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MINISTRY OF HEALTH-ETHIOPIA



ETHIOPIA
DUP

DATA USE
PARTNERSHIP

Ethiopia Data Use Partnership

End of Project Report

November, 2016 - February, 2023



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DUP's success over the last six years was the fruit of concerted efforts of multiple actors in the HIS space. We are grateful to the extraordinary guidance, coordination and leadership support of the Ministry of Health (MOH) and respective regional health bureaus (RHBs) without whom nothing would have been possible. DUP would also like to extend its sincere gratitude to all HIS implementing partners and CBMP Universities for the collaboration and contribution they hand in materializing the IR agenda.

Kudos to the brave DUP team for their strategic engagement, thought leadership and intensive support to the MOH and RHBs as a trusted technical arm for the HIS efforts. You managed this demanding undertaking with great professionalism and admirable work ethic. We couldn't be prouder!

Finally, DUP is indebted to the BMGF and DDCF for their generous funding and guidance for the smooth implementation of this project.

Acronyms

Acronym	Full form	Acronym	Full form
AACAHB	Addis Ababa City Administration Health Bureau	HSTP	Health Sector Transformation Plan
ACHIS	Agrarian community health information system	ICCM	Integrated Community Case Management
ARM	Annual Review Meeting	IPP	In patient department
AWS	Amazon Web Service	IR	Information Revolution
BMGF	Bill & Melinda Gates Foundation	KM	Knowledge Management
CBMP	Capacity-Building and Mentorship Program	KPI	Key Performance Indicators
CBNC	Community Based Newborn Care	LQAS	Lot Quality Assurance Sampling
CHIS	Community Health Information System	M&E	Monitoring and Evaluation
COVID-19	Corona Virus Disease	MCH	Maternal and Child Health
CSA	Central Statistics Agency	MOH	Ministry of Health
DDCF	Doris Duke Charitable Foundation	MRU	Medical Record Unit
DHA	Digital Health Activity	NCoD	National Classification of Disease
DHBp	Digital Health Blueprint	NHDD	National Health Data Dictionary
DHILC	Digital Health Innovation and Learning Center	NTF	National Task Force
DHIS2	District health information software, version 2	ODK	Open Data Kit
eCHIS	Electronic Community Health Information System	OPD	Outpatient department
E-DHPIS	Ethiopian Digital Health Projects Inventory System	PCHIS	Pastoralist Community health information system
EFY	Ethiopian Fiscal Year	PHCU	Primary Health Care Unit
EHR	Electronic Health Record	PMT	Performance Monitoring Team
EOC	Emergency Operation Center	PPMED	Policy Planning, Monitoring and Evaluation Directorate
EPHI	Ethiopian Public Health Institute	RAG	Regional Advisory group
FHIR	Fast HealthCare Interoperability Resources	RDQA	Routine Data Quality Assessment
GDHF21	Global Digital Health Forum 2021	RHB	Regional Health Bureau
GII	Geospatial Information Institute	RMNCH	Reproductive, Maternal and Newborn and Child Health
HBIC	Home-Based Isolation and Care	RSC	Regional steering committee
HC	Health Centers	SNNP	Southern Nations, Nationalities and People
HEP	Health Extension Program	SOP	Standard operational procedure
HF	Health Facility	ToR	Terms of Reference
HIS	Health Information System	ToT	Training of Trainers
HISP	Health Information Systems Program.	TWG	Technical Working Group
HIT	Health Information Technology	USAID	United States Agency for International Development
HITD	Health Information Technology Directorate	WHO	World Health Organization
HMIS	Health Management Information System	WorHO	Woreda Health Office
HP	Health Post	ZHD	Zonal Health Department



Message from the Director

Dear Reader,

It has been more than six years since we have embarked on this incredible journey of supporting Ethiopia's endeavor in transforming health information collection, management and use practices. Looking back, it strikes me to see how far the country's HIS has progressed in such a short time since the Ministry of Health (MOH) launched the Information Revolution.

The Ethiopia Data Use Partnership, collaborated and aligned its support with the government priorities to revolutionize the challenging and fragmented health information system (HIS).

Through the days, we scored remarkable achievements in all of the three IR pillars; data use cultural transformation, digitization of priority systems and HIS governance. Moreover, the extensive research works we jointly conducted with the academia at CBMP universities, MOH experts and HIS partners have contributed richly to the body of evidence in HIS locally and globally.

True to our name, partnership is at the heart of our identity. Whatever we have accomplished over the last six years is a collaborative achievement. Thus, I feel humbled and honored for the opportunity of working closely with the government, and my deepest gratitude goes to the MOH, Regional Health Bureaus and Universities.

Furthermore, I am very thankful to the Bill and Melinda Gates Foundation and the Doris Duke Charitable Foundation for the generous support that contributed to this tremendous achievement. Likewise, the ingenuity and collaboration among HIS implementing partners and stakeholders had been a true privilege and drive to our work. Thank you all.

As the world succumbed to the COVID 19 pandemic, and civil unrest prevailed in many parts of our country, DUP also took its fair share of challenges. I witnessed the steadfast and relentless spirit of our project staff to leaning forward in the face of danger. I am proud of our talented staff for all the hard work and commitment to what we accomplished together. I would simply say, "You have made it! Congratulation!"

I will take a pause here and invite you to learn from us, use our evidences, build on our accomplishments and scale-up our innovations to advance the HIS space to meet the needs of our people.

Wubshet Denboba

Project Director, Data Use Partnership

Executive Summary

Introduction: The Data Use Partnership (DUP) project, a project co-created by MOH in collaboration with JSI Research & Training Institute, Inc. (JSI) and with funding mainly from BMGF and a supplemental grant from DDCF, was implemented in Ethiopia between November 2016 and February 2022. The MOH institutionalized the project in support of its Information Revolution (IR) agenda, and aiming to improve the collection and use of high-quality routine information while cultivating a data use culture in Ethiopia's health sector. These efforts were meant to ultimately lead to better quality, efficiency, and availability of primary health and nutrition services at all levels of the health system.

DUP's project activities followed the IR's framework that included transformation of an information use culture, digitization of priority HIS, and the HIS governance coupled with enhancing implementation research, knowledge management, and communication. The DUP project implementation philosophy stresses country leadership, ownership, and strong coordination among diverse stakeholders. This end of project report covers major achievements and contribution of DUP throughout the project implementation period. The achievements included in this report were fulfilled in partnership with multiple stakeholders under the auspice and leadership of MOH and RHBs.

Project Goal, Principles and Focus areas

- **Goal:** To improve the use of high-quality routine information in the health sector, contributing to improved quality, efficiency, and availability of primary health and nutrition services at all levels.
- **Principles:** Inclusive and collaborative engagement; promotion of country ownership and accountability; deliberate investment; innovative and strategic change.
- **Focus Areas:** Information use culture; digitization of priority HIS; HIS governance; evidence generation and dissemination.



Major Achievements



Increase human capacity in HIS

- Standardized and harmonized the HIS pre-service courses and integrated them with health-related professional pre-service trainings. More than 10 universities adopted the newly developed HIS curriculum.
- Developed human resource capacity by training 26,283 (18,874 male and 7,409 female) health workers, HITs, health program managers and leaders.
- Trained and deployed 169 new IT graduate interns across all regions for a one-year internship program (December 2019–December 2020).



Transformation of Data Use Culture

- Institutionalized the data quality monitoring and feedback mechanisms and the application of data quality assurance mechanisms that led to enhanced use of quality data. On average >90% reporting completeness and >70% reporting timeliness rate were achieved for both service and disease reports.
- Routinized data analytics and visualization practices which resulted in the use of tailored dashboards and the development of more than 410 periodic analytic reports for data-driven decisions.
- Improved data use platforms. About 98%, 90% and 85% of HFs have PMT, conduct PMT meetings regularly and conducted root cause analysis for identified performance gaps.
- Revised the existing HMIS tools and indicators to address the evolving needs and programmatic modifications through periodic review. Standardized Ethiopia's list of distinct diagnosis by developing and implementing the Ethiopian Simplified Version of International Classification of Disease (ESV-ICD11).
- Tested and replicated data quality and data use innovation in the learning woredas and hospital.
- Through the support of CBMP, the IR model sites grew from 2% in June 2018 to 39% in May 2022 and the 'Emerging' status sites dropped from 74% in June 2018 to 1% in May 2022.
- Developed and implemented standards, training manuals, guidelines and Standard operating procedures on different HIS topics.



Digitization of Key HIS

- Developed the Ethiopian eHealth architecture framework and prominent shared services like MFR and NHDD.
- Intensively supported the transition from siloed HMIS to unified and country owned DHIS2 system. We established and built local capacity on DHIS2 customization, analysis and use through basic and academy level trainings.
- Coordinated the eCHIS scoping, development, testing, scale-up, strategy and road-mapping tasks.
- Customized the DHIS2 system for COVID19 case-based tracking and for aggregate data reporting.
- Implemented the interoperability of the MFR/DHIS2, eCHIS/DHIS2 and COVID-19 Tracker/Lab Systems.
- Developed the Ethiopian Digital Health Projects Inventory System (E-DHPIS) that allows rigorous documentation and certification of digital health projects based on the eHA principles.
- Developed and implemented an online reference platform based on an Open Concept Lab (OCL). Populated the HMIS indicators and more than 2,500 distinct diseases and conditions on the OCL. Developed the NHDD Mobile App (NHDD-Pocket) to improve data quality during Disease data capture
- Familiarized, implemented and supported Cloud hosting (AWS) of priority digital health systems in the country. We also established a Corporate email services using Google Workspace (G-Suite) with more than 2,100 users (MOH, RHBs, and Agencies).
- Established the Digital Health Innovation and Learning (DHILC) for the MOH with the purpose of availing a dedicated workspace, leaning and innovation site, resource center and HelpDesk.



HIS Governance

- Supported the development and implementation of the HIS Governance Framework which is customized to the regions.
- Developed and supported the implementation of HIS governance documents that guide the HIS investment. This notably include, the National HIS Strategic Plan, M&E plan of HSTP, Digital Health Blue print, Data access and sharing guideline among others.
- Facilitated decision on priority HIS matters through organizing the steering committee, NAG and the TWG meetings.
- Successfully facilitated the nationwide “National Health Data Week” and “Digital Health Week” with active engagement from HIS stakeholders.



Monitoring and Evaluation, Research and Learning

- Guided and supported the completion of 12 HIS implementation researches and made them ready for dissemination.
- Eighty-one Master's and 10 PhD students received grants for their research works; of the Master's students, 20% published their researches so far.
- Conducted three operational research and disseminated the findings for use.
- Conducted HIS effectiveness assessment to measure the impact of improvement of HIS on health status.
- Published 54 manuscripts in reputable local and international journals.
- Developed 43 success stories; shared five success stories on different outlets, and produced the quarterly IR newspaper.
- Supported the production of documentary films including the evolution of Ethiopia's digital health.
- Produced and shared TV program focusing on "Data Use for Action".

Major Challenges The conflict and security situation in the country and the COVID-19 pandemic during the project period made implementation of planned activities difficult.



Introduction

1. Background

1.1. Introduction

One of the four distinct but highly interwoven transformational agendas in the first Health Sector Transformation Plan (HSTP-I), the Information Revolution (IR) was launched in response to increasing demands for health information and opportunities to leverage advancements in information and communications technology (ICT). With its focus to cultivate fundamental cultural change and accelerate data use within the health sector, the IR agenda continued to be a major priority in HSTP-II. To advance the IR objectives, the Ethiopian Ministry of Health (MOH) developed a national IR Roadmap (2016–2020). This strategic document identified two pillars with actionable and measurable interventions: (1) enhancing the culture of information use for decision-making, and (2) implementing and scaling-up of priority health information systems (HIS) and tools.

Despite the extensive investment in the national HIS, Ethiopia still faced various HIS-related challenges, including infrastructure, management capacity, and performance. In addition, there was a need to address workforce motivation and capacity related to the use of data at all levels of the health system. Improved system design and increased HIS infrastructure can only go so far in addressing gaps in data quality and use; therefore, the MOH developed the HIS strategy as a mechanism to support the HSTP.

To advance the country's healthcare through the IR, the MOH institutionalized the Ethiopia Data Use Partnership (DUP), led by JSI Research & Training Institute, Inc. (JSI). DUP has provided technical assistance, resources, and partner engagement in order to realize the IR. As the partnership's lead implementer, JSI has built key alliances with local and external technical partners with expertise in health informatics, nutrition data, electronic medical records (EMR), and mHealth solutions, while sustaining a decades-long collaboration with MOH on health system strengthening, health service delivery, and health management information systems (HMIS) strengthening.

This report highlights the major milestones and accomplishments that DUP has achieved over the last six years of project implementation. The majority of the activities included in this report were implemented in partnership with other stakeholders and under the leadership of MOH, regional health bureaus (RHBs), and local universities.

1.2. Report Organization

Major data sources for this report are: DHIS2, annual reports from the last six years, result framework reports from the last five years, training database, monthly and quarterly quantitative and qualitative reports, and other field visit-based reports including from supportive supervision and mentoring activities.

The report has four main sections: (1) introduction, project context, and principles; (2) major achievements organized under project domains — a) Transformation of an Information Use Culture, b) Digitization of Priority HIS, c) HIS Governance, and d) Monitoring, Evaluation, Research, and Learning (MERL) including Communication and Knowledge Management (KM), (3) challenges and project adjustments; and (4) recommendations.

1.3. Project Context

The DUP consortium was a dynamic, responsive team of partners, jointly selected by the MOH and the Bill & Melinda Gates Foundation (BMGF) that also included: Regenstrief Institute, University of Gondar, and the Gobe Group. DUP aimed to improve the collection and use of high-quality routine information in the health sector, leading to better quality, efficiency, and availability of primary health and nutrition services at all levels of the health system.

The agreement between BMGF and JSI was signed on November 10, 2016. This first phase of DUP ran for six years, from November 10, 2016 to June 30, 2023. The BMGF and JSI mutually agreed to adjust the project years to align with the Ethiopian fiscal year.

1.4. Project Objectives

The overall goal of DUP reflected the IR goal: to improve the use of high-quality routine information in the health sector, contributing to improved quality, efficiency, and availability of primary health and nutrition services at all levels.

1.5. DUP Principles and Main Implementation Strategies

The DUP consortium's guiding principles are as follows:

- Inclusive and collaborative engagement with a range of stakeholders from the MOH, global development partners, and other players outside the health sector in the country.
- Promotion of country ownership and accountability for the national HIS to ensure sustainability.
- Deliberate investment in creating an information culture that facilitates information use at every level, both vertically within the health system and horizontally at the level of interface of the health system with the community and the political administration.
- Innovative and strategic change that builds on current investments in HIS governance, infrastructure, design, and capacity; optimizes learning from local as well as global experience; and draws from systems thinking and from human-centered design disciplines and theories.

The DUP's main implementation strategies are as follows:

The DUP's focus areas are:

1. Creation of an Information Culture
2. Digitization of priority health information systems
3. In place a well-functioning HIS governance system
4. Evidence generation and dissemination

Aligned with guiding principles and strategies, DUP mainly applied the embedded staff approach, both at national (MOH) and regional (RHB) levels, to provide high-level technical support, bring desired change while ensuring an efficient and effective working relationship, and ensure ownership and sustainability of the initiatives as detailed below.

1.5.1. Embedment

The first iteration of DUP was operationalized using a fully embedded approach that allowed DUP staff to provide TA support to the MOH and RHBs and closely mentor, coach, and build government capacity to drive the IR agenda. As such, DUP staff were embedded in the MOH and RHBs and worked alongside MOH staff to realize IR objectives. As a result, DUP built trusted partnership with MOH and RHBs working alongside colleagues. With its unique embedment approach, DUP supported the development of HIS strategic and operational plans, established plan alignment processes and conducted resource mapping for HIS. This approach promoted government ownership of the DUP implementation activities that would ensure sustainability and smooth transitioning.

1.5.2. Country Ownership and Alignment with Government Priorities

One of DUP's main strategies was to promote and ensure country ownership and government leadership of HIS improvement efforts in Ethiopia. To this end, DUP aligned its plans and activities with MOH and RHBs' priorities on an annual basis. DUP also supported the MOH to put in place a coherent and shared approach to transition from a fragmented HIS landscape to an integrated system. Working with MOH and other stakeholders, the embedment approach created a special opportunity for DUP to serve as a thought leader in the development of the Connected Woreda Strategy, national eHealth architecture, digital health blueprint, and the national HIS and digital health strategy, among others and ensure alignment of the data, application, and infrastructure architecture with MOH's goals.

1.5.3. Partnership and Collaboration

It is critical that HIS stakeholders come together in a shared commitment to partnership and mutual accountability for the success of the IR. Coordination and collaboration have been at the heart of DUP's efforts in Ethiopia. As a strategic and technical partner, DUP supported the MOH to coordinate donors, implementing partners, and other HIS actors. In order to coordinate and promote HIS partnerships, DUP engaged in facilitating platforms for collaborative engagement between key HIS stakeholders, including the HIS Steering Committee, National Advisory Group, and Data Use and Digitization Technical Working Groups (TWGs) at national and regional levels. Through these engagements, DUP sought to enhance evidence-based decision-making by ensuring the HIS governance are well-functioning. DUP's support included setting discussion agendas, providing technical and logistics support for organizing forums, and mobilizing technical expertise and financial resources from different partners to contribute to the planning, implementation, and monitoring of priority data use and digitization interventions.

1.6. Project Area and Beneficiaries

The DUP project has been implemented across all regions of Ethiopia (both in agrarian and pastoralist regions) in alignment with the MOH and RHB structures. Similarly, the project beneficiaries are mainly the MOH, RHBs, zonal health departments (ZHDs), woreda health offices (WorHOs), and health facilities (HFs), including hospitals, health centers, and health posts.

1.7. Project Funding

The BMGF has been DUP's primary funder. From 2018 and on, the DUP also received a supplemental grant from the Doris Duke Charitable Foundation (DDCF) to support implementation research and the Capacity Building Mentorship Program (CBMP) that is executed in collaboration with MOH, RHBs, and the six local universities.



Major Achievements of the Project

2. Major Achievements of the Project

2.1. Increase human capacity in HIS

The global health and development community have widely accepted that capacity building plays a vital role in strengthening health systems, particularly when sustainability and country ownership are a priority. Like any other asset, human capital has the ability to depreciate through long periods of unemployment and the inability to keep up with technology and innovation.

Increasing human capacity in HIS was among DUP's key intervention areas in improving data use and data quality because it also served as an entry point for DUP to realize the expected level of IR implementation. The project invested and contributed to improve the skills and knowledge of managers and decision makers to oversee data collection, data management, data quality, and interpreting and using data to improve health system performance in addressing health issues. The notable activities to increase human capacity in his included: standardizing and harmonizing the HIS pre-service courses and integrating them with health-related professional pre-service trainings; providing in-service training on HIS topics for the MOH, RHBs, ZHDs, and HF staff; conducting mentorship to RHB, zonal, woreda, and facility level HIS staff; and conducting supportive supervision to health institutions.

2.1.1. Pre-service Training

DUP supported the MOH and local public universities in the development of a nationally standardized and harmonized bachelor's level health informatics curriculum and training modules. The curriculum was developed by experienced health informatics professionals from universities, the MOH, the Ministry of Education (MOE), and implementing partners. The final curriculum was approved by the MOE and distributed to all public universities for implementation. A team composed of MOH, University of Gondar, and other CBMP universities further developed eight standardized pre-service training modules for major health informatics courses to be provided by higher education institutions. Thus far, about eight universities including University of Gondar, Metu University, Mekelle University, Haramaya University, Debre Markos University, Arbaminch University, and Minilik Health Science College are providing the newly developed HIS courses as part of the pre-service training curriculum.

To facilitate the provision of quality training for health information technicians (HITs), DUP via DDCF funding, procured furniture (150 tables and 300 chairs), desktop computers (290), LCD projectors (10), and local area network supplies to establish ten computer labs across the country.

Furthermore, DUP in collaboration with USAID's Digital Health Activity (DHA), supported the preparation of HIT occupational standards that define the occupational requirements and expected outcomes related to HIT work.

2.1.2. In-service training on HIS topics to MOH, RHB, ZHD and HF staff

One of the major programmatic activities of DUP across all domains was increasing HIS capacity of the existing health workforce. In line with that, the DUP planned to provide capacity building training on HIS topics for a total of 20,000 experts, health care providers and/or managers from MOH, RHB, ZHD, and HF staff. Throughout the project life, DUP provided capacity building training to a total of 26,283 (18,874 male and 7,409 female) participants on different HIS topics. More than half of the participants were trained on DHIS2, followed by HMIS, and eCHIS as depicted in Figure 1 below.

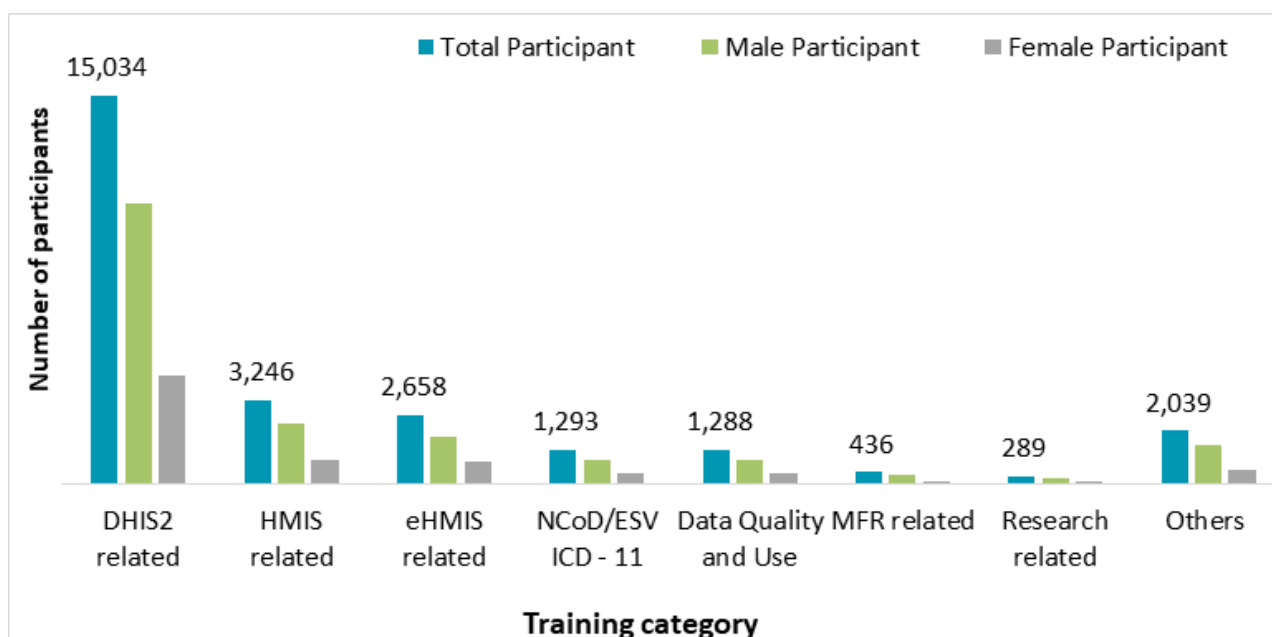


Figure 1: DUP supported training participants by training topics and sex

Note: Other topics include research, woreda-based planning, knowledge management, and HSTP/IR-related topics

Recording the training participants' organizations that they represented was essential for follow-up and support of trainees after the training event. Over the six years, DUP had prioritized creating master trainers at all levels and coordinating other implementing partners to further cascade these trainings. The majority of DUP-supported training participants were from RHBs, followed by HFs and WorHOs (Figure 2).

