDSS was initiated since the country had no continuous and systematically organized registration of vital events at the community level and nationwide surveys, which are used as sources of information, are conducted infrequently. The Ethiopian Public Health Association (EPHA) and six local universities (Addis Ababa University, Jimma, Gondor, Haroma-ya, Mekelle, Arbaminch) launched one mortality surveillance program in collaboration with the CDC to produce data which may reflect some pictures of the country related to health and demography. This network, named the ‘Ethiopian Universities Research Centers Network,’ was established in 2007. Before the establishment of the network, there were isolated efforts by individual universities such the Butajira DSS site which was managed by AAU school of public health. The HDSS sites follow a dynamic, open cohort, based in the community, to register the occurrence of vital events, while the Addis Ababa Mortality Surveillance Program (AAMSP) registers deaths by cemetery clerks in a burial based surveillance system. With the exception of the AAMSP, all HDSS sites follow the same method and procedure to identify the underlying causes of death at the community level.

MATERNAL DEATH SURVEILLANCE AND RESPONSE (MDSR)

The MOH launched the national Maternal Death Surveillance and Response (MDSR) system in May 2013.
that was rolled-out in phases for nationwide implementation. It is a system being implemented in the entire country to ensure that every maternal death (at home or in a health facility) is identified, audited, and responded to. The system operates as part of the national Public Health Emergency Management (PHEM) system at health facility and community levels to identify and capture maternal deaths happening in both facilities and the communities.

**EMERGENCY OBSTETRIC AND NEWBORN CARE (EMONC) SURVEY**

In Ethiopia, it is a national census of all facilities that provide delivery services. The primary objective of the EmONC assessment is to provide up-to-date information for policymakers, planners, researchers, and program managers, which would allow guidance in the planning, implementation, and monitoring and evaluation of maternal and newborn services in the country. The first EmONC assessment in Ethiopia was conducted in 2008 led by the Family Health Team MOH in collaboration with partners. The second assessment was conducted by the Ethiopia Public Health Institute (EPHI) in 2016.

**PERFORMANCE MONITORING AND ACCOUNTABILITY 2020” (PMA2020)**

Current DHS data are reported in five-year intervals—a lengthy gap that restricts the ability of stakeholders to make timely adjustments to policies and programs based on these data. PMA2020 data are intended to fill gaps in the availability of current and reliable information on population dynamics; family planning; reproductive health service delivery; and water, sanitation, and hygiene (WASH). The goal of PMA2020 is to contribute to a global monitoring and evaluation system for family planning and uses innovative mobile technology to support low-cost, rapid-turnaround, nationally representative surveys to monitor key indicators for family planning and water and sanitation. The Addis Ababa University School of Public Health completed six rounds of the PMA2020 family planning survey in Ethiopia between 2014 and 2019.

**STEPWISE APPROACH TO SURVEILLANCE (STEPS)**

The WHO STEPwise approach to surveillance (STEPS) is a simple, standardized method for collecting, analyzing, and disseminating data on non-communicable diseases (NCDs) and risk factors. Data from STEPS surveys can be used by countries to help monitor progress in meeting the global voluntary targets related to specific risk factors such as alcohol, tobacco, diet, and physical inactivity. Nationally representative surveys on NCDs and their risk factors in Ethiopia were not available until the inception of HSTP. A population-based ‘STEPS’ survey was conducted in Jimma (southwest Ethiopia) from 2008 –2009 which showed a substantial burden of NCDs and their risk factors within the community. Ethiopia has conducted a sub-national STEPS survey in Butajira in 2003, in Addis Ababa in 2006, and a national STEPS survey in 2015. The 2015 survey is the first national representative population-based risk factor survey conducted in Ethiopia.

**MALARIA INDICATOR SURVEY (MIS)**

Malaria Indicator Surveys (MISs) were developed by the Roll Back Malaria (RBM) Monitoring and Evaluation Reference Group (MERG) with the aim to help national ministries of health collect key and timely information on malaria control at the national level. Additionally, the information collected during MISs is comparable with existing DHS and multiple indicator cluster surveys (MICS) protocols, which allows for the comparison of data amongst the surveys and monitors the progress of National Malaria Control Program efforts. A DHS took place in Ethiopia in 2005 before the massive scale-up of key interventions launched in 2005. In order to evaluate progress, in 2007 the MOH conducted a Malaria Indicator Survey (MIS), applying the Roll Back Malaria Monitoring and Evaluation Reference Group tool that uses similar methods to DHSs and multiple indicator cluster surveys. Another round of MIS was carried out in 2011, 2015, and 2019 with the support from several key partners.

**OTHER SURVEILLANCE AND SURVEYS**

The below are other key general health system and program specific surveys and surveillances conducted over the previous years in Ethiopia.

- ANC surveillance surveys
  - Since 1988, every two years since 2000 and regional estimates since 2005
  - 2018 round under analysis
- Ethiopia Population Based HIV impact assessment (EPHIA): 2017-2018
A household-based national survey in urban Ethiopia, was conducted between October 2017 and April 2018 in order to measure the status of Ethiopia’s national response to the urban HIV epidemic.

- TB prevalence survey: 2011

- Facility-based surveys: SARA (2016 and 2018) and SPA (2013/14 and the second round is under preparation)


<table>
<thead>
<tr>
<th>S.N</th>
<th>Name of Survey</th>
<th>Type (Facility or HH)</th>
<th>Frequency</th>
<th>Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Service Provision Assessment (SPA) Plus</td>
<td>Facility</td>
<td>5 years</td>
<td>EPHI</td>
</tr>
<tr>
<td>2</td>
<td>Service availability and readiness assessment (SARA)</td>
<td>Facility</td>
<td>2 years</td>
<td>EPHI</td>
</tr>
<tr>
<td>3</td>
<td>Demographic and Health survey</td>
<td>Household</td>
<td>Every 5 years</td>
<td>EPHI/CSA</td>
</tr>
<tr>
<td>4</td>
<td>Mini Demographic and health survey</td>
<td>Household</td>
<td>Every 2 and 1/2 years</td>
<td>EPHI/CSA</td>
</tr>
<tr>
<td>5</td>
<td>Emergency Obstetric and Newborn Care (EmONC)</td>
<td>Facility</td>
<td>Every 5 years</td>
<td>EPHI/MOH-MCHD</td>
</tr>
<tr>
<td>6</td>
<td>National Health Accounts (NHA)</td>
<td>Institution</td>
<td>Every 2 years</td>
<td>MOH-PCD</td>
</tr>
<tr>
<td>7</td>
<td>Household health service utilization and expenditure survey</td>
<td>Household</td>
<td>Every 5 years</td>
<td>MOH-PCD</td>
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<tr>
<td>8</td>
<td>STEPS survey</td>
<td>Household</td>
<td>5 years</td>
<td>EPHI/MOH-DPCD</td>
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<tr>
<td>9</td>
<td>Tuberculosis Prevalence survey</td>
<td>Household</td>
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<td>EPHI/MOH-DPCD</td>
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<td>10</td>
<td>NTD Prevalence survey</td>
<td>Household</td>
<td>5 years</td>
<td>EPHI/MOH-DPCD</td>
</tr>
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<td>11</td>
<td>Malaria: MIS</td>
<td>Household</td>
<td>5 years</td>
<td>EPHI/MOH-DPCD</td>
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<tr>
<td>12</td>
<td>HEP Assessments</td>
<td>Household</td>
<td>5 years</td>
<td>EPHI/MOH-DPCD</td>
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<tr>
<td>13</td>
<td>IHR assessment</td>
<td>Facility</td>
<td>Yearly</td>
<td>EPHI/PHEM</td>
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<tr>
<td>14</td>
<td>PRISM assessment</td>
<td>Facility</td>
<td>5 years</td>
<td>MOH-PPMED</td>
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<tr>
<td>15</td>
<td>RDQA</td>
<td>Facility</td>
<td>Yearly</td>
<td>MOH-PPMED</td>
</tr>
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<td>16</td>
<td>Ethiopia population based HIV impact Assessment (PHIA)</td>
<td>Household</td>
<td>3-5 years</td>
<td>EPHI/HAPCO</td>
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<td>17</td>
<td>KPP size estimation and integrated behavioral survey</td>
<td>Household</td>
<td>3-5 years</td>
<td>EPHI/HAPCO</td>
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<td>18</td>
<td>Stigma index survey</td>
<td>Household</td>
<td>3 years</td>
<td>EPHI/HAPCO</td>
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<td>ANC/ PMTCT Sentinel surveillance</td>
<td>Facility</td>
<td>2 years</td>
<td>EPHI/HAPCO</td>
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<td>Nutrition</td>
<td>Household</td>
<td>5 years</td>
<td>EPHI/MCHD</td>
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<td>21</td>
<td>Environmental Health and Hygiene assessment</td>
<td>Household</td>
<td>5 years</td>
<td>MOH-HEHD</td>
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<td>22</td>
<td>Health System resilience assessments</td>
<td>Facility</td>
<td>2-3 years</td>
<td>EPHI</td>
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<tr>
<td>23</td>
<td>Health System responsiveness assessment</td>
<td>Facility/ Individuals</td>
<td>2-3 years</td>
<td>MOH-PPMED</td>
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<tr>
<td>24</td>
<td>Post market surveillance survey</td>
<td>Institution</td>
<td>2-3 years</td>
<td>EFDA</td>
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</tbody>
</table>

List of surveys to be conducted in HSTP II period

SUCCESS, CHALLENGES, AND THE WAY FORWARD

The strong capacity built in local institutions, such as CSA and EPHI, to conduct population/household based surveys and surveillances, the use of the output of these sources for program specific and sector-wide strategic planning, such as HSTP; the strong partnership and support from donors and implementing partners to conduct the studies; the institutionalization of NHA at MOH; the introduction of EMDHS to address the problem in the timing of DHS in relation to strategic planning cycles; and the introduction of mobile data collection in some studies, such as PMA2020, are among examples of successes. Among the major challenges related to surveys and surveillances are delayed census to get updated population data; inability of these studies to provide estimations for lower levels of the health sector, such as zones and districts; irregularities of some surveys and assessments; weak information utilization; and mismatch between the timing of the surveys and their result dissemination with the planning cycle of the health sector. Addressing the aforementioned challenges during HSTP2 is of paramount importance to tap into the huge data contained in these studies and better inform the health sector.
BACKGROUND

The MOH is committed to ensuring equitable and affordable access to health care services. The achievement of this vision requires among other things a robust health information technology that is both affordable and appropriate. eHealth architecture is designed to support this goal, helping coordinate IT choices, ensuring appropriate resource utilization, and facilitating access and integration of data.

Fragmented investments in ICT health projects lead to duplicate efforts (in choosing, developing, and implementing eHealth systems) and wasted resources. Without a coordinated plan, the health system will continue to evolve in a way where patient care and the collection of population health data is increasingly distributed amongst many different healthcare workers and local and institutional levels and systems. This process results in disparate information stored in different locations and formats, making it seemingly impossible for data to be collated, synced, and shared. As a result, MOH is limited in its ability to develop knowledge, collaborate in care, and understand and trust the reports and population and public health data available for use throughout the health system. To ensure that information and data can be easily shared across the health system, a blueprint or roadmap of how the systems will interact is required.

