Coping with Skilled Human Resources Gaps in the Digital Health Era: Ethiopia's Experience with the IT Internship Program

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Abstract

Background: The implementation of digital health systems across Ethiopia requires a robust deployment of skilled human resources. Despite efforts to rollout various digital health initiatives launched by the Ministry of Health (MoH); significant gaps remain due to constraints in human resources. To address this challenge, the MoH partnered with the Data Use Partnership (DUP) to develop and execute an Information Technology (IT) internship program. This initiative was crafted in consultation with key stakeholders such as the Bill and Melinda Gates Foundation (BMGF), USAID, and the Job Creation Commission Ethiopia, with the aim of enhancing capacity and bridging the workforce gap in digital health implementation.

Case presentation: The Ministry of Health (MoH) and Data Use Partnership (DUP), in collaboration with six universities, initiated a program to recruit and deploy recent graduates in computer science, information technology, software engineering, and health informatics from December 2019 to December 2020. The primary objective was to enhance human resource capacities across different levels of the health system, aiming to improve the quality and utilization of health data. A total of 169 interns underwent a two-week training program on Health Information Systems (HIS) before being deployed to 11 regional health bureaus. During their deployment, IT interns supported the health system by maintaining computer equipment, ensuring data quality, and contributing to COVID-19 response efforts, with a small stipend for their work.

Qualitative feedback gathered through interviews with six interns, four representatives from regional health bureaus, two MoH staff members, eight HIS specialists from DUP, and seven focus group discussions (averaging 12 participants per group) indicated that the program significantly strengthened the HIS and facilitated better utilization of high-quality health data across the national health system.

Conclusion and recommendations: The internship program supported the deployment and implementation of various digital health tools and HIS programs, resulting in improved utilization of quality data for informed decision-making and actions. The program also provided employment opportunity for the young graduates, contributing to the government's effort of reducing unemployment. This experience in Ethiopia could serve as a valuable lesson for countries with limited resource in addressing gaps in human resources and strengthen HIS performance. [*Ethiop. J. Health Dev.* 2024; 38(SI-2)]

Keywords: HIS performance, Data quality, Data use, COVID-19 response, IT internship, Information revolution, Digitalization, Ethiopia

Introduction

Ethiopia's health sector is significantly digitizing its information system to enhance quality of data and facilitate its use for decision-making as part of the country's Health Sector Transformation Plan (HSTP) implementation (1). The Ethiopia Ministry of Health (MOH), in collaboration with sector stakeholders, is engaged in the development, deployment and implementation of several digital health tools, including District Health Information Software (DHIS2), electronic Communicate Health Information System (eCHIS), Electronic Medical Records (EMR) and Master Facility Registry (MFR), to ensure accessibility, equity, and quality of service. (Health Sector Transformation Plan- 2, HSTP-II, 2020, MOH).

These digitization efforts created a demand for more health workers in the field of information technology (IT) across all levels of the health system. Adequately skilled human resources are essential to successfully deploy and benefit from these digital tools. However, there is a significant shortage of skilled professionals at national regional, woreda and health facility levels in Ethiopia To address the human resource gap, particularly regarding technological aspects, the MOH, in collaboration with partner organizations- including the Bill and Melinda Gates Foundation (BMGF) through the Ethiopia Data Use Partnership (DUP) implemented an innovative one-year internship program where recent university graduates contributed to strengthening the health information system(HIS) in Ethiopia. The internship program provides an alternative option for prospective health professionals to understand the working conditions and environments in the field, as well as opportunities to establish a sense of belonging (3). Developing and implementing an IT Internship Program to improve the functionalities of the health in Ethiopia's health sector.

This case study documents the program design, selection and deployment of interns, program implementation and monitoring, contributions, lessons learned, and implications of the IT Internship program – an initiative that has been implemented across Ethiopia's health system.