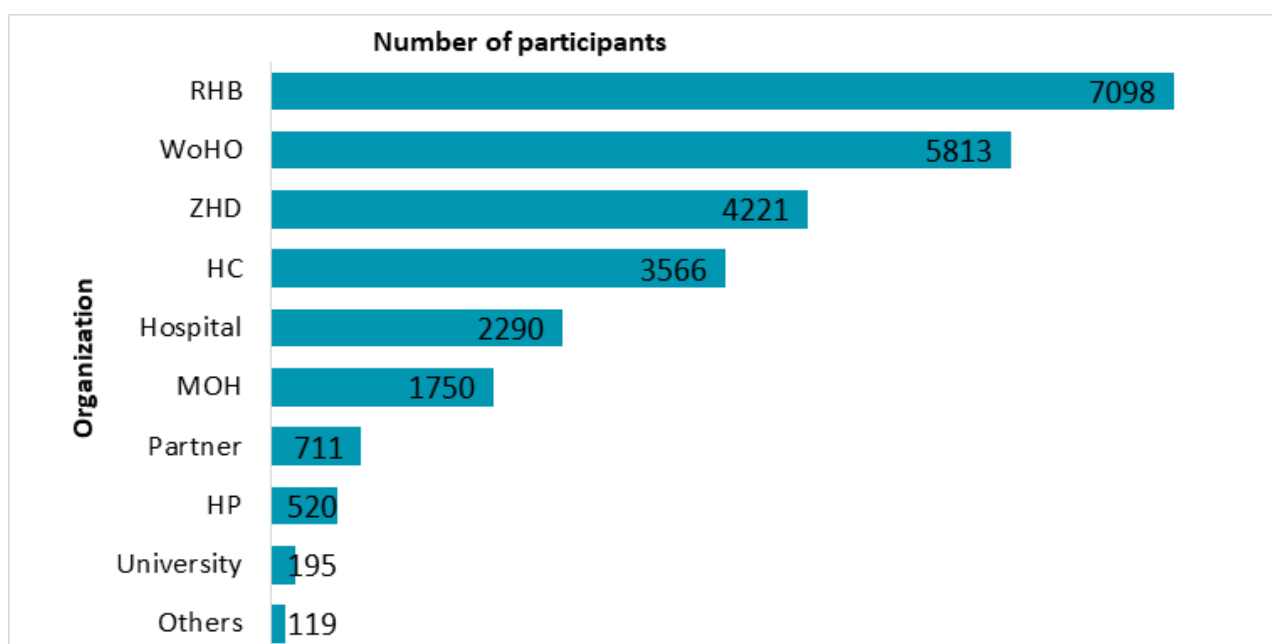


Figure 2: DUP supported training participants by organization

2.1.3. IT Internship Program

In realizing the digital health system across all levels in Ethiopia, deploying adequate skilled human resources is indispensable. However, the readiness and digital health literacy at the implementation sites were limited. There was a huge gap between existing trained and skilled information technology (IT) professionals and the levels needed in order to implement the multiple digital health initiatives that the MOH launched, which necessitated innovative strategies. The IT Internship Program was one example of DUP's innovative approaches to ensure sustainable implementation of the digital solutions on the ground.

As of December 2019, the MOH in collaboration with DUP, designed and launched the IT Internship Program, following a consultative process with stakeholders, including the BMGF, USAID, Job Creation Commission of Ethiopia and CBMP universities. One-hundred and sixty-nine new graduates in IT and health informatics-related fields were recruited, trained, and deployed in their respective ZHDs across 11 regions of the country for a one-year internship (December 2019–December 2020).

The IT interns supported the health system by solving digital health infrastructure challenges (hardware and software maintenance, troubleshooting, supporting the HealthNet connectivity including the LAN); supporting DHIS2 and eCHIS implementation in WorHOs and service delivery sites; collecting data for MFR; engaging in data quality assurance activities; facilitating the country's COVID-19 response; and building technical capacity of HIS workers at the zonal, woreda and facility levels.

At the end of the program, a qualitative study was conducted to assess implications of the program. The study revealed that the program significantly contributed towards strengthening the HIS, as well as better use of quality health data across the country's health system. The internship program served as an employment opportunity for the young graduates, contributing to the government's effort of reducing unemployment. It helped the interns receive capacity building training, form small scale enterprises, obtain licensing, and employ themselves with small seed money in collaboration with DHA. Moreover, some of the interns were permanently hired by the regions and are leading the IR implementation in their respective regions. This experience in Ethiopia could be a lesson for countries in low-resource settings to fill the gaps in human resources and strengthen HIS performance.



Apart from strengthening the HIS, the IT Internship Program also created job opportunities for the youth and attracted and retained competent IT experts to build their careers in the digital health industry through formal employment or small and micro enterprises



The IT Internship Acknowledgment and Transition Conference, December 21, 2020

As the IT Internship Program ended in December 2020, DUP documented the learnings of the program, officially acknowledged the interns for their irreplaceable contributions, shared the experience with the wider digital health community, and successfully worked on transitioning the interns to DHA for further support in creating micro and small-scale enterprises.



2.1.4. Capacity Building and Mentorship Program (CBMP)

CBMP is a flagship program of the MOH. In a bid to bridge the gap between academia and industry within the HIS arena, the MOH, in collaboration with higher education institutions, introduced CBMP. In this program, the MOH partnered with six local universities, namely; University of Gondar, Addis Ababa University, Haramaya University, Hawassa University, Jimma University, and Mekelle University. DUP embraced the vision of local ownership, sustainability, and innovation and supported the program from the outset. Notably, it was engaged in the concept development of the CBMP, selection of local universities, HIS capacity building of the universities, guiding the implementation process, and providing project management guidance including building operation and finance skills and systems.

Through funding from DDCF, DUP identified one woreda from each region under the CBMP program and provided financial support to make them into demonstration sites. This funding was flexible enough to be used for HIS material procurement in addition to the capacity and mentorship activities.

During the course of the project life, DUP, in collaboration with the MOH and local universities, has provided the following intensive support:



- Built the capacity of HITs and health care workers to execute HIS interventions and improve the system on a regular basis through need-based trainings, continued mentorship, and supportive supervision. This was provided by experts from DUP, PPMED, and regional teams.
- In addition to the routine assistance of the CBMP implementation, DUP organized an advocacy workshop which was led by the Minister of Health H.E Dr. Lia Tadesse that drew close to 80 participants from donors, implementing partners, regions, and other relevant stakeholders. During the event, the program was applauded as a platform that removed the gulf that had always existed between academics and practice, and for demonstrating enormous accomplishments in different HIS endeavors. The workshop increased interest among more implementing partners who also started partnering with the universities.
- Although it was a critical segment of the HIS interventions, HIS mentorship lacked uniformity and trained and capable mentors and was not result oriented. There was also a lack of clarity on its definition as it was often mixed with supportive supervision. Cognizant of this, the DUP commissioned an experienced consultant that undertook a rigorous document review; conducted interviews, site visits, and a series of consultative workshops; and from this work developed HIS mentoring implementation guidelines and an HIS short-term training curriculum document. These resources will shape and standardize the HIS mentorship practice and capacity of the country.

Because of the support, CBMP sites that scored model status improved from 2% to 39% while emerging status significantly decreased from 74% to 1%, between June 2018 and May 2022 as presented in Figure 3 below.

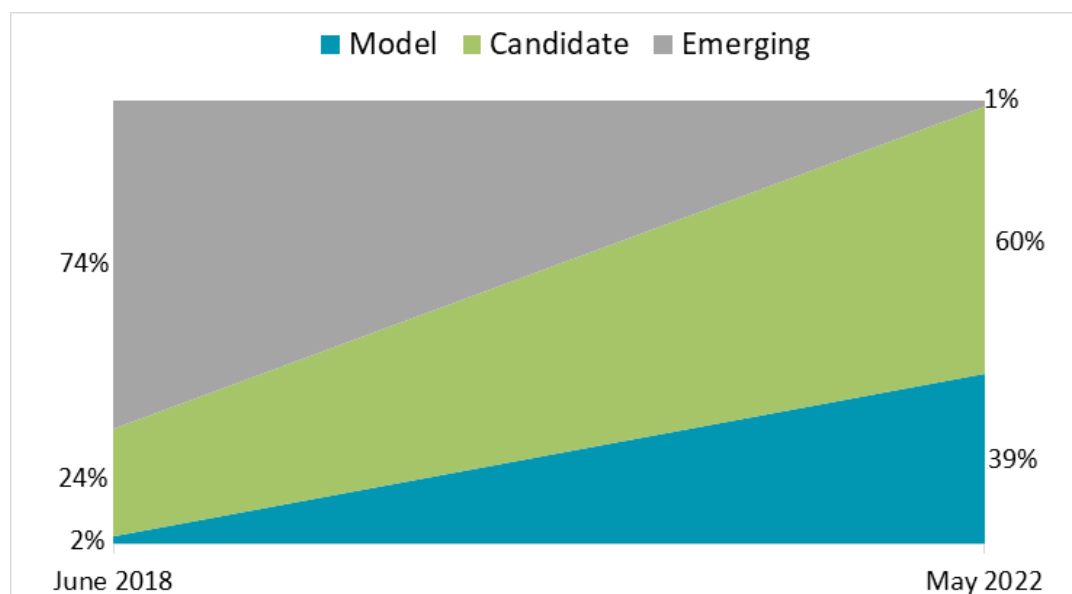


Figure 3: CBMP sites IR Pathway status in June 2018 and May 2022

Lessons from Building Human Resource for HIS Capacity

Engaging experts from multiple disciplines and sectors can improve the quality and use of health data.

- Academia can serve beyond teaching by linking research with program implementation.
- The CBMP initiative requires building academic institutions' HIS implementation capabilities.
- Leadership's awareness and commitment at all levels of the health system is essential for the success of CBMP.
- Building the motivation and capacity of health workers at all levels of the health system to model and cultivate a culture of data use is needed.
- HIS capacity building should go beyond a classroom-based training. In CBMP, the application of practice-based and peer-to-peer trainings proved to be effective.
- In resource-constrained settings, alternative initiatives like the IT Internship Program can serve as gap fillers while creating an employment opportunity for young graduates, contributing to reducing unemployment. Such an initiative also helps to consciously bring female graduates into IT and HIS professions, who are currently underrepresented in Ethiopia.

“We are establishing a system where every trained staff gives a training orientation on the training they received to other staff members as peer-to-peer learning.” (Hospital quality head in one of the CBMP sites revealed)

2.1.5. Standardizing Training Manuals and Guidelines

In addressing issues related to standardization, sustainability, and capacity building of the HIS implementation, DUP supported the development of manuals, guidelines, and standard operating procedures (SOPs). Over the past six years, DUP provided technical and financial support to produce and share several guidelines, tools and training manuals as presented in Box 1.

Box 1. Developed and/or standardized tools

- Data quality manual,
- Information use manual,
- Knowledge Management (KM) training manual,
- Health sector planning guide,
- End user guide on E-DHPIS,
- Comprehensive training manual on Google Workspace,
- HMIS indicators definition (previous),
- Revised HMIS 2021 indicator reference guide

2.2. Cultural Transformation in Information Use

Data use does not arise solely from the creation of a technical infrastructure designed to deliver data. It is also critical to ensure that the tools are actually useful to the users who interact with them. In addition, as envisioned in the IR, it is important that actors at every level of the system are convinced of the benefits of data-based decision-making to bring about a robust culture of information.

Since the inception of the IR agenda, DUP has been supporting the MOH in translating its intended goal. During the project implementation period, with the intent to promote and facilitate improved use of data at all levels of the health system, DUP provided the necessary technical and financial support in major initiatives planned under the information use domain of the IR. The following section summarizes the detailed activities that were implemented during the project period.



2.2.1. Data Quality, Data Analytics, and Data Use Practices

Data Quality Optimization

One of the activities within the HIS core process is ensuring the quality of routine health data, mainly timeliness, completeness, consistency between related data elements, and outliers' analysis. DUP throughout its project life advocated for the availability of quality data as it is the base for informed decisions. The project developed guides and SOPs for data quality assurance, implemented and routinized systems for data quality monitoring and feedback mechanisms, and built technical capacity for data quality auditing mainly within the M&E structures. Currently, a monthly reporting rate monitoring and a quarterly comprehensive data quality review is practiced by all regions and the MOH. In addition, DUP, with intensive technical support of its embedded staff, ensured that staff conducted routine data quality assessments (RDQAs), developed action plans, and followed up on progress at least once a year in each region.



Despite challenges related to conflict, COVID, and other factors, the data quality generally improved in terms of completeness, timeliness, and reporting accuracy. According to the national RDQA conducted in June 2022, the percent of facilities with verification factor within acceptable range (between 90% and 110%) for indicators of TB, skilled birth attendant and Penta3 immunization coverage rate were 88%, 88% and 79% respectively. Moving forward, extending the data quality check and audit practice to program units, developing automated monitoring systems, and conducting community level data verification will be priorities.

According to the routine reporting status monitoring, the health system was able to achieve >95% average reporting completeness and >70% average reporting timeliness over the years.

Moreover, the HIS effectiveness study conducted in 80 HF's and 28 WorHOs in 2022 against the 2018 baseline assessment revealed that data quality and data use improved in project sites. HMIS data completeness on HMIS registers, as well as service and disease report completeness and timeliness improved respectively against the baseline (Figure 4)

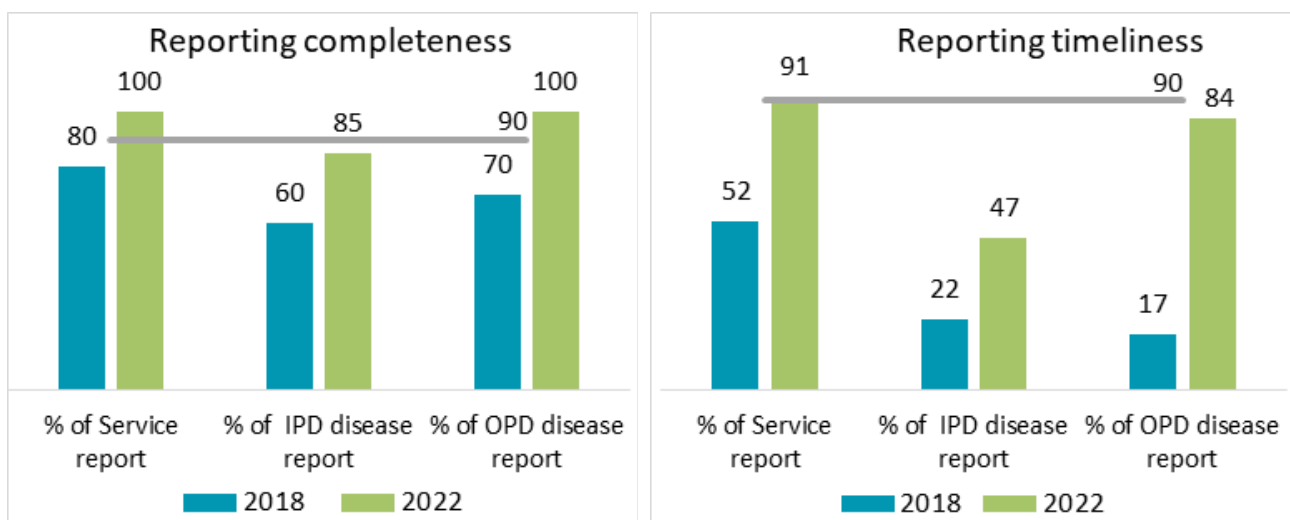


Figure 4: HF's Routine reporting completeness (left) and timeliness baseline vs. end-line assessment (right)

Translating data to information - Data analytics and visualization

A common barrier to using data for decision-making has been the limitations among data users to analyze and interpret data in the context of program improvement. Under the leadership of PPMED and regional counterparts, DUP supported the development of data analytic applications that are built on DHIS2. Some of these applications are DHIS2 data analysis dashboard, scorecard, bottleneck analysis, action tracker, and immunization data analysis.

Over the past six years, DUP's staff embedded at each level (national and regional) have contributed to the preparation of more than 410 (30 national and 380 regional) analysis reports based on routine data from national, regional, or lower levels. These reports include monthly/quarterly performance analysis. In general, the use of data for RHIS quality improvement and planning and target setting increased from 53% to 80% and from 60% to 76%, respectively.

The level of knowledge and skills among the health workforce to perform key HIS tasks improved significantly as depicted in Figure 5 below.

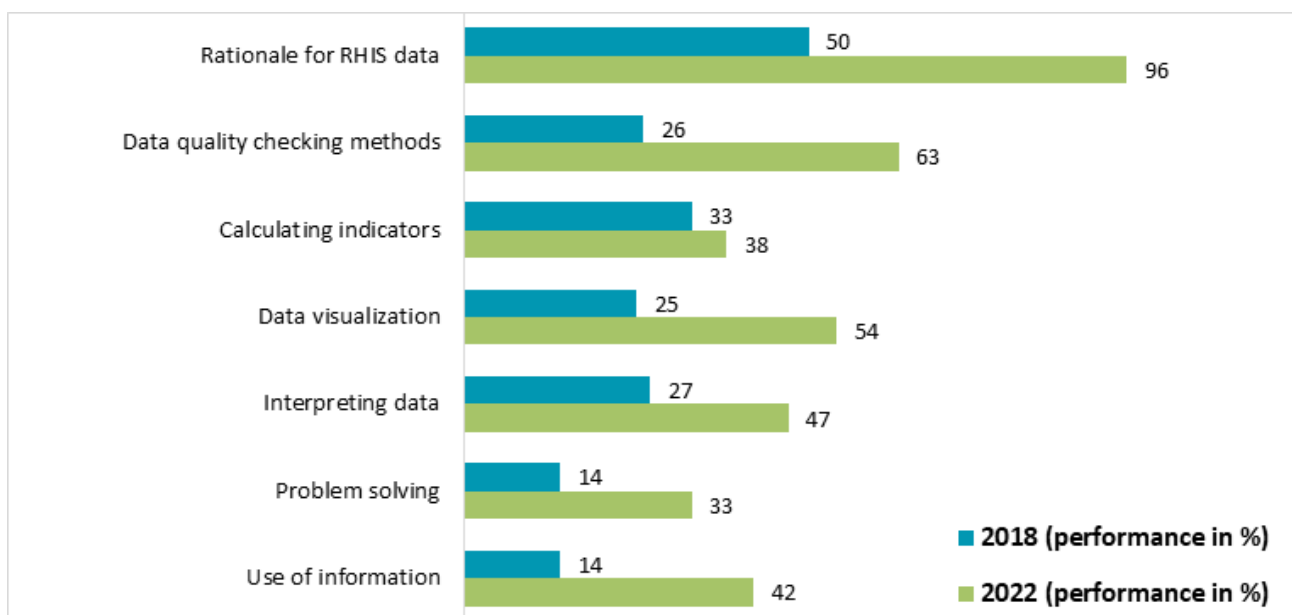


Figure 5: Level of HIS knowledge and skills among health workforce in HFs

Due to the capacity building support of DUP, MOH program staff (particularly the MNCH Directorate) started using the DHIS2 data analytics during the onset of the COVID-19 pandemic to track, analyze, and present their program data to ensure continuity of essential services. Moreover, DUP as a member of national and regional data analytic taskforces became involved in various essential health services uptake and reportable diseases trend/pattern analysis and evidence generation in the context of COVID-19 pandemic. As part of this effort, DUP conducted facility-based mortality trend analysis and respiratory disease morbidity and mortality trend analysis and shared the results with relevant bodies for follow-up.

To aid decision making by managers and leaders, numerous tailored dashboards have been developed and used at all levels. Moreover, the DUP team developed PowerBI dashboards to create more appealing and interactive visualization to MCH department using a human centered design model. The Amhara team also linked DHIS-2 dashboards with android mobile phones for easy access and use among the leaders.

Improved platforms for data driven decision making - Data use

Establishing a culture of data use requires strong processes and platforms in addition to the data and the competence around data. DUP supported the following major areas in this regard:

Performance Monitoring Team Meetings (PMT): The PMT meeting is the foremost platform for analyzing health service data, identifying gaps and root causes, and using data for action at all levels of the health system. The project improved the regularity and functionality of PMT meetings at all levels through continuous monitoring, key performance indicator identification, designing the improvement cycle, building capacity of PMT members, and attaching motivation mechanisms.

Moreover, DUP together with PPMED, established the PMT at the MOH which previously was a limitation for promoting data use practices within the MOH itself. Likewise, regional DUP teams oriented and customized the national terms of reference (ToR) for the regional context, followed implementation progress, and extended the process to case team levels. As a result, the average number of PMT meetings per annum in the regions doubled from three in Ethiopian Fiscal Year (EFY) 2013 to six in EFY 2014. In this meeting, routine data is used to make major decisions to improve the utilization and quality of service at health facilities and for planning and budgeting at management levels. Overall, the health facility PMT functionality improved in all parameters as presented in Table 1 below.



Table 1: PMT functionality in the visited HFs during baseline and end-line assessment

HFs PMT Status	2018 (%)	2022 (%)
HFs with PMT	93.75	97.62
HFs with regular PMT meetings held	68.89	90.24
HFs that have PMT meeting minutes	97.44	97.5
PMT meetings chaired by facility in charge/medical director	73.68	84.62
HFs discussed performance tracking progress against target	97.37	100
HFs identified performance related problems	76.32	92.31
HFs conducted performance root cause analysis	71.05	84.62
HFs developed action plan for performance improvement	60.53	87.18

Health Sector Annual Review Meeting (ARM): The ARM is a major performance review and information dissemination platform for the Ethiopia health sector where evidence-based discussions and decisions are made. Since November 2017, DUP supported the national and regional annual performance review meetings. Collaborating with other stakeholders, DUP contributed to the preparation and printing of the ARM executive summary reports, annual health sector and regional performance reports, special bulletins, health and health-related indicators report, and proceeding writings.

Program Specific Performance Review Meeting: The project collaborated with program units, mainly MCH, and supported them with data analysis and ensuring their periodic performance review is data driven.

Data Use Technical Working Group: During the inception of the project, DUP in collaboration with MOH (including all MOH directorates and RHBs) conducted a co-creation workshop to set priorities for enacting a culture of data use, with the purpose of familiarizing the MOH, RHBs, and other relevant stakeholders. The workshop identified key priority areas, such as data use barriers and potential solutions. Subsequently, DUP facilitated the establishment of a data use technical working group (TWG) and supported the convening of regular data use TWG meetings. Participants, drawn from PPMED, major implementing partners including DUP, and CBMP universities, participated in the meetings. The TWG has provided thoughtful leadership in data use and served as a forum for sharing lessons, best practices, and challenges among stakeholders.

Health Sector Annual Planning: The use of concrete and reliable evidence to prioritize high-impact interventions is the most prominent element in Ethiopia's annual woreda-based health sector planning process. The DUP team ensured the availability and use of data during this operational and strategic planning period.



2.2.2. Standardizing the National HMIS through Indicators and Tools Revision

The MOH with stakeholders has made remarkable achievements in the standardization and implementation of RHIS over the years. In line with this, the MOH has undertaken an extensive reform and re-design of the HIS during the last two decades of health sector development program implementation and in the current HSTP. The main aim of the reform is to improve the data quality and information use culture at all levels. The first HMIS was redesigned in 2007/2008 under overarching principles of standardization, simplification, and integration. The revision process is generally expected to happen every three years to align with major programmatic developments and introduction of new strategic plans and initiatives. So far, three revisions were conducted in 2014, 2017, and 2021.

The third (last) revision was conducted to address the shifts in the HSTP-II and monitoring challenges of programs. The revision continued in 2022 and was finalized later that year. Because of those revisions, not only did the quality of data collection tools improve, but also the number of indicators increased from about 120 in 2008 to 177 in 2022. DUP staff played an important role in supporting the MOH to effectively lead the overall process, starting from the development of a ToR. Staff were represented in the Core Technical Team (CTT) and supported each directorate and agency to draft and review their proposed list of indicators, collectively and in one-on-one discussions with the respective directorates. This support resulted in the development of the following national HMIS tools, guidelines, and manuals:

- a) **HMIS indicators reference guide:** DUP led the coordination, overall review, write-up, and finalization of the reference document. The 177 indicators selected through the iterative process are described with a definition, formula, interpretation, data source, reporting level, and period. DUP did the graphic design and disseminated the document to relevant stakeholders.
- b) **HMIS reporting formats:** The HMIS reporting formats with their data elements were finalized and are ready for use. DUP staff technically supported the finalization of the reporting templates.

