

Health Workers' Perceptions on Data-informed Decision-Making practices in Primary Health Care Units at Awi Zone, Northwest Ethiopia

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Abstract

Background: Data-informed decision making is influenced by organizational, technical, and behavioral factors. Behavioral factors are the major contributing factors for data-informed decision-making practices. This study aimed to explore health workers' perceptions of data-informed decision making at primary health care units in Awi zone.

Method: A cross-sectional qualitative study was undertaken to explore health workers' perceptions on the barriers of health data-informed decision-making practices. Eleven healthcare workers were purposively selected from primary hospitals, health centers and health posts. Medical doctors, nurses, midwives and health extension workers were selected as key informants for the in-depth interview. The selected healthcare workers were asked about their perceptions that affect health data use practices. The data obtained was analyzed through thematic analysis using Open Code software. Analysis was performed using three themes namely, organizational, behavioral, and technical barriers of data-informed decision making.

Results: All the health care workers including health extension workers utilized a data-informed decision-making practice at least once during their point of care. Five of the eleven key informants reported their data-informed decision-making practice as reviewing quality of facility data, while none of them reported data-informed decision-making practices for their monthly performance monitoring. Behavioral factors included negligence, workarounds, and skill gaps. Organizational factors included staff turnover and shortage of recording tools. Technical factors included high workloads which lead to data error and paper-based systems were considered major barriers to data-informed decision-making practices.

Conclusion: Data-informed decision-making practices were low at primary health care units. Behavioral, organizational, and technical factors contributed to the decreased use of data. [*Ethiop. J. Health Dev.* 2022; 36(2):000-000]

Keywords: Data-informed decision making, Perception, Organizational, Behavioral, Technical, Ethiopia

Background

Data-informed decision making refers to the proactive and interactive process of using data during monitoring, review, planning, improvement, advocacy, and policy development. It is also the process through which health care providers, decision makers and stakeholders explicitly consider information in one or more steps for the process of service provision, program planning and management (1,2).

Health information is the back bone for clinical decision making and for the management of health services at the point of service delivery (3,4). Poor utilization of routine health information at the facility level negatively affects the efficiency, competency, and quality of service. Whereas a well-functioning health information system supports the delivery of health services by ensuring dissemination and use of reliable and timely information. Inaccurate, untimely, incomplete and inconsistent health data are common challenges in planning, monitoring and evaluation of health sector performance in many sub-Saharan African settings (5–7).

The logic model indicates that through assessing and improving the use of data, engagements between data users and data producers, improving data availability

and quality, identifying information needs, building capacity in data use, strengthening organizations data demand and through the use of infrastructure, monitoring, evaluation and dissemination of information outputs were found to achieve improved data-informed decisions (8). The generation and strategic use of information, intelligence and research on health and health systems is an integral part of the leadership and governance function (9). The Ethiopian government emphasizes the importance of supporting the Health Information Systems (HIS), of which the routine Health Management Information System (HMIS) is a basic part and applied in most health care facilities in order to handle day to day data and utilize it for decision making primarily through Performance Monitoring Teams (PMT) at each level (10).

The current Ethiopian health service is structured into a three-tier system, which include primary, secondary, and tertiary levels of care. Primary Health Care Units (PHCU) are the lowest level in referral systems. It consists of five health posts, one health center and one primary hospital. Two health extension workers staffed in each health post provide preventive, promotive and basic curative services. Primary hospitals are staffed with around 53 healthcare workers to provide preventive, curative, inpatient, ambulatory services,

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and emergency surgical services. Primary hospitals serve as a referral point for health centers and a practical training center for nurses and other paramedical health professionals (11,12).

Research has found that data informed decision making is affected by various factors such as: the negligence of professionals when recording data, the unavailability of registers and other important tools for health information systems, and a lack of routine supportive supervision and feedback at the points of care (13–16).

According to Performance of Routine Information System Management (PRISM) framework, health information utilization practices of health workers is affected by different factors like behavioral, technical and organization factors (10,17–19). Among these the behavioral factor is the foremost factor (20). Behavioral factors are the major contributing factors for health care workers when utilizing information that has been collected (21,22). Health workers information collection, analysis, presentation and utilization skills are essential in order to ensure effective and efficient utilization of information at the points of care (13,23–26). In Ethiopia, little is known about data-informed decision-making practices and its barriers at primary healthcare units. This study aimed to examine data-informed decision-making practices and its barriers on behavioral, technical, and organizational dimensions.