**eHEALTH ARCHITECTURE (eHA) AND INTEROPERABILITY**

**National Health ICT Infrastructure**

<table>
<thead>
<tr>
<th>Shared Services</th>
<th>Institution-Based HIS &amp; Data Source</th>
<th>Population-Based HIS &amp; Data Sources</th>
<th>Analytics &amp; Business Intelligence</th>
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</thead>
<tbody>
<tr>
<td>Shared Health Record</td>
<td>Facility Surveys (SPA+)</td>
<td>Health Surveys</td>
<td>Analytics and BI</td>
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<td>Client Registry (EMPI)</td>
<td>idsr / ephem</td>
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<td>Data Warehouse</td>
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<td>eHPRIS</td>
<td>eLMIS/HCMIS</td>
<td>eRIS</td>
<td>eHIFAP</td>
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<tr>
<td>Master Facility Registry</td>
<td>eHMIS/DHIS2</td>
<td>HGIS</td>
<td></td>
</tr>
<tr>
<td>Health Data Dictionary</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Interoperability Service**

- Authentication
- Encryption
- Routing
- Transformation
- Queuing
- Validation
- Translation

**Point of Service HIS**

- Nutrition
- eLIS
- Surveillance NR
- EMR
- Patient Portal

**eHealth Architecture Government, Principles, Processes and Standards**

Ethiopia eHealth Architecture
The eHealth Architecture (eHA) is the foundational plan or blueprint that creates a framework for how the HIS subsystems interact. The eHA is created to ensure that information and data can be easily shared and appropriately used across the health system. The eHA is used as a guidance for ICT projects that support the health system and it ensures systems are developed and maintained to support patient care and the collection and aggregation of population health data.

GOAL AND OBJECTIVES

The eHA goals are designed to support the vision of the Information Revolution:

- Presenting a conceptual model for organizing components according to the capabilities that each provides to the enterprise.
- Promoting coordination and reuse by defining and helping evaluate the health information systems, data sources, and capabilities that the MOH aims to make available to stakeholders throughout the health system.
- Enhancing interoperability by defining minimum terminology and messaging standards that must be used to store and exchange information with components in the architecture.
- Supporting planning and investment by providing a visual roadmap for iterative development of architectural components and capabilities.

CURRENT STATUS

The eHA should continuously evolve in reflecting the current status of the HIS national landscape and adjusted to reflect emerging national and international needs. In doing so, several activities have been undertaken, ranging from the development of software solutions, preparation of interoperability and messaging standards, development of training/course materials to conducting capacity building and knowledge transfer trainings.

Ethiopia Digital Health Projects Inventory System (E-DHPIS): The E-DHPIS is a web based system that allows registration of digital health projects and makes documentation of the enterprise architecture/applications searchable with appropriate attributes. With the Health Sector Transformation Plan (HSTP) in place, the eHealth projects inventory serves as an epicenter to conduct current landscape analysis of the health sector and assess what activities have been done so far. The inventory system can also be used as a clearing house for the standards followed in a certain application and clearly shows the technology with which a project is developed, its focus area, and geographic coverage to mention a few.

**eCHIS/DHIS2 Health Data Exchange:** The eHA provides an architectural solution to enable data exchange for point of service (PoS) applications, eCHIS, and health management information systems, DHIS2. To enable data exchange, a mediator service was developed as a component of the eHA interoperability layer and utilized capabilities of eHA shared services, i.e. terminology management service (TMS) and facility registry (FR).

**MFR/DHIS2 Data Exchange:** The data exchange between the two systems is basically to ensure that the DHIS2 health facilities are aligned with the country’s master facility registry. The integration was deployed on a test environment and User Acceptance Test (UAT) was successfully done by performing 14 identified test cases. The data exchange system was presented at the OpenHIE 2019 community workshop. Technical documentation has been prepared and an updated version of the developed source code was stored in a MOH source code repository.

**DHIS2 And Polytech (Lab Information System Data Exchange):** Different HIS have been implemented for the COVID-19 response to collect, aggregate, manage, analyze, and report health data. DHIS2 is currently being used for case-based surveillance at the national level to accelerate case detection, active surveillance, and response. In addition, Lab Informa-
Interoperability and Commodity Management System (LIS) and Commodity Management System are among the platforms implemented to manage the health data. Following the eHA guidelines, a middleware-based service layer is developed and implemented to mediate the data exchange between DHIS2 and LIS by providing the architecture and components for connecting the systems.

**LEARNINGS**

- To move forward on the journey to make the eHA more tangible, an iterative approach based on use case selection, support for the use case with the eHA, and learning from the process will bring a desirable outcome.
- Local capacity building and knowledge transfer are key criteria to make eHA and interoperability solutions sustainable and maintainable.
- Stakeholders’ engagement and participation plays a significant role for the successful implementation of health data standards and eHA governance.

**WAY FORWARD**

Developing, maintaining, and ensuring the success of eHA, including interoperability, is a large undertaking and this journey to success is already in progress in Ethiopia. Our main focuses as next steps are:

- Identification and Implementation of additional HIS and Shared Services consistent with eHA
- Conducting regular Technical Working Group (TWG) meetings and running eHA and Governance Processes
- Strengthening and maintaining the HIS application inventory system
- Deployment of eHA processes, capability assessments, and training documentation
- Defining, capturing, and using metrics to determine the value that the eHA processes are providing.
BACKGROUND

The eHealth Architecture (eHA) provides a foundational plan to support the acquisition, exchange, sharing, and use of health data. Shared Services are among the crucial components of the bigger eHA in this regard. Shared Services provide access to common functionalities and data sources for interoperability of health information systems. The Master Facility Registry (MFR) and the Terminology Management Services (TMS) are the prominent shared services that are implemented by MOH.

Master Facility Registry (MFR): MOH’s MFR is a platform for storing, managing, and sharing a complete, up-to-date, authoritative listing of the health facilities for the country. It is meant to be a single source of truth for health facilities in the current setup. It is the primary source from which other facility lists in the country are drawn and thus, must be validated, continuously updated, and accessible. The MFR will facilitate better planning, referrals, reporting and data visualization, interoperability, public access to facility information, and better quality facility data. The MFR serves as a foundational component of the national eHA as defined in the Information Revolution Roadmap.

MFR data can be accessed via two separate interfaces, each intended for different audiences and different uses. The first is an open-source platform that allows administrators to manage the standardized data stored inside the MFR and to import and export facility data sets into the MFR. For example, an administrator may add a new facility, update the type of service offered by a facility, or identify new health equipment a facility has acquired. The second interface for the MFR is the public portal. The public portal provides view-only access to the information in the MFR and will be accessible to the public from the MOH website. It is intended for use by anyone to search for health facilities by filters, such as services offered or location, among others.

Terminology Management Service (TMS): The MOH is taking an incremental step towards ecosystem-wide implementation of terminology standards. The MOH has developed the National Health Data Dictionary (NHDD) to serve as the authoritative source for indicator and information standards within the health system. The dictionary provides a common language for clinicians, lab technicians, pharmacists, researchers, and administrators to communicate and exchange health information to ensure that meaning is not lost as data is shared or aggregated into reporting systems. The NHDD harmonizes data definitions from multiple programs and facilitates the mapping of definitions to international standards, such as the International Classification of Diseases (ICD-10), the Systematized Nomenclature for Medicine (SNOMED-CT), or the Columbia International eHealth Laboratory (CIEL) interface terminology. The NHDD was initially populated with indicators and data definitions from the HMIS Data Recording and Reporting Guidelines, the NCoD, and HSTP guidelines and mapped to ICD-10, SNOMED-CT, and CIEL. Plans are developed and reviewed to promote adoption and to expand the NHDD to other prioritized domains too.
MFR - CURRENT STATUS

• Requirements were gathered using a user story framework that was followed by training and consultations.
• The governance document is prepared and adapted – appreciating regional differences in curation and licensing facilities.
• For the first time, MOH extracted facility codes from DHIS2 and populated them in the MFR. Existing geocodes from the SPA survey were also taken and used in MFR.
• Facility data curation at lower levels is underway.

MFR – CHALLENGES:

• Gaps in complying to the governance protocols for facility data curation and maintenance.
  » Efforts are underway to help regions internalize the tailored protocols.
• Software (backend) problems.
  » Backed enhancement tasks are underway.
• Too many requirements that are sometimes beyond the scope of MFR.
  » Discussions are happening to make the requirements tailored to the MFR and be incremental.

MFR - WAY FORWARD

• Refine the MFR system and data requirements in light of reference service and interoperability.
• Stabilize the backend of the MFR and expedite data curation online.
• Support and follow-up the compliance of the MFR governance protocol for data curation, quality, and maintenance.
• Build the capacities of the facility data curators based on the governance structure of the individual regions.

NHDD – CURRENT STATUS

• The National Classification of Diseases (NCoD), HMIS indicators, and the HSTP indicators are published in the NHDD.
• The inclusion of the likes of drugs formulary, immunization lists, and lab tests is underway.
• The NHDD Pocket (a mobile app of the NHDD) was developed and implemented to facilitate offline access to the dictionary by clinical and public health practitioners.
• The NHDD governance protocol developed.

NHDD – CHALLENGES:

• The TMS task requires an extensive mix of technical skills.
  » The NHDD TWG will engage different groups of experts based on the priority domains.
• Not all required users are getting access to the terminology services.
  » NHDD Pocket is designed to improve (offline) access to the TMS.
  » It is planned to promote the importance of the NHDD using different platforms and media outlets.

NHDD – WAY FORWARD:

• Enhance the NHDD Pocket and promote its use for data quality and decision support purposes.
• Continue incorporating priority health data domains in the NHDD by engaging relevant experts.
• Build the capacities of regions and stakeholders on the continuous use of the NHDD.
• Improve the usability of the terminology services by incorporating advanced features for users and systems.
BACKGROUND
The Ethiopian health management information system (HMIS) underwent a series of reform and revisions since 2007 responding to identified gaps and emergence of new initiatives. As a result, the country has standardized, integrated, and responsive HMIS for the growing data demand by different health stakeholders. However, the early attempts to digitize HMIS reporting and the efforts to increase data use for decision-making were not successful because of various technological, organizational, and behavioral factors.

For over the past decade, the Ethiopian Ministry of Health (MoH) relied on two independent, propriety health management information systems (HMIS) to monitor the country’s health system, each providing coverage to different regions in the country. This parallel structure made it challenging for the MoH to integrate datasets from different regions, conduct national-level analysis without manual data integration, and implement improvements to the HMIS reporting or data collection functionality. Intent to address these challenges, and subsequently improve the ability to use health system data for decision-making, the MoH began exploring the possibility of a singular, open-source, government-owned HMIS. The new system would be able to harmonize upstream data collection as well as downstream reporting, data use, and analysis across all levels of the health sector. After consideration, the MoH decided to transition to DHIS2.