- c) **HMIS recording and reporting procedure manual:** DUP led and coordinated the development of the procedure manual to facilitate proper recording of data elements on each HMIS tool (cards, registers, tally sheet, reporting forms, etc.).
- d) **HMIS training manual and plan:** DUP supported PPMED in the development of an action plan, cost estimation, and possible scenarios to provide capacity building training to health care workers on the revised HMIS. DUP also supported the preparation of an agenda and slide decks for the health systems strengthening section of the revised HMIS training materials. The MOH and its partners, including DUP, distributed the revised HMIS tools to the relevant bodies.

Moreover, DUP in collaboration with partners supported the MOH in conducting a master and regional ToTs and cascading training on the revised HMIS for 3,246 (2,314 male and 932 female) participants who represented national, regional, and lower level health institutions, including HFs, for the last two years. DUP provided both technical and financial support for 43% of the HMIS training while providing technical support only for 57% of the HMIS training via its central and regional staff. These trainings created capacity among implementing partners, CBMP university project teams, and regional staff to cascade, monitor, and support the implementation of the currently revised HMIS reporting and recording tools.

2.2.3. Transition from the National Classification of Disease (NCoD) to the Ethiopian Simplified Version of ICD-11 (ESV-ICD-11)

The International Classification of Diseases (ICD) is a global standard diagnostic tool for epidemiology, health management, research, and clinical purposes as well as the international standard for reporting diseases and health conditions. Ethiopia has been using the ICD since the sixth version. In 2008, the MOH made a major revision on the reportable disease list during the HMIS reform. Together with the HMIS indicator revision in 2017, the HMIS disease classification was again revised and coined as NCoD and had been used to generate disease reports routinely up to 2021. DUP's support in the NCoD started during the 2017 customization and implementation with developing NCoD codes based on ICD-11, NHDD dynamic reference guide and printing.

However, upon implementation, the notable changes in disease recording and reporting as causes of morbidity or mortality and the poor data quality alerted the need for a revision of the NCoD. Subsequently, DUP and the MOH led the revision by conducting an NCoD design, content, and implementation gap assessment which reached 51 HFs and interviewed 162 clinicians, HITs, and nurse assistants.

DUP organized a series of consultative NCoD revision workshops including three rounds of evaluative workshops to rate diseases. A total of 294 health professionals (244 physicians) from 25 professional categories and specialties were involved in rating at least one chapter of ICD-11 diseases based on the frequency and public health importance with due consideration of the diagnostic capabilities of tertiary level hospitals. As a result, the group developed a refined and contextualized disease list with five editions as summarized in Table 2 below.

Table 2: Editions of the Ethiopian simplified version of ICD-11 (ESV-ICD-11)

S/N	Edition #	Purpose/to serve for	Diseases
1	Comprehensive edition	Tertiary level HFes	2,527
2	General hospitals edition	Secondary level of health service delivery points	2,091
3	Primary hospitals edition	Designed to be used at Primary hospitals	1,409
4	Health centers edition	Designed to be used at Health centers	700
5	Health post edition	For health extension workers to be used at HP level	94

Moreover, in order to assist the implementation, DUP guided the development of implementation manuals, SOPs, mobile apps, job aids, and formats (Box 2). Additionally, DUP organized the launch of the Ethiopian simplified version of ICD-11 (ESV-ICD-11) in March 2022 and provided extensive capacity building training in the form of a Master level ToT and cascading training for a total of 1,293 (927 male and 366 female) HITs and clinical experts from all the regions and high-caseload hospitals. This training aimed to create a nationwide pool of trainers, enhance ownership, and facilitate the ESV-ICD-11 mentorship during the implementation.

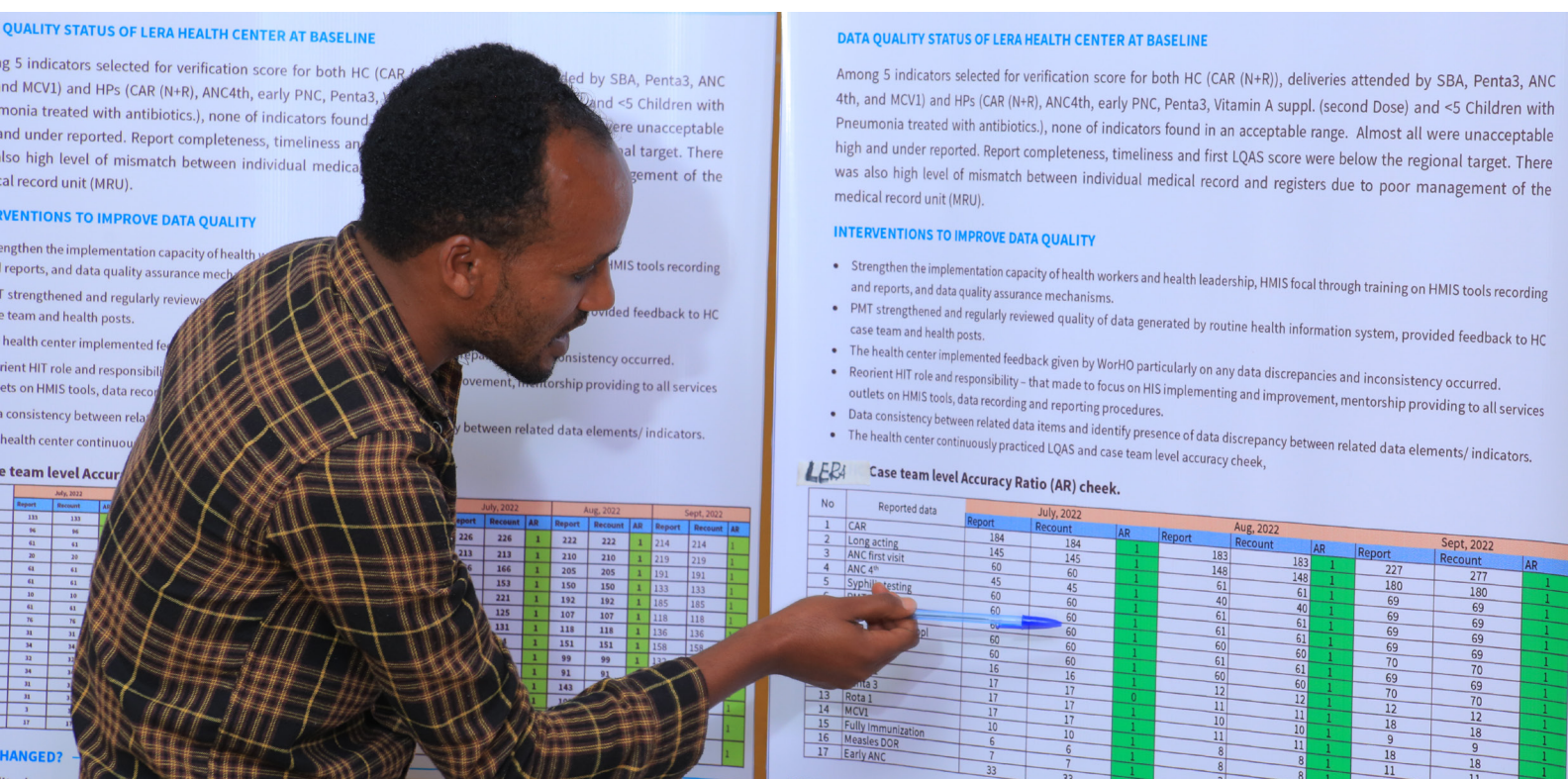


Together with major stakeholders, like the MOH directorates, RHBs, hospitals, Vital Strategies, and the World Health Organization (WHO), DUP and MOH provided oversight, coordination, and technical and financial support to make the shift from the NCoD to the comprehensive simplified version of ICD-11 for improved disease and mortality data availability, quality, and use.

2.2.4. The IR Agenda Implementation

Operationalizing the IR through Model Woreda Creation

Though a compelling concept, early on it was challenging to operationalize the IR agenda into practical tasks. The DUP jointly with the MOH designed a “Connected Woreda Strategy” to translate the high-level vision into implementation, using the woreda as the mainstay. The Connected Woreda Strategy has been implemented by the MOH since 2018 and operationalizes data use innovations by instituting a tiered pathway for facilities and woredas to achieve the highest standards in data quality and data use. DUP has made an extraordinary contribution, particularly in the ideation, strategy development, socialization, training, measurement tool development, and the subsequent monitoring, documentation of best practices, and sharing of experiences.



Currently, the MOH in collaboration with DUP and other development partners and local universities are applying the strategy to create IR model sites in the regions. The number of site (woredas and health facilities) enrolled in this process increased from 250 in 2018 to 1,036 in 2022.

Based on the May 2022 national IR assessment status of the IR sites, there is significant improvement in the IR score. Accordingly, the percent of sites that achieved model status increased by 26% while emerging status decreased by 63% (Figure 6).

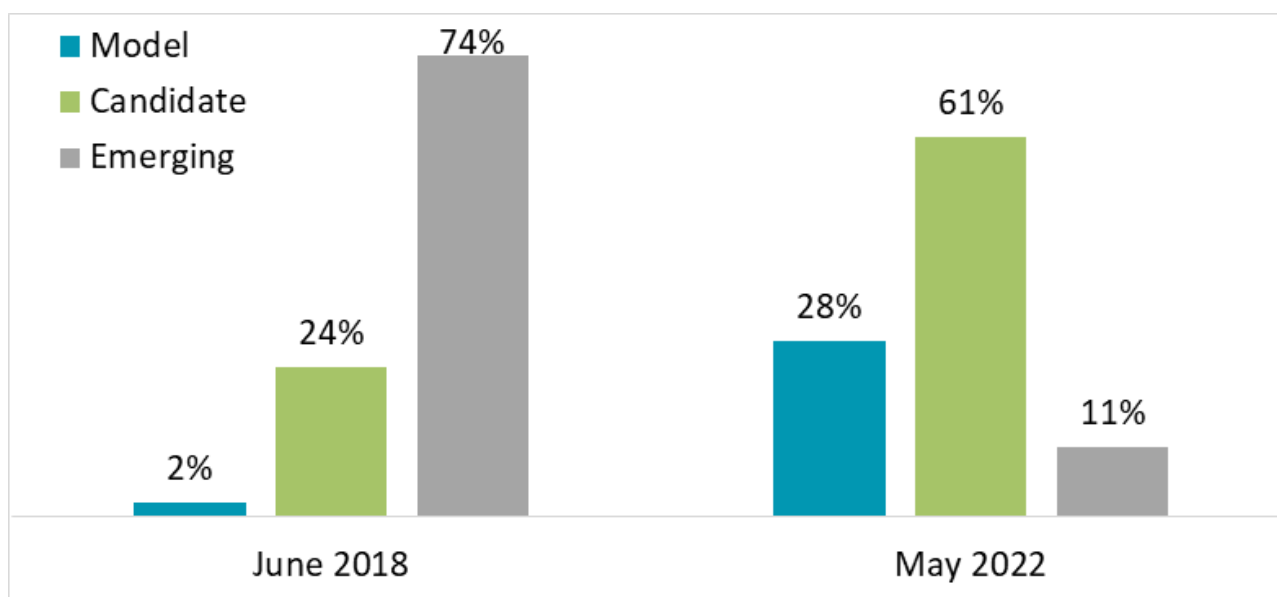


Figure 6: All sites IR Pathway status in June 2018 and May 2022

2.2.5. Revision of the IR Connected Strategy to “Implementation Guideline”

After two years of on the ground experience using the IR assessment tool to measure and monitor the IR status through the IR model woreda creation strategy, the MOH in collaboration with partners revised the existing strategy, including the IR assessment tool in EFY 2014 (2021/2022) to incorporate lessons from HSTP-I implementation and the current strategic direction stated in the HIS Strategic Plan. Primarily, the MOH led the revision process via coordinating the implementing partners including DUP to maximize existing scarce resources and avoid duplication of efforts.

DUP played an instrumental role in the revision process by being an active member of TWG, conducting desk reviews, and gathering additional inputs from different implementing partners and CBMP implementing universities. The strategy was enriched with inputs from a consultative workshop, organized by DUP and the MOH, that had representatives from PPMED, RHB, partner universities, hospitals, HCs, and WorHOs in attendance. This process resulted in a sound strategy and a robust, more objective and comprehensive IR measurement tool with weighted parameters and composite parameters.

2.2.6. The Learning Woredas and Hospitals Initiative

In addition to the broader support on IR implementation at the MOH and regional levels, DUP also worked with selected learning woredas and hospitals in order to test HIS interventions, document lessons learned, ensure facilities became models, and scale-up successful interventions to other woredas and facilities. To aid this process, a brief guide was developed to standardize its implementation approach and intervention package so as to provide a similar intensity of support to learning woredas and hospitals. This guide included a list of intervention packages, such as capacity building training, mentoring, review meeting, woreda-level RDQA, and data analytics.

The Learning Woredas

DUP selected eight woredas across five regions of Afar, Amhara, Oromia, SNNP, and Tigray and provided intensive technical and financial support for those eight WorHOs and 43 HCs, found in their respective catchment areas (Table 3).

Table 3: List and number of DUP Learning woredas and catchment HFs

S.N.	Region	Learning woredas	Number of HC	Number of HP	Total
	Afar	Amibara	5	20	26
	Amhara	Legambo	9	37	47
		Shebel Berenta	6	20	27
	Oromia	Aleltu	4	20	25
		Tiyo	4	18	23
	SNNP	Damot Woide	4	24	29
		Mirab Azernet	4	17	22
	Tigray	Ahferom	7	23	31
	Total	8	43	179	230

The support provided to these woredas included;

- A. Conducted baseline data collection followed by gaps identification and root cause analysis to understand the underlying causes of data use and data quality limitations.
- B. Tailored action plan development to guide context driven implementation
- C. Assisted implementation in collaboration with RHBs, primarily mentoring and supportive supervision focusing on data quality assurance, data use, DHIS2, data analytics, and visualization among others.
- D. Procured and distributed equipment and materials to improve collection and use of information.

Monthly report analysis of the learning woreda sites for the last 18 consecutive months of review from July 2021 to December 2022 revealed that

- Average monthly service report completeness and timeliness was consistently 98% and 92% respectively;
- Average monthly disease report completeness and timeliness was consistently 96% and 90% respectively;
- 98% of sites conducted monthly LQAS consistently and 97% of the facilities had their first LQAS score of the month was >90%
- Majority (94%) of HFs conducted PMT meeting consistently (Figure 7) and similarly 91% of the sites provided feedback to their respective lower level facility on regular reports;
- All the HFs found in learning woredas have access to the DHIS2 with majority having an online access.

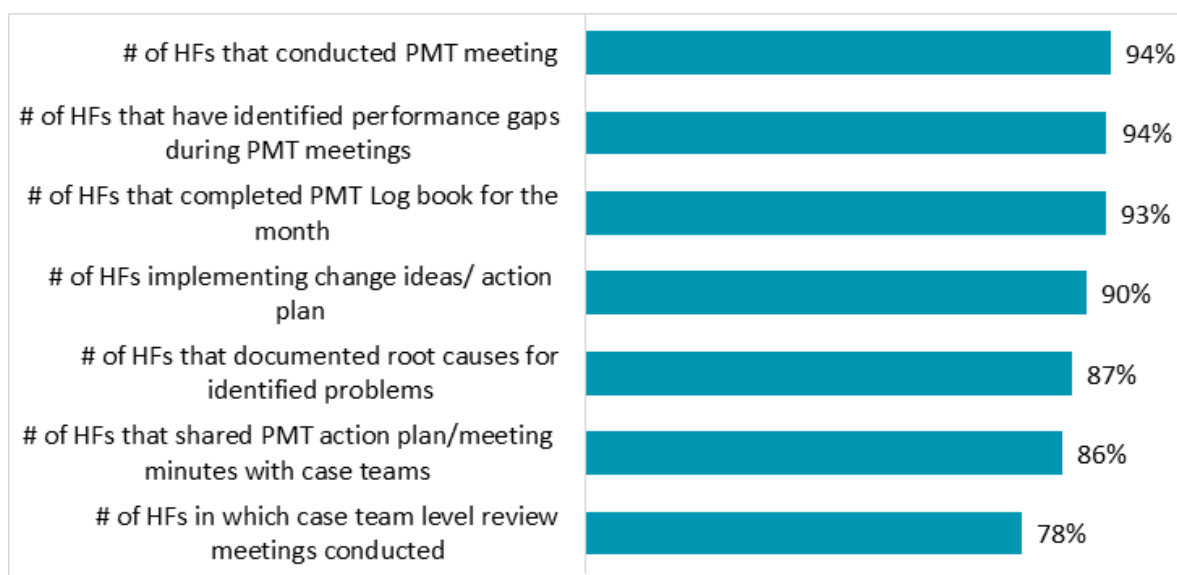


Figure 7: Average PMT performance of learning worda sites for the last 18 months

Based on the IR assessment conducted at baseline (January 2020) and more recently (October 2022), the performance of the IR in learning worda sites showed significant improvement with an overall HIS score increasing from 59% to 89% (Figure 8). Likewise, with respect to the IR Pathway, the percent of sites with IR model status improved from none to 39% while the emerging status decreased from 59% to 0% at baseline (Figure 9).

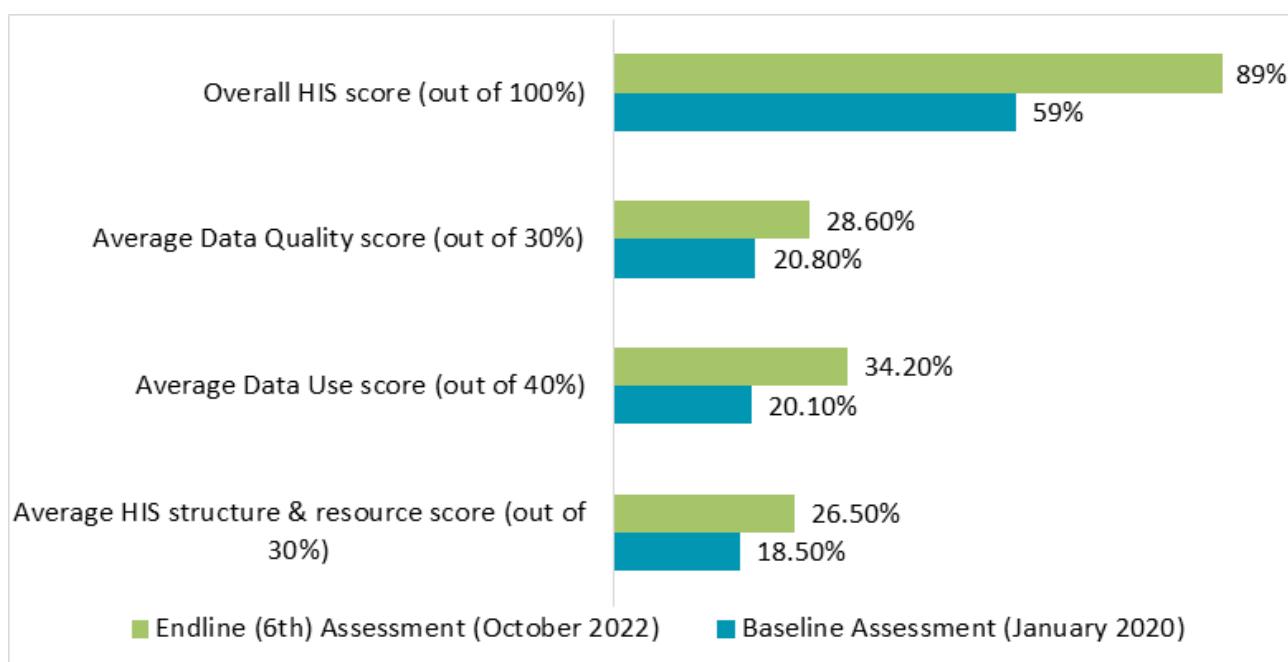


Figure 8: Average IR score of learning worda site during baseline and end-line IR assessment

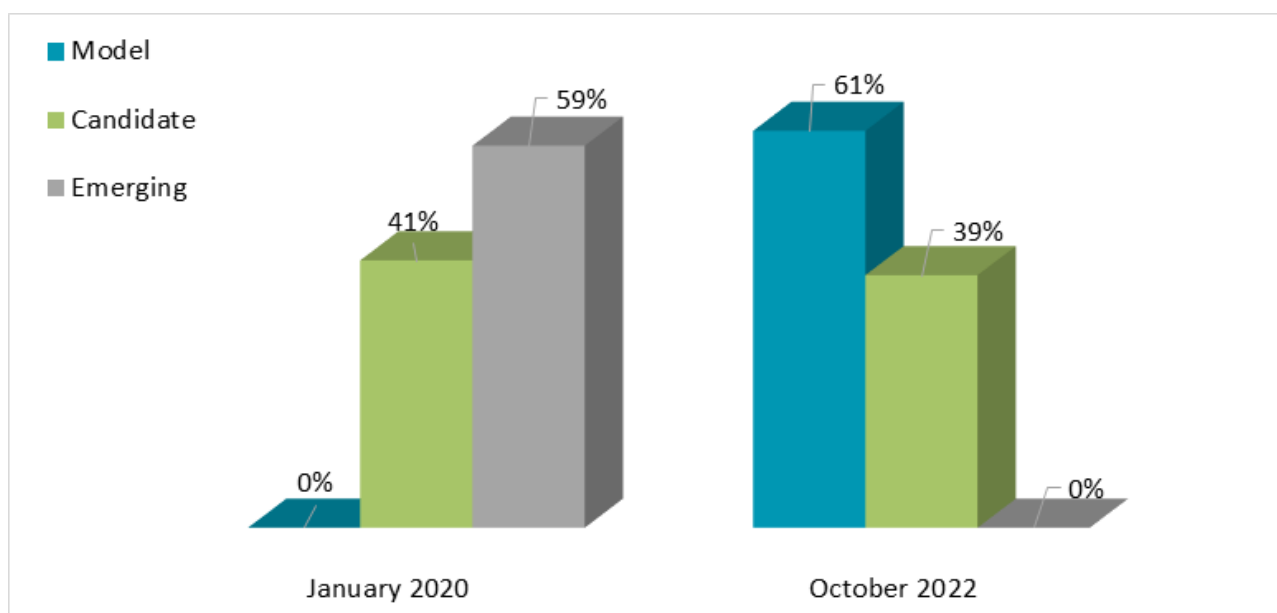


Figure 9: IR Pathway status for learning woreda sites in January 2020 and October 2022

Beyond generating learnings, these woredas and HFs served as demonstration sites. In February 2021, around 60 MOH higher officials and representatives from RHB, ZHD, WorHOs, health centers and partners visited Tiyo woreda (one of the learning woredas in Oromia) to view its exemplary implementation of the Connect Woreda Strategy. In a bid to replicate the lessons, experience sharing forums were conducted in all of the woredas.

The Learning Hospitals

Similar to learning woredas, the MOH selected 28 high-caseload hospitals to achieve the highest standards in data quality and data use, through intensive support.

To this end, DUP supported PPMED to customize the IR model woreda measurement tool to a hospital context by integrating a clinical data audit and other parameters. The support provided extended to identifying HIS performance gaps, developing tailored plans, conducting awareness creation workshops and training, and tracking the IR implementation status of these hospitals. Accordingly, the respective hospital staff were trained on the IR model woreda concept, data quality, and information use, coupled with DHIS2 data analysis features. As of October 2022, out of 18 hospitals that conducted the IR assessment, 28.0% of them achieved model status and 72.0% reached candidate level. None were at emerging status as is summarized in Table 4 below.