Methods

Study design and setting

A cross-sectional qualitative study was conducted in Primary Health Care Units (PHCUs) from April 1 to May 4, 2018. The study was conducted in Awi Zone, Northwest Ethiopia. Awi Zone is one of 10 Zones in the Amhara Regional state. Currently, Awi Zone has one General Hospital, three Primary Hospitals, 46 Health Centers and 185 Health Posts. About 1812 health care providers are currently working in the Zone.

Study participants

Unit (department) heads of health care facilities and heads of health posts under the district primary health care unit were included. In this study, one Primary Hospital, three Health Centers and three Health Posts were purposely selected. Medical doctors, Nurses, Midwives and Health Extension Workers (Community Health Workers) were selected as key informants, considering their important role in routine data-informed decision-making practices. Eleven key informants (3 Medical doctors, 3 Nurses, 2 Midwife and 3 Health Extension Workers) were involved in the study. The number of study participants was decided based on reaching the point of information saturation. Information saturation in this study is defined as no further information being obtained from additional interviews (27). Study participants with a minimum of six-months experience were included in the study. The participants were attached to various departments (units), including emergency, medical, general surgery, pediatric, obstetrics, gynecology, ophthalmology, and psychiatric.

Data collection

A Semi-structured open-ended questionnaire was used for data collection. An in-depth interview was undertaken to identify health workers' perceptions that influence data-informed decision-making practices. Key informants were selected from primary health care units that consisted of primary hospitals, health centers and health posts. The interviews were conducted with eleven health workers at primary health care units and these interviews were undertaken from April 1 to May 4, 2018. Ethics approval was obtained from the University of Gondar, Institute of Public Health, Institutional Review Board (Ref No/IPH/281/2017) and the primary health care units that participated in the study were determined prior to data collection.

An interview guide was designed to manage the discussion with the health workers. The interview questions contained neutral and open-ended questions to avoid eliciting socially desirable responses. New questions were permitted that may arise because of the discussion. Potential participants were approached at their workplace to obtain their consent to participate in the interview. They were given a brief explanation about the study and the interview. Once they agreed to participate, face-to-face interviews were conducted at the participants' workplace at their convenience. A mix of both English and Amharic languages were used throughout the interview.

The interview questions consisted of neutral and open-ended questions. The interview sessions were audio-recorded, except for two sessions which were manually recorded because the participants were reluctant to audio record their discussion. Each interview session took around 24–30 minutes, and the total duration of all the interviews was approximately 6 hours.

Data analysis

The analysis of the interview data was conducted according to the steps suggested by Creswell (28). First, recorded audio data and handwritten notes from the interviews were transcribed according to word processor text. Transcripts of interviews were then presented to the interviewees for validation purposes to ensure the interviewer had captured the respondents' intended meaning. Then, the interview transcripts were organized into sections for easy retrieval. Subsequently, the transcribed interviews were then coded using the qualitative data analysis software, Open code (29). Open Code was used for importing text from the interviews, to condense segments of the text, assign codes to segments of the text, to synthesize codes, write memos, find words in text, search for codes, and to link the codes to synthesized concepts.

The interview transcripts were divided into text segments and these segments were labelled using the codes. The transcripts were read repetitively to highlight parts of the text and to emphasize the sections and issues that appeared to be significant and relevant. Deductive coding was then used for the analysis.

The coded data was reviewed to detect areas of similarity and overlap between the codes. All

overlapping and redundant codes were removed. Finally, similar codes were grouped together under themes or categories to form a major idea. Codes that appeared to share some unifying features were clustered into a theme. Thematic maps were used as visual representations to help sort the different codes into themes. All the themes were reviewed and conferred among the team members to confirm that the themes meaningfully captured the important and relevant elements of the coded extracts and the entire data set. Any variance in interpreting the findings was resolved through discussions until consensus was reached. Themes that were deemed not relevant were discarded.