Ethiopia's Health System

Ethiopia is divided into eleven regions (two regions established recently) and two city administrations. The national health system is structured into regional health

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bureaus (RHBs), Zonal Health Departments (ZHDs), and Woreda Health Offices (WoHOs). Health service delivery in Ethiopia is organized into three tiers. The first tier is primary-level care, which is mainly provided by primary hospitals, health centers, and health posts. The majority of healthcare services are offered at this level, with selected cases referred to the second tier, which is provided by general hospitals. The third level of care is designated for selected cases that require specialty care at specialized referral hospitals (1).

Ethiopia's Information Revolution (IR) agenda outlined health information transformation as part of its HSTP, aiming to with the objective of maximize the availability, accessibility, quality, and use of health information for decision-making processes. The Ethiopia Data Use Partnership DUP - a joint initiative between the MOH and JSI Research and Training Institute Inc. (JSI) supports the Government of Ethiopia in its efforts to transform its health information system and data use culture.

Case Presentation

The IT Internship Program Description

The Internship Program was a creative intervention to fill the gap in skilled human resource in the implementing various digital heath solutions and (HIS) initiatives, deployed from December 2019 to December 2020. Developing and implementing an IT Internship Program to improving functionalities of the health information system and enhance health service delivery has been a novel and innovative concept in Ethiopia's health sector.

The IT Internship Program is selected as an interim solution in the health system to perform troubleshooting and effectively communicate HIS issues that are beyond the local healthcare providers' capacity. To address this challenge, the Data Use Partnership (DUP) approached the Bill and Melinda Gates Foundation (BMGF) for funding and the then Job Creation Commission of Ethiopia for partnership to jointly execute the year-long IT Internship Program initiative. To this end, DUP developed a comprehensive outlining a one-year plan, including an ideal source for trainable youth, deployment plan, and resource requirements for implement the IT Internship Program.

Program Design

In designing the program, representatives from MOH, DUP, BMGF, and USAID deliberated on efficient ways of address the need for skilled professionals. These stakeholders reached a consensus on the potential of the internship program to serve as an interim solution to support the health information system, particularly the digital initiatives, at regional and lower levels of the country.

DUP, in consultation with stakeholders, identified the program's approaches, activities, targets, and major deliverables, emphasizing the role the program would play in supporting the digitization of the health information tools and improving the practice of data use for action. The major intervention areas of the program's implementation include hardware and software maintenance, supporting the HealthNet connectivity (including the LAN), strengthening the HIS, collecting data for the master facility registry (MFR), and building technical capacity of the HIS workers at the zonal, woreda and facility levels.

To this end, interns had a job description to guide their contributions to strengthening the HIS. These included building the technical capacities of health units in HIS performance, coordinating between health institutions and Ethio-Telecom to ensure proper HealthNet functionality for internet connectivity, supporting the execution and smooth functioning of various digital health systems like DHIS2 and eCHIS, and troubleshooting day-to-day issues related to the HIS tools. Interns were expected to carry out these activities at the, zonal, district and facility levels. All interns received a monthly living and transportation allowance, guided by JSI's local internship guidelines upon signing an agreement.

Moreover, this program was chosen for its opportunity to introduce and familiarize recent university graduates with Ethiopia's health information system, its relative cost-effectiveness, its potential for job creation for youth contributing to the government's overarching employment efforts, and its capacity to attract and retain competent interns as IT professionals in the health sector through formal employment or Small and Micro Enterprises (SMEs).

The Selection and Deployment Process

Six local universities that are currently supporting the MOH in the HIS implementation through a Capacity Building and Mentorship Program (CBMP) conducted the first stage of the recruitment process. Following five days of official advertisement for IT interns, 1,234 recent graduates in the fields of Health Informatics, Information Science and Technology, Computer Science, Software Engineering applied before the deadline.

During the first round of screening, a total of 238 participants were evaluated based on a set of criteria, including academic merit, relevant educational background, and gender parity to encourage participation of female candidates. After recruitment, candidates underwent a two-week training prior to deployment. The training included sessions on the Ethiopian health system, HealthNet, DHIS2, eCHIS, Electronic Medical Records (EMR), Master Facility Registry (MFR), Open Data Kit (ODK), data quality, use of information and sessions specific to each region. This training also served as an opportunity to continuously evaluate candidates based on punctuality, time management, participation, and communication. Subsequently, candidates were given a written exam to determine their eligibility for the internship. Based on a cumulative result of a continuous assessment and written exam, 169 candidates were selected.