Table 4: Summary of Learning Hospitals IR performance during baseline (January 2020) and end-line (October 2022) IR assessment

IR score measurement and Pathway	Baseline Assessment	End-line (6th) Assessment
Average HIS structure & resource score (out of 30%)	21.9%	25.7%
Average Data Use score (out of 40%)	22.4%	31.3%
Average Data Quality score (out of 30%)	25.1%	27.5%
Overall HIS score (out of 100%)	69.0%	85.0%
IR Pathway Status Model	4.0%	28.0%
IR Pathway Status Candidate	59.0%	72.0%
IR Pathway Status Emerging	37.0%	0.0%

From the 28 high-caseload hospitals, DUP selected and provided intensive support for five hospitals, in order to generate learnings from data use initiatives that will be used to improve information systems and information use in all hospital settings. The selected hospitals are Zewditu Memorial Hospital in Addis Ababa, Finote Selam General Hospital in Amhara, Nekemte Specialized Hospital in Oromia, Adare General Hospital in Sidama, and Adigrat General Hospital in Tigray Region.

As a result, all of the learning hospitals showed consistent improvement in their data quality assurance and data use practices. Except Adigrat Hospital, where the required supports were not provided and data was inaccessible due to security issues in the region, about 97% of the four DUP learning hospitals have conducted monthly data consistency checks regularly for the last 16 months.

Generally, service and disease monthly reporting completeness rate was maintained at 100%; timeliness reporting for service and disease reached 95% and 98% respectively. In addition, all four hospitals conducted monthly PMT meetings for the last 16 months without any interruption as depicted in Figure 10 below.

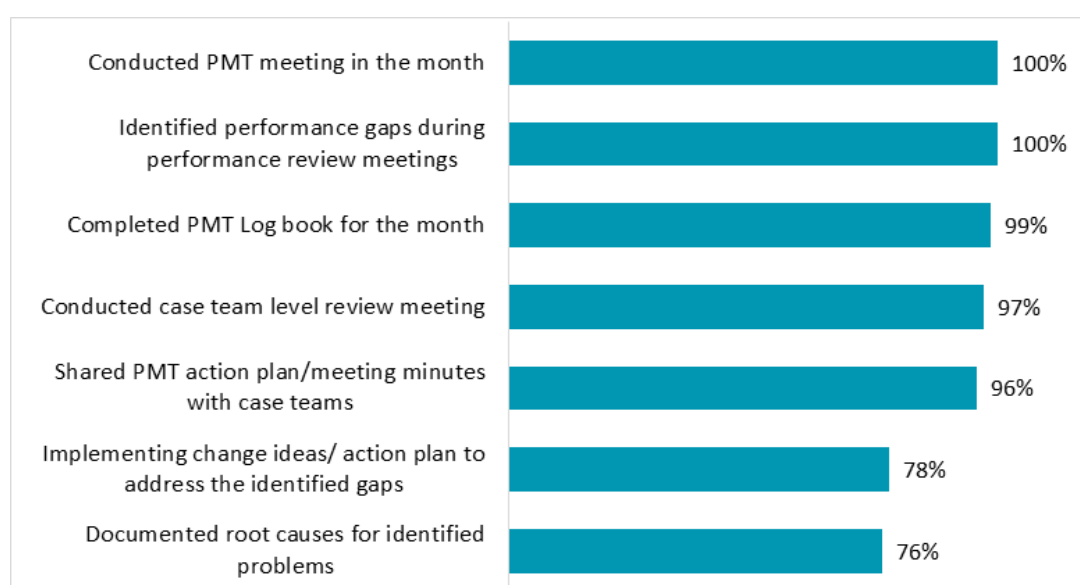


Figure 10: Average PMT performance of DUP learning hospitals since July 2021 to December 2022 (18m)

The trend of IR assessment results also revealed that there is steady improvement in the HIS performance of the four hospitals. Except for Nekemte Hospital, the remaining three hospitals maintained model status for the last three consecutive IR assessments (from January 2021 to October 2022) (Figure 11). Nekemte Hospital did not receive any onsite mentoring in the review period due to security issues.

Zewditu Hospital was a paragon in implementing the IR agenda. The hospital has a strong PMT, committed leadership and HIS staff, conducted regular data quality checks, reviewed weekly HIS performance by departments and recognized staff with nonmonetary incentives. Moreover, the hospital achieved model status consistently for the last six IR assessments conducted from June 2020 to October 2022.

“Data review and use of data for programmatic decisions is now a culture in the hospital, from the leadership to all hospital clinical staff. The practice in return improved data quality and use, ultimately which impacted the hospital’s quality of care positively.” Dr. Eden Alemayehu (Medical Director of the ZMH)

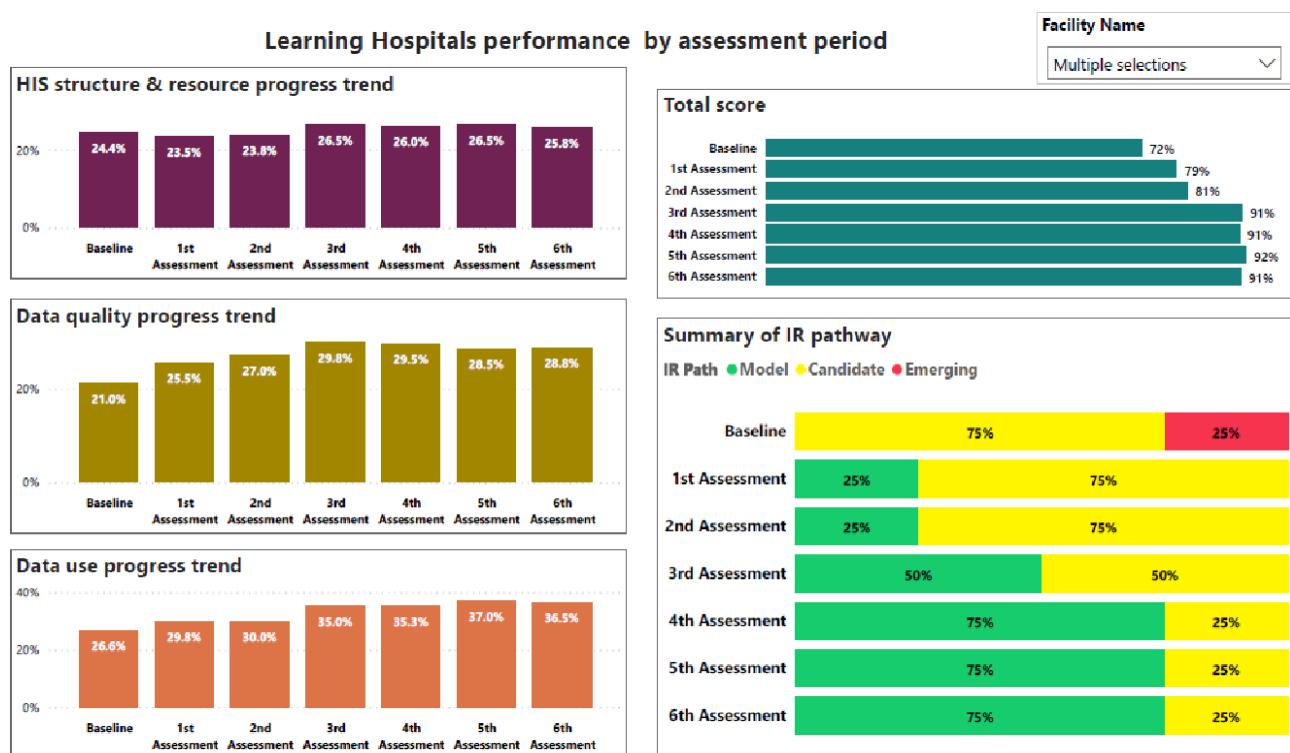


Figure 11: Trend of DUP supported learning hospital IR assessment result from baseline to date (January 2020 -October 2022)

Through the learning woreda and hospital initiative, multiple innovations were tested that revealed a variety of lessons and experiences that can be applied to other sites. Successful interventions included a non-monetary incentive mechanism for improved HIS, data days/weeks, extension of the PMT to department level, data accountability framework, daily HMIS mentorship, simplified excel-based tool for data quality monitoring, among others. Some of these lessons are incorporated in the data use and data quality manuals and SOPs. Moreover, regional level dissemination workshops of these learnings were conducted and nearly all leadership decided to replicate the lessons in one district in each zone at minimum.

In Oromia the IR performance of the learning woredas was so compelling that the RHB passed directives for “each zone within the region must replicate the experiences. At least one woreda should be identified and intensively supported to have a model woreda per zone.”

2.2.7. Use of Data for Planning and Target Setting

Planning is a major platform for data use for target setting, resource allocation, activity prioritization, etc. DUP, both at the central and regional levels, has advocated and facilitated the availability and use of synthesized data, mainly routine data, for improved decision-making for health sector planning. The support provided included the preparation of planning tools, formats and guide, indicative plans, plan alignment, training and orientation of planners, plan development, assessments to the final process of target aggregation, and reconciliation process. In the last six years, DUP has supported the generation of a final core plan document with major targets, initiatives, and budget which is shared among stakeholders for action.

In addition, DUP supported:

- Development of a comprehensive plan by the different departments with MOH and RHBs and their periodic monitoring. Specifically, the project helped to prioritize high-impact interventions for PPMED and HITD annual plans.
- Development of a protocol for program-based budget, staff capacity building, and the entire process of program-based budget development. This supports one of the major MOH activities of preparing and an annual program-based budget and financial report to the Ministry of Finance.
- Technical assistance in the preparation of a standardized protocol that defines the procedure (technical and approval process) for health sector strategic plans, sub strategies, roadmaps, etc. This protocol acts as a framework which outlines all the requirements recommended by the planning commission and accompanying strategic plan preparation templates.
- Review of the strategies of major sectors to assess how health-inclusive they are to reinforce HSTP-II strategic focus on health in all policy. Accordingly, the appropriate recommendations are provided to realize the mission.

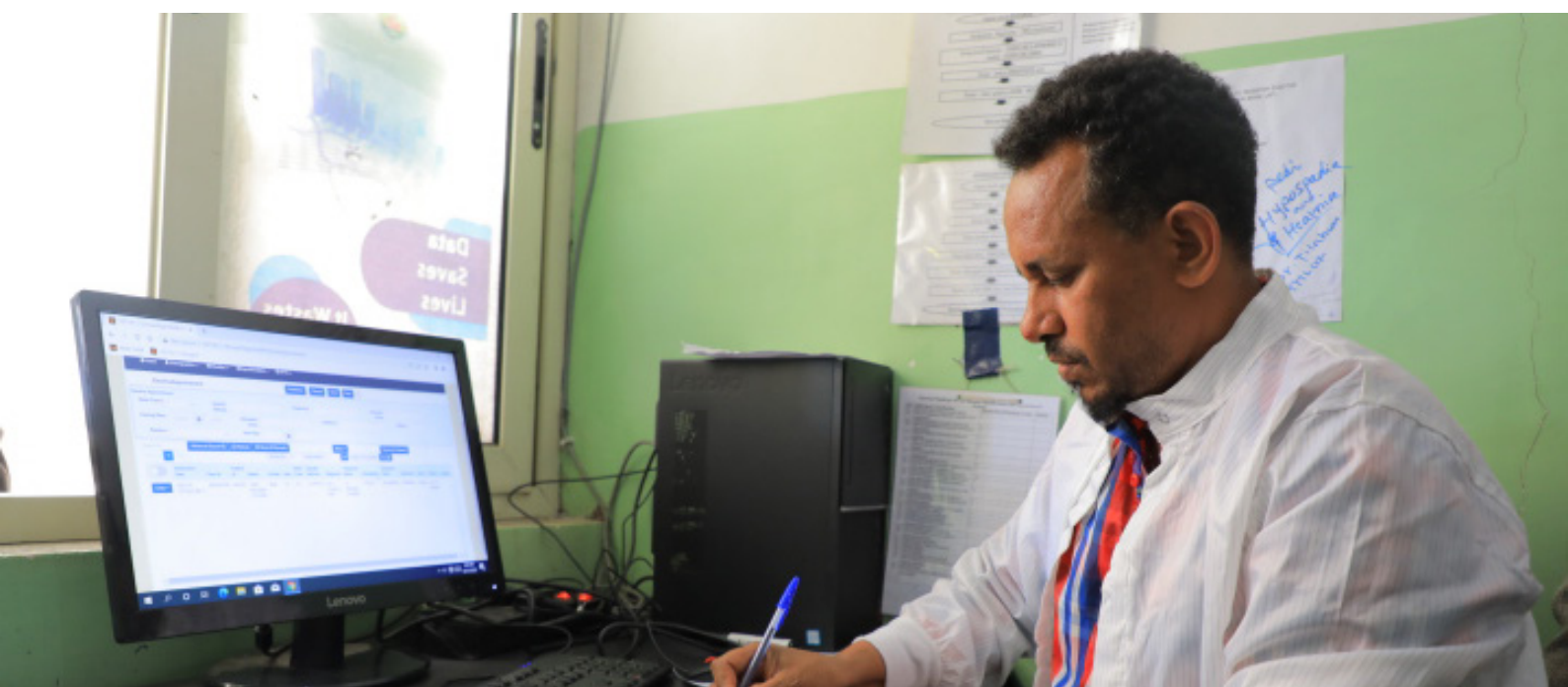
The major lessons learned and way forward include improving the quality and use of the plan for budget negotiation and performance review at all levels, exploring and introducing simplified target setting, and costing tools for the annual planning process.

2.2.8. HIS Recovery for Conflict Affected Areas

The political unrest in the country has devastated the infrastructure of the health system, particularly in Amhara and Afar regions, which exacerbates mortality and morbidity in conflict affected communities. DUP supported recovery plan preparation by facilitating a ten-day workshop for experts to develop a nation-wide post-conflict health recovery plan. DUP staff were actively engaged in the process, primarily in the estimation of cost of the restoration process. Moreover, DUP donated supplies worth more than 4 million ETB to replace the damaged/lost HIS materials. Notably, 54 desktop computers, 19 printers, and 100 information display boards were procured and donated to Amhara and Afar regions.

The Tigray regional DUP team had coordinated the establishment of a partners' forum, developed an emergency HIS recovery plan, and assigned the responsibilities to support the recovery plan to different partners during the conflict in the region. They also supported implementation of the recovery plan, monitoring HFs performance using offline DHIS2, and maintaining ICT infrastructures for use.

Moreover, cognizant of the need to restore the HIS in the conflict affected areas, we prepared a proposal and received a grant from BMGF which runs through February 2023. There will be a separate consolidated report for this grant.





Major Lessons Learned in the Cultural Transformation in Information Use Domain

- Engaging the government staff on data quality review and analysis plays an important role to institutionalize data quality and use practice;
- Working on woreda level structure capacity development through training, onsite supportive supervision, and mentoring not only improves the culture of data use, but it also enhances the local ownership of the HIS initiatives;
- Integrating different data use platforms at the hospital level, such as PMT and quality improvement units, have a synergistic effect which calls for developing national level comprehensive guidelines;
- Having only an institution level PMT does not suffice to reinforce data quality and data use practice as everyone's role. Creating team level data quality and use forums is very important in addition to strengthening institutional PMT;
- Providing non-financial incentive mechanisms such as recognition and linking data quality and use practice with service delivery improvement contribute toward motivating the health workforce, increase ownership and accountability;
- Developing and implementing a simplified and customized HIS performance measurement tool that can be applied regularly to monitor HIS strengthening efforts in low-resource settings is possible.
- Using dashboard apps for visualization of data analysis products improve data accessibility to the health workforce and leaders at all levels thereby enhancing the evidence-based decision-making practice.



2.3. Digitization of Priority HIS

The IR Roadmap stressed the need for a strategy that promotes coordinated digital health investments and data management through exchange and interoperability among the HIS. In light of this, DUP played a critical role since 2017 in supporting the digital health investment in the country. DUP's technical and financial supports focused on the following major areas: (1) eHealth Architecture and Shared Services; (2) Digitization of the Priority HIS; (3) Interoperability of the Priority HIS; (4) Digital Health Strategic and Governance Supports, and (5) Digital Health Infrastructure Supports.

2.3.1. The eHealth Architecture and Shared Services

The eHealth Architecture: Streamlining the digital health investment and data exchange in Ethiopia's HIS

The MOH developed various national eHealth applications to meet priority health needs. While recognizing the promising progress, the country's eHealth initiatives were characterized as fragmented, poorly coordinated, and not strategized for investment. There was no framework or standards to normalize health data and govern standard-based health information exchange among the existing eHealth solutions. Moreover, there was a lack of mechanisms to institutionalize the existing eHealth solutions and assess their maturity level. These challenges limited MOH's ability to efficiently govern digital health investments and implement interoperable systems that are critical to improve the quality of healthcare.

Recognizing these challenges, the MOH and DUP collaboratively developed a national electronic health architecture (eHA) framework that outlines and governs the existing and planned business processes, data management, systems and technologies. The architecture also highlighted the terminology and messaging standards, interoperability profiles that can be optimized among current and incoming applications in the sector. The eHA framework detailed the eHA principles and guidelines, standards, schema and components (including point-of-service systems, shared services, institution-based systems, population-based systems, external systems, the national ICT infrastructure, the interoperability layers and the analytics and business intelligence services) as detailed in Figure 12 below.

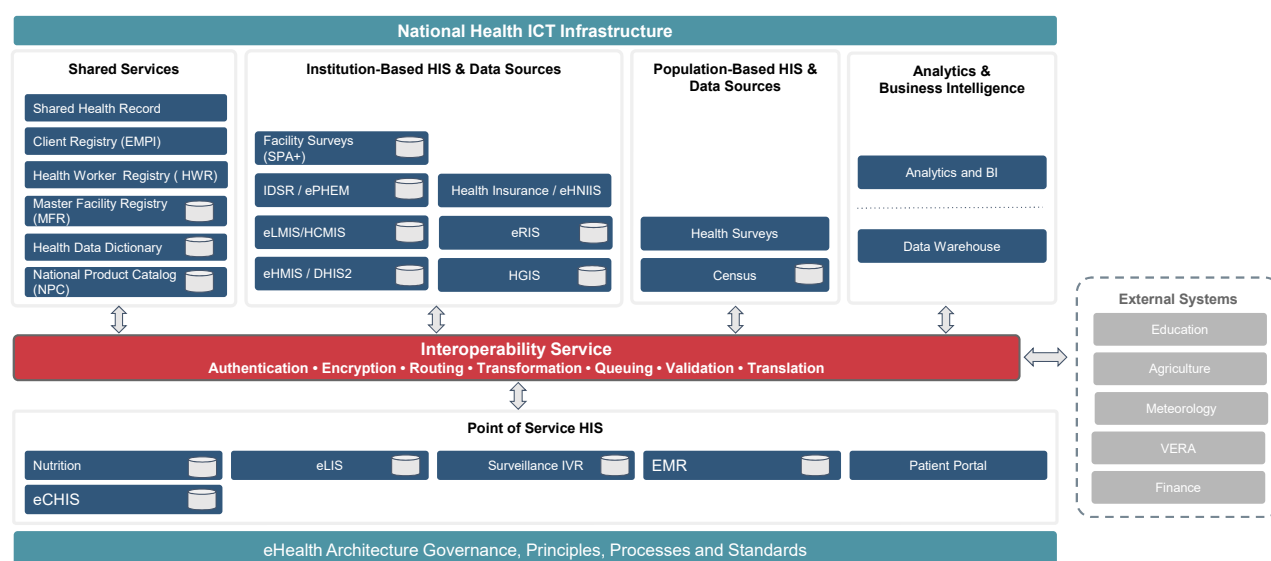


Figure 12: The Ethiopia eHealth Architecture (eHA), Revised in March 2022

Key DUP support in the eHA included:

The eHA Technical Working Group: DUP supported MOH in establishing the eHA TWG to familiarize the concept, ensure compliance to standards, and guide capacity building and sustainable implementation. Since 2017, the TWG members, coming from various disciplines and multiple stakeholders, guided and supported the materialization of the eHA.

The eHA framework development and subsequent revisions: DUP provided continuous technical and financial support in the realization of the umbrella eHA vision document (the roadmap) in 2017/2018, its familiarization with stakeholders, capacity building, and its revision in 2021/22.

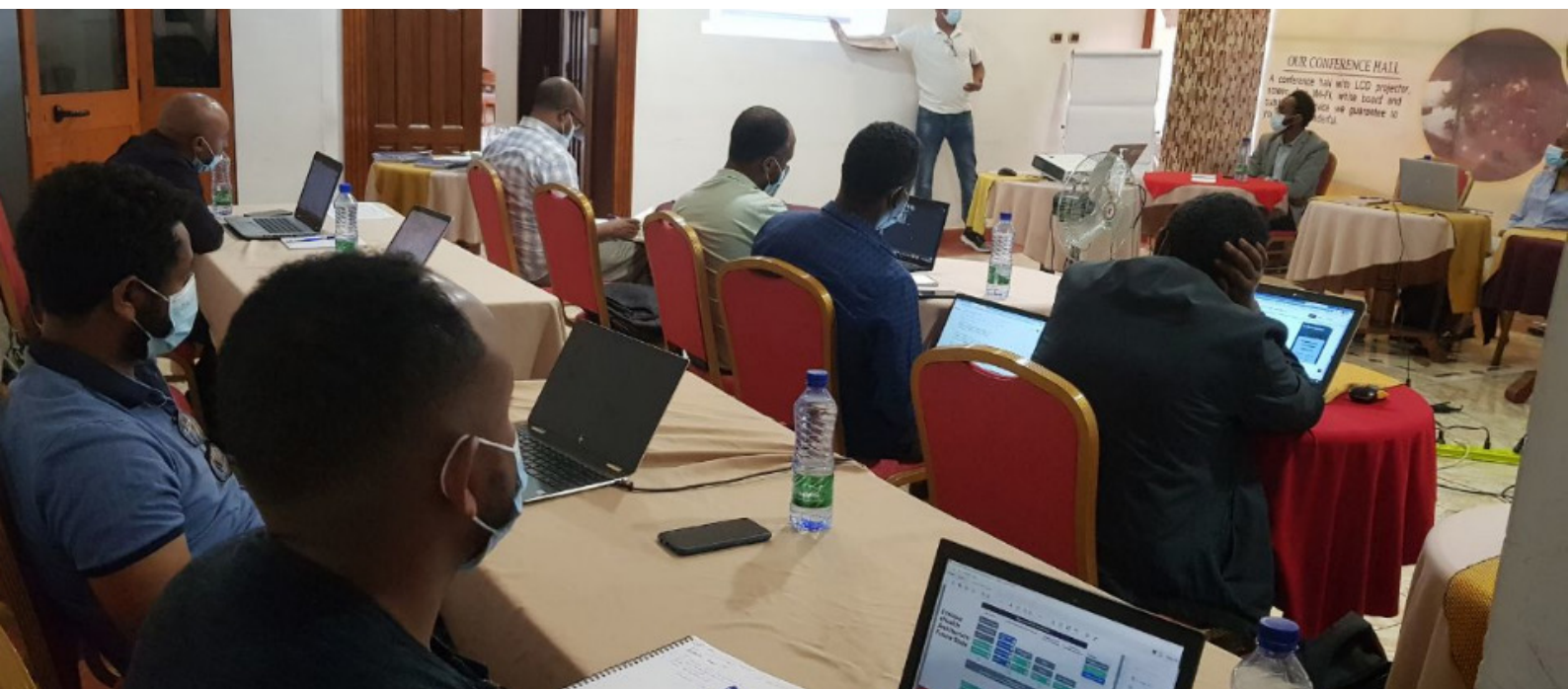
Digital Health Projects Inventory System (DHPIS): As part of the realization of the principles and compliance mechanisms to the eHA vision, DUP developed the DHPIS, a web-based system that allows registration, rigorous documentation and certification of digital health projects. It also makes documentation of the enterprise architecture/applications searchable with appropriate attributes. With the HSTP in place, the eHealth projects inventory is serving as an epicenter to conduct current landscape analysis of the health sector and assess what activities have been done so far. The inventory is used to build a baseline of short- and long-term plans for new small- and large-scale digital health investments. On top of proper registration of the projects, the system clearly shows their alignment with Ethiopia eHA and the status of the projects with comprehensive attributes. The operationalization manual, governance document, and capacity building manuals were also produced to support sustainable implementation of the system, which is now fully functional.