Results

Socio demographic characteristics

Out of the eleven participants three of them were females. All were directly involved in handling patient and client data. Three of them were general practitioners employed in the maternity ward of the hospital and doing gynecologic and obstetric procedures. Three others were health extension workers who worked at the health post level. Three were nurses and two of them were midwives, as shown in table 1.

Table 1: Characteristics study subjects

Characteristics	Number of participants	Percentage
Sex		
Male	8	72.7
Female	3	27.3
Residence		
Rural	4	36.4
Urban	7	63.6
Type of Profession		
Health Extension Worker	3	27.3
Nurse	3	27.3
Midwifery	2	18.1
Medical doctor	3	27.3
Number of study participants		
Working in Health Post	3	27.3
Working in Health Center	5	45.4
Working in Primary Hospital	3	27.3
Total	11	

Data-informed decision-making practices

All study participants were asked to discuss the practices of data-informed decisions made with clinical care, public health, and administration in their health facilities.

All participants including health extension workers mentioned that they were using routine data for identifying health problems, root causes of the problem, finding the right solution for that problem and tracking the progress of individual patients over time.

A 31-year-old Midwife said that: "...the provider uses the patient history for referencing the clients' condition what he or she had previously."

Two of the eleven key informants reported that their facility practiced data-informed decisions for outbreak investigations and interventions to exercise control should an outbreak arise.

A 28-year-old Nurse: "...honestly, health information is one important component of the health system, that enables to know about your public health issues, particularly if, outbreak happens in the community, number of cases, amount of resource needed to address these outbreaks, etc. is key part of outbreak management."

A 30-year-old Nurse: "...example as I have told you cases like measles, polio, we may need to translate every information to action to investigate and control if outbreak arises"

Majority (9/11) of key informants indicated that campaigns like: immunization, deworming, supplementations, etc. Intervention decisions were based on local level data. Health extension workers during their routine household visits, utilize the data to make mutual decisions with the family to improve the health of the family members.

A 31-year-old health extension worker: "...We collect information from house to house and from one to five network. From house-to-house scanning, we collect children less than a year, less than five years. We use this information for all kinds of purposes. Now we use different data like for deworming, vitamins A and C for less than 1 year, and we use it to identify children who is under the vaccine and not."

The same key informant also indicated: "...at community level, if new home has been built, we provide home ID number, then we can use it to retrieve data on household size, the number of women in the household, the number of children in the population."

One key informant mentioned the use of data for conducting research, however, studies mainly undertaken by students and their findings did not generally come back to the facility for use in evidence-based practices.

A 31-year-old Midwife: *"...some researchers mainly students at higher education institution used to come for requesting the collected data to perform research, the findings however not come back for us to use for evidences."*

Respondents believed that routine health information is used for planning and reviewing the progress of their work and for the services provided to the community.

A 31-year old midwife: *"...we utilize health information in our health facilities for the plan. ...the budget itself was based on its own data."*

A 30-year old Nurse: *"...for example, the top ten aggregate of information in the facility will give insight for determining demand logistics for interventions including drug stock in and out for particular health problems."*

A 30-year old health extension worker: *"...Health information is to plan for the overall health of the population."*

PMT is a team of multidisciplinary healthcare workers at each level of the health system who meet on monthly basis at all levels prior to submitting reports to the subsequent levels. It is the primary responsibility of health workers to improve data quality and to use the information regularly to monitor progress and improve performance at all levels based on the guidelines from the Federal Ministry of Health (FMOH). In this study five of the eleven key informants reported their monthly PMT reviews and utilized data-informed decisions for quality facility data. While none of the study participants reported data-informed decisions in order to review their monthly performance based on the national standard. All key informants revealed that health facilities were considering local-level data during their planning processes.

A 26-year old midwife: *"The PMT used to sit together and check for data quality, if incorrect or inaccurate, or false report will be returns to the unit where it came from. It means that someone is going to check into someone else's unit as what looks like the tally sheet, report, client cards and cross check as it is correct. So, it goes through all of this, and that's what we use it. So, I think we can say that there is a better way of utilizing data."*

A 28-year old Nurse: *".... HMIS indicators regarding health information system mainly focus on data quality; to mention some; LQAS, report timeliness and report completeness data elements reported monthly to monitor the national HIS performance. This indicates that data use practice has no performance monitoring indicator. So that stakeholders at all health levels will not give emphasis."*

Based on the views of the respondents, it is noted that providing onsite training on HIS-activities and implementing digital systems were reported as vital steps in improving the process.