Before being dispatch to their duty stations, interns were oriented about their roles and responsibilities, payment modalities, administrative issues such as

reporting requirements, time sheet and field travels. They were also provided with job description and the internship agreement to review and sign the contract. Upon deployment, interns were assigned to the health information technology (HIT) department of the Zonal Health Departments (ZHDs) across the nine regions and two city administrations (two more regions were established after completion of the program) to support the HIS strengthening efforts. During placement, geographical proximity of the interns' residences to the catchment areas and implementation sites was taken into consideration to facilitate easy deployment, transportation to and from work, and post- internship transition. The profile and regional distribution of the interns are presented in Table 1 below.

Table 1: Profile and regional distribution of the interns

Region	Number of Interns Distribution		
	Female	Male	Total
Addis Ababa	5	7	12
Afar	0	2	2
Amhara	5	35	40
Benishangul Gumuz	3	0	3
Dire Dawa	1	1	2
Gambella	0	3	3
Harari	2	0	2
Oromia	8	39	47
Somali	0	11	11
SNNP	11	23	34
Tigray	5	8	13
Total	40	129	169

The program aimed to provide equal opportunities for both female and male graduates. However, a low representation of women was observed, as the program was only able to recruit 24 percent female interns overall due to a general lack of female students in the IT and related fields of studies. This proportion varies from region to region. Although gender parity was achieved in Dire Dawa Region and Benishangul Gumuz Region, regions such as Afar, Gambella and Somali regions did not have any female interns. Moreover, regions with the largest number of interns, particularly Amhara and Oromia, exhibited low representation of young women.

Implementation, Monitoring and Contribution of the Program

The IT internship program was implemented for one year, from December 2019 to December 2020. Interns were based in the zonal health departments of eight regions, and regional health bureaus in Gambella, and the city administrations of Addis Ababa and Dire Dawa.

DUP recruited a Project Officer at the central (Addis Ababa) office to monitor the day-to-day financial, operational, and logistical needs of the interns. The Project Officer, in collaboration with DUP's IT regional staff, RHBs, and zonal health departments (ZHDs), supervised and supported the interns at their stations to maximize efficiency. Furthermore, to ensure sustainability and skill transfer, interns' plans and activities were integrated and aligned with the focus areas of the woredas and facilities, enabling coordination and collaboration between the interns and local level workers. Interns and contributions and performance were reported monthly, along with the DUP regional report to the DUP central office and the MOH who reviewed the reports and provide feedback.

"Interns, who were deployed in their respective service areas after receiving adequate training on top of their academic background, played a paramount role in terms of analyzing existing problems and fixing the challenges that hampered normal day-to-day functioning of the digital platforms. We have contributed towards the ending of paper-based information systems ranging from installing and configuring HealthNet connectivity platforms to repairing the VPN connectivity, as well as effectively following and periodically reporting the status of the HealthNet functionality," an intern from Amhara remarks.

At their respective placement sites, the interns engaged in various activities to support the country's health information system. We conducted 20 in-depth interviews (4 RHB representatives, 8 DUP staff, 2 MOH staff & 6 Interns) and 7 focus group discussions (with an average of 12 participants in one group) from other key informants at JSI-DUP, stakeholder organizations to support this documentation.

Hardware and Software Maintenance and Troubleshooting

The interns assessed the availability and functionality of IT infrastructure at health facilities and compensated for the limited availability of qualified technicians at each level by maintaining the functionality of computers, laptops, printers, photocopiers, scanners, and other device. They also installed essential software, provided troubleshooting services to maintain the proper functionality of major national healthcare systems such as the DHIS2, eCHIS, and the SmartCare-EMR. They also enabled regular backup and recovery of health data. By identifying, and troubleshooting non-functioning computers and various ICT tools in health administration units and facilities, the IT interns helped enhance the functional capability

of health institutions improved service delivery and health outcomes.