Figure 13: The Digital Health Project Inventory System

The eHA Online Academy Platform: In collaboration with Mekelle University, an e-Learning platform that hosts different courses on general digital health in addition to health information exchange and interoperability was developed in 2020/2021. The main focus of this activity was to widely familiarize the eHA and interoperability concepts via an online training platform. Courses like Introduction to Health Information Exchange, eHealth Architecture and Health Data Standards, Interoperability Layer, Registries and Workflows, and Digital Health Leadership have been prepared and uploaded on the platform alongside quizzes and assignments. The content was also shared with MOH to be included in the Continuing Professional Development (CPD) modules for the health workforce.

Interoperability and messaging standards: The Ethiopian eHA envisions a holistic and harmonized exchange of data between and among the participating components and health information systems. To realize this envisioned future state with interoperable systems in-between, standards for terminology syntax, security, and privacy are needed. In light of this, DUP collaborated with Mekelle University and other stakeholders to come up with the interoperability and messaging standards that help participating systems understand each other's message segment and interpret it accordingly.



Data Exchange Standards Workshop, June 2021

The standards were prepared for point-of-service systems, aggregate systems, and commodity and supply chain systems. Data and Terminology Standards such as FHIR, HL7 V2.5.1/HL7 V3, HLT Continuity of Care Document, DICOM, PIX, ICD11, LOINC, SNOMED-CT, and the like were recommended for compliance based on the nature of the interoperability workflows and tasks.

Because of the eHA Framework and related endeavors over the last few years, the Ethiopian health sector has:

- a. Clearly identified the government priorities and HIS components that contribute to the larger digital health goals, allowing investments to be made accordingly;
- b. Received assurance that information and data can be categorically shared and appropriately used across the health system;
- c. Guided stakeholders into seeing HIS endeavors as a unified whole, and not disparate components;
- d. Streamlined the digital health systems registration, documentation, and certification mechanism using the Digital Health Projects Inventory System (DHPIS).
- e. Avoided significant duplication of efforts in HIS investment;
- f. Encouraged and paved the way for government ownership and leadership.

Shared Services

Shared services (sometimes also called shared health records), such as master facility list, terminology service, master patient index, master client index, product catalog, etc., are among the crucial components of the greater eHA in acquisition, exchange, sharing, and use of health data. Shared services provide access to common functionalities and data sources for interoperability of HIS. The master facility registry (MFR) and the terminology management services (TMS) are the prominent shared services that are implemented by MOH with DUP's technical and financial support that are paving the way for other services. As key partner of the MOH in the enterprise architecture, DUP has availed these shared services based on recent Global Open Health Information Exchange (Open-HIE) recommendations.

MFR: DUP made significant investments in the development and national adoption of the MFR, which acts as a central authority to collect and distribute up-to-date and standardized health facility (and health administration sites) data, including geospatial data. DUP closely worked with the MOH and DHA on MFR project governance, coordination, implementation, capacity building, software backend upgrade, identification of and addressing implementation challenges, and progressive amendment of system requirements (both functional and nonfunctional).

Most of the facility lists in the MFR database lacked geospatial information, which was a huge gap that limited the analytics function of the system. In order to address these challenges, DUP supported the MOH both financially and technically to reconcile facility data from multiple sources and to create a harmonized single list of HFs with geospatial data elements. Considering the large number of HFs in the country, to make the facility matching exercise manageable, public facilities were prioritized in the first phase, followed by private and non-government owned HFs in the second phase. In early 2021, the Ministry of Information Technology, CSA, and the Geospatial Information Institute agreed with the MOH on the objectives of sharing geospatial data along with a data sharing protocol.

Subsequently, the facility matching process was completed in a series of facility validation and reconciliation workshops in which representatives from HEP Directorate, PPMED, HITD, Health and Health Related Regulatory Directorate (HHRD), RHBs, the Ethiopia Geospatial Information Institute, DUP, and DHA participated. These workshops enabled 1) to align and generate a master list of MOH facilities from three data sources: HEP database, DHIS2, and the existing MFR and 2) to reconcile and harmonize a facility list between the MOH, CSA, and EPHI data sources and to align geospatial data for the matched facilities. A web-based automated reconciliation tool, Global Facility Reconciliation App (GoFR), was locally installed and used to assist in mapping facility lists from different data sources. The tool helped to automatically and manually match facilities at a lower-level administrative boundary. Unmatched facilities were re-evaluated by the same tool at a higher-level administrative boundary to get a final list of matched facilities. So far about 86.7% (17,791) public HFs have reconciled their geospatial data using ArcGIS and recent administrative boundaries to ensure that the geographic information system (GIS) coordinates represent the actual facility on a map.

NHDD (National Health Data Dictionary): The NHDD, Ethiopia's health system's terminology management service, is one of the areas DUP solely supported over the project implementation period. The NHDD is aimed to facilitate accurate data exchange among the participating HIS. The terminology standards helped clinicians and administrators improve data quality and enhance information use. In this regard, DUP closely worked with MOH to develop and implement an online reference platform which is based on open-source implementation called Open Concept Lab (OCL).

The platform was populated with the HMIS indicators, customized list of diseases and conditions from the ESV-ICD-11, and hosted data elements from eCHIS and DHIS2 in order to enable data exchange between priority HIS.

Complementing the OCL-based NHDD, DUP also developed an Android-based NHDD Mobile Pocket app (NHDD Pocket), to facilitate easy searching, listing of favorites, and uniformly coding the different categories/editions of NCoD (mini, compact, and extended) for the same disease or condition at service delivery sites based on the newly revised NCoD list. Moreover, it facilitated re-mapping of the customized diseases and conditions to international standards like ICD-10 and SNOMED to support clinicians grappling with a list of over 2,500 diseases and conditions. The Pocket also included disease descriptions from trusted sources to enhance its usability. Beyond the disease domain, Pocket also captured HMIS indicators and data elements.

The efforts made toward realization of priority shared services for the Ethiopia's health sector has resulted in the following:

- a. The MOH was able to materialize interoperability for a few priority use cases (e.g., MFR/DHIS2, eCHIS/DHIS2, DHIS2/COVID 19 Tracker).
- b. The MOH and stakeholders have been able to work with and learn from the OpenHIE Global Community. DUP facilitated the OpenHIE Global Conference that was held in Ethiopia (OHIE #2019 at the Hyatt Regency in Addis Ababa) and had participants from 24 countries. It was a prominent opportunity to showcase what DUP was doing in familiarizing those services and breaking the silos of interoperability.
- c. The NHDD harmonized data definitions from multiple programs and facilitated the mapping of definitions to international standards, such as the ICD-10/11, Systematized Nomenclature for Medicine (SNOMED-CT), and Columbia International eHealth Laboratory (CIEL) interface terminology.
- d. The use of the TMS, including the use of the NHDD Pocket, improved data quality, especially the quality of the disease data.

2.3.2. Digitization of Key HIS

District Health Information software (DHIS2)

Since 2007, the Ethiopian HMIS underwent a series of reforms and revisions, responding to emerging needs and initiatives of the sector and the rise of new technological solutions. As a result, the country came up with a standardized, simplified, integrated, and responsive HMIS for the growing data demand from a variety of health stakeholders. However, early attempts to digitize HMIS reporting and increase data use for decision-making faced challenges because of various technological, organizational, and behavioral factors.

Between 2010 and 2016, the MOH relied on two independent, non-interoperable, proprietary electronic HMIS (eHMIS) solutions to capture, report, and disseminate the country's health data, each providing coverage to different regions in the country. These parallel systems made things challenging for the MOH to integrate datasets from different regions, conduct automated national-level analysis, and improve the data collection and reporting in the HMIS. Further, the two systems were merely reporting tools with limited data analytics and visualization capabilities and were used primarily for report tracking purposes. With an intent to address these challenges, the MOH began exploring the possibility of having a single open-source, government-owned digital 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 critical landscaping, the MOH decided to transition to DHIS2, an open source software platform and a global tool for capturing, analyzing, reporting, and dissemination of data for health programs. DUP remained the core partner in DHIS2 customization, capacity building, implementation, and sustainability.

One of the key areas of DUP's investment over the project life was DHIS2 implementation support. The following were the major areas of DUP's engagement in DHIS2 implementation.

DHIS2 Implementation Roadmap: DUP led and supported the development and compliance of a DHIS2 implementation roadmap, detailing the key areas for a smooth and expedited implementation. The roadmap covered the details of customization, capacity building, software deployment approach, user management policy, data entry, and monitoring and evaluation approach. With minimal tweaking based on the regional contexts, the roadmap served its purpose and stakeholders used it as a guiding document for the scale up of the system all the way to the facility level. The first version of the roadmap was produced in December 2017, and it was updated as required. To materialize this ambitious move, the roadmap defined the governance mechanisms at national and regional levels (the national HIS Steering Committee, HIS TWGs, Core Customization Team, National Implementation Team, and Regional Implementation Teams). Those governance mechanisms were fully implemented during the entire course.

DHIS2 Customization: The DHIS2 customization process was conducted almost every two years (DHIS2 v2.27 in 2017, v2.30 in 2019, and v2.36 in 2022), and involved a team of experts from HITD, PPMED, MOH's agencies, selected MOH program teams, and Oslo University's Health Information Systems Program (HISP). Each round of customization included enhancement of existing features and/or additions of other demand-driven features and applications/modules that made DHIS2 more dependable.

DHIS2 National Capacity Building: The DHIS2 training used a well-organized multi-tier cascade approach supported by user manuals, SOPs, and guidelines. The training topics include DHIS2 software training, DHIS2 tracker end user training, COVID-19 surveillance platform training, DHIS2 app development training and DHIS2 integrated with data quality and data use. A total of 15,034 participants (10,851 male and 4,183 female) were trained on DHIS2-related topics. Of that group, 2,287 participants were trained on ToT while 12,747 were trained on basic/cascading. The following graph depicts the training provided following the first-round customization of the system, and the same model was followed in the subsequent (second and third) upgrades (Figure 14).

On top of the basic DHIS2 features that support the common needs of countries and projects globally, Ethiopia also needed a significant tweak to accommodate the data capturing and analysis needs of the health sector. The new features included incorporation of the Ethiopian Calendar and Ethiopian Fiscal Year, enhancement of the data entry application's graphical user interface, integration of on-the-spot data quality checks, introduction of new data types (e.g., last value, last period), analysis of disease burden (Top-ten diseases) for any geographical focus and/or period, and inclusion of custom reporting applications with multiple periods and multiple organization units.

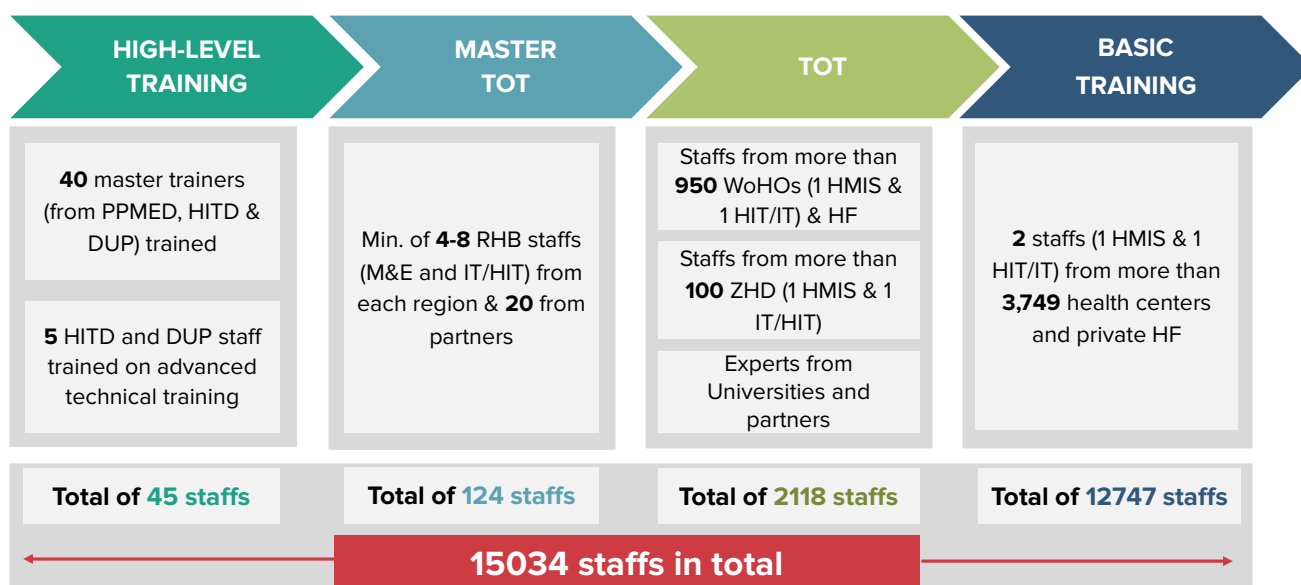


Figure 14: Summary of DHIS2 training delivered via technical and financial support of DUP

After government facilities started using DHIS2, MOH, through its trained experts of the lower structures, provided DHIS2 training to the private facilities (hospitals and clinics). Likewise, more than 5,000 private facilities were trained and started using DHIS2 for reporting. With that, the majority of the legally registered health facilities at all levels of the country were able to use DHIS2 and send reports using the system, either directly or through the supervising institution.

DHIS2 Implementation: Over the first 12 months of project implementation, DHIS2 was customized and rolled out in more than 5,300 government health facilities—which accounts for more than 95% of the total government facilities targeted. The current implementation covers more than 12,700 government and private facilities (MOH, 13 regions, 106 zones, 976 woredas, 3,776 health centers, 449 hospitals, and 7,379 private clinics) and the number will continue to increase as new health facilities are made functional.

DHIS2 Sustainability Strategies: While DHIS2 implementation went well, there were concerns on its sustainability primarily due to the heavy customization (e.g., Ethiopian calendar and other unique features that were customized for the country context) that significantly shifted it from the standard version. To ensure sustainable implementation of DHIS2, MOH devised four interrelated mechanisms: (1) Launching local DHIS2 academies; (2) Creating Centers of Excellence for DHIS2; (3) Developing HIT pre-service and in-service curriculums; and (4) Partner mapping and building their capacities.

- DHIS2 Academies:** The health sector suffered a huge turnover of trained staff at all levels, and the MOH and its strategic partners were forced to constantly offer refresher trainings to new staff. The number of core trainers were very limited, and it was not possible for the small team to travel to all the regions and provide repeated trainings and technical assistance. A pool of DHIS2 customization and data use certified experts in the sector was desperately needed. As it was neither affordable nor sustainable to send the number of experts that were needed to DHIS2 Academies abroad for training, the MOH opted instead to run standard DHIS2 Academies locally. In light of this, the MOH, in collaboration with DUP and with technical assistance from HISP-Oslo, organized two DHIS2 Academies in DHIS2 Design and Customization for 50 customizers and one DHIS-2 Academy in Data Analytics for 26 experts. Further, the first Design and Customization Academy graduates were able to make major contribution in the customization of DHIS2 as Ethiopia upgraded from version 2.30 to 2.36.



DHIS2 Design and Customization Academy (left) and Analytics Academy (right), May 2021

- Creating Centers of Excellence for DHIS2:** University of Gonder, one of the oldest universities in Ethiopia and a pioneer in the field of health informatics, was selected by the MOH as the Center of Excellence for DHIS2. With support of strategic partners like DUP, the university is significantly contributing to DHIS2-related endeavors that include providing Academies and conducting research. Additionally, the national digital health innovation and learning center (DHILC), which was established by the MOH with financial and technical support from DUP, is expanding its innovation work to include serving as a helpdesk for DHIS2 technical support through the use of its call centers.
- HIT Pre-service and In-Service Curriculums:** A major activity included working with the academic institutions that train HIT experts to incorporate DHIS2 in their pre-service curriculum. The objective of this initiative was to shorten the learning curve for new HIT experts starting in the industry by providing them with background knowledge to increase their efficacy from the start. With engagement from development partners and CBMP universities, the MOH successfully incorporated DHIS2 into the pre-service curriculums of HIT training institutions, which has yielded positive results, particularly at the woreda and facility levels. Moreover, the in-service training guides, end-user manuals, and training materials were standardized for all levels. Short training videos and DHIS2 troubleshooting manuals were also prepared and availed to ensure sustainable use of DHIS2 at service delivery sites.

- **Partner Mapping:** As Ethiopia is an expansive country with thousands of facilities to support in DHIS2 scale up and implementation, it was very difficult to handle all of the ongoing support requests from the center. One of the strategies designed in response was a detailed mapping of strategic partners, based on their geographical location. The mapping exercise was followed by the DHIS2 capacity building training to relevant experts of the partners through DUP support. Accordingly, 65 senior staff members of implementing partners were trained on DHIS2 data use and basic troubleshooting procedures in addition to being provided with the necessary guides, training materials, and software packages. The return on investment was very high, sustaining DHIS2 to a national level.

Electronic Community Health Information System (eCHIS)

The electronic community health information system (eCHIS) is one of the high-priority initiatives of the IR, developed by the MOH and a consortium of partners, with the intention of supporting health extension workers (HEWs) to use it as a job aid both to provide service and do referral linkage with the catchment health facilities. The eCHIS is believed to improve the quality of service delivery, contribute to ensuring continuum of care, and bolster data quality and data use at the community level. Thus far, the eCHIS has been implemented in more than 7,000 agrarian health posts. Most have finalized household registration and a few started providing services using the system.

Over the project implementation period, DUP was one of the trusted partners who supported the realization of eCHIS. Major areas of DUP support were: project coordination, capacity building, implementation support, and documentation and learning.



Project Coordination

DUP played the role of coordinating the various partners involved in the eCHIS initiative (DHA, L10K, Dimagi, Amref Africa, Weema International, and others) during product development, capacity building, landscaping, piloting, documentation, and scale up efforts. DUP and partners developed the eCHIS implementation roadmap and facilitated the formulation and continuous discussion of a national TWG composed of MOH and other HIS stakeholders. The following were some of the key areas of coordination support provided by DUP over the project period:

Coordinated Product Development: MOH followed a modular approach for the eCHIS product development. DUP coordinated with partners in road-mapping tasks and prioritizing the development of eCHIS modules. DUP also regularly ensured the timeliness of quality deliverables. As the first phase of the DUP project implementation concluded, all of the agrarian health extension program (HEP) modules were successfully developed, and the development of modules for the pastoralist and urban settings are at the verge of completion.

Coordinated Review Meetings and Forums: DUP facilitated and supported the eCHIS Steering Committee and TWG meetings as part of the coordination and quality assurance of eCHIS. The regular DUP-assisted quarterly review meetings with relevant eCHIS stakeholders was key in evaluating the progress and working toward improvement. There were also need-based discussions around topics such as “paper-free” woredas, scale up strategies, workforce capacity development, eCHIS infrastructure, maintenance and support strategies, and others that were later used as inputs to frame eCHIS implementation.

Coordinated the eCHIS Strategy Document Preparation: DUP supported the MOH in the development of the eCHIS Strategic Plan (2022–2025) that guides the eCHIS investment in the country for the years to come by standardizing the implementation approach, bringing all relevant stakeholders onboard, and mobilizing resources. DUP collaborated with DHA, L10k, and the MOH in organizing subsequent co-creation workshops before it came up with the comprehensive strategy.



eCHIS Training participants

Mobilized Resources for MOH: Given the cost-intensive nature of the eCHIS initiative, DUP's team continuously developed proposals on behalf of the MOH to solicit more resources from funders. Accordingly, the likes of the World Bank and Global Fund responded positively and granted resources over the past three years — and other resources are in the pipeline. Moreover, DUP extensively supported the eCHIS partner mapping exercise, and jointly achieved successful alignment of the available partners that support different woredas.

Moreover, DUP has significantly contributed in building stakeholders' eCHIS capacity. As stated above, a total of 2,583 staff from the MOH, RHBs, partners, and eCHIS pilot implementation sites were trained for ToT and basic eCHIS training.

Documentation and Learning: DUP continuously supported the documentation of the learnings from the phase-based eCHIS implementation approach. The lessons would guide future investment and increase efficiency during scale up while solving practical challenges at the implementation sites. Learnings related to the eCHIS tools, logistics, digital literacy and motivation of the HEWs, maintenance and support mechanisms, etc. were documented and used with DUP's intensive support. Below are examples:

- DUP supported periodic follow-up visits at the eCHIS pilot sites. HPs and HCs' use of the piloted eCHIS modules was observed, and critical feedback were collected from those visits. The action items of such visits included: devising efficient use of the eCHIS SIM cards by creating mechanisms to avoid misuse; improving tablets' performance by optimizing the applications; providing training to a mix of experts in supervising health centers; and, starting to use eCHIS data to further encourage the use of the new system.
- DUP supported the eCHIS Biometrics and connectivity assessment and documented the lessons. Worked with Simprint (an organization that worked on eCHIS Biometrics) to incorporate the feedback from sites.
- DUP funded and supported implementation research to devise a tailored strategy to realize the eCHIS. The research helped the MOH identify implementations challenges, develop alternative implementation strategies, and improve implementation accordingly.
- DUP strategized continuous maintenance and support mechanisms through an online support platform to capture, fix, and escalate eCHIS issues from the implementation sites and regions.

Major Achievements:

DUP along with the MOH and other stakeholders have achieved the following milestones, among others:

- Number of eCHIS employing HPs and household registration increased significantly as depicted by Figure 15 below.

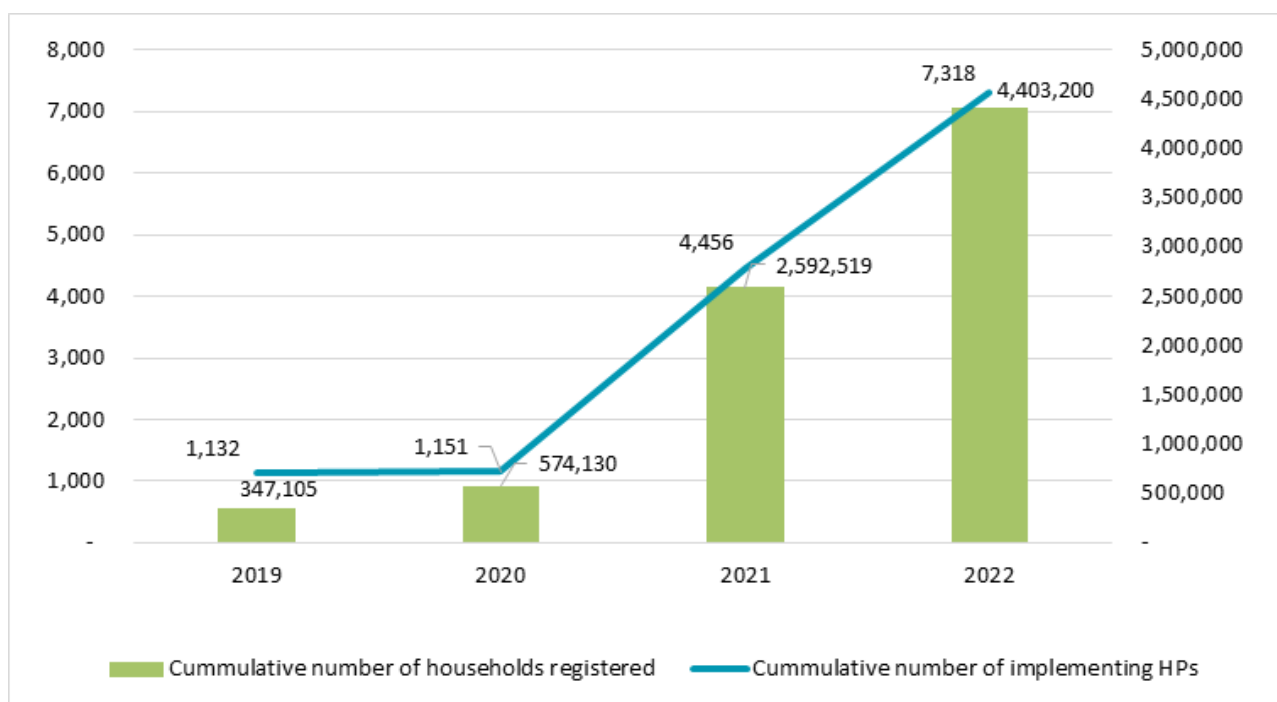


Figure 15: eCHIS implementation and household registration (2019 - 2022)

- eCHIS has become a flagship digital health project for leadership of the MOH and RHBs.
- eCHIS stakeholders were given clear roles and responsibilities that significantly reduced duplication of efforts.
- MOH's Directorates that need community-based data (RMNCH, Disease Prevention, HEP, etc.) were mobilized to invest on the eCHIS rather than investing on fragmented digital health initiatives.
- eCHIS implementation strategy was refined and standardized through piloting, documentation, and learning.
- eCHIS was implemented in more than 7,000 HPs, with a majority finalizing their household registration and a few providing services using the system.
- The development of the agrarian eCHIS was successfully finalized, allowing for paper-free service provision in the years to come.