A 28-year old Nurse: *"...we face gaps in-school courses given in the universities will not enable you directly to implement during employment. It needs pre-service and on-job training."*

A 30-year old Nurse: *"...on-site training as means to overcome this issue."*

A 31-year old midwife: *"...to improve gaps in utilization of health information we use day to day follow up as one means and there is sometimes external supervision every three or six month accordingly."*

A 28-year old Nurse: *"If system becomes computerized, you may not have the chance to lose information. It eases access, analysis and enhance data use"*

Factors that influence data-informed decision making

Data-informed decision-making practices could be influenced by many factors. In this study, pre-established themes namely: behavioral factors, organizational factors and technical factors were used to identify major factors that affect data-informed decision-making practices at primary health care units at various levels.

According to the findings, majority of health professionals agreed that behavioral factors were major contributing factors for the utilization of health information at the point of service delivery, followed by organizational factors.

A 30-year old Nurse reported: *"...I believe that information as big resource of the institution and in my opinion for quality data we should start from careful recording of each and every thing."*

A 29-year old Midwife reported: *"...I collect routinely data from my patients and didn't use it for another purpose other than reporting, because if I need trainings on information use and analysis, information needs to be analyzed."*

A 28 year old Nurse: *"The most important thing to avoid being carelessness during collection and use of health information at the point of delivery and more vigilant about the information that we have and when to utilize it. You are the only one responsible for the patient data you collected; no one is going to remind you about the information that you capture and utilize for different purposes."*

A 24-year old Physician said: *"...in terms of documentation during our clinical work, we routinely collect data from customers and we didn't transform it in to useable form because of the workload and analysis skill we acquire."*

The same respondent also indicated *"...In maternal unit we collect data daily from our customers, we generate report from this data, and we try to see the trend, but we need further analysis skills like how to calculate indicators because indicators are instruments for measuring the program."*

Lack of basic knowledge, attitude, skills, health workers' negligence and non-adherence to the standards were some of the behavioral factors. Respondents also listed: lack of indicators for data use, staff turnover, poor accountability to data and shortage of resources as organizational factors (table 2).

Table 2: Factors that influence data-informed decision making

Category	Factors influencing data-informed decision making
Behavioral factors	<ol style="list-style-type: none"> 1. Lack of awareness and knowledge on data-informed decision making 2. Lack of enthusiasm when working with the data Poor attitude in data use 3. Lack of analytics and interpretation skills 4. Care providers' negligence when using and handling data 5. Non-adherence to Health Information System /HIS/ standards 6. Inappropriate use and poor handling of data collection tools 7. Inadequate computer skills 8. Lack of commitment by care providers for data use practices 9. Negligence 10. Workaround
Organizational factors	<ol style="list-style-type: none"> 1. Lack of indicators to measure local level data use practices 2. High staff turnover 3. Poor accountability systems 4. Shortage of recording tools 5. Shortage of trained manpower in the health information systems field 6. Inconsistency of training for newly recruited care providers 7. Poor data quality
Technical factors	<ol style="list-style-type: none"> 1. High workload leads to data errors and missing data 2. Care providers prioritize patient/client care over data entry 3. Paper-based systems do not allow easy access and analysis of data

Suggestions to improve data-informed decision making

Study participants provided suggestions that can be implemented at primary health care units. A few have been listed below:

- Skilled human resource development aimed at improving health information systems
- Allocated budgets for health information systems at facility levels
- Consistent awareness and on-job training
- Establishing accountability systems and cultures for data use practices in health facilities by preparing the “DO” and “DON’T DO” guidelines
- Incorporate data use practices into the integrated follow-up and supportive supervision checklist
- In the long term, policy makers should consider formulating indicator/s for data-informed decision making
- Implementing electronic health record systems could facilitate data use practices
- Motivating health workers and health administrators to boost their performance in utilizing health information

Discussion

Healthcare is a complex system, with multiple interdependencies and an array of factors which influence the outcomes. Complex systems are open,

unpredictable, and continually adapting to their environment (30). No single source of data can explain how a complex system behaves; therefore, several data sources are required to understand the performance of a complex system in healthcare. Data enables the improvement of health systems by identifying problems and enabling the identification of opportunities to improve and advance existing or new systems in the healthcare industry.