Transitioning from the two legacy HMIS to a new, singular system also came with its own challenges. The two distinct systems have been in operation for many years with HITs, PMTs, and clinicians trained in the specific processes for data collection, analysis, and reporting that are required to properly monitor the health system. An abrupt systems transition could negatively affect data quality, restricting the MoH’s ability to access and monitor the health data required for critical decisions on policies, planning, and resourcing for the country’s health sector. It was essential for the MoH to implement a strong transition strategy that would cause minimal disruption to existing processes of data collection and use.

DHIS2 is an open source software platform for reporting, analysis, and dissemination of data for all health programs. The solution covers aggregated data (e.g. routine health facility data, staffing, equipment, infrastructure, population estimates) and event data (disease outbreaks, survey/audit data, patient satisfaction surveys, longitudinal patient records, etc.). The system supports the capture of data linked to any level in an organizational hierarchy, any data collection frequency, and a high degree of customization at both the input and output side. It is best referred to as a system that is designed to fulfill the needs of an automated national health information management system. It helps to accurately and timely collect, aggregate, store, analyze, and evaluate health-related data from health facilities to the level.

MOH has successfully developed and implemented the DHIS-2 transition strategy with minimal disruption to the processes of data collection and use. As a result of this successful transition, DHIS2 is now accepted as a primary source of information for planning and decision making at all levels in the health system, partners and donors are utilizing the data for planning interventions and support, and increased use the DHIS-2 data for health service quality improvement.

GOAL AND OBJECTIVES
The main goal of DHIS2 implementation in Ethiopia is to improve the ability to collect, analyze, and use health system data through establishing harmonized, robust, scalable, and government-owned national routine health management information system that avoids fragmentation, improves data quality, and strengthens data analysis and use across all levels of the health sector.

CURRENT STATUS (ACHIEVEMENTS AND CHALLENGES)
The MOH has accomplished customization of the software to the Ethiopian context and conducted user acceptability and field application tests and successfully achieved legacy data migration. In addition, DHIS-2 is deployed in cloud based servers and all of the facil-
ity data is aggregated to these servers. Health facilities with offline access use a data export and import feature to aggregate their report at the nearest facility with access to the online DHIS2. Currently including regional, zonal, woreda health bureaus, hospitals, and health centers, there are 3,605 online and 1,600 offline access sites.

Monthly, quarterly, bi-annual, and annual aggregate data are being reported by almost all public health facilities. Furthermore, hospital quality improvement (EHSTG), Ethiopian Health Center Reform Implementation Guidelines (EHCRIG), and Health Service Transformation Quality (HSTQ) are integral parts of the HMIS system being reported from the health facilities. The data quality and reporting completeness and timeliness have been improving from time to time as a result of the capacities around DHIS-2 data management built, infrastructure improved, and stability and better maturity of the system achieved.

Remarkable accomplishments have been achieved in building the capacity of data managers and data users, wherein over 7,000 data workers were trained on how to capture, analyze, and report data using DHIS2. More than 4,000 data users were also trained on usage, analysis, and utilizing data for action.

Harnessing the expandability feature of DHIS2, several improvements have been made on the system emanating from the ever-increasing requirements of the users. Numerous analytics features, including “TOP-n” diseases, custom data set reports, public health emergency (PHEM) data entry and data export apps, scorecards, LQAS apps, league tables, maps, interactive data set assignment features, smart display, metadata browser, etc. are introduced to the system to enhance the capability of the system in terms of analyzing and utilizing data for better decision-making.

LESSONS LEARNED

Below are some of the lessons learned during the implementation of the DHIS2:

- Strong commitment and effective leadership of officials at all health offices have contributed to the successful implementation of the system
- DHIS2 runs very well in strong infrastructure settings and significant attention and investment is required to improve the infrastructure at the front and back end
- To ensure that the DHIS-2/HMIS goal is met, it requires to look at the system from an Enterprise Architecture (EA) approach to analyze the current DHIS2 implementation, diagnose the problems hampering efficiency of the functioning of the overall HIS and finally proposes possible solutions to promote better alignment between the organization business goals, the data, the application and the technical architectures.
- Continuous monitoring and evaluation, a robust feedback mechanism, and follow-up have contributed significantly to complete data reporting with optimal data quality.

NEXT STEPS

In lieu of the successes registered thus far, there are several activities to be carried out to sustain the system and enhance data use for action. The following are some of the major activities to be undertaken as the continuation of the implementation of DHIS2 for HMIS.
DEVELOPMENT AND IMPLEMENTATION OF THE ELECTRONIC COMMUNITY HEALTH INFORMATION SYSTEM

BACKGROUND

The Electronic Community Health Information System (eCHIS) is a high priority initiative of the Information Revolution, demonstrating the MOH’s intentions to further utilize technology and data to improve service delivery, starting at the community level. The eCHIS digitizes the CHIS content into a mobile platform for use by health extension workers (HEW) around the country. The mobile platform and corresponding clinical, reporting, and system management portals will promote access to and utilization of data about community service delivery within the Health Extension Program (HEP), supporting HEWs in their responsibilities and equipping decision makers with relevant, high quality data for advancing the health system in Ethiopia.

GOALS AND OBJECTIVES

The overall purpose of the MOH’s initiative to establish an eCHIS in Ethiopia is to contribute to achieving the goal of universal coverage of primary health care in Ethiopia, in both agrarian, urban and pastoralist areas of the country. With that end, the goals set by MOH for the development and implementation of eCHIS can be primarily grouped as automating reporting, monitoring and performance analysis, and bringing efficiency in service delivery and referral linkage by allowing HEWs, their supervisors, health managers, and other healthcare providers to easily review household and individual data to deliver tailored services to households and individuals.

With these goals in mind the eCHIS TWG of MOH has developed an application with the following components:

**eCHIS Components**

**FAMILY FOLDER**
- Household info,
- Household properties,
- Household members

**SETTING**
- Data element list,
- data element to form mapping,
- user management,
- access to users, organization units

**DATA SYNCHRONIZATION**
- Data sync between tablets and to central server

**SERVICES**
- RMNCH, CDs, NCDs, NTDs,
- logistics supply and management

**REPORTS**
- Demographic report,
- Service coverage report,
- disease report,
- HMIS reports, CHIS reports etc

**DASHBOARD**
- Charts, graphs, maps,
- indicator analysis etc
CURRENT STATUS (ACHIEVEMENTS AND CHALLENGES)

MOH has accomplished significant milestones since the eCHIS launched. Steady and recognizable progress, including an initial governance model, a systems analysis document that outlines requirements for the technology product, selection of the platform, and development of a roadmap, has been made in preparing for the development and implementation of a mobile solution that will connect data collected by HEWs with the core HMIS.

Development and implementation of the eCHIS has made significant progress over the past couple of years. The development of the digital family folder and the RMNCH modules are finalized. Currently, the malaria and tuberculosis modules are under development with a plan to finalize it before October 2020. MOH has documented various iterations of requirements for the eCHIS, including overall system design and deployment architecture. Based on the new requirements and the system architecture design, a technology review has been conducted and it was decided to develop the application based on a single comprehensive platform. Consequently, the digital family folder and the RMNCH modules were integrated using a CommCare platform. In addition, configuration and setup of CommCare HQ for local hosting has been done in parallel to the development of the mobile app. It is currently implemented in 1,250 rural health posts across four agrarian regions (Tigray, Amhara, Oromia, and SNNPR).

A lot of challenges have been encountered during implementation including, shortage of tablets, Airtime/SIM CARD related problems, server downtime at MoH data center and connectivity, lack of helpdesk at central and regional level-eCHIS, capacity gap of supervisors and focal persons to support eCHIS, low coverage of household profiling performance, and poor data quality.

LESSONS LEARNED

Appropriate and timely nation-wide roll-out of eCHIS will require robust preparation and arrangements that will ensure not only the expansion of the eCHIS, but also the sustainability of the system in the long run. Based on the implementation of eCHIS in the 1,250 health posts, the following are some of the learnings to ensure that necessary arrangements and support systems are in place to make eCHIS successful.

- Regional and woreda level commitment and ownership – through advocacy meetings, engagement of regional experts, and involvement in implementation planning and execution.
- Establish a decentralized support system – documentation and vetting by MOH and regional health bureaus of the support system.
- Training of HEWs in a way so that the use of eCHIS fits into their workflows: As part of the eCHIS requirements document, MOH has developed a detailed workflow and transaction document that is guiding the development of the various eCHIS modules. In addition to training HEWs and their supervisors on how to use the tablet and the eCHIS data entry, the HEWs should also get orientation on how the eCHIS fits into their usual workflows.
- Develop a M&E document and system for monitoring and evaluation of eCHIS implementation. This system should detail out the input, process, output, and outcome indicators to be monitored; the persons responsible for monitoring; the tools to be used for monitoring; and the monitoring procedures to be followed.
MOH needs to have a clear roadmap for transitioning from the existing paper-based CHIS to a totally electronic CHIS. The phase-out plan should clearly mention the responsible authorities/stakeholders for its implementation and also specify the budget requirements. The plan should be well communicated beforehand to the regional health bureaus and other implementing partners.

A performance dashboard for quick viewing of selected 4–5 performance indicators by HEWs and their managers may be considered as one of the eCHIS components.

**NEXT STEPS**

The MOH is planning to scale-up eCHIS in all agrarian, pastoralist, and urban health posts within the next three to four years. The following are activities that will be implemented to ensure successful implementation of the system.

- **eCHIS training, including Master ToT, ToTs, and end-user trainings**
- **Establishment of a support system for eCHIS at different levels in the health system**
- **Establishing device management system, including supply, verification of delivery to HEWs, and replacement of faulty devices**
- **Providing reliable connectivity for HEWs to regularly synch eCHIS data**
- **Establish mechanisms for monitoring and evaluation of system roll-out; system use; and data use**
- **Develop plan for paper-based CHIS phase-out**
- **Establish proper management and governance of eCHIS roll-out at all levels in the health system**
- **Develop the remaining modules of agrarian eCHIS and the urban and pastoralist versions of eCHIS**

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**Road to effective, efficient, and sustainable implementation of eCHIS**

- HEWs using eCHIS for better quality and universal coverage of primary health care services
- HEWs trained on eCHIS (hardware and software; programmatic use)
- HEWs appropriate equipped with eCHIS (software and hardware)
- Effective software, hardware maintenance and trouble-shooting support in place
- Trainers and mentors available at HF, WorHO, RHB
- Continuous mentoring and on-job orientation taking place
- Hierarchical system of trouble shooting support established
- Training curriculum available
- Trained mentors with appropriate tools available and functioning
- Tools for trouble-shooting support available and used
- Communication channels established and used
ELECTRONIC MEDICAL RECORDING SYSTEM

DESCRIPTION

Unlike the banking or insurance system, the medical industry is known for its data intensive interactions. A health facility generates a huge amount of data during provider-to-patient encounters. The individual medical record consists of demographic, personal, clinical, laboratory investigations, diagnostic images, medications and billing information. This individual level information is used not only to monitor an individual’s health status and ensure continuity of care but measure performance of the health services through aggregate data analysis. In addition, the medical records can serve as a secondary source of data for research and as evidence for medico-legal issues.