"We trained the call center staff. We even have spent time working with them listening to calls and everything. While doing this we prepared tutorial videos and explainers on how to troubleshoot when errors occur on the system." Intern, Addis Ababa

Internet Connectivity Support (HealthNet)

The interns ensured functionality of HealthNet, which connects healthcare institutions and professionals throughout the country by installing, monitoring and resolving issues related to HealthNet connectivity platforms such as broadband internet, dongles, (portable device that enable the use of 3G internet network,) and Virtual Private Network (VPNs) that allow healthcare facilities use secure connections over the internet. By ensuring uninterrupted internet connectivity for facilities and district health offices through a continuous liaising and coordination with Ethio-telecom - a national and state-owned telecommunication service provider-, the interns helped improve online data sharing and information exchange capabilities both within facilities and across the nation's health system. Additionally, they installed and provided maintenance support for local area network (LAN) at health facilities. The interns produced reports on the status of HealthNet functionality.

MFR Data Collection

Interns collected data that enabled the Ministry of Health (MOH) to curate authoritative signature and service domain data about health facilities in the MFR, including geospatial coordinates of some of the hospitals, health centers, and health posts. In addition, the collected data helped to analyze the status of HealthNet functionality in health facilities, an actual number of facilities that are using the online version of DHIS2, and the availability of local area network (LAN), functional computers, and other related ICT devices, among other things – and make decisions accordingly.

HIS Performance Improvement

Interns engaged in collecting and compiling weekly, monthly, quarterly, and annual reports from healthcare facilities and the zonal level they supported, submitted the collected quality periodic reports to their respective RHBs, and provided feedback to their respective woreda health offices (WoHOs) and healthcare facilities. In addition, interns reminded(HITs)at health facilities about compiling and submitting regular reports to higher levels and produced and distributed educational materials focusing on data quality and information use.

"The IT internship program has made [a] remarkable contribution to strengthening the health system in the regions. It has lived up to its expectations by availing and creating the needed capacity at the lower tiers of the health system to spur the transformation of the health management information system and culture of data use." State Minister, Ethiopia MoH

"Interns' support in resolving issues related to HealthNet and other health information technology tools was magnificent. With its very compelling achievements, interns proved that they can be a reliable workforce to tackle the major outstanding issues related to health information technology tools - which under previous situations could have the potential of derailing the whole effort of ensuring data quality and use." Project Director, Ethiopia DUP.

Mentorship Support

With the guidance of their respective zonal senior officers, the interns provided mentorship to health management information system (HMIS) workers at the district/woreda health offices focusing on improving use of quality health data. Furthermore, IT interns supported in developing, distributing and sensitizing educational materials on major health topics, including the importance quality health data for planning. Similarly, they participated in supportive supervision, provided follow up support to health facilities and woredas, and took part in HIS review meetings and woreda-based planning proceedings. Moreover, they supported health facilities and woredas in conducting reporting consistency checks using Lot Quality Assurance Sampling (LQAS) and routine data quality assessments (RDQA).

COVID-19 Pandemic Response

Even though the internship program was designed as a temporary solution to address the skilled human resource gap in the country's health information system (HIS), the interns rose to the occasion and supported the health system during the challenging time of the COVID-19 outbreak. Their presence in various parts of the country was an additional input to the national COVID-19 response. Specifically, interns engaged in COVID-19 sample collection at health facilities, data encoding, result notification, tracking and reporting of COVID-19 incidence as well as coordinating of the overall prevention activities.

Since the first case of the pandemic emerged in Ethiopia, interns have assumed a frontline role in supporting COVID-19 data management systems. They also provided training for the Rapid Response Team Support (RRTS), a team composed of medical doctors, nurses and HIT professionals, about the COVID-19 case surveillance and monitoring digital tools, including eCHIS, HealthNet and DHIS2.