Data enables health professionals and to understand and improve their services by providing them with the insight and the tools to describe what is going on and to compare their performance, either against known standards or against previous performance. In the present study, key respondents from primary health care units mentioned their routine use of data for identifying health problems, root causes of the problem, and to be able to find the right solution for that problem and check the progresses of individual patients and clients over time in health facilities including health posts at the community level. This finding is consistent with studies reported previously (31,32).

Research has found that continuity of health care is only understood with access and use of timely and adequate data collected from the individual patient and client. Overall, the quality of care is determined by routine data-informed clinical decisions made by care providers. This study found that health professionals

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use the data at the point of care. Findings in this study are consistent with previously reported studies (33,34).

Data-informed decision making is also part of disease surveillance processes. Routinely collected surveillance data is beneficial in enabling health workers to review the occurrence of outbreaks and the progression status of any diseases they may have developed in the area. Patient data or case-findings provide important information regarding the epidemiology of the outbreak. In this study, however, only two of the eleven key informants reported that their facility had a data-informed decision-making culture which they used to track and follow progression of epidemics. However, this finding contradicts the results reported by other studies (9,15). This might be due to the emphasis provided by government towards health data and facility, to facilitate quality data.

Public health facilities are authorized bodies that are responsible for the catchment households and the community at large. To identify, prioritize, intervene and to control the leading health problems in the community, health professionals would rely on the use of local-level data including community rumors. In this study, most key informants indicated that health workers make data-informed decisions mainly for campaigns like child immunization, deworming, supplementations, etc. Health extension workers during their routine household visits, use data to make mutual decisions for the family members' wellbeing. This finding is in line with the results of other studies (19,25).

The FMOH guideline encourages all health facilities and health administrative organizations at all levels of the health system to establish PMTs primarily, to ensure the use of available data for performance monitoring and evaluation. The present study revealed that PMTs are established according to the recommended standards, however, their monthly PMT meeting was not held on a regular basis and during meetings their focus was mainly on improving the quality of facility data. This is consistent with previously conducted research (21,26). According to the Ethiopian HMIS guideline, PMT should be established according to the recommended standards at all levels of the health system including community level health posts. The established PMT needs to have meetings chaired by the head to check the quality of data and review the performance of the facility monthly. During the meetings, the team needs to: identify, prioritize, investigate root causes, propose, and decide on the best solutions for the problems, approve action plans, monitor, evaluate and circulate the minutes of the meeting. Most planning processes are dependent reliable information. This study also identified the demand for data to be used in the planning process for all facilities.

Health facility-based studies account for a large portion of existing research. This is due to its feasibility and the reduced cost of conducting the study. Key informants agreed on the value of facility data for research purposes, however, to date there has not been

a study that has been conducted using data from any of the participants. Only students undertake their thesis using data from the facility, however their studies are only for academic purposes. This finding is line with the results of other studies reported previously (35,36).

This study attempted to identify behavioral, organizational, and technical factors that affect data-informed decision-making practices at primary health care units. Based on the findings, many of the informants admitted that they did not have adequate skills to utilize information at the facility level, furthermore they revealed that they did not take part in trainings related to information handling and utilization during their academic years or as part of a seminar. Research indicates that training is vital for improving data informed decision making practices at the lower levels of the health care system (21,26,37).

This study demonstrated that health workers' knowledge, attitude and their commitment also affected their data-informed decision-making practices in their routine activities. Respondents stressed that negligence could cause the healthcare workers to unintentionally write notes on the wrong field. Inappropriate use and poor handling of data collection tools (e.g. registers) are also a challenge in facilities (15,20,25).

Moreover, some healthcare workers forget to write their notes regarding their patients and then had to try and remember and type out all the details about their sessions with their patients, which may result in the omission of vital details or incorrect and/or insufficient reporting of details for some patients. This problem impacts data-informed decision making and could be a problem for other health workers viewing the notes, in terms of patient-care plans or to enhance data-informed decision making. Healthcare workers write down all related data in notebooks and later transfer the information into the register due to insufficient access to the register and other important forms that are unavailable at the patients' bedside. Research supports that behavioral factor in general affect the utilization of health information at the point of care for evidence-based practices. A study performed in Northwest Ethiopia, found that data analytic skills have an influence on the information utilization practices of health worker.