Paper based patient charts are usually eligible; difficult for cross-referencing; prone to damage; and requires a lot of space for archiving. Therefore, with the advent of technologies coupling with ever-growing demand for individual level data, deploying an electronic medical recording system that meet the minimum data and functional standards is critical for a health facility. Besides having a well-functioning EMR software, that meets all the requirements, readiness of the health facility for paperless environment in terms of availability of adequate infrastructure, willing & skillful care providers, and leadership with high commitment are key factors for a successful implementation of the system.

As it is clearly outlined in the national information revolution roadmap, the ministry of health is pushing the digitization efforts towards strengthening the existing medical recording systems through leveraging the available resources and developing EMR standards to guide its adoption and implementation.

IMPLEMENTATION STATUS

Aiming at establishing the national patient level data repository -containing individual’s health information- from his/her birth to death, the Ministry of health- in collaboration with implementing partners had adopted and started to deploy electronic medical recording system since 2009 (widely known as SmartCare- later TenaCare) in some public health facilities. However, due to its resource intensive nature to sustain the implementation, and failure to update the software to the ever-changing user requirements, most implementing sites failed to continue using the system except –Ayer referral Hospital in Tigray Region, and Bahir Dar Health center in Amhara Region.

Nevertheless, more than a thousand sites are using the system to handle patients’ registration information in their medical record units. In addition, over 470 ART sites-public facilities deployed the updated software to keep intake and follow-up records of PLHIV who are taking antiretroviral medications. On the other hand, some private hospitals such as Korea and Kadisco hospitals run proprietary electronic medical systems to support the daily operations of the hospitals.

The customization or development and scale-up of interoperable EMR system to the public health facilities is integral part of the national e-health architecture. As foundational work, HITD directorate with other stakeholders has established a technical working group and developed TOR to prepare the national EMR standard in the context of the territory, secondary and primary level health facilities found in the country. The document is expected to define the minimum dataset, functionalities, and technical requirements that serve as selection or certification criteria for any EMR system to run in the health system.
LESSON LEARNT

From the previous implementation efforts, a lot have been learnt that we need to take into account for a successful implementation of electronic medical recording systems in the Ethiopian context. To mention some:

- Having an EMR software that supports all hospital/facility level activities and capable of generating both patient-level summary and aggregate reports with easy access to the database for authorized users is crucial to avoid the effort of parallel data collection by care providers for the sake of reporting. Eventually this may become a ‘good’ reason for end users to stop using the system. Therefore, it is important to ensure the EMR to be developed or customized should incorporate all the current and future data needed to monitor the patient’s health status and health intervention programs as well.

- EMR deployment requires establishing a robust infrastructure with adequate maintenance and budget. Since the practice of medicine is teamwork, the flow of the data requires end-to-end connectivity and a back-up system supporting off-line options. Thus, frequent downtime is not tolerated in such an environment; and may set back to manual practice, making the implementation process difficult to resume. Though it is a resource intensive investment, successful implementation of EMR demands adequate infrastructure, maintenance and budget to maximize system availability closer to 100 percent.

- In the practice of medicine, technology has an indispensable role to improve the quality of care, reduce cost of care, and access to specialty services through embedded decision supporting tools and telemedicine services. Therefore, it is important to articulate and communicate the benefits of EMR to care providers and leadership at the initial step of its implementation.

- The other key element affecting the EMR system implementation is the skill and willingness of care providers to use the system. Therefore, adequate training on the application with regular update; and recognizing care providers who are champions in leading the change process is essential to boost end-users technical capacity and interest to use the system in-place.

FUTURE PRIORITIES

In the past few years, DHIS2 and e-CHIS customization and rollout activities were the priorities for the ministry of health. However, due to increasing need for individual level data need, and shift of focus to quality health service, the demand for EMR system implementation in health facilities is rapidly growing. Therefore, defining EMR standards, and mobilizing resources for the development and implementation of the new generation of EMR are emerging as new priorities in Ethiopia.
DEVELOPMENT AND IMPLEMENTATION OF HUMAN RESOURCE INFORMATION SYSTEM (HRIS)

BACKGROUND

Human Resource Information System (HRIS) allows users to manage human capital in an entity to enable easy management and tracking of the health workforce. HRIS provides Ministry of Health (MOH) and all health stakeholders a system to progressively improve the availability, quality and use of data on their health workforce, allowing the country to have comprehensive and multi-faceted data to strengthen the HRH decision-making process.

In the business context of human resource administration, as an acceptable service provided by human resources, specific services can be pointed out. The common services are licensing, administration, retirement, development, payroll, timesheet and etc.

Ministry of Health has three human resource directorates as a service providing structure. These directorates are Human Resource Administration(HRA), Human Resource Development(HRD) and Health Professional Competence Assessment Licensing (Licensing). HRA directorate is responsible for managing job vacancy, hiring and activities involved between hiring and exit of an employee. HRD directorate is responsible overseeing the capacity building activities for employees both in short and long term program plans. In addition, the HRD directorate is responsible for overseeing health educational programs across the nation and is responsible for forecasting future health workforce. Licensing directorate is responsible for handling licensing information of the health workforce, examination administration and exam content generation.

Under each directorate specific services are provided using case teams. The implementation of the HRIS system will automate the process of how human resources are managed and tracked and will provide decision makers real-time information of current human resources available in the health workforce.

The HRIS implementation initial need was initiated by MOH management so that health workforce data can be managed properly and efficiently. Properly managed human resource data will enable decision makers to make efficient and quick decisions. Currently, MOH uses a partially implemented HRIS system to manage current data and automate some of the workflows. Because the system has very limited features and no flexibility to accommodate new requirements, MOH decided to transition the system to another platform that meets its current and future requirements.

In this project the automation focus will be on three sub-domains under the human resource structure, these are HRA, HRD and HPCAL(Licensing). In addition, legacy data migration will be part of the work, so that previous data from the existing system can be leveraged during data processing. The rollout for this new system will be in a phased approach that is accommodating each sub-domain with their specific priorities. Early installment of the system will be conducted at federal level and next implementations will encompasses regional level tasks.
GOAL AND OBJECTIVES

The main goal of the HRIS project is to design, develop, implement, and support a human resource information management system for human resource administration, development and licensing work processes and ensure visibility of HRH data for decision makers at all levels in the health system.

CURRENT STATUS (ACHIEVEMENTS AND CHALLENGES)

Following the Ministry of Health’s decision to transition the current legacy human resource system to the iHRIS platform, the customization of iHRIS to serve as the Ethiopian HRIS has been started by prioritizing the Human Resource Administration module of the system. The features that have been selected for first release include the personnel management, leave management, performance tracking and dashboard feature.

Currently, personnel management, leave management, administrative look up, and dashboard features are fully customized and are under user acceptance testing while the rest of the admin features are being developed. On HRD (Human Resource Development), as a part of early release graduate tracking feature and trainee registration and course update is being developed. These features have been prioritized to be included as part of early release implementation work.

NEXT STEPS

- Complete the customization of HR admin, development, and licensing modules
- Implement iHRIS at national and sub-national levels
- Legacy data migration from the old system and paper-based records
- Enable data exchange between HRIS and other systems as per the requirements of Ethiopian eHealth architecture
INFORMATION REVOLUTION - SUPPLY CHAIN TECHNOLOGIES

OVERVIEW

Nearly 20,000 public sector service delivery points (hospitals, health centers, and health posts) across Ethiopia offer citizens access to health care. A well-functioning supply chain that reliably delivers health commodities is critical to the ability of these delivery points to provide quality care and services and achieve desired health outcomes. Over the last decade numerous investments have been made in the public sector healthcare supply chain to support the Government of Ethiopia (GOE) to achieve the country’s Information Revolution Roadmap, one of four Transformational Agendas of the national Health Sector Transformation Plan (HSTP). The goal of this investment is to build a sustainable, resilient, and interoperable health information system (HIS) that ensures the entire health sector has the data, analytics, and skills necessary to improve the health and well-being of all Ethiopians. To achieve this, the GOE has focused on building a robust and agile supply chain technology infrastructure by:

- Strategic design and systems development
- Information systems development and implementation
- Monitoring of commodity availability at health facilities
- Forecasting and supply planning
- Stores and transportation improvement
- Use of data for decision-making
- Capacity building and supportive supervision to health facilities

Significant investments are being made specifically in the health sector’s management information technologies. Under the direction of the Federal Ministry of Health (FMOH), the Ethiopian Pharmaceutical Supply Agency (EPSA), and the Ethiopian Food and Drug Administration (EFDA) a suite of software systems and tools were designed, developed, and implemented which are being used to operate the supply chain. These include:

- **Vitas**, an enterprise level procurement, inventory and warehouse management technology system
- **Dagu**, an inventory management system for health commodities at the health facility level
- **mBrana**, a mobile inventory management system for vaccines
- **Fanos**, a supply chain dashboard to support decision making
- **eRIS**, a pharmaceutical and medical device regulation information system

All systems are interoperable - working seamlessly with each other to transmit data between levels to ensure continuity of supply chain information and services. With the roll out of each system and tool, EPSA and EFDA operations have grown increasingly agile, efficient, and effective. They standardize business processes and streamline commodity management and offer vital insight into both the location and levels of valuable commodities so EPSA can forecast, procure, and distribute with confidence. Because each supply chain function is integrated through the use of these systems, EPSA operations run more efficiently and, ultimately, improve health care and outcomes.
**Vitas**

Vitas is a locally developed, open source, custom software platform designed to support procurement, warehouse management, inventory control, and logistics management information. It is an enterprise-level software used to control inventory, from receipt to issue, and manage movement and storage in EPSA center and hub warehouses. Vitas leverages the latest technology to support industry best practices in supply chain management and optimize business processes. In doing so it automates the flow of information and coordinates key activities within and across warehouses. The application is designed to manage any kind of inventory, whether in full or non-full supply, including medicines, vaccines, equipment, chemicals, and consumables.

Deployed in 2011, it is now fully operational in all EPSA hubs and directs supply operations at the warehouse level and is used to manage four commodity types and around 7,548 unique products with over 1100 users across the EPSA network. It captures real-time commodity movements across the warehouse network, as well as expiries, losses, and adjustments, providing EPSA vital insight into both the location and levels of valuable commodities and allows it to forecast, procure, and distribute with confidence.

**Dagu**

Dagu is an inventory management system designed to manage daily transactions at health facilities. It is a locally developed, open source, custom software platform designed to support inventory control as well as logistics management information at service delivery points. It provides a systematic record-keeping system for managing health commodities at health facility stores, managing almost 700 commodity types across 4 categories (pharmaceuticals, medical supplies, medical equipment, and chemicals and reagents). The application is designed to manage any kind of health commodities, including medicines, consumables, supplies, chemicals etc. This system facilitates the use of standard operating logistics procedures including issue and receipts, 'first to expire, first out', and batch/expiry tracking. Dagu also helps store and generate timely stock reports for decision making. Dagu is installed in more than 1000 health facilities, including most hospitals and major health centers across Ethiopia. These facilities use over 75 percent of the commodities that flow through the public sector health care supply chain. An estimated 3000 clients use Dagu to conduct EPSA business.