COVID-19 Response System

Since the breakout of COVID-19 pandemic in Ethiopia in March 2020, DUP worked with the MOH and EPHI in the selection, customization, and implementation of different applications to establish the national COVID-19 surveillance and tracking system. DUP's involvement ranges from providing technical assistance to procuring technology to providing training and mentoring to end users to hiring consultants for data encoding and management. DUP's major accomplishments are described below.

Box 2. Tools developed together with ICD-11 revision

- ESV-ICD-11 edition and booklet
- ESV- ICD-11 implementation guide, SOP, and job aids
- Revised registers and tallies
- ESV-ICD-11 mobile application
- Revised DHIS2 data collection software based on the disease registrations, reporting formats, and mobile apps

Designed and Established COVID-19 Surveillance Blueprint: During the onset of the COVID-19 outbreak, there was no well-established digital case-based tracking system. The surveillance team at EPHI was desperately seeking a digital system to support the Emergency Operation Center's (EOC's) pandemic response. DUP in collaboration with DHA approached EPHI and developed a blueprint for a digital platform to meet the workflow and data requirements of the national COVID-19 response team. DUP developed the DHIS2 Tracker (including the laboratory test and result tracker), aggregate daily treatment and isolation center data reporting feature, home-based isolation and care (HBIC) aggregate daily reporting tool, community registration, and the interoperability layer (using OpenHIM) for laboratory information system integration with DHIS2 Ttracker. DUP also developed the toll-free and the port of entry applications in collaboration with DHA. DUP went through several demonstrations and meetings with different stakeholders to gain buy-in from health managers at MOH and EPHI and endorsement of the system as the national digital platform, replacing Open Data Kit (ODK) and other fragmented systems.



Customized DHIS2 Tracker: DUP fully led and supported the customization of DHIS2 Tracker. DUP followed an agile approach to accommodate the changing data requirements and workflows of the various COVID-19 response units (e.g., rapid response team, contact tracing, laboratory sample collectors, surveillance, and case management team) during the development. DUP's technical team adopted OpenHIM as an interoperability layer and Health Level Seven as messaging standards to establish and operationalize the data exchange platform. The customized system evolved to COVID-19 Surveillance Tracking System (CSTS). The CSTS is hosted on the Cloud (AWS) to improve server performance and reduce challenges related to inadequate infrastructure at the MOH data center. DUP also covered the costs of hosting.



As part of the CSTS implementation/rollout process, several virtual and face-to-face hands-on computers/tablet-based trainings were provided to trainers and end users. DHIS2 COVID-19 Tracker trainings were provided to all case managers, interns, focal persons, and HITs from more than 100 quarantine, isolation, and treatment sites in Addis Ababa and Oromia.

Developed COVID-19 Data Access and Sharing Protocol: DUP's software development team prepared the data access and sharing protocol to govern application usage and implementation in the case-based and surveillance tracker suite.

Provided CSTS Deployment and Mentoring Support: In addition to procuring and distributing tablets and barcode readers, DUP implemented the DHIS2 tracker in more than 68 test laboratories in the country and over 100 quarantine, isolation, and treatment sites in Addis Ababa and Oromia. Likewise, DUP supported the implementation of daily and weekly aggregate data reporting modules in more than 40 isolation and treatment sites in Addis Ababa. DUP's IT interns were heavily involved in supporting system deployment and mentorship and four data encoders were temporarily hired and assigned to EPHI, treatment sites, and regional testing laboratories to support entry of laboratory request and treatment data. Data analytics was an integral part of the system.

Deployed Home-based Isolation and Care (HBIC) at Treatment and Isolation Centers: In response to the revision in COVID-19 case management protocols, the HBIC application was developed and the HBIC aggregate data entry and reporting tool was integrated to the DHIS2 Tracker. DUP supported deployment and mentoring on the upgraded DHIS2 tracker with a daily aggregate data reporting module and newly developed HBIC module at the isolation and treatment sites and administrative levels, respectively.

Developed and Implemented COVID-19 national case-tracking dashboard: DUP in consultation with the EPHI EOC and the National Implementation Team developed dashboards that provided decision makers with timely and visual insights to the pandemic situation in the country. The main data sources of the dashboards were MOH COVID-19 daily situation updates, rumor-capture tools, and toll-free, point of entry registration, and community and workplace screening applications developed by DHA. The dashboard was built on Power BI and updated regularly to provide users on-time access to information.

COVID 19 Transition and Continued TA: The National Implementation Team managed and provided oversight on the implementation of the COVID-19 digitization efforts while working closely with the EPHI team to facilitate a smooth handover/transition of the system to EPHI's digitization team. As DUP's COVID-19 complementary budget came to an end in March 2021, DUP focused on providing technical assistance post funding.

Other Priority HIS: EMR, iHRIS

Following the principles of the eHA, DUP provided technical and financial support and thought leadership in other priority HIS that were implemented by the MOH, collaborating with other partners in the areas of development, capacity building, and governance. The following are some examples:

- DUP markedly supported the electronic health record (EHR) standards development and the integrated human resource information system (iHRIS) software requirements specification (SRS) for the MOH by engaging its senior experts. DUP also contributed in strategizing governance and capacity building of those systems.
- DUP led the development of the selection criteria to compare and prioritize the EHR solutions that were going to be implemented in Ethiopia's public health institutions. Accordingly, the Bahmni/Open Source EMR and the PulseCare EMR solutions were selected for implementation in 36 high-caseload hospitals. System implementation is currently underway and is supported by other partners.

2.3.3. Interoperability of Priority HIS

MFR/DHIS2 Interoperability:

The implementation of the data exchange between the MFR and DHIS2 systems was to ensure that the DHIS2 health facilities are aligned with the country's MFR. The integration was deployed on the MOH server environment and User Acceptance Test (UAT) was successfully done by performing different test scenarios. Technical documentation was also prepared, and the updated version of the developed source code was stored in a MOH source code repository. As the MFR is an authoritative source of facility list, DHIS2 will keep updating the facility information directly from the MFR through the interoperability layer, OpenHIM.

eCHIS/DHIS2 Interoperability

Targeting different levels of the health sector from the MOH to HCs and HPs and different reporting periods, the recent version of DHIS2 is configured with more than 40 data sets and more than 4,000 data elements. Similarly in recent years, eCHIS, a mobile-based community level point-of-service data collection platform, was developed for use by HEWs and supervising PHCUs. To enable data exchange between the two systems, DUP developed a mediator service as a component of an eHA interoperability layer and utilized capabilities of eHA shared services, i.e. terminology management service (TMS) and MFR.

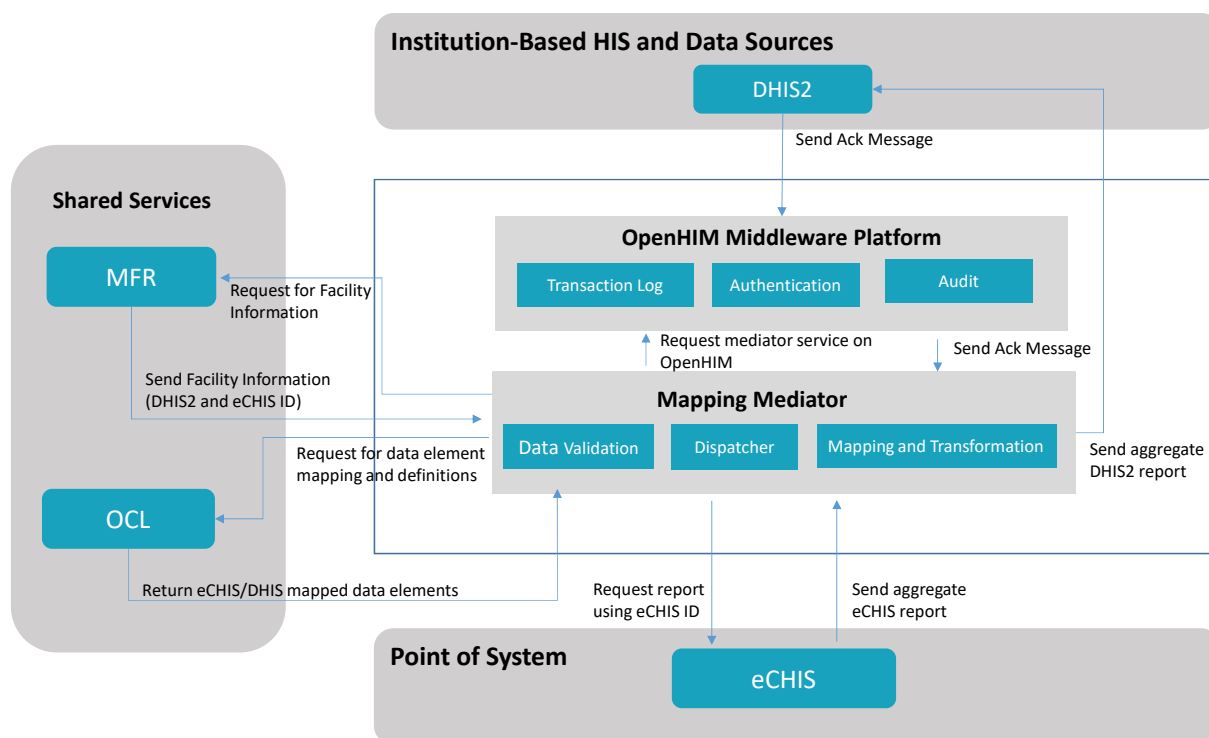


Figure 16: eCHIS-DHIS2 interoperability

The effectiveness of the interoperability has been successfully piloted based on the RMNCH Module of the eCHIS —comparing the data with the one recorded in DHIS2 in an aggregate form. While the participant systems (particularly eCHIS) should be further matured, the technical implementation of the interoperability was a success.

The benefit of such interoperability solutions is immense. It will not only reduce the burden of the HEWs and give them space to focus on service provision, but it also dramatically improved the service quality by avoiding intentional or unintentional data manipulation in the middle. Moreover, it will ensure the availability of “real-time” data for analysis and decision-making.

COVID-19 System (Polytech)/DHIS2 Interoperability

As part of the response to the COVID-19 pandemic, the DHIS2 Tracker was used for case-based surveillance at the national level to accelerate case detection, active surveillance, and response. In addition, the lab information system (LIS) and commodity management system were among the platforms implemented to manage the health data. Following the eHA guidelines, a middleware-based service layer was developed and implemented to mediate the data exchange between DHIS2 and LIS by providing the architecture and components for connecting the systems.

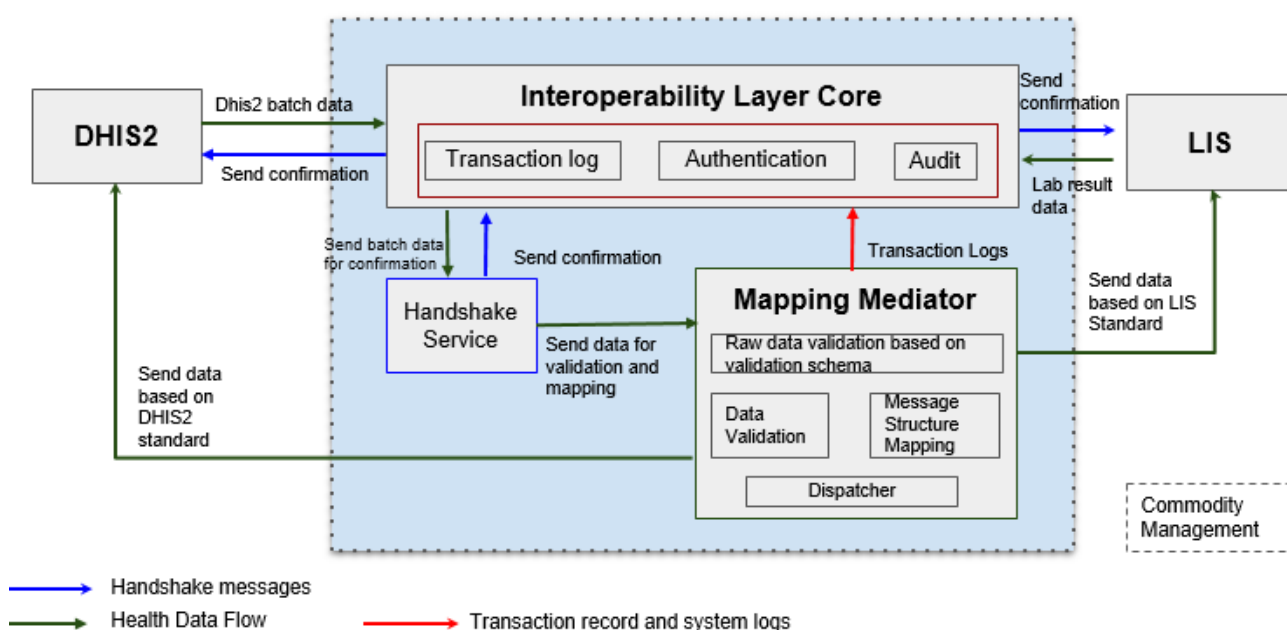


Figure 17: DHIS2/LIS data exchange components

Because of the implementation of the interoperability between the DHIS2 Tracker and Polytech Lab System:

- Repetitive registration in two different systems was avoided.
- Transcription errors were significantly reduced.
- The self-reported efficiency of the clinical decisions was high.
- The COVID-19 test result turnaround time was reduced by half, which ultimately improved client satisfaction.

Digital Health Infrastructure Support

Optimized Hosting Support through the Use of Amazon Web Service

Given the fragile local infrastructure within the MOH, it was necessary to look for alternative hosting strategies for key HIS in the country. DUP played a vital role in convincing the MOH to consider hosting selected digital health solutions on the Cloud, like Amazon Web Services (AWS), in parallel to supporting capacity enhancement efforts for local hosting. MOH accepted the proposed solution and hosted DHIS2, MFR, Knowledge Management System, the MOH Website, etc. on AWS since May 2018. As of its inception, DUP continuously provided for the subscription and hosting costs. Moreover, by embedding dedicated senior experts at the MOH, DUP provided technical support and on-the-job capacity building on AWS, such as maintaining interconnection between instances, deploying new instances (e.g. for COVID-19 system), optimizing the hosted instances, troubleshooting during system failure, and other need-based support. DUP also supported the real-time monitoring of the hosted systems using tools such as Paessler PRTG Network Monitor.

G-Suite Corporate Email System:

Google Workspace, formerly known as G-Suite, is a collection of cloud computing, productivity and collaboration tools, software and products, developed and marketed by Google. Since 2018, DUP supported in establishing a corporate email and collaboration platforms for staff of MOH, RHBs, and agencies using G-Suite. This effort significantly contributed to knowledge management and better communication, collaboration, and accountability among staff. The MOH's G-Suite served more than 2,100 users with individual and group emails. At the MOH's request, DUP provided training to all directorates (a total of 180 staff) on the packages and services of the Google Workspace to enhance the use of the G-Suite Services, mainly the email, audio/video calls, and hangout services.

The Digital Health Innovation and Learning Center (DHILC):

With financial and technical support from DUP, the Digital Health Innovation and Learning Center (DHILC) was established at St. Peter's Hospital Compound. DHILC's serves as a platform for major digital health innovations through user-centered design to validate 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 innovations are translated to scale through impact-driven partnerships. Some of the major objectives of the Center include: (1) Providing a dedicated workplace for collaborative development and testing of the newly developed or adopted applications; (2) Facilitating innovation and capacity building, which are the core of the DHILC; (3) Expediting the development and testing process of eHealth applications and tools in a more secured environment; and, (4) Providing hotlines for system and data use-related support from end users.



The Center was inaugurated on August 06, 2020 in the presence of H.E. Dr. Lia Tadesse, Minister of Health and H.E Dr. Abraham Belay, the then Minister of Innovation and Technology, signifying the importance and significance of the Center for the health sector to achieve its digital health strategic objectives. From its establishment, DUP ran the DHILC by dedicating two full-time staff who managed and executed the daily tasks to ensure uninterrupted functionality and its seamless transition to operate under the MOH.

As the DHILC is fully functional, DUP worked hard to seamlessly transition the management of the Center to the MOH. DUP considered capacity building as one of the key strategies in this regard. With this in mind, DUP successfully finalized the technical documentation of the Center; finalized call center deployment; activated the license for the call center; provided a detailed DHILC Infrastructure Management Training (that included the helpdesk/call center management) to the MOH staff; and successfully transitioned DHILC to management under HITD, based on the initial project agreement. Jointly with the MOH experts, DUP developed the governance protocol and other documentation for the DHILC.

In summary, the DHILC accomplished the following major activities so far.

- More than 536 participants trained on eHealth digitization in the center.
- Applications tested and uploaded to the center's Git-Lab Repository Server include EMR, iHRS, Dagu 2.0, eAPTS, Fanos, Vitas, MFR, MBrana, and eRIS, nearly about nine applications were deployed and tested in collaboration with the MOH and DHA.
- The MOH DUP, DHA and ICAP are the primary users of the center.
- More than 350 support request calls from various places have been made. 95% of the queries were answered by this center, and the remaining 5% are sent to MOH for senior-level assistance



The Digital Health Innovation and Learning Center, St. Peter's Specialized Hospital Compound, Addis Ababa

Digital Health Leadership and Governance

Preparation of Digital Ecosystem Blueprint

DUP notably engaged and supported the preparation of the National Digital Health Ecosystem Blueprint (DHBp), an initiative triggered and guided by the Office of the State Minister, Operations. The DHBp was prepared with the intention of creating an ecosystem and clear governance mechanism for the execution and sustainability of digital health strategies, policies, procedures, and projects of MOH and its stakeholders. In addition, the blueprint is meant to help the harmonization and packaging of the many fragmented digital health initiatives. The blueprint has four main pillars: solutions and services, access and delivery, data hubs, and infrastructure, and technical details have been included for each pillar. The blueprint also identified ten overarching digital health initiatives to guide digital health in the coming decade.

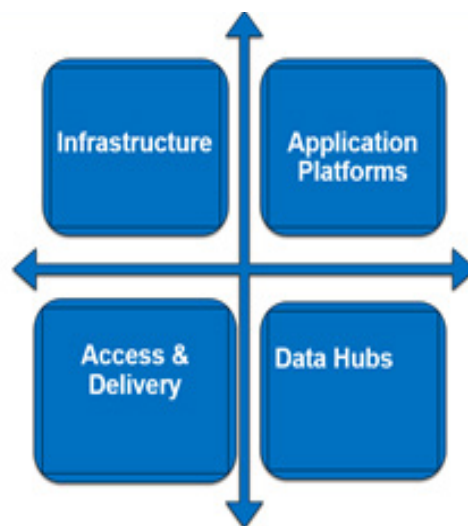


Figure 18: The National Digital Health Ecosystem Blueprint

DUP provided a wide range of technical assistance and logistics support in the development as well as socialization of the DHBp.

Development of the National Digital Health Strategy (2020 – 2029)

DUP supported MoH in developing a comprehensive and long-term National Digital Health Strategy technically and by covering the logistic expenses for the entire process that included rigorous development, refinement, and alignment workshops. The digital health strategy was developed in light of the DHBp and in harmony with the existing documents such as HSTP-II, IR roadmap, the HIS strategy, the draft health information technology policy, and other strategic documents of the health sector, as well as global experience. The strategic document unpacked the present status of digital health, digital health vision, mission, and objectives, implementation strategies, strategic directions/pillars, core initiatives, detailed implementation plan, costing and budget, and monitoring and evaluation plan.

HIS Maturity Assessment

In 2021, DUP supported the MOH to conduct a national HIS Maturity Assessment to bridge the information gap, measuring the overarching HIS maturity level based on the major domains and subdomains of the system.

This assessment was conducted with strong engagement of relevant MOH directorates, RHBs, MOH agencies, the CBMP universities, and strategic digital health partners (DUP, DHA, Transform PHC, Italian Cooperation, CHAI, ICAP, and AMREF). The assessment revealed that the workforce, data quality and use domains scored (3.27), relatively higher than the other domains and seem to be on the right track. However, the leadership and governance, ICT infrastructure, and standards and interoperability scored the lowest (between 2.29 – 2.47) and were identified as areas that need more concerted investment moving forward. The goal is to bring all between 4.11 – 4.72 scores by the end of 2024. The improvement roadmap and key interventions were identified and published for action.

Subsequently, the maturity of DHIS2 and eCHIS were assessed in 2022 by the MOH, DUP, and DHA jointly with Universities of Gondar and Jimma University. The results of these two assessments were essential to benchmark the current maturity levels of these digital health applications and guide policymakers in strategizing their successful scale-up and sustainability.



Major lessons learned in the digitization domain:

- Digital health is not a static endeavor; it grows and transforms as the health needs, policies, and priorities of the country change. It needs to come up with a scalable mechanism for its realization.
- Regardless of who is going to implement or support it, any digital health initiative has to be planned end-to-end and its governance mechanism should be clearly defined.
- No single partner is sufficient enough to fully implement a digital health system or service at all required levels. It is essential to carefully design an engagement mechanism for all relevant stakeholders to play their parts.
- A phase-based digital health systems/services implementation approach saves resources and provides a room for learning and improvement.
- Strong linkage with global Communities of Practice (CoP) is key in knowledge and skill transfer, resource optimization, and tapping into global goods.
- Government ownership and leadership are key for a sustainable execution of digital health endeavors and to unlock their potential for improved health outcomes.



2.4. Governance of the HIS

HIS governance is the process of decision-making about the HIS and the process by which these decisions are implemented (WHO). Per WHO guidance, HIS governance is composed of a set of five functions of health system governance as summarized in Box 4.

A well-functioning HIS governance requires the presence of an HIS governance framework, HIS governance structures, and relevant governance documents such as policies, legal frameworks, protocols, and standards both at national and regional levels.

2.4.1. HIS Governance Framework

HIS assessments are important tools for HIS governance as they provide a structured approach to identifying priority areas for HIS strengthening. An assessment of the HIS performance in Ethiopia conducted prior to the start of the DUP project revealed that weak HIS governance was one of the main causes of poor data quality and data use. Accordingly, the IR Roadmap called for “strong HIS governance as the foundation of a sustainable national HIS”.

The project supported the development of the HIS governance framework which was finally endorsed in 2021. It encompasses the overarching HIS governance components including goal and objectives, functions and principles, and structures at national and regional levels. This framework is later customized by all regions to their own contexts.

The HIS governance work stream supports overall HIS strengthening, with a particular focus on both pillars of the IR (data use and HIS digitization). DUP supported this work stream to create a strong data governance structure within the MOH that implements and enforces coherent policies and practices for data collection and use.