Organizational factors also have an influence on data-informed decision-making practices within the facility. Among the factors, a shortage of HIS resources was reported as having an association with the timely availability of data and information use. The availability of registers and tally sheets impacts the data use practices of the organization and the country. Through reviewing the results of other studies, it is clear that the availability of resources for data capture has an impact on data use practices for health workers (20). No HMIS indicators were used in the routine assessment of health workers' practices on data-informed decision making, however, data quality monitoring indicators were available in the national HMIS indicator reference guide. A failure of institutionalizing appropriate indicators would impact

the data use culture and limit the prioritization of the use of indicators to assist with the collection of quality data.

Other organizational factors like, poor accountability systems and an inconsistency of training for newly recruited care providers were also reported as bottle necks for data-informed decision-making practices in primary health care units. This result is consistent with other findings reported previously (15,21,26).

In this study, technical factors were raised during in-depth interviews. Among these factors, the burden of added work resulting from adequate data capture and an overlap of activities were major contributing factors.

According to findings, the utilization of technology improves the access to data informed decision making (38,39). A study in Kenya also revealed that these challenges can be resolved through motivational packages, including training the Health Workers (40). These finding suggest that human resource development, securing budgets for health information systems, subsequent awareness creation, instituting eHealth systems and motivation of health workers were major solutions to be deployed at each level of the primary health care units. This study pointed out that introducing technology to health care data informed discission making practices could improve service provision and the quality of data.

Conclusion and Future Recommendations

Health professionals were generally aware of data-informed decision-making practices at the point of care, however, institutional culture on data-informed decision-making practices were low. Behavioral factors like the lack of commitment and skill gaps; organizational factors like staff turnover and poor accountability systems, and technical factors like workload and paper-based systems were major barriers for data-informed decision-making practices at primary health care units. Further research needs to be done to validate these findings. Training for health workers on data-informed decision making is still vital to improve their data-informed decision-making practices at the point of care. The Government needs to provide special attention to motivating staff members, providing responsibility for health professionals, and implementing electronic medical record systems in the organization. Establishing accountability systems for data use in decision making and research could improve the culture of data-informed decision-making practices.

This study has the following strengths and limitations. This study included a diverse sample of participants in the study. Participants quotations were used to increase the transparency of interpretations in the study. This study was done only in government health facilities which may limit the transferability of the findings. Social desirability bias might be a limitation in the study as the findings depended on self-reported data.

Ethical Issues

An ethical clearance letter was obtained from the Institutional Review Board of the University of

Gondar. Permission was obtained from heads of the health facilities and informed consent was obtained from each participant. Data was collected anonymously, and researchers attempted to reduce personal descriptions.

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Availability of data and materials

Data will be available upon request from the corresponding author.

Consent for publication

Not applicable

Authors' contributions

HAG developed the proposal, collected the data. HAG, KDG and AMS analyzed the data and prepared the manuscript and read and approved the final manuscript.

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Abbreviations

FMOH: Federal Ministry of Health; HIS: Health Information System; HMIS: Health Management Information System; LQAS: Lot Quality Assurance system; PHCU: Primary Health Care Unit; PMT: Performance Mentoring Team

References

1. Belay T, Mbuya N, Rajan V. Data utilization and evidence-based decision making in the health sector: survey of three Indian states. 2009 [cited 2021 Dec 23]; Available from: <https://openknowledge.worldbank.org/handle/10986/3161>
2. Abouzahr C, Boerma T. Policy and Practice Health information systems : the foundations of public health. 2005;014951(04).
3. Lærum H, Karlsen TH, Faxvaag A. Use of and attitudes to a hospital information system by medical secretaries, nurses and physicians deprived of the paper-based medical record: A case report. *BMC Med Inform Decis Mak*. 2004 Oct 16;4.
4. AbouZahr C, Health TB-B of the W, 2005 undefined. Health information systems: the foundations of public health. *SciELO Public Heal* [Internet]. [cited 2021 Dec 23]; Available from: https://www.scielosp.org/article/ssm/content/r aw/?resource_ssm_path=/media/assets/bwho/v83n8/v83n8a10.pdf
5. Ogega P. Data use challenges and the potential of live visualization tools data-A case study of health data-use workshops in Zambia. 2017 [cited 2021 Dec 23]; Available from: <https://www.duo.uio.no/handle/10852/60022>
6. Mutale W, Chintu N, Amoroso C, Awoonor-Williams K, Phillips J, Baynes C, et al.