**mBrana**

Supplying hospitals, health centers, and health posts with safe supplies for immunizing the nearly 3 million infants born each year in Ethiopia is a complex task. Increased visibility into the vaccine supply greatly improves program performance. To increase visibility, EPSA implemented a mobile logistics information and inventory management system for vaccines – mBrana. mBrana is an open source mobile software platform designed to manage vaccine inventory – from receipt to issue -- at woredas and zones. It is fully integrated into Vitas and Fanos in order to ensure end-to-end visibility into the entire EPSA supply chain.

It is deployed nationwide to all woredas and is currently being piloted at health centers in order to extend data visibility further down the supply chain to the last mile. Currently, it is being used to manage...
nine pharmaceuticals and three medical supplies (syringes, safety box, and mosquito bed nets). Almost 1000 EPSA employees are using mBrana (700+ to manage vaccine supplies and 250+ to manage malaria supplies).

**Fanos**

Fanos is an online tool that makes EPSA supply chain data accessible in real time through the visual presentation of selected supply chain indicators. It displays data from all facilities using Vitas, which manages supplies at warehouses, and mBrana and Dagu, which manage supplies at woredas (for vaccines) and service delivery points, respectively. This data represents the entire network of EPSA warehouses and Fanos makes it available for analysis and reporting in real time. It is designed to be used to support decision-making among facility managers at any level of the supply chain. In doing so, data represents the entire network of EPSA warehouses and Fanos makes it available for analysis and reporting in real time. It provides end-to-end visibility into the entire supply chain, from forecasting to issue. This platform gives EPSA access to accurate, timely, and complete events, transactions, and associated data across locations and organizational units.

**EFDA and the Electronic Regulatory Information System**

Over 21,500 unique items flow through Ethiopia’s health commodity supply chain under the private sector, NGOs and Governmental Institutions, supplying around 29,200 service delivery points (hospitals, health centers, pharmacies, drug stores and health posts) across the country. The Ethiopian Food and Drug Administration (EFDA) oversees the market authorization and import permit approval for both medical and food products for a wide variety of vendors from multiple countries. The complexity of EFDA’s organization and its work, its size, the numbers and quantities of products, and the variety of tasks it is charged with (registration, quality, testing, inspection, importation, control, post market surveillance, pharmacovigilance etc.) requires rigorous implementation of and adherence to laws, policies and processes to ensure success in achieving its mission “to promote and protect the public health by ensuring safety, efficacy and quality of health and health related products and services”.

Technology plays a pivotal role in facilitating and maintaining both implementation and adherence. EFDA is building a technology infrastructure that links the various tasks it undertakes under one unbroken chain of information from licensing and registration to import and quality assurance. To facilitate the registration and import permit process, the Electronic Regulatory Information System (eRIS) was designed and implemented for EFDA. eRIS was developed and released as part of Ethiopia’s planned open-source electronic regulatory information system, which adapts best practices from the private sector to solve key challenges in the public sector. Currently, all EFDA employees utilize the software to manage the import process for medical supplies and pharmaceuticals and over 3000 importers use it.

**eRIS** is the umbrella system at EFDA comprised of multiple component sub-systems which work together—

1. **i-License** which allows entities to apply for a certificate of competency to register and import products.
2. **i-Register** which is used to manage the medicine registration process when an applicant seeks to register a pharmaceutical in Ethiopia for later import.
3. **i-Import** which is used to manage the import process, once registered in Ethiopia.
4. **i-Verify** which is used to monitor the movement of health commodities and products from manufacturer to the point of issue.

eRIS dramatically increases processing efficiency and transparency by enabling both EFDA authorities and
importers to manage the licensing, registration, and import request and approval process fully online. With eRIS, each step in the licensing, registration, and import application process is now managed through a shared portal. Benefits include—

- **Increased transparency** – importers and EFDA management can track the status of each request online,
- **Improved efficiency** – EFDA can manage the application process in a fraction of the time and enhance collaboration with EPSA and importers to complete tasks more efficiently,
- **Workforce management** – EFDA managers can assign work more effectively across staff and measure worker productivity,
- **Interoperable with the EPSA information systems** – EPSA purchase requests sync directly to i-Import, offering the potential to enhance overall supply chain visibility from import approval to last mile delivery,
- **Facile and robust reporting** – all applications generate reports and analytics on medicine, medical device, and food product import approvals to facilitate performance monitoring,
- **Improved data quality** – eRIS and EPSA information systems share the same master data which reduces data error and redundancy, and
- **End-to-end traceability** – because the application integrates GS-1 global standards for barcode tracking, it allows regulators to trace products entering Ethiopia from the moment of import to their delivery to a patient.

Since deployment, the import permit processing time dropped from 4 days to 2 days while the average market authorization processing time also reduced - from 280 to 139 days and the average port clearance processing time dropped from 10 days to 2.5 days.

### i-License

i-License is a sub-component of eRIS which is used to digitize the application process to receive a certificate of competency. It is an open source, online application developed for the EFDA which allows importers, exporters, wholesalers, and manufacturers to apply for certificate of competency and for EFDA authorities to approve these applications online. This application is designed to manage the licensing process for all entities who wish to register products for and receive permission to import products into Ethiopia – from the start of a licensing application to approval.

### i-Register

i-Register is a sub-component of eRIS that digitizes the product registration application process. It is used by EFDA to accept, review, and authorize applicant registration request applications. It is also an open source, online application developed for the EFDA which allows importers to apply for market authorization approval to register products in Ethiopia for import and for EFDA staff to review and approve these applications online. This application is designed to manage the registration process for all health commodities being imported into Ethiopia – from the start of a registration application to approval.

### i-Import

i-Import is a sub-component of eRIS that digitizes the product import application processes. It is used by EFDA to accept, review, and authorize applicants import request applications for import. i-Import is also an open source, online application and it allows importers to apply for and receive permits to import medicines online and EFDA staff to manage these applications online. This application is designed to manage the import process for all health commodities being imported into Ethiopia – from the start of an import application to approval.

### i-Verify

iVerify is an open source mobile application which is used to monitor the movement of health commodi-
ties and products from manufacturer to the point of issue – throughout the health import process and supply chain. It is used to trace a product back to where it was created to determine how, where, and who transferred it. And it is used to track it forward as it moves through the supply chain to make sure it arrives in the hands of the client. This application is designed to be used at any point in the supply chain by anyone to verify the authenticity of a product.

iVerify makes it easy to identify a health commodity and determine its authenticity. It automates the verification process and allows the public real time access to the location of each item flowing into and throughout the country. It ensures traceability of products to clients and informs accurate and targeted recalls. It allows users to verify a product upon import and track and trace it at any point in their distribution journey answering:

- **WHAT** – what items are in the system?
- **WHEN** – at what point did an item move vis-à-vis a time-stamped?
- **WHERE** – was the product, where is it now?
- **WHY** – was this observed, which process step?

**IMPLEMENTATION STATUS**

EPSA and EFDA systems continue to expand, supporting business objectives and operations effectively.

With the roll out of Vitas, EPSA operations are increasingly agile, efficient, and effective. A one-stop application, Vitas is improving supply chain operations by—

- Standardizing business processes and streamlining commodity management,
- Automating tasks to reduce errors and redundancy,
- Ensuring data integrity by utilizing a central data repository, and
- Expanding data visibility.

These improvements are resulting in time and cost efficiency. As work flow improves, so does the movement of information between forecasting, procurement, warehousing, and distribution units. Each supply chain function is integrated through the use of Vitas to make EPSA operations run more efficiently. As Vitas expands EPSA operational capacity, anticipated benefits include—

- **Streamlined operations** -- From forecast to issue, every step integrates data and actions to account for and protect valuable commodities.
- **Proactive inventory control** -- Combined inventory tracking, procurement, and issue and receipt is automated to desired min and max levels, preventing over and under stocking.
- **Confident forecasts** -- Demand is anticipated with better accuracy to maintain sufficient inventory levels.

Since it was deployed EPSA has seen the wastage rate reduce about 3.7 times with the annual inventory time reducing from over a month to 2 days.

By facilitating improved management of and access to issues data at stores, Dagu has made notable improvements in the flow of supplies as it—

- Shortens requisition submission and fulfillment times,
- Improves data quality through requisition automation,
- Ensures data integrity by providing a central data repository, and
- Expands data visibility through timely reporting.

With consistent use, Dagu is revolutionizing supply chain management at health facilities—
• Minimizes commodity shortages, and overages,
• Improves stock management (inventory levels between minimum and maximum),
• Reduced wastage due to Dagu’s features which support stock status monitoring,
• Improved request and report generation with complete data for timely replenishment,
• Enhanced data visibility for redistribution of stocks between facilities, and
• Increases access to and accuracy of information.

Facilities can easily identify what they have on hand, what is available for issuing, what they need to order, and which products are near-to-expire.

mBrana makes key supply chain tasks like receipt and issue within and across woreda warehouses easy and automates the flow of information. Consistent and accurate data is needed to manage vaccine supply chains and mBrana offers exactly this through real time access to vaccine availability, receipts and issues, and bin card tracking. Other benefits include—

• Improved supply chain efficiency – woredas can quickly generate and instantly send orders to hubs and track order progress, from order to issue to delivery,
• Process standardization – by using the standard Vaccine Request Form mBrana facilitates increased adherence to supply chain standard operating procedures across all facilities,
• Data-based decision making – mBrana allows users real time access to vaccine stock data; both what is at woredas and what they are sending to health centers,
• End-to-end visibility – the system is integrated with Fanos, EPSA’s supply chain dashboard, so decision makers can access data in one place for national, regional, and woreda levels,
• Facile reporting – users can generate and print reports including historical data at any time, and
• User acceptance and long term sustainability – as a mobile system, user acceptance is high and the system is quick and easy to set up and to use.

Fanos facilitates the analysis of supply chain performance by providing EPSA with ready access to essential data needed to make sound operational and strategic decisions. Regular syncing of data with the data mart whenever connected to the internet ensures that data provided reflects on-the-ground inventory levels. In doing so, Fanos amplifies the benefits of Vitas, mBrana, and Dagu. By providing data to any user in any location, Fanos offers—

• An enterprise-wide view of EPSA with the ability to improve performance and accuracy across units and locations.
• Transparency and efficiency across the supply chain by enabling real time product tracking.
• Ability to identify wastage and better control costs.
• Improved capability to identify issues and anticipate and solve problems before they develop.
• Improved inventory control and reduced lead times.
• Better decision-making as users collaborate to monitor and analyze real time data.
**NEXT STEPS**

As Ethiopia’s public health supply chain evolves and grows, so also do the management information systems that support it.

**EPSA**

New features and modules continue to be designed and developed for Vitas, Dagu, mBrana, and Fanos:

- **Vitas** — Efforts are underway to expand functionality of Vitas to support GS1 enabled tracking of select program commodities as well as introduce an online ordering module for EPSA clients / +online ordering from facilities to EPSA and EPSA hubs. Work is also ongoing to partner with manufacturers and suppliers to capture data at the point of transaction.