Box 4: The five functions of HIS governance

1. Formulating policy and strategic plans
2. Generating intelligence: information and analysis for decision-making
3. Putting in place levers or tools for implementing policy – including design of health system organizational structures and their roles, powers and responsibilities; design of regulation; standard-setting; incentives; enforcement and sanctions
4. Collaboration and coalition-building across sectors and with external partners
5. Ensuring accountability by putting in place: governance structures, rules, and processes for health sector organizations.

Source: WHO (6).

Box 5: Summary of National HIS governance Structures

National HIS Steering Committee: the steering committee:

The HIS Steering Committee: Expected to meet quarterly under the leadership of H.E. the Minister of Health. Among the few members are USAID and BMGF. This committee deals with high-level issues that need the decision of higher officials.

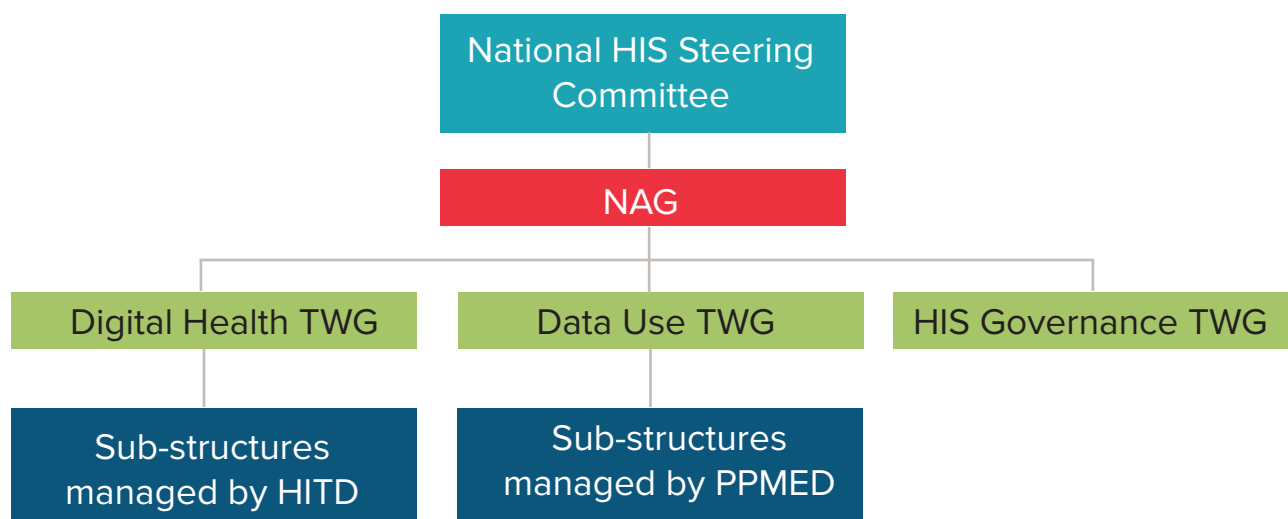
The National Advisory Group (NAG): Is chaired by the chief of staff of Office of the Minister of Health and PPMED and HITD serve as secretaries in rotation manner. Meets every two monthly and comprises government and nongovernment partners. Among its main objective are to track the progress of the IR agenda, align partner support with MOH priorities, and socialize policy and strategic documents.

Data use and digitization TWGs: Under the umbrella of this TWG, there are sub-TWGs on DHIS2 TWG, MFR, eCHIS, eHRIS, and governance that serve as the technical arms of the Steering Committee and the NAG. Detailed technical discussions and decisions are made at their monthly meetings.

HIS Governance TWG: follows up, monitors and flags the existence and functionalities of the various HIS governance functions as per the HIS governance frameworks and the TORs both at national and regional levels.

2.4.2. HIS Governance Structures

Throughout the project life, DUP supported the development, endorsement, and revision of national and regional HIS governance structures. Forming, strengthening, merging, and revitalizing these structures as needed, enabled the MOH to have functional HIS coordination platforms at national and regional levels. These structures are primarily led by the MOH and RHB's PPMED and HITD, and members of the respective structure consists of other MOH/RHB directorates and agencies, donors, and implementing partners. DUP assisted in the development of TORs that served to clarify the composition and roles and responsibilities of these structures and the frequency of their meetings.



Later, the structure was amended to five HIS governance structures with the following list:

1. HIS Steering Committee, 2. HIS National Advisory Group, 3. Digital Health TWG, 4. Data Use TWG, and 5. HIS Governance TWG. However, more structures were established and functioning throughout the project period. Similar structures were also instituted at regional levels. Summary of the HIS Governance Structures are presented in Box 5:

These structures have conducted in-person and online meetings, regularly discussed the status of the two pillars of IR and provided critical guidance in the development of national HIS initiatives, documents, etc. DUP provided technical and financial support to several of these structures, which included serving as secretariat, coordinating invitations, agenda-setting, facilitating and presenting on different topics, and providing the write-up of meeting minutes.

Other TWGs and Task Forces: In addition to the above listed TWGs, there are structures established on an ad hoc basis to complete specific but significant activities (e.g. the HMIS Indicator Revision Task Force, the NCoD Revision Task Force, etc.).

Regional-level HIS Governance and Coordination Platforms: These platforms are either a standalone or integrated with overall regional partner forums, depending on the regional realities.

Overall, the coordinated efforts of the MOH, RHBs, and partners in the implementation of the HIS governance achieved significant results. For example, the number of regions that established HIS coordination platforms and made them functional increased from four in January 2020 to ten in June 2022 (except in Afar and Tigray) (Figure 5).

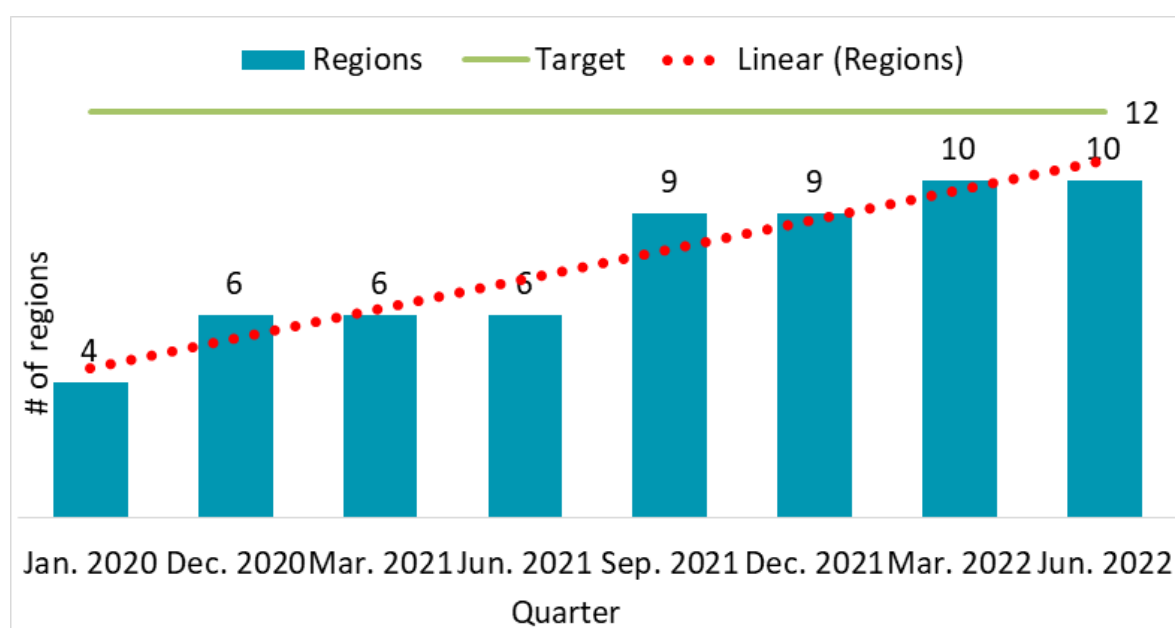


Figure 19: Trend in the number of regions that have functional HIS coordination platforms

2.4.3. Develop and Implement HIS Governance Documents

Under the leadership of the MOH, DUP coordinated, collaborated, and contributed in the write-up, review, and finalization and or/endorsement of policies, legal frameworks, and protocols that govern the country's HIS activities. DUP also provided significant oversight in the socialization and implementation of these efforts after endorsement. Some of these documents include:

HSTP-II: DUP technically and financially supported the MOH to finalize the document by organizing a series of consultative workshops. Additionally, the project supported the development of a separate HSTP monitoring and evaluation (M&E) plan. The DUP also supported the translation of this strategic document into Amharic.

HIS Strategic Plan: DUP immensely supported the entire process that included organizing several rounds of joint write-up and validation meetings, orientation sessions, and provided oversight on its customization by RHBs.

MFR Governance and Management Protocol: DUP was instrumental in supporting the Health and Health Related Institutions Regulatory Directorate (HHrIRD) in the development and endorsement of the protocol. One year after it was endorsed in 2021, the document was revised to accommodate emerging needs and expansion in the service domain.

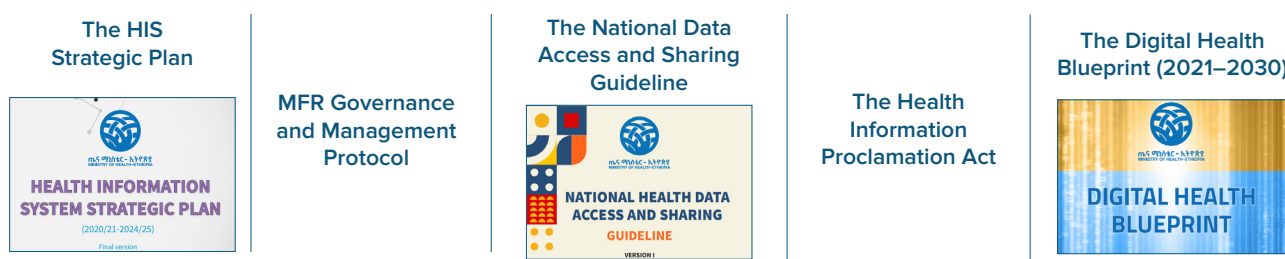
National Data Access and Sharing Guideline: DUP supported the MOH in developing this guideline with the aim to maximize the use of data; avoid duplication of efforts; improve efficient and effective use of resources; increase accountability and better decision-making by enhancing data governance; and improve access to health data. It clearly outlines roles and responsibilities and processes for making routine, research, survey, and surveillance data sharable and accessible while ensuring confidentiality and data security. The guideline was a result of a series of consultations mainly between MOH's PPMED, HITD, EPHI, the legal directorate, and relevant partners. The parties eventually reached a consensus to establish a National Health Data Warehouse at the MOH and a National Data Management Center at EPHI. Both will be owned by the MOH, nevertheless these agencies, systems, or platforms can freely exchange data as needed and as applicable. The document was endorsed in 2022.

DHBp (2021–2030): DUP significantly engaged in and supported the preparation of the DHBp, endorsed in 2021. The details are mentioned above in the Digital Health section of this report.

National Digital Health Strategy (2021–2025): DUP significantly engaged in and supported the preparation of the national digital health strategy. The details are mentioned above in the Digital Health section of this report.

Costed plan for IR Roadmap: In DUP's first and second year, the MOH in close coordination with donors and implementers revised the IR strategic roadmap and measurement framework and costed the plan by an experienced health economist to determine funding gaps and help in mobilizing resources. Among other things, DUP supported the MOH in developing a funding proposal to the CDC and Gavi, the Vaccine Alliance to support this initiative.

Health Information Proclamation Act: In 2019 and 2021, DUP supported the MOH to conduct a series of consultative workshops with the legal consultant in charge of drafting the proclamation. Later this document became part of the broader “Health Services Administration Proclamation and Regulation,” developed by the Legal Directorate of the MOH. The “Health Services Administration Proclamation,” which contains two HIS-related chapters, has been reviewed by the Ministry of Justice and is pending endorsement by parliament. The “Health Services Administration Regulation,” which also contains two HIS-related chapters, is in the finalization process to be endorsed by the council of ministers.



2.4.4. National Health Data Week

With the aim of advocating for data quality and use, DUP in collaboration with the MOH pioneered and started a national health data week program. The week is an opportunity to recognize the major milestones achieved by the health sector while calling for enhanced partnership and collaboration among all HIS stakeholders.

The MOH with its agencies, regional and city administration health bureaus, and other HIS stakeholders celebrated National Health Data Week in the month of March 2022, with various events, press conferences, workshops, panel discussions, radio and TV coverage, as well as dissemination of social media content through Twitter, Facebook, Telegram, and SMSs that reached across the nation.

The first data week was celebrated from March 14–18, 2022 under the theme of “Enhancing partnership and collaboration to strengthen the health information system” PPMED.

DUP led the inception, preparation, and undertaking of many national and regional level events and also provided coordination, communication, and support of HIS partners, including RHBs, to celebrate the week with tailored events corresponding to their contexts. DUP also sponsored the production and dissemination of the radio and TV spots.



Major Lessons Learned in the HIS Governance Domain

The following key lessons learned over the past few years of progressive improvement in HIS governance found there is a need for:

- A clearly outlined HIS Governance framework that is expected to guide the HIS governance functions
- Leadership engagement from endorsement of HIS governance frameworks and in the governance structures
- Clearly defined roles and responsibilities of the governance structures and expectations for realistic frequency of meetings
- Regular assessment and revision of governance framework and structures to address evolving needs
- Joint planning and monitoring of HIS progress in this country. Developing HIS progress tracking dashboard for which all HIS stakeholders will be accountable to and contributing to will improve effectiveness, ownership, and efficiency.
- Adequate attention by the senior management to the endorsement of HIS governance documents as much the attention given to initiate or conceive the documents

2.5. Monitoring, Evaluation, Research, and Learning (MERL)

2.5.1. Monitoring and Evaluation (M&E)

The DUP monitoring, evaluation, research, and learning (MERL) activities aim to develop a continuous management function to gauge and evaluate the project's execution in light of the MOH's IR initiatives. As part of MERL, the project assesses if progress is made in achieving the expected results, guides interventions, flags bottlenecks in the implementation of the IR, and manages learnings. Initially, DUP developed a project Theory of Change (TOC), which described the pathways and preconditions to achieve the intended results, which served as the foundation for the creation of the MERL system. DUP also used a results framework that was developed with the aim of clearly articulating the change the project plans to achieve over its lifespan and ensuring the availability of data to support the project's narrative of change.

DUP monitored its performance on a quarterly basis using 55 indicators that were created and connected to 52 outputs and eight intermediate outcomes, which are grouped under the four project operation domains: (1) Transformation of data use culture; (2) Digitalization of HIS; (3) HIS governance; and (4) HIS research, learning, documentation, and dissemination.

Starting from year four, DUP digitized its monthly data collection system. The ODK-based system enabled electronic data capturing, transfer, and visualization. Regional teams were trained to use the system for reporting and performance tracking. DUP also developed Excel-based interactive dashboards to simplify the follow-up of monthly quantitative reports that were collected from each region.

To coordinate efforts and meet government requirements, DUP annually aligned and co-planned with its government counterparts at the federal and regional levels. Furthermore, to review performance, evaluate and reorient internal workflows, and fine-tune work plans, DUP conducted bi-annual internal review meetings.

2.5.2. Research and Learning

Implementation Research: DUP envisions creating a culture of implementation research to strengthen Ethiopia's HIS for increased and better health outcomes. It is a relatively new approach in generating evidence while implementing proven interventions by involving researchers (CBMP universities) and implementers. To achieve this vision, staff from six CBMP universities, all RHBs, the MOH, and a few chosen woredas were trained with the objective of teaching participants how to develop, test, and scale up solutions to improve HIS programs. Following the implementation research capacity-building workshops, collaborative research teams (including experts from MOH, RHB, the six CBMP universities, and DUP) were formed in each region. Accordingly, DUP supported 12 embedded implementation researches on topics that focus on understanding and addressing data use bottlenecks for evidence-based MNCH interventions that were designed and carried out by the collaborative research teams. DUP also set up a monthly meeting schedule and an online monitoring system to track the progress of these studies. (Annex 1: Annex 1. Status of implementation researches as of September 2022)

The embedded research helped the collaborative research teams to deepen their understanding of the barriers faced when programs are implemented in a real-world context and gain experience on how to develop, test, and scale-up evidence-based solutions to optimize HIS. In order to link research with policy and strategic decisions, DUP in collaboration with the six CBMP universities prepared regional and national level policy briefs and organized various dissemination workshops. The MOH and RHB higher officials and representatives of MOE, universities, implementing partners, and donors attended the final dissemination workshop where H.E Dr. Lia Tadesse, Minister of Health, appreciated the efforts done to strengthen evidence-based decision-making.

Operational Research: In addition to implementation research, DUP supported operational research to aid decision-making and generate evidence to improve the implementation of HIS programs. Accordingly, a study aiming to synthesize evidence on how to better implement CHIS in urban areas was conducted by a team, composed of DUP and MOH staff, that employed qualitative research methods and conducted a series of stakeholder consultation workshops. The study identified 66 strategies under eight domains of which, 47 strategies were rated as highly important and feasible to implement in urban settings.



In year three of CBMP implementation, DUP collaborated with the MOH and Addis Ababa University to conduct a qualitative assessment to identify drivers of and barriers to improving HIS data quality and use, focusing on key IR strategies including Connected Woreda, CBMP, PMTs, and motivational incentives. The study indicated that the main drivers of data quality and use at the point of service delivery were the use of the Connected Woreda strategy and its tools, capacity-building activities including mentorship, PMT activities that led to active leadership engagement, and motivational incentives for data producers and users. It also stressed that future investments should focus on strengthening promising data-use practices, resolving bottlenecks caused by duplicative data collection tools, enhancing individual and institutional capacity, addressing suboptimal health worker attitudes toward data, and overcoming infrastructure and connectivity challenges.

Additionally, aiming to document lessons learned and best practices from the IR model woredas under the CBMP program, DUP conducted a qualitative study in collaboration with the University of Gondar and Hawassa University. The study concluded that the following critical factors should be in place to improve IR status of a health institution at district and facility levels: adequate resources to support the interventions; contextual evidence generation and translation; use of evidence-based change theories (i.e., practice-based learning approaches, diffusion theory, etc.) to guide interventions; strong engagement and motivation of leaders; and strategies to minimize staff turnover.

HIS Effectiveness Evaluation: DUP in collaboration with the MOH conducted an HIS effectiveness evaluation study to assess the changes in the HIS structure and resources, HIS performance (data quality and data use), and effect of HIS performance on MCH service coverage. This study was a two-arm quasi-experimental study, implemented in intervention and comparison woredas. Baseline and end-line surveys were conducted for both arms (2020 and 2022). A linked health facility-level and population-based survey were conducted concurrently in both intervention and comparison woredas. At baseline, the assessment covered 3,016 households; 33 woredas; 71 HCs; 15 hospitals; and 81 HPs. At the end-line, it covered 3,077 households; 28 woredas; 67 HCs; 13 hospitals; and 80 HPs.

Along with the HIS effectiveness study, DUP used the Performance of Routine Information System Management (PRISM) tools to measure the effect of the CBMP intervention package on HIS performance in selected study sites. The assessment employed a pre-post design and was conducted initially in 219 facilities from 38 woredas/sub-cities and then in a total of 24 selected health facilities (six hospitals and 18 health centers) from 11 woredas/sub-cities in Ethiopia at project baseline (2018), midline (2020), and end-line (2022). The assessment provided a comprehensive picture on the status of HIS performance in the CBMP woredas and indicated the strength and gaps of the HIS particularly at health facility level, which inform intervention refinements.

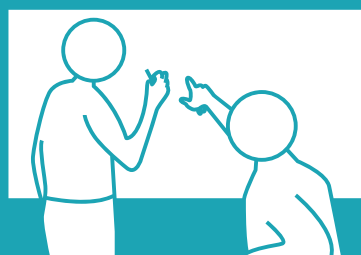
This work has proven that the various interventions implemented in the different parts of the country led to improvements in HIS performance (improvement in most of the data quality and data use indicators), which in turn led to improvements in health services delivery, particularly in MCH and FP service utilization indicators, and promoted active learnings in the IR implementation. DUP organized a dissemination workshop entitled “Impact of Interventions on HIS Performance and MCH Service Utilization in Ethiopia” to share the findings of HIS effectiveness on MCH service coverage and best practices of CBMP model woredas for 60 stakeholders, including the MOH, RHBs, MOE, and implementing partners. Most participants agreed that the study provided insight that will be used for advocacy, resource mobilization, and policy decisions in the HIS space.

Research Grant Support: As part of the HIS research capacity-building initiative, DUP supported a total of 81 master’s students through funding from DDCF. Of the 81 master students that received research grants, 69% defended their thesis, 72% submitted manuscript, and 20% published their research. In addition, ten PhD students were awarded PhD research grants and published four researches on peer-reviewed international journals. Two of them completed their doctoral program and assumed leadership roles within MOH and RHB as presented in Table 5 below. Moreover, the CBMP platform is utilized to train the workforce who are well-aware and skilled in the area of HIS. DUP supported CBMP universities to prepare HIS-related modules and revise curriculum and research works of the master’s and PhD students.

Table 5: Summary of master's Students' Research Status

Partner University	# Masters grant awarded	Thesis not submitted	Thesis submitted	Thesis defended	Manuscript submitted	Manuscript published
Addis Ababa	16	6	10	10	5	2
Gondar	20	0	20	20	14	9
Haramaya	15	6	9	9	4	1
Hawassa	12	4	8	8	4	3
Jimma	10	6	4	4	2	1
Mekelle	8	0	8	5	0	0
TOTAL	81	22	59	56	29	16
Achievement	100%	27%	72%	69%	36%	20%

Publications: DUP started an HIS publication initiative to collectively disseminate evidence generated through implementation research, operational research, and master's and doctoral studies to the scientific community. So far, DUP in collaboration with the six CBMP universities, MOH, and RHSBs published 54 manuscripts in reputable peer-reviewed journals, contributing to local and global knowledge base. [Annex 2: List of publications produced through CBMP and DDCF funds including Master's and PhD students and implementation research]



Major Lessons Learned in MERL

- **Conducting and supporting the implementation research** helped to increase use of evidence by linking the research institutions (academia) and the policy makers (implementers). Building capacity and engaging decision makers in all phases of the implementation research created a sense of ownership, built trust, and facilitated translating evidence into action.
- **Generating evidence through operational and evaluative research** should be a critical segment of projects to inform policy and practice. DUP's work was exemplary in this regard.
- **Supporting HIS human resource by training PhD and Master's students** brought transformational changes in the HR for HIS space and evidence generation.
- **Documentation and dissemination of evidence and best practices** through multiple outlets and the active engagement of people concerned in HIS interventions brought about continuous learning, improvements, and scale-up of interventions. For example, the CBMP advocacy conference sparked momentum and interest in improving and scaling-up the program.

2.6. Communication and Knowledge Management (KM)

The primary objective of communication and KM is to support the MOH in documenting, communicating, and disseminating the progress and lessons learned from the implementation of the IR agendas to appropriate stakeholders. Establishing a KM platform and using the platform to manage the knowledge and information within the ministry and health sector is the other objective of the communication and KM work.

To identify the KM needs of the MOH, different rounds of discussions with the MOH were organized. DUP supported designing, developing, and operationalizing a KM system. The KM tool known as Alfresco Software was developed for the MOH and shared with and endorsed by the leadership of the MOH. In February 2021, the MOH officially launched the tool across its different functions as its main organizational KM system. DUP provided KM training to MOH staff from different directorates and mentored the KM focal persons on the system so that they could upload their data and use the system.

To increase visibility and promote learning, DUP produced several communication and KM products and disseminated them to various target audiences. This includes DUP's annual reports, success stories, quarterly IR newspapers, bi-annual health bulletins, posters and brochures, documentary films, and TV programs.