- Improving health information systems for decision making across five sub-Saharan African countries: Implementation strategies from the African Health Initiative. *BMC Health Serv Res.* 2013;13(SUPPL.2).
7. Solomon NM. Health information generation and utilization for informed decision-making in equitable health service management: The case of Kenya Partnership for Health program. *Int J Equity Health.* 2005;
 8. Nutley T, Reynolds HW. Improving the use of health data for health system strengthening. *Glob Health Action.* 2013;
 9. Andualem M, Kebede G, Kumie A. Information needs and seeking behaviour among health professionals working at public hospital and health centres in Bahir Dar, Ethiopia. *BMC Health Serv Res.* 2013;
 10. Aqil A, Lippeveld T, Hozumi D. PRISM framework: A paradigm shift for designing, strengthening and evaluating routine health information systems. *Health Policy Plan.* 2009;
 11. Ministry of Health F. HMIS Information Use Guide. 2013. p. 1–59.
 12. FMOH. Health Sector Transformation Plan. Addis Ababa: Federal Democratic Republic of Ethiopia, Ministry of Health. 2015. [Internet]. [cited 2021 Dec 23]. Available from: https://www.globalfinancingfacility.org/sites/gff_new/files/Ethiopia-health-system-transformation-plan.pdf
 13. Nicol E, Bradshaw D, Uwimana-Nicol J, Dudley L. Perceptions about data-informed decisions: An assessment of information-use in high HIV-prevalence settings in South Africa. *BMC Health Serv Res.* 2017;
 14. Nutley T, Gnassou L, Traore M, Bosso AE, Mullen S. Moving data off the shelf and into action: an intervention to improve data-informed decision making in Cote d'Ivoire. *Glob Health Action.* 2014;
 15. Shiferaw AM, Zegeye DT, Assefa S, Yenit MK. Routine health information system utilization and factors associated thereof among health workers at government health institutions in East Gojjam Zone, Northwest Ethiopia. *BMC Med Inform Decis Mak.* 2017;17(1).
 16. Yu TH, Fu PK, Tung YC. Using medication utilization information to develop an asthma severity classification model. *BMC Med Inform Decis Mak.* 2017 Dec 20;17(1).
 17. MOHSW. Performance of Routine Health Information System Management in Liberia: 2012;(October):1–41.
 18. Hill C, Snow J. PRISM Tools for Assessing , Monitoring , and Evaluating RHIS Performance. Prism Perform Routine Inf Syst Manag. 2010;
 19. Yitayew S, Asemahagn MA, Zeleke AA. Primary Healthcare Data Management Practice and Associated Factors : The Case of Health Extension Workers in Northwest Ethiopia Abstract : 2019;2–7.
 20. Asemahagn MA. Determinants of routine health information utilization at primary healthcare facilities in Western Amhara, Ethiopia. *Cogent Med [Internet].* 2017;4(1):1–11. Available from: <https://www.cogentoa.com/article/10.1080/2331205X.2017.1387971>
 21. Dagnew E, Woreta SA, Shiferaw AM. Routine health information utilization and associated factors among health care professionals working at public health institution in North Gondar, Northwest Ethiopia. *BMC Health Serv Res.* 2018;
 22. Kagaruki GB, Kimaro HC, Mboera LG. Factors affecting utilization of evidence based health information system for effective supply chain of essential medicine in Tanzania: a case study from Mbeya Region. *J Health Inform Dev Ctries [Internet].* 2013;7(1):62–75. Available from: <http://jhdc.org/index.php/jhdc/article/view/99/139>
 23. Hotchkiss DR, Aqil A, Lippeveld T, Mukooyo E. Evaluation of the Performance of Routine Information System Management (PRISM) framework: Evidence from Uganda. *BMC Health Serv Res.* 2010;
 24. Gutheil TG. Fundamentals of medical record documentation. *Psychiatry (Edgmont).* 2004;
 25. Shagake SS. Data Management Knowledge, Practice and Associated Factors of Ethiopian Health Extension Workers in Gamo Gofa Zone, Southern Ethiopia: A Cross-Sectional study. *J Heal Med Informatics [Internet].* 2014;5(1):1–5. Available from: <https://www.omicsonline.org/open-access/data-management-knowledge-practice-and-associated-factors-2157-7420.1000150.php?aid=24450>
 26. Abajebel S, Jira C, Beyene W. Utilization of health information system at district level in jimma zone oromia regional state, South west ethiopia. *Ethiop J Health Sci.* 2011;
 27. Saunders B, Sim J, Kingstone T, Baker S, Waterfield J, Bartlam B, et al. Saturation in qualitative research: exploring its conceptualization and operationalization. *Qual Quant.* 2018 Jul 1;52(4):1893–907.
 28. Creswell JW. *Research Design Qualitative, Quantitative, and Mixed Methods Approaches* , Inc .accessed on May, 12/2018 https://www.academia.edu/26353013/John_W._Creswell_Research_Design_Qualitative_Quantitative_and_Mixed_Methods_Approaches_SAGE_Publications_Inc_2009_. SAGE Publ. Third Edit.
 29. ICT Services and System Development and Division of Epidemiology and Global Health (2015).OpenCode 4.Umeå: Umeå University; 2015. 2015.
 30. bmj JB-, 2018 undefined. Changing how we think about healthcare improvement. *bmj.com [Internet].* [cited 2021 Dec 23]; Available from: <https://www.bmj.com/content/361/bmj.k2014>.