- **Dagu** — Dagu is currently being re-designed and deployed to be interoperable with Vitas and Fanos and ensure that health facilities can submit Report and Request Forms (RRF) electronically. With electronic RRF transmission and improved data visibility, EPSA anticipates faster order processing times and, ultimately, higher product availability and reduced commodity shortages and overages.

- **mBrana** — Nearly 60% of Ethiopia’s population lives in areas at risk of malaria. To ensure that all long-lasting insecticide-treated nets (LLINs) reach their intended users, a LLIN distribution tracking system using mBrana has been deployed to increase visibility of distribution to the last mile. This year, this system will be expanded to track the distribution of bed-nets in the Southern Nations and Nationalities Peoples’ (SNNP) region.

- **Fanos** — Fanos contains transactional data from Vitas Warehouse at EPSA. As noted, the dashboard provides users with live commodity data for decision-making across EPSA central, hubs, and regional levels and so work is underway to accelerate the development of visualization and analytics dashboards for sub-systems.

Interactive Voice Response (IVR) is a useful tool that supports the broader community so that they can use their mobile phone to call a general number and receive commonly requested information. Efforts are underway to identify and document current fragmented IVR-based systems that support the FMOH and other agencies. These systems include DHIS, eCHIS, PHEM, EFDA, and EPSA IVR-based systems. HIV, malaria, TB, and other program data will be collected by these IVR systems. PHEM collects surveillance data but by using the IVR system, information will reach EPHI faster. Under the direction of the FMOH, a single national infrastructure that can house all IVR based systems will be built.

**EFDA**

EFDA is currently using eRIS to manage the registration, import and licensing activities of the agency. The different subsystems of eRIS, i-Register, i-Import, and i-License are being used to facilitate medicine, medical device and food registration, importing, and facility licensing. Additional work is needed to develop a port and inspection module to eRIS and to scale the i-License subsystem to branch offices and regions. Work is also underway to further embed GS1 standards through the introduction of Global Document Type Identifier (GDTI) to certificates being generated, incorporate the revised business process of registration and other relevant modules in the software, and develop a new module in eRIS for port clearance and inspection. Finally, efforts are focused on developing a national standard master product list agreed upon by stakeholders nationwide.
MOH and EPHI worked together to digitize the Public Health Emergency Management (PHEM) system using DHIS2, as of March 2018. Earlier to this decision, there were other WHO-driven tools that were implemented by EPHI to capture and analyze PHEM data, but they did not serve the purpose as intended for different reasons, including data quality and confidentiality issues. Encouraged by a successful implementation of DHIS2 for the routine HMIS, PHEM system managers believed that DHIS2 would also be suitable for the PHEM data tracking purpose.

Accordingly, in March and April 2018 PHEM system requirements were collected and documented, considering both weekly routine data needs and case-based tracking (the weekly reporting system being the priority one). Based on the detailed requirements and documented experiences of other East African countries, MOH and EPHI developed and implemented a digital PHEM system for the weekly data capturing and analysis. Moreover, the PHEM data set was harmonized with the already established MOH’s DHIS2 for the ease of data capturing at all levels. The harmonization saved a significant cost for EPHI because there was no need to invest in computers, network infrastructure, or capacity building. The system was cascaded along with the updated version of DHIS2 (v2.30). The capacity building also went hand-in-hand with the upgrade training.

While the MOH’s DHIS2 uses the Ethiopian Calendar, the PHEM data are analyzed using Epidemiological Weeks (Epi Weeks). As DHIS2 can only pick one of the calendars at a time, we needed a mechanism to capture data in the Ethiopian Calendar, export the data mapped with the Epi Weeks and import to a DHIS2 instance for analysis with Epi Weeks. To facilitate this process, two custom applications – PHEM Data Entry and PHEM Export were developed and implemented for data entry and export of the entered data respectively, in collaboration with experts from Oslo University.

Based on the decision made to handle data entry at the facilities level by PHEM experts themselves (unlike the HMIS data entry that is managed by HITs), a separate PHEM user account has been created for all regions and facilities under them. Capacity building trainings were also provided for PHEM experts at national, regional, and other lower levels. Experienced HITs are there at all levels to further fill the capacity gap with the new PHEM system.
CHALLENGES AND PROPOSED SOLUTIONS

- Lack of permanent PHEM experts in the majority of the health facilities (particularly health centers) and reliance on the focal personnel to handle PHEM tasks (including data management).
  - Regions are advised to either recruit permanent PHEM experts for facilities or to at least lengthen the delegation cycles of the focal persons.
- Relatively high-frequency (weekly) reporting requirements that makes offline data entry and sending the export file to the next level (example, woreda) difficult for those sites who struggle to report online.
  - The current efforts of implementing the Android version of DHIS2 will significantly solve the problem, as it will promote online reporting.

LESSONS LEARNED

- Optimal strategies can save significant costs in systems implementation.
- Continuous capacity building is necessary given the high turnover and role shifts of the staff.
- Coordination of resources is key in scaling-up digital initiatives.

WAY FORWARD

- Strengthen weekly data capturing, reporting, and analysis of PHEM data.
- Further enhance the PHEM system based on the user requirements.
- Develop and implement the PHEM case surveillance system based on the promising experience of the DHIS2 COVID-19 Tracker.
BACKGROUND

One of the core components of the Ethiopian MOH’s eHealth Architecture is the Analytics and Business Intelligence Service. Ethiopia’s health system has no less than 77 unique electronic HIS deployed to meet specific requirements. These systems are stand-alone, transaction-based systems that are not adequate to address advanced decision support, data mining, knowledge discovery, and business intelligence demands. Given the ever increasing demands from stakeholders for quality and equitable access to health data that come from various sources and the need for doing a seamless analysis from a single window, it has become necessary to establish a data warehouse technology.

OBJECTIVE OF THE INITIATIVE

To implement a state-of-the-art national health data warehouse for MOH and partners with data coming from multiple sources and in multiple formats that will ensure advanced data analyses and business intelligence services for the health sector.

CURRENT STATUS

Understanding that the establishment of a national data warehouse is a huge and resource-intensive investment, MOH opted to handle this initiative in a more agile manner and based on priority use-cases to facilitate learning and reduce involved risks (what we call “eating an elephant one bite at a time”). Accordingly, the RMNCH domain came out as a priority use case with a huge multi-sectoral data demand for the first Data Mart. Remarkable progress has been made in realizing this massive initiative. Key achievements so far include the following:

- Per the Data Warehouse governance TOR, a use case approach was followed to come up with the RMNCH Directorate as a priority domain.
- The functional and non-functional requirements have been collected and documented with the participation of RMNCH, HITD, and PPMED Directorates. Data source mapping has also been completed.
- A comprehensive scope of work has been prepared and reviewed for the data warehouse design, implementation, and deployment.

In light of this, MOH showed a strong commitment to realize a national data warehouse that can provide the capacity to integrate and store health data from multiple sources and enable planners, program managers, policy makers, and public health practitioners to have a comprehensive perspective on the public health domain.
LESSONS LEARNED
From the promising efforts made thus far, the following are lessons learned:

- It is wise to start resource-intensive initiatives, like the data warehouse, small and simple.
- Regardless of the obvious challenges in bringing all concerned parties onboard, it is essential to ensure a strong engagement of the ultimate owners of the initiative.
- The business requirements should drive the technology, and not the other way around.

WAY FORWARD
The following are the major tasks MOH aims to accomplish in the few years to come.

- Establish the first Data Mart for RMNCH based on the requirements documentation.
- Continue with identification, prioritization, and inclusion of key health domains in the planned incremental warehouse.
- Mobilize resources and engage more partners in the initiative to address the resource gap (as data warehouse is a resource-intensive initiative).
- Build the business intelligence services for ultra-modern analytics and disease modeling purposes.
BACKGROUND

The Ministry of Health is currently developing and rolling out multiple digital health systems, including DHIS2, EMR, HRIS, LMIS, eCHIS and others to improve health data systems and evidence-based decision-making at all levels of the health system. ICT infrastructure and connectivity have been major challenges during the implementation of these systems. The Ministry of Health prioritized and invested to establish robust and reliable technology infrastructure to ensure proper functioning of digital tools at point of care and institution levels. The Ministry of Health has been working with Ethio Telecom to provide internet connection to all health facilities and health administration units across the country via HealthNet, a Virtual Private Network (VPN) service. The VPN allows these sites to access digital tools such as DHIS2 to timely enter data and submit reports.

Following are the key benefits of HealthNet:

1. **Improve timeliness of reports**

   With any paper-based reporting system, there are delays in sending performance reports to the next level. Someone physically has to take the report to the reporting office. With online tools the time gap in physical transmission of the report is reduced to almost real-time reporting. With a functional HealthNet system, data entered by health centers or hospitals can be accessed by woreda, regional or eral level within a few hours.

2. **Improve accuracy and completeness of health data**

   With improved access to online tools such as DHIS2, health facility staff can directly enter data in DHIS2. They can also use data quality features of DHIS2 for validation and to check data inconsistency, outlier performance, and provide immediate feedback. This will result in improving the quality of data as data will be entered by staff compiling the report first-hand at the point of data collection.

3. **Timely feedback to hospitals, health centers and woreda offices and improved data quality and use**

   As with timely reporting, eral, regional or woreda offices can review and submit feedback on the reports in near real time. This will improve data quality and use of data and faster action taking at health facility and service delivery levels.

4. **Use by multiple systems**

   Currently, DHIS2 and LMIS are the two systems using the HealthNet VPN system. Additional systems are being developed to support multiple health domain areas, such as Master Facility Registry (MFR), Electronic Medical Records, Human Resource Information System (HRIS). HealthNEt will be useful for all these new systems and result in improved data flow, better decision-making and higher efficiency in the health sector.

5. **Data access during emergency internet shut-down**

   As recently observed, HelathNet continues to function even if there is internet shutdown for different reasons. A function HealthNet system allowed systems access within the health system. This is a huge benefit for the health sector as it allows smooth functioning of the data systems in the sector and less disruption due to such externalities.

6. **Future uses of improved network connectivity via HealthNet**

   The Health sector in Ethiopia is vast with large number of Health Extension workers, health centers, hospitals and multiple levels of management units all over the country. With im-
proved HealthNet functionality, technology can be useful new initiatives such as telemedicine that allows easy and faster communication with and between healthcare providers across the country and globally. This will further enhance the quality and efficiencies in the Ethiopian healthcare system.

GOAL AND OBJECTIVES

The main goal of healthNet program to provide a functional infrastructure and connectivity for all health institutions in Ethiopia to allow for real-time data transfer between levels of the health system, facilitating data use at each level, while improving quality and timeliness of care by improving referral and other linkages across the continuum of care to help achieve the Connected Woreda vision.

CURRENT STATUS (ACHIEVEMENTS AND CHALLENGES)

MOH has provided Virtual Private Network (VPN) services to the majority of health institutions (Regional Health Bureau, Zonal/Town Health Departments, Woreda Health Offices, Hospitals, Health Centers and other health institutions). Different technologies were used to establish network connections at health facilities. These are:

1. ADSL Solutions using 2 Mps /8Mps where there are incoming services (Ethio telecom cable accessible) within 5km radius
2. Using 3G, where there is no incoming service but 3G available
3. Tailored solutions using Router and Media converter, where is no Ethio telecom cable and 3G service in the area
4. Very Small Aperture Terminal Satellite (VSATs)

A total of 3605 have been connected to the HeathNet using one of the above four options.