"The newly introduced dashboard-based system enabled the professionals to access the needed information whenever they open the DHIS-2" Intern, Addis Ababa

"In the advent of the COVID-19 pandemic, the interns' role became crucial in supporting the national COVID-19 pandemic response efforts. They supported the public health Emergency Operation Center to train and develop the COVID-19 surveillance and tracking system in Ethiopia. The COVID-19 Tracker developed in the DHIS-2 platform, now serves as the backbone of managing the COVID-19 pandemic in Ethiopia." Representative, BMGF

Benefits to the Interns

The internship program served as a learning opportunity for the interns to understand the country's health system and acquire skills.

"For me, the internship period was a time of great learning, as well as a rare opportunity that helped me effectively understand our country's overall health information system, one thing that makes my experience of the internship program unique was that it helped me to elevate my profession and understanding of Information and Communication Technology (ICT) as well as the role of ICT in the health sector," Intern, Harrari

The IT internship program has attracted competitive and energetic IT graduates and has contributed to nationwide job creation efforts. After witnessing the success of the program, both the private and the public sector recognized the added value these trained interns to the health system. In line with this, twenty- one interns were offered full-time employment in the health and related sectors.

Beyond this documentation, this internship program may also help the interns' better cope with the challenges of the work environment in their future employment.

Lessons Learned and Implications for Future Program and Practice

After running for a year, from December 2019, the IT internship program was completed in December 2020. DUP facilitated an exit workshop where all relevant stakeholders in the health system were represented to share the program experiences and appreciate the interns for their contributions.

The internship program served as a youth employment opportunity, contributing to the government's efforts to reduce unemployment while tapping into a younger, less expensive workforce that could be trained to address critical skill shortages and generate economic opportunities. The Program created an opportunities for the interns to learn and gain experience in the sector of the nation's health information system, leading to a pathway sector to retain and attract new talent. It also demonstrates successful coordination and integration between higher academic institutions and implementing organizations can effectively tackle implementation gaps in the sector. Ethiopia's experience could serve as a lesson for other low resource countries seeking to fill gaps in human resources and strengthen their HIS performance.

Advocacy among the relevant stakeholders, such as IT departments, students, and the Ministry of Education, is essential for the successful integration of IT interns into the HIS. This will facilitate absorption of new IT graduates by the health system in the foreseeable future.

Major national stakeholders, such as the MOH, donors, and implementing partners, are encouraged to maintain this initiative or introduce similar programs that allow new IT graduates to enter the sector. Strong and impactful partnerships are also needed at all levels - governmental and non-governmental , public and private, as well as the academia - to provide lasting solutions to challenges associated with the HIS. IT interns, including upcoming and aspiring IT graduates, are advised to consider the HIS as a dynamic and emerging field within it that offers both a suitable career opportunity and a contribution to the country's healthcare service delivery.

List of abbreviations

- BMGF --------- Bill & Melinda Gates Foundation
- CBMP --------- Capacity Building and Mentorship Program
- DHIS2 --------- District Health Information Software 2 (DHIS2)
- DUP --------- Data Use Partnership
- eCHIS --------- electronic Community Health Information System
- EMR --------- Electronic Medical Records
- HIS --------- Health Information System
- HIT --------- Health Information Technology
- HMIS --------- Health Management Information System
- HSTP --------- Health Sector Transformation Plan (HSTP)
- ICT --------- Information and Communication Technology
- IR --------- Information Revolution
- IT ---------Information Technology
- JSI --------- John Snow Inc.
- LQAS ---------Lot Quality Assurance Sampling
- MFR ---------Master Facility Registry
- MoH ---------Ministry of Health
- ODK ---------Open Data Kit
- RDQA --------- Routine Data Quality Assessment
- RHB --------- Regional Health Bureau
- SMEs --------- Small & Micro Enterprise
- USAID --------- United States Agency for International Development
- VPN --------- Virtual Private Network
- WorHOs --------- Woreda Health Offices
- ZHD --------- Zonal Health Department

Declarations

Ethics approval and consent to participate

For this case study, informed consent was obtained from all the study participants. This study is approved by the ethical review board of the Ethiopian Public Health Association (EPHA). All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication; Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declared no competing interest.

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