2.6.1. Success Stories Preparation

In an effort to document and share best practices, during the past six years, DUP created and distributed 26 success stories. The stories were widely shared on different platforms including JSI's website, the UN World Data Forum blog, RHBs, and universities' social media networks. The list and links of each success story are summarized in Annex 4.

2.6.2. IR Newsletter Preparation

DUP supported the MOH to document, publish, and update the wider public on the status of the IR initiatives by initiating the production of an IR Newsletter. Over the project period, six issues covering several topics were prepared and shared both online and in hardcopy. In total, 500 copies were printed and disseminated by DUP. Some of the significant updates covered in these newsletters included the creation of the HIS strategic plan, release of the digital health blueprint, revision of the national HMIS, HIS maturity assessment, CBMP advocacy, digital health conference, and National Health Data Week.

2.6.3. Documentary Films and Promotional Materials

DUP supported the production of three documentary films, the first is a 20-minute long film, focusing on the evolution of Ethiopia's digital health over the past seven years. The second film is about 15 minutes long and highlights the evolution of Ethiopia's digital health, while the third film presents DUP's contribution to the HIS of the country in 12 minutes. The documentary films were produced in Amharic and English and shared using TV outlets, YouTube, and events, including the Digital Health Conference in Addis Ababa.

DUP also supported the preparation and distribution of data quality and data use posters and brochures that were prepared in four languages (English, Amharic, Afan Oromo, and Tigrigna) to 18 woredas, eight primary hospitals, 90 health centers, and 381 health posts. Over the project period, DUP jointly with MOH prepared and disseminated several communication products to promote HIS strategic guidelines to various health institutions across Ethiopia. IR messages and information were widely disseminated through numerous data display tools, including roll-ups, banners, and backdrop banners.

2.6.4. Conferences Participation and Presentations

DUP participated and presented its work and lessons in various national and international conferences and events as listed below:

- MOH's Health Sector Annual Review Meetings (ARMs)
- National level HIS review meeting
- Regional health bureaus HIS annual review meetings
- OpenHIE Community Meeting
- Global Digital Health Forum
- Health Systems Research Symposium (HSR)



Major lessons learned in Communication and KM

- Communication supports IR implementation by creating a common understanding among the stakeholders regarding the strategies and guidelines of the transformation agendas. It helped in building the required implementation capacities at the lower tiers of the health system.
- It also helped in documenting and disseminating implementation progress and challenges so that decision makers at the bureaus and MOH level could take appropriate action.
- The KM tool provided a repository that enabled the MOH to collect, organize, and file documents, ensuring easy accessibility and availability of the resources and knowledge.

2.7. Additional Resources Mobilized because of DUP's Effort

Doris Duke Charitable Foundation (DDCF): after the launch of DUP, DDCF was interested to support the national HMIS work through strengthening implementation research and building capacity by supporting pre-service postgraduate level education on health informatics and related areas. Based on this, DDCF gave five million USD to DUP and this work is being implemented in collaboration with six local universities.

Capacity Building and Mentorship Program (CBMP): DUP facilitated collaboration between the MOH and six lead universities and four collaborating universities. In this arrangement, the MOH is providing grants to the six lead universities to support implementation of the IR in 36 woredas. Through this collaborative engagement, significant resources are mobilized both from the local universities and from the MOH.

Resources for Health Information Technology Infrastructure: to support access to internet connectivity to more than 5,000 sites in the country, DUP facilitated the mobilization of resources from government and non-government sources.

Launching of USAID's Digital Health Activity: USAID was encouraged to devise a large HIS project because of the ground work done through the support of DUP. The clear strategies and governance protocols, coordination platform, eHA, and related roadmaps prepared with the support of DUP motivated USAID to invest heavily in this area. Based on this, USAID launched a 63 million USD five-year grant in 2020 to support Ethiopia's HIS and digital health.

Children's Investment Fund Foundation (CIFF) Ethiopia eCHIS Scale-Up for Health Extension Program (HEP) Performance Improvement: DUP is playing a key role in the coordination of the implementation of eCHIS and also in leading the software design process by supplementing the MOH's capacity by hiring two full time staff. Encouraged by the smooth and coordinated implementation of eCHIS, CIFF launched a five-year eight- million USD grant in 2021 to support the implementation of eCHIS.

MOH's Investment in Health Information System, Digitization, and Evidence Generation: With its unique embedment approach model, DUP supported the MOH in the development of HIS strategic and operational plans. DUP ensured that these plans are well consulted by relevant HIS stakeholders and included prioritized and high-impact interventions. One major activity undertaken during the planning phase is the plan alignment process. In this process, development partners align their resources and budget with the national plan to ensure that the high-impact interventions are prioritized and avoid duplication of effort and resources. These in turn, resulted in improved effectiveness and efficiency of the investment on HIS. One good example is a massive capacity building training called integrated data quality, data use, and DHIS2 training that was given to program experts across the country between 2020 –2021. To accomplish this task, technical and financial resources worth more than two million USD were mobilized from the government and non-government sources.

In addition to the above-mentioned resource mobilization activities, DUP assisted the MOH to develop a long-term HIS and digitization investment plan. By playing a coordination role, the DUP team also helped the MOH to mobilize more than one million USD to generate evidence on COVID-19.

2.8. Gender Mainstreaming in DUP

Gender mainstreaming which is a process of integrating a gender lens into all aspects of an organization's strategies and initiatives was given due attention under DUP, especially during the last two years of implementation. DUP applied a gender lens and integrated its concepts through two strategies:

Gender mainstreaming in organizational processes: This encompasses interventions ranging from intentionally looking and engaging for competent female applicants to:

Learning Forums for Female Staff:

- Established a women's mentorship program to promote peer learning by matching female mentors and mentees. In addition, a women's coffee hour session was held every two months for women to gather and share their life skills and experiences.

Employee Recruitment

- Included encouraging female candidates in job adverts, ensuring the inclusion of competent female applicants in the shortlist, provision of a 5% plus for women as an affirmative action during the interview process, and headhunting capable professional women, among others.
- Intentionally provided internship opportunities for females. Four competent females were given such an opportunity who are now successfully pursuing their careers.

Gender integration in program implementation:

HIS Capacity Building:

- With the project's support, in six years out of 26,283 individuals trained in different HIS topics, [7,409 - 28%] were female.
- The IT Internship Program: From the 169 interns trained and deployed in regions across the country, 36% were females. These interns were either transferred to DHA and organized in micro-enterprises or are permanently hired by the regions to lead the IR implementation.

Gender in the Ethiopian HIS Space:

- Ensured the availability of gender disaggregated data for analysis and use in decision-making. Particularly during the recent revision, we assisted in the inclusion of new indicators such as leadership positions held by women, gender-based violence, in addition to disaggregating the key indicators by sex.
- Conducted an assessment, in collaboration with MOH and DHA, to explore the gender divide in the HIS space. The inputs will be used to enrich the strategy for gender integration in HIS which is under development.
- Supported the MoH in the development of the National Health sector women empowerment manual



Lessons Learned from mainstreaming gender:

- Gender is the most overlooked agenda during implementation. In order for gender mainstreaming to happen optimally, there has to be in place:



Clear plan & policy



Awareness



Deliberate action
for change



Accountability



Continuous
follow-up



Meaningful
commitment



Lessons Learned from the Project Overall

3. Lessons Learned from the Project Overall

The embedment approach promoted government ownership of DUP activities: The embedded nature of DUP created a special opportunity for it to serve as a thought leader in the development of HIS strategies and operational plans. To this end, DUP embedded its staff and aligned its plans and activities with MOH and RHBs priorities on an annual basis. Highly appreciated by MOH and RHBs, this approach facilitated government ownership and sustainability of anything implemented by the DUP such that operations can seamlessly transfer to the government in the near future.

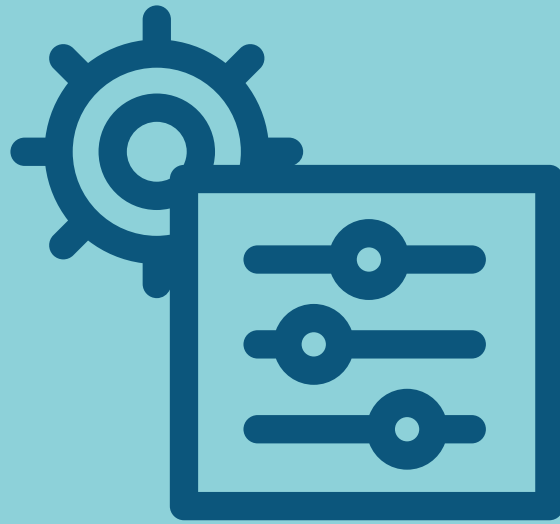
Putting in place functional HIS governance: Over the last six years, DUP has extensively supported development and implementation of the HIS governance agenda through an HIS governance framework, defining governance structures, and guiding documents. This garnered the commitment and involvement of policy-makers and partners in moving the IR agenda forward. Building on the existing momentum, future HIS governance strengthening activities should have a focus on enforcing the enacted governance documents, revitalizing the governance framework, and creating a joint mechanism for planning, implementation, and monitoring of HIS among the HIS stakeholders through platforms, HIS monitoring dashboards, and accountability frameworks.

Building health workforce capacity: Capacity building helps healthcare workers evolve from being data collectors who report information to higher levels of the health sector to data users who are able to access and use data for improved decision-making and service delivery. Good examples of this are the integrated data quality, data use, and DHIS2 training and mentorship provided for data users in WorHOs and HFs, which enabled staff to explore the data based on KPIs during PMTs. The training and mentorship sought to improve data access by ensuring users had logins to the DHIS2 and knew how to access and increase knowledge and understanding of RHIS through data use manuals.

Taking a holistic view: DUP's took the whole context under consideration and ensured that the eHA's strategies were aligned to broader health outcomes. For instance, the underlying philosophy of DUP's efforts was to explicitly shift from a "report-seeker mindset" to data analysis and data use so that the entire health system responds to and acts according to the evidence generated. Taking this holistic view of digital health systems helps keep strategies aligned for greater overall functionality and use and helps keep workstreams streamlined.

Comprehensive action: Making data quality monitoring and improvement and use of data for action everyone's role and responsibility while building the necessary capabilities, systems, and processes are crucial for the health system to bring change. There is no single magic bullet to bringing about the culture of data use. The foundation for culture change lies in a holistic application of all data quality assurance techniques, engagement of all actors (data people, health care workers, managers, implementing partners, etc.), regular implementation of the data use interventions, incentives for top performers, and institutionalizing accountability frameworks. It is critical to offer continuous support at all levels to establish systems thinking, encouraging healthcare workers and managers to link data beyond just figures and to the bigger impact on improving health outcomes.

Embedding research in the health system: By embedding research into the health system, implementers and researchers are able to work together to generate robust evidence and lessons to improve the health system. This approach was used to identify priorities of the national health system, address different aspects of the system's gaps, and document lessons learned. The involvement of implementers in health systems research created ownership and enabled the smooth translation of the generated evidence to improve program implementation, planning, and development of national strategies. Moreover, embedding research served as a means to build the capacity of implementers at all levels of the health system.



Major Challenges and Project Adjustments

4. Major Challenges and Project Adjustments

There were some challenges in the project implementation of DUP, which were addressed as appropriate. Some of the major challenges faced by the project were:

Insecurity: The security issues of the country significantly affected DUP's performance in delivering the planned activities and accessing data. A complete shutdown of activities happened in the entire Tigray region for more than two years. Prolonged unrest in Afar, parts of Amhara, Benishangul Gumuz, Gambella, and Oromia regions, hampered site visits and onsite activities such as mentorship, supportive supervision, review meetings, RDQAs, trainings, etc. at the institutions located in these areas. It also resulted in shifts of resources (human, financial, and material) for emergency and restoration of war affected areas/facilities.

COVID-19 pandemic: Emergence of the COVID-19 pandemic in the middle of project implementation constrained providing hands-on training and physical access to project sites to provide direct technical support including data collection for research and supervision.

Limited infrastructure: In almost all regions, there is limited infrastructure and poor HealthNet access (both VPN and LAN) to create data access for health service providers and program experts at ZHDs, WorHOs, and health facilities.

In addressing those challenges DUP applied the following approaches:

- Rescheduled activities in consultation with the MOH/RHBs and partners for a convenient time
- Prioritized activities that can be done with COVID-19 restrictions and precautions in place
- Followed strict application of personal protective devices
- Increased use of digital tools, like shifting to virtual meetings and online training
- Requested extension of the project to help in implementing the remaining activities that were affected by the COVID-19 pandemic and security issues



Annexes

5. Annexes

Annex 1. Status of implementation researches as of February 2023

No.	Research Title	Status	University
1	Strengthening Performance Monitoring Team through Quality Improvement Model Implementation in Selected Health Facilities of Addis Ababa	Completed the implementation research and submitted final report	Addis Ababa
2	Motivating the Performance Monitoring Team to Improve Data Use at Selected Public Health Facilities in Dire Dawa and Harari Regions: An Implementation Research	Completed the implementation research and submitted final report	Haramaya
3	On-Site Training Mentoring to Improve Quality of Data in Selected Public Health Facilities of Somali Regional State	Completed the implementation research and submitted final report	Haromaya
4	Improving Data Use through Enhancing Performance Monitoring Team Function in Sidama Region, Ethiopia	Completed the implementation research and submitted final report	Hawassa
5	Ensuring Sustainability of Health Information System Changes in Capacity Building and Mentorship Program Woredas, Southern Ethiopia	Completed the implementation research and submitted final report	Hawassa
6	Improving Data Quality through Implementation of Data Quality Assurance Strategies at Health Facilities in Digalu Tija Woreda, Arsi Zone, Oromia Region, Ethiopia	Completed the implementation research and Writing final report of the research	Jimma
7	Improving Data Quality through Implementation of Data Quality Assurance Strategies at Health Facilities in Godere Woreda, Majang Zone, Gambella Region, Ethiopia	Completed the implementation research and Writing final report of the research	Jimma
8	Improving Health Data Quality Through Optimizing Mentorship and Supportive Supervision in Health Facilities of Tigray Region	Analyzed baseline data (both qualitative and quantitative) and revising implementation strategy	Mekele
9	Improving Health Data Quality Through Optimizing Mentorship and Supportive Supervision in Health Facilities of Afar region	Analyzed baseline data (both qualitative and quantitative) and revising implementation strategy	Mekele
10	Performance-based Non-financial Incentive Intervention for Improved Data Quality and Information Use, in Wogera District: Amhara Region	Completed the implementation research and submitted final report	Gondar
11	Capacitating HIS Leaders to Improve Healthcare Data Quality and Use in Assosa District	Completed the implementation research and submitted final report	Gondar
12	Optimizing eCHIS Implementation to Improve RMNH Service Delivery and Data Quality; a Hybrid Implementation-Effectiveness Study in Amhara and Oromia Regions	Completed the implementation research and Writing final report of the research	DUP and MOH

Annex 2. List of publications produced through CBMP and DDCF funds including Masters and PhD students and implementation research

		Published articles with links
1	2022	Contribution of health information system to child immunization services in Ethiopia: Baseline study of 33 woredas
2	2022	Current and Future Needs for Human Resources for Ethiopia's National Health Information System: Survey and Forecasting Study
3	2022	Pathways to improve health information systems in Ethiopia: current maturity status and implications
4	2022	Optimizing eCHIS implementation in Ethiopia: Major determinants and recommended strategies
5	2022	Health workers' use of routine health information and related factors at public health institutions in Illubabor Zone, Western Ethiopia
6	2022	Embedding Research on Implementation of Primary HealthCare Systems Strengthening: A Commentary on Collaborative Experiences in Ethiopia, Ghana, and Mozambique
7	2022	Barriers and Facilitators to Data Use for Decision Making: The Experience of the African Health Initiative Partnerships in Ethiopia, Ghana, and Mozambique
8	2022	Drivers and Barriers to Improved Data Quality and Data-Use Practices: An Interpretative Qualitative Study in Addis Ababa, Ethiopia
9	2022	Lessons Learned from the Capacity-Building and Mentorship Program to Improve Health Information Systems in 11 Districts of Ethiopia
10	2022	Maternal Service Coverage and Its Relationship to Health Information System Performance: A Linked Facility and Population-Based Survey in Ethiopia
11	2022	Improving Primary Care Quality Through Supportive Supervision and Mentoring: Lessons from the African Health Initiative in Ethiopia, Ghana, and Mozambique
12	2022	Level of health data quality and information use, and contributing factors in the Benishangul Gumuze Region, west Ethiopia: using social ecological framework
13	2022	Routine Health Information System Data Quality and Associated Factors in Selected Public Health Facilities of Jijiga Woreda, Somali Regional State's, Eastern Ethiopia
14	2022	Electronic Medical Record Utilization, Determinant Factors and Barriers Among Healthcare Providers at Selected Health Facilities in Addis Ababa, Ethiopia
15	2022	Health workers with good self-perceived competency have lower actual competency levels on HIS in Eastern Ethiopia: A cross-sectional study
16	2022	The Influence of Parallel Reporting Systems on Data Quality and Information Use in Northwest Ethiopia: A Qualitative Study
17	2022	Health Facilities Performance Monitoring Team focused motivation interventions to improve the use of health information for better decision making: An implementation research study protocol
18	2022	The Quality of Medical Records Management in Public Health Facilities in the Jimma Zone, Oromia Regional state, Southwest Ethiopia
19	2022	Facilitators and Barriers Affecting the Implementation of Capacity Building and Mentorship Program (CBMP) in Improving Evidence-Based Decision-Making in Amhara Region, Northwest Ethiopia: An Exploratory Qualitative Study

20	2022	<u>Quality of Health Data in Public Health Facilities of Oromia and Gambela Regions, Ethiopia</u>
21	2022	<u>Utilization of HIS Data and Associated Factors at Public Health Facilities of Sidama Regional State, Southern Ethiopia-Health Information Utilization at Public Health Facilities</u>
22	2022	<u>Health Workers' Knowledge, Perceptions, and Self-Efficacy Regarding the Use of Information Systems in Rural Districts of Oromia and Gambella Regions, Ethiopia</u>
23	2022	<u>The influence of Performance Monitoring Team on the Use of Health Information by Health Facilities at Shabedino and Hawella Districts of Sidama, Ethiopia</u>
24	2022	<u>Barriers and Enhancers of Data Quality in Health Sector of Somali Regional State, Eastern Ethiopia</u>
25	2021	<u>Strengthening the national health information system through a capacity-building and mentorship partnership (CBMP) program: a health system and university partnership initiative in Ethiopia</u>
26	2021	<u>A mixed-methods assessment of Routine Health Information System (RHIS) Data Quality and Factors Affecting it, Addis Ababa City Administration, Ethiopia, 2020</u>
27	2021	<u>Acceptability, Barriers and Facilitators of Mobile Text Message Reminder System Implementation in Improving Child Vaccination: A Qualitative Study in Northwest Ethiopia</u>
28	2021	<u>Assessing the existing e-health system functionalities towards digitization and integration</u>
29	2021	<u>Assessment of routine health information utilization and its associated factors among Health Professionals in Public Health Centers of Addis Ababa, Ethiopia</u>
30	2021	<u>Commitment Levels of Health Care Providers in Using the District Health Information System and the Associated Factors for Decision Making in Resource-Limited Settings: Cross-sectional Survey Study</u>
31	2021	<u>COVID 19 Epidemic Trajectory Modeling Results for Ethiopia</u>
32	2021	<u>Data quality and it's correlation with Routine health information system structure and input at public health centers in Addis Ababa, Ethiopia</u>
33	2021	<u>Assessment of quality of routine health information system data and associated factors among departments in public health facilities of Harari region, Ethiopia</u>
34	2021	<u>Effect of Mobile Phone Text Message Reminders on the Completion and Timely Receipt of Routine Childhood Vaccinations: Superiority Randomized Controlled Trial in Northwest Ethiopia</u>
35	2021	<u>Hospitalization, Recovery, Death, incubation period and Severity of COVID-19: A Systematic Review</u>
36	2021	<u>Implementation of Human Development Model Impact on Data Quality and Information Use in Addis Ababa, Ethiopia</u>
37	2021	<u>Improving health care services through enhanced Health Information System: Human capacity development Model</u>
38	2021	<u>Improving the Quality of Clinical Coding through Mapping of National Classification of Diseases (NCoD) and International Classification of Disease (ICD-10).</u>
39	2021	<u>Level and contributing factors of health data quality and information use in two districts in Northwest Ethiopia: social-ecological perspective</u>
40	2021	<u>Outcome evaluation of capacity building and mentorship partnership (CBMP) program on data quality in the public health facilities of Amhara National Regional State, Ethiopia: a quasi-experimental evaluation</u>
41	2021	<u>Patterns of essential health services utilization and routine health information management during Covid-19 pandemic at primary health service delivery point Addis Ababa, Ethiopia</u>

42	2021	<u>Quality of Primary Health Care during COVID-19 Pandemic in Addis Ababa Ethiopia: Patients-side and facility level assessment</u>
43	2021	<u>Routine health information system utilization for evidence-based decision making in Amhara national regional state, northwest Ethiopia: a multi-level analysis</u>
44	2021	<u>Smartphone Medical App Use and Associated Factors Among Physicians at Referral Hospitals in Amhara Region, North Ethiopia, in 2019: Cross-sectional Study</u>
45	2021	<u>The Ethiopian Health Information System: Where are we? And where are we going?</u>
46	2021	<u>The Plight of COVID-19 in Ethiopia: Describing Pattern, Predicting Infections, Recoveries and Deaths Using Initial Values from Different Sources</u>
47	2020	<u>E-health literacy and associated factors among chronic patients in a low-income country: a cross-sectional survey</u>
48	2020	<u>Healthcare providers' digital competency: a cross-sectional survey in a low-income country setting</u>
49	2020	<u>Intention to use electronic medical record and its predictors among health care providers at referral hospitals, north-West Ethiopia, 2019: using unified theory of acceptance and use technology 2(UTAUT2) model</u>
50	2020	<u>Timely completion of vaccination and its determinants among children in northwest, Ethiopia: a multilevel analysis</u>

Annex 3. Some list and links of Success Stories

1. [Improving health service delivery in Ethiopia through strengthened performance monitoring teams](#)
2. [Ethiopia' Experience: Empowering and improving the use of quality data for evidence-based decisions through capacity building and mentorship](#)
3. [Using quality data to improve service outcomes](#)
4. [Data-powered decisions: How an Ethiopian Health Center Improved Antenatal Care](#)
5. [Connected Woreda Program: A conduit to the Health Information Revolution in Ethiopia](#)
6. [Ethiopia launches Digital Health Innovation and Learning Center](#)
7. [JSI's Ethiopia Data Use Partnership Jointly Hosts the First IT Internship Program Appreciation and Exit Ceremony](#)
8. [The Ambassadors of Mothers](#)
9. [Ethiopia Embarks on Standardizing its Electronic Health Management Information System](#)
10. [An Innovative Approach to Improving Health Data Use in Ethiopia](#)
11. [Optimizing Performance Monitoring Teams to Improve Data Quality and Use In Ethiopia Hospital.](#)
12. [Improving Reproductive, Maternal, Newborn and Child Health Services through eCHIS in Ethiopia's Oromia Region](#)
13. [Harari Region's Experience Implementing an Electronic Community Health Information System \(eCHIS\)](#)
14. [Incentivizing improved use of Health Information at the Harari Regional Health Bureau](#)
15. [The pathway to delivering the simplified Ethiopian Version of ICD-11](#)

16. Supporting Health Information Recovery in Ethiopia's War-Affected Areas
17. Retrieving and Using Legacy Health Data to Make Evidence-Based Decisions in Ethiopia's Amhara region.
18. Non-monetary Incentives Cultivate Data Use Culture in Ethiopia's Zewditu Memorial Hospital.
19. Building eHealth Architecture to Streamline Exchange and Investment in Ethiopia's Health Information System.
20. Restoring Information System Functionality in War-Affected Health Institutions
21. The Transformation from Data- Dismissive Attitudes to Data-Driven Practices at A Primary Health Care Unit in Ethiopia.