LESSONS LEARNED

- Ownership of the program and the infrastructure by the RHBs is critical. Functionality of VPN increased in regions where there is strong communication between Regional Health Bureaus/Zonal health Offices and Ethio telecom. Therefore, strengthening communication with Ethio telecom in decentralized manner where regions, zones, woredas and health facilities can communicate with Ethio telecom at their respective level enables to solve VPN deployment related gaps and fasten its implementation.

NEXT STEPS

- Assess the healthNet functionality status and provide troubleshoot support in areas where there are problems
- Train HITs and other support staff on HealthNet troubleshooting
- Expand the infrastructure to sites where there is no connectivity
- Expand local area networks to enable the use of HealthNet in different departments of health institutions
- Work with Ethio Telecom to improve the quality of service and speed of connectivity
BACKGROUND

The Ministry of Health has established a national digital health innovation and learning center at St. Peter’s Comprehensive Hospital to create collaborative problem solving, innovation, experiment/testing, and learning space related to different digital health systems. The innovation and learning center is working in partnership with St. Peter’s Comprehensive Hospital and implementing partners to lead the realization of innovation in data-driven health care by building and implementing interoperable health information systems that are owned and led by the government.

The center was established at St. Peter’s Hospital because the hospital setting will help to better understand the innovation process from a health service perspective where value for patients and physicians are the most important driver for digital health innovation.

The center is expected to serve as a resource for the MOH, hospital staff, and external partners and will offer accredited, advanced-level training. DHILC will immediately feature a software development and testing environment for eCHIS and HRIS and will serve as a clearinghouse for any new digital health tools that will be implemented in the health system.

Furthermore, the DHILC is a space where practitioners can seek and receive technical and professional support to help overcome any health system implementation challenges. Based on the experiences of other countries, the center is expected to solve around 85% of minor health information system related challenges encountered by the users.

GOAL AND OBJECTIVES

The main goal of the DHILC is to create a platform for major digital health innovations through the user-centered design and validation of new requirements and use cases (especially in a health facility setting); synthesize and promote the best-available practices and global goods; validate new digital tools; and ensure that innovation is translated to scale through impact-driven partnerships.

Some of the major objectives include:

- Provide a dedicated workplace for collaborative development and testing of the newly developed or adopted applications
- Facilitate innovation and capacity building, which are the core of the DHILC
- Expedite the development and testing process of eHealth applications and tools in a more secured environment
- Provide hotlines for system and data use-related support from end users

CURRENT STATUS

In the past year, a lot has been done in terms of creating the physical lab space. There was major renovation work on the historical building that currently hosts the center. This renovation includes installing lighting, plastering, painting, and doing floor maintenance. Local area networking and a mini data center have been designed and implemented using state of the art technology. A virtual desktop infrastructure technology is used to implement all the necessary IT equipment required to efficiently run resources in the center. This includes procurement of servers, storage area networks, terminals, smart boards, smart screens, and software licenses for the servers and clients. A cloud-based call center infrastructure has also been implemented to support the end users through hotlines.
The DHILC was launched on August 06, 2020 with the following five important functional components.

1. **Data Use Innovation Concept Room** - Ideation room for collaborative problem solving and design sessions

2. **eHealth Application Development and Testing Room** - A room for collaborative eHealth application design, development, and testing

3. **Capacity Building Center** - Two training rooms to hold various digital health applications and data use capacity building sessions, including a DHIS2 academy

4. **Resource Center** - A space for staff/researchers to access electronic scientific publications and other gray literature about the Ethiopian health information systems

5. **eHealth Support Call Center** - A call center to provide remote support to users on implemented eHealth applications and consultations around data quality and data use issues

Two software development teams working on the electronic community health information system and human resource information system are deployed and working from the center. In addition, admin staff are hired and the lab operational guidelines are being drafted.

**LEARNINGS**

In establishing the DHILC at MOH, the team has identified the need for a strong conceptualization of the innovation process(es) in order to enhance understanding and collaboration between the MOH, St. Peter’s Hospital, and the partners involved in digital health innovation and development projects.

**NEXT STEPS**

- Strengthen software development and testing environment for eCHIS and HRIS within the DHILC
  - establishing standard software development processes
  - ensuring the products are properly checked, packaged, and archived
- Introduce creative strategies to make the innovation lab a resource for both internal MOH and external health partners in delivering certificate accredited trainings and as a center for a specialized HIT team
- Produce next cadre of developers for DHIS2, eCHIS, HRIS, Vitas, and other systems by providing internship opportunities for current or recent graduates to help build new and upcoming talent by coordinating with universities
- Organize technical and public events to raise awareness about contemporary issues on digital health and data use
- Support efforts to use the innovation lab as a clearing house for new digital health applications
INTRODUCTION

The Ethiopian Information Revolution includes two pillars — cultural transformation for health data use and the digitalization and scale-up of the health information system. As governance is the foundation of the Information Revolution, it is difficult to play its role without a well-articulated governance framework.

The overall objective, or purpose, of the HIS governance framework is to define and document HIS governance functions, principles, and structures in a consultative process with stakeholders.

HIS GOVERNANCE FUNCTIONS AND PRINCIPLES

There are four key governance functions that are part of the national HIS governance framework, which are expected to be applicable and customizable as needed at the regional levels.

1. Promoting HIS Accountability and Transparency
   • One of the main functions of the HIS governance is to promote HIS accountability through monitoring and regular and inclusive transparent reviews of progress and performance at the facility, subnational, national, regional levels.
   • Mechanisms of promoting HIS accountability and transparency through:
     » Defining clear roles and responsibilities of stakeholders and reporting structures
     » Strengthening mechanisms to make health data available to users through electronic dissemination and easy access to a central data repository;
     » Use of annual health reports to identify facilities and districts with high and poor performance on HIS management, maintenance, and use.

2. Developing HIS Policy and Strategy
   • As new health strategies and technologies emerge, HIS policies and strategies may need to be modified and/or developed that address the current and anticipated changes, helping ensure that HIS policy and strategy remain aligned with the Ethiopian health goals. Illustrative policy and strategy areas could include:
     » HIS Policy and strategy
     » HIS strategic planning
     » HIS Strategic investment guidelines
     » eHealth policy and digital health standards including privacy and security
     » HIS Human Resource Strategy

3. Developing HIS Legislation and Regulation
   • HIS Governance includes developing, reviewing, and proposing appropriate regulations and legislations that are pertinent to the HIS. Illustrative areas for appropriate legislation and regulations in the Ethiopia HIS context include the development of the following directives:
     » Public health data recording, access, sharing, and reporting
     » eHealth-related legislation/regulation
4. **Fostering HIS Coordination and Partnerships**

- The coordination and maintenance of collaborative partnerships is critical for the development of health information systems and for the effective operation and sustainability of important HIS functions. Illustrative partners may include the following:
  - Relevant ministries and agencies engaged in health and related information systems
  - Local and international academic partners
  - Representatives of the private sector
  - Donor and UN agencies: WHO, UNICEF, CDC, USAID, BMGF
  - Civil societies and NGOs
  - Other governments/external entities, such as the African Union, Africa CDC

HIS governance structures provide a platform for coordination, dialogue, and consensus on appropriate policies, strategies, and interventions with active engagement of key HIS stakeholders at different levels of the structure, such as National Steering Committee, NAG, TWGs and their regional counterparts.

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**National HIS Governance structure**
CURRENT STATUS AND SUCCESSES

The national HIS governance framework, which was endorsed two years ago, has recently been further refined, updated, and readied for re-endorsement. Among the amendments include inclusion of NAG, Data Use and HIS Governance TWGs, changing the meeting frequency of the National HIS Steering Committee from the initial biannually to quarterly. The National HIS Steering Committee was able to meet by the end of the EFY 2012 that was chaired by Her Excellency Dr. Lia. The committee endorsed the revised TOR and passed important decisions, such as changing the frequency of the Steering Committee meeting from the initial biannually to quarterly.

A generic regional HIS governance framework, based on the national version, was prepared and shared with regions for customization and approval. Accordingly, some of the regions were able to customize the generic regional HIS governance framework to their situation and were able to establish platforms either as a standalone or integrated with overall regional partners’ forums, depending on the regional realities. Regions such as Amhara, Dire Dawa, Somali, and Gambella have established standalone HIS coordination platforms and are conducting meetings with HIS stakeholders on a regular basis. On the other hand, in Oromia and Benishangul Gumuz, the HIS coordination platforms are integrated with the overall partner coordination platform at the regional level. The HIS coordination platforms are in the process of establishment in SNNP, Afar, Harari, Tigray, and Addis Ababa regions.

LESSONS, CHALLENGES, AND THE WAY FORWARD

Relying on HIS governance frameworks to guide the formation of governance structures and implementation of governance functions has helped to make progress in HIS governance in a conscious, focused, and organized manner. The experience of the regions customizing the governance framework and structures to their situation, such as integrating HIS-related platforms with existing sector-wide platforms, is an indication of their ownership of HIS governance.

A lack of functionality of HIS governance structures, as per the requirements of the governance frameworks, and delays in the endorsement/re-endorsement and adoption/adaption of the national HIS governance framework by some regions were among the challenges encountered.

Overall, putting in place a functioning HIS governance framework requires adequate engagement of key HIS stakeholders in the development of the framework; endorsement and ownership of the framework by the health sector leadership; and due emphasis and active engagement of donors and implementing partners in the implementation of HIS governance based on the agreed upon framework.
INTRODUCTION
Among the structural prerequisites of HIS include the existence of necessary policies, laws, regulations, standards, guidelines, protocols, and procedures. The overall purpose of these important governance functions and documents is to create an enabling environment for HIS to operate, to standardize HIS procedures, to assist health care workers to implement HIS activities, and to enhance accountability and enforce HIS requirements. Although these documents are expected to be primarily prepared at the national level, some are potentially customizable to regional contexts and realities.

There are numerous such documents in the Ethiopian health sector that have been prepared over the past many years and exist at various levels of development. Some are in the draft form which took relatively longer time to finalize and get endorsed, some have been revised along with the revision of HMIS, some are in the pipeline to be finalized and endorsed, and others are under consideration to be developed in the short- and medium-term. The below are among the key documents along with their intended purposes.

HEALTH INFORMATION PROCLAMATION: HEALTH ACT
The preparation of the health information proclamation started more than five years ago by the then PPD and now PPMED with a general purpose of enhancing evidence-driven decision-making and quality and safety of health care; facilitating public health and clinical research and improving and enforcing proper recording, storage, and sharing of data for the purpose of improved health system performance and public health outcomes.

However, with the same purpose, the contents of the Health Information Proclamation were decided to be an integral part of the Health Act, which defines legal structures and functions of the health sector. The process of development of the Health Act and stakeholder consultation is being led by the Legal Directorate of the Ministry of Health and its finalization and submission to the parliament is expected in EFY 2013.