- abstract
31. Wagenaar BH, Sherr K, Fernandes Q, Wagenaar AC. Using routine health information systems for well-designed health evaluations in low- and middle-income countries. *Health Policy Plan.* 2016;
 32. Gimbel S, Micek M, Lambdin B, Lara J, Karagianis M, Cuembelo F, et al. An assessment of routine primary care health information system data quality in Sofala Province, Mozambique. *Popul Health Metr.* 2011;
 33. Nyamtema AS. Bridging the gaps in the health management information system in the context of a changing health sector. *BMC Med Inform Decis Mak.* 2010;
 34. Tyagi A, Singh P. Health information system. In: *Healthcare Policy and Reform: Concepts, Methodologies, Tools, and Applications.* 2018.
 35. Hoxha K, Hung YW, Irwin BR, Grépin KA. Understanding the challenges associated with the use of data from routine health information systems in low- and middle-income countries: A systematic review. *Heal Inf Manag J.* 2020;
 36. Kumar M, Gotz D, Nutley T, Smith JB. Research gaps in routine health information system design barriers to data quality and use in low- and middle-income countries: A literature review. *Int J Health Plann Manage.* 2018 Jan 1;33(1):e1–9.
 37. Awol SM, Birhanu AY, Mekonnen ZA, Gashu KD, Shiferaw AM, Endehabtu BF, et al. <p>Health Professionals' Readiness and Its Associated Factors to Implement Electronic Medical Record System in Four Selected Primary Hospitals in Ethiopia</p>. *Adv Med Educ Pract.* 2020;
 38. Messias DKH, Estrada RD. Patterns of communication technology utilization for health information among Hispanics in South Carolina: Implications for health equity. *Heal equity.* 2017;1(1):35–42.
 39. Nguyen HTL, Nakamura K, Seino K. Association between a wider availability of health information and health care utilization in Vietnam: cross-sectional study. *J Med Internet Res.* 2017;19(12):e405.
 40. Wekesa RN. Utilization of the health information management system by community health workers in the AMREF facility in kibera ,NAIROBI COUNTY, KENYA. 2014 Dec; 2014;

Annex -1

Questionnaire for qualitative part

1. Describe your age, sex, and work experience?
2. What is your profession? What do you really do in your health facility in relation with data? List all possible tasks.
3. What is data informed decision making for you? Do you think staffs have knowledge about data informed decision making?
4. How data informed decision making is practiced in your facility?
5. What are the possible challenges for data informed decision making in your health facility?
 - a. List organizational related challenges
 - b. List technical related challenges
 - c. List behavioral related challenges
6. What do you suggest minimizing the challenges related to data informed decision making in your health facility?