DATA ACCESS AND SHARING DIRECTIVE
Despite the huge sources and amount of health and health-related data and the emphasis on sharing data in the Ethiopian constitution, health policies, and information strategies, there exists minimal data sharing and access to practices and traditions. A large quantum of data generated by using public funds by various organizations remains inaccessible, though most of such data may be non-sensitive and could be used by the public for scientific, economic, and developmental purposes. This tradition has poorly supported the health policy that should be derived from a comprehensive view of health and health-related evidence in Ethiopia, sound program management, health facility administration, and clinical services. This concern has prompted the development of a clear, comprehensive, obligatory, and governing national data access and sharing directive to guide all health and health-related data sources in the country. The directive is being prepared by PPMED/MOH and EPHI. The draft guideline has been refined by incorporating inputs from NAG members and is awaiting more consultation and input from stakeholders, the legal directorate of MOH, the eral Attorney General, MOH management, and Executive Committee to be finalized in EFY 2013.

HIS GOVERNANCE FRAMEWORK
As governance is the foundation of the Information Revolution, it is difficult to play its role without a well-articulated governance framework. The HIS governance framework is a document that defines and guides HIS governance functions, principles, and structures. The first version of the National HIS governance framework was prepared and endorsed in 2019. The framework was further updated in EFY 2012 by incorporating NAG and Data Use and HIS Governance TWGs as part of the national HIS governance structures and amending the meeting frequency of the National HIS Steering Committee from six-monthly to quarterly were among the major changes. The revised framework is expected to be endorsed by the National HIS Steering Committee.
MASTER FACILITY REGISTRY (MFR) MANAGEMENT AND GOVERNANCE PROTOCOL

The Master Facility Registry (MFR) is a platform for storing, managing, and sharing a complete, up-to-date, authoritative listing of the health facilities in a particular country. It is one of the shared services and many information systems for stakeholders requiring a comprehensive list of health facilities. The draft MFR Governance Management and Protocol, which outlined the MFR data content, management, governance structure, operating, and maintenance procedures, has been finalized in 2019 by the MFR TWG by incorporating inputs from RHBs and HIS stakeholders. The protocol has guided the development of the ResourceMap-based MFR platform and is expected to be updated based on the need to expand the content and functionality of the MFR platform. The current version protocol is pending endorsement by the National HIS Steering Committee.

NATIONAL HEALTH DATA DICTIONARY (NHDD) SOP

The national health data dictionary (NHDD) is a central and authoritative source for terminology and indicator definition. As a major component of the shared services of the Ethiopian eHA, MOH is building a national data dictionary that is expected to promote data integrity by supporting the adoption and use of consistent data elements and terminology within health IT systems. The SOP was prepared in 2018 and outlined the NHDD governance structures and roles and responsibilities of various actors, including NHDD TWG and dictionary management teams.

ETHIOPIAN eHEALTH ARCHITECTURE (EHA)

The Ethiopian eHealth Architecture is a conceptual model that depicts the information systems, data sources, and integrations that the Ministry of Health proposes to implement and maintain to help achieve its strategic goals. The document, which has been under work for the last few years and in draft form, is designed to outline the current state and the future directions of Ethiopia’s eHealth Architecture. The eHealth Architecture is not a static concept; it is expected to grow and transform as the health needs, policies, and priorities of the country grow and change. The key audience of the eHealth Architecture document are the multiple stakeholders that develop, implement, and support projects within the Ethiopian health information systems.

HMIS INDICATOR REFERENCE GUIDE

Indicators are the most important management tools for monitoring, reviewing and evaluating purposes. Indicator reference guides were prepared to serve as a standard reference and guidance for health indicators in the health sector of Ethiopia. In addition, the guide is expected to enhance the availability and quality of data on performance and results, avoid duplicative reporting requirements so that data burden on health workers can be reduced, standardize data collection tools and procedures based on the selected core indicators at all levels of the health system. The first version was released in 2008 as part of the HMIS reform and subsequent revisions were made in 2014 and 2017 following HMIS revisions. The current working document is the 2017 version that describes 131 selected indicators. The driving forces for revision include changing and new health initiative requirements by the health sector, requirements to align with international indicators, and also other factors. Revision is expected in EFY 2013 following the overall HMIS revision to meet the goals and objectives of HSTP2.

HMIS PROCEDURES MANUAL: RECORDING AND REPORTING PROCEDURE

The HMIS captures much of its service and disease surveillance data from client/patient records that health professionals maintain for care and follow-up. Accordingly, a procedure manual has been in place since the HMIS reform in 2008 with the purpose of standardizing and streamlining the recording and reporting of the routine/HMIS data. Since the first version, the manual was updated in 2014 and 2017 following respective HMIS revisions. The manual elaborates for major areas: Client/patient encounter formats, intra-facility data flow, HMIS reporting formats, and HMIS data flow. Revision is expected in EFY 2013 following the overall HMIS revision to meet the goals and objectives of HSTP2.

WOREDA-BASED HEALTH SECTOR PLANNING GUIDELINE

The sector has institutionalized a peculiar planning process which uses a Top-Down and Bottom-Up Approach that suits the country’s decentralized health system. PPMED has been regularly preparing and updating the planning protocol since 2009 up to most recently in 2020. The latest version is different in that
it tried to integrate the strategic planning and management format of the Eritrea Plan Commission (EPC) with the traditional Balanced-Score Card (BSC). The document describes an indicative plan, resource mapping, efficient costing, and core and comprehensive planning.

**NATIONAL HMIS MENTORSHIP GUIDELINE**

Over the past many years, the Ministry and Regional Health Bureaus (RHBs) have been recruiting many trained health information technicians (HITs) who were deployed at facility and district levels. Regular in-service trainings were also provided to HITs to improve their skills. However, limited human capacity due to the lack of continuous follow-up on the area of the field has been identified as one of the major challenges. The HMIS mentorship approach is among one of the helpful methods that allow the workforce to enhance their knowledge and skills in broad areas of content without moving outside of the work station for theoretical and practical instruction. With the general objective of providing a nationally standardized and uniform HMIS mentorship approach to improve data quality and use, the first version of the “National HMIS Quality Improvement Guide” was prepared in 2014. Taking into account the many changes in the HMIS, particularly the introduction of the Connected Woreda strategy, a revision was made in 2017 thought not formally endorsed.

**LESSONS, CHALLENGES, AND THE WAY FORWARD**

The preparation and deployment of various types of HIS-related documents have undoubtedly facilitated the implementation of HMIS in a standardized and streamlined manner. Attempts have been made to revise and update the various documents to reflect the changing realities which should be further enhanced. One of the challenges related to these documents was that though good attention was given to initiate the preparation of many documents, the same level of attention has not been paid to monitor the progress of preparation and timely finalization of documents. The other challenge was failure to endorse the finalized documents in a timely manner by respective governance bodies. More attention to timely finalization, endorsement, and monitoring of proper implementation of such documents, and inclusion of missing HIS governance documents, such as HIS policy, and sub-component policies, such as eHealth policies, will further advance the already established efforts.

**OTHER DOCUMENTS**

There are also other documents which have been prepared with defined purposes and objectives over the past years which are at different levels of development. Among these are: Guidelines for Integrated Supportive Supervision; Verbal Autopsy Implementation Guide; CRVS operational guideline; Guideline on Incentivizing Data Quality, Use, and Performance Improvement; Connected Woreda Implementation Strategy; IR road map/HIS strategic plan, Human resource road map for national health information system of Ethiopia, 2020-2030, IT infrastructure management guideline (Under development), Governance practice framework for Digital health activities (Under development), National Digital Health Strategy (Under development); Urban Community Health Information System Procedure Manual; information use training modules; Health Data Quality Training Modules, national guidelines for administrative data use;, and HIV/AIDS Community Information System: Technical Guideline and National Monitoring and Evaluation Framework for the Multi-Sectorial Response to HIV/AIDS in Ethiopia.
The information revolution is continued to be one of the five transformation agendas in the second health sector transformation plan. It refers to the phenomenal advancement on the methods and practice of collecting, analyzing, presenting, using and disseminating information that can influence decisions. It entails a radical shift from traditional way of data utilization to a systematic information management approach powered by corresponding level of technology. Information revolution is not only about changing the techniques of data and information management; it is also about bringing fundamental cultural and attitudinal change regarding perceived value and practical use of information.

**GOAL:**

The overall goal of information revolution is improving the capability of the health system to generate and use high quality data for evidence-based decision-making and drive towards a better health systems performance. During the HSTP2 period, most of the focus will be to address the critical gaps in cultural transformation for health data use and the digitalization and scale up of the overall health information system and a strong HIS governance as the foundation of sustainable National HIS.

**INITIATIVES**

The major initiatives implemented to improve the culture of data use will include continuous improvement of the availability and quality of data, building capacity in data use core competencies, engaging data users and data producers, strengthening the organization’s data demand and use platforms and proper documentation and communication of data demand and use successes.

The major initiatives under the digitization pillar of information revolution will include development and implementation of already started and newly initiated electronic applications according to the Ethiopian e-health architecture. This includes development and implementation of registry services (Client registry, facility registry, health worker registry, terminology services etc), point of service information systems (electronic medical record, and information systems such as e-CHIS, DHIS-2 together with its data use features, LMIS, HRIS, insurance system etc.). Appropriate design and implementation of architecture to support easier interoperability between disparate e-health systems and components will be emphasized.

**EXPECTED RESULTS**

Major expected results of this agenda are improved culture of data demand and use of high quality data for decision-making supported by technology to improve service quality, patient care outcomes, efficiency and effectiveness. This will be regularly monitored using the IR checklist that categorizes facilities/woreda as emerging, candidate, model and, connected based on set of parameters under infrastructure, data quality and data use themes.

**RESOURCE REQUIREMENTS**

The total estimated cost of the HIS strategic plan for the first five years (2020/21 – 2024/25) is 1.01 Billion USD. The average yearly total estimated cost is 203.9 million USD.
The table below shows estimated HIS budget in relation to its major strategic objectives in Millions USD.

<table>
<thead>
<tr>
<th>Directions (Implementation Strategies)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2020</td>
</tr>
<tr>
<td>Improve Data Quality</td>
<td>14.86</td>
</tr>
<tr>
<td>Nurturing Digitalization for data manage-ment and use</td>
<td>5.13</td>
</tr>
<tr>
<td>Improve standardization and integration of different HIS subsystems</td>
<td>0.38</td>
</tr>
<tr>
<td>Develop &amp; enforce policy, strategy, legislation &amp; regulation</td>
<td>2.08</td>
</tr>
<tr>
<td>Improve Health IT Infrastructure</td>
<td>20.53</td>
</tr>
<tr>
<td>Enhance information use culture</td>
<td>1.92</td>
</tr>
<tr>
<td>Total</td>
<td>200.6</td>
</tr>
</tbody>
</table>

The Share of HIS from HSTP2 budget is expected to be high at the beginning of HSTP2 planning period (4.6%) and annually decreasing and reaches 2.6% at the end of the planning period due to the requirement of huge IT infrastructure cost. However, the per capita of HIS in the first year of the strategic plan (2020/21) is 0.51 USD and at end of the planning period 2029/30 reaches 0.63 USD.