# Routine Health Information System Data Quality and Associated Factors in Selected Public Health Facilities of Jigjiga Woreda, Somali Regional State's, Eastern Ethiopia

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**Abstract**

**Background:** Health data quality are limited within the health sectors of low- and middle- income countries (LMICs). Although public health decision-making is mainly dependent on the timely availability of quality data, the quality of health data is not satisfactory in some countries, including in the Somali Regional State. Therefore, this baseline assessment was aimed at assessing the level of data quality and its determinants in the public health sector of the Somali Regional State, Ethiopia.

**Methods:** A baseline assessment was conducted as part of an implementation research project. The study was conducted in three selected public health facilities of the Jigjiga Woreda, including the Woreda Health Office and the Somali Regional Health Bureau. A total of 179 health care workers participated in the survey. Interviewer guided self-administered, record review, and observation data collection techniques were used for data collection. Data was analyzed using descriptive, bivariate, and multivariate logistic models to identify predictors of data quality. A P-value of 0.05 was used as the statistical significance cut-off point.

**Results:** The overall data accuracy and content completeness in the studied facilities was 88.12% and 75.75%, respectively. Data accuracy was 92.2% in the Karamara Hospital, 83.1% in Jigjiga Health Center, and 79.8% in the Ayardaga Health Center. Content completeness was 81.6% in the Karamara Hospital, 81.2% in the Jigjiga Health Center, and 69.7% in the Ayardaga health center. For the studied variables, the data recording value given by their immediate supervisors was a strong predictor of data accuracy in the study setting. The odds of those who felt that data recording was not valued by supervisors had 0.26 times poorer data accuracy than their counterparts (AOR: 0.26, 95%CI: 0.10, 0.66).

**Conclusion:** Both the accuracy and completeness of health data in Eastern Ethiopia were inadequate. As a result, health work force immediate supervisors and Performance Monitoring Teams (PMT) should undertake regular and ongoing supervision and provide timely feedback for corrective action. In addition, specialized training in data recording and documentation would be beneficial in bridging the gap between workers' skill. [*Ethiop. J. Health Dev.* 2022;36 (SI-1)]

**Keywords:** Data quality, implementation research, formative assessment, public health facilities, Jigjiga, Ethiopia

## Introduction

The quality of health data is an important factor in making decisions and transforming the health sector in order to improve equity and the quality of health care services (1, 2). It is crucial to improve the quality and availability of routine health information systems (RHIS), which can be used for planning, monitoring, and making informed decisions for continuous improvement in the health system. Furthermore, a well-functioning RHIS can provide timely information on disease morbidity and mortality and service provision and help to guide intervention strategies in the health sector (1, 3-5). As a result, accurate, timely, and accessible health care data is crucial in health care services (1, 2).

The routine health information systems performance is affected by technical, behavioral, and organizational factors(6). In Ethiopia, the routine health information systems (RHIS) data quality is not satisfactory for most indicators(7), despite the interventions made to strengthen the health information systems(8, 9). Thus the quality of data has become a growing concern in the sector, which requires reliable data registration, storage, and management at the facilities and all the health care systems (10, 11).

However, health data quality in low- and middle-income countries (LMICs) is inadequate (12). The Information Revolution was one of the four transformation agendas in Ethiopia's first Health Sector Transformation Plan (8, 10); and one of the five priority issues identified as part of the transformation agenda for HSTP-II (9). However, the prevailing practices in terms of data quality dimensions are still not satisfactory in the country (7, 13, 14).

Studies conducted in different parts of the country found that the level of data quality measured in terms of the timeliness of reports, registration completeness, report completeness, and data accuracy across healthcare facilities was reported to be too low, not meeting the standard set by the Ministry of Health. Commonly reported reasons for poor data quality are weak support of management, lack of accountability for false reports, poor supportive supervision, and a

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lack of separate and responsible units for health information management (14-16). Moreover, health professionals' motivation towards health care data has an association with data quality and health information system task competence; and the existence of non-functional Performance Monitoring Team (PMT) facilities also contributed to poor data quality (17). In the Dire Dawa Administration (14) and in the Harari region (18), the overall data quality was found to be below the national expectation level and the degree of low data quality was more existent at healthcare facilities as compared to the health administrative units.

Therefore, this study aimed to assess factors affecting RHIS data quality in the public health sector of the pastoralist setting of eastern Ethiopia. The findings of the assessment provided in- depth insight into the level of data quality and its related factors in the public health sector. It also laid the foundation for the implementation of a bottom-up implementation strategy to improve data quality in the sector.

## Methods

**Study Setting and Period:** This formative assessment was conducted as part of an implementation study aimed at improving data quality in selected public health facilities, Woreda Health office and Regional Health Bureau of the Somali Regional State, Ethiopia. The region shares international borders with Kenya to the south, Somalia to the south-east, and Djibouti to the north-west. The region has 11 administrative zones subdivided into 96 districts (*Woreda*), and 6 town councils (19). The region has an estimated total population of 6,506,235 by 2022 (3, 454, 673 males and 3,051,562 females)(20).

Pastoralism, whether nomadic or agro-pastoralism, is practiced by more than 85% of the population. The Regional Health Bureau (RHB), which administers Woreda/District Health Offices (WoHO) and hospitals, is at the top of the health-system structure. The WoHO, in turn, manages health centers and health posts in each district. According to the 2019/2020 Health and Health Related Indicators published by MoH, Ethiopian Somali region has 12 Hospitals, 208 Health Centers and 1214 Health Posts (21). The baseline assessment was conducted from April 10 -29, 2021.

### Study Design and Settings

A formative survey was conducted at the pre-intervention phase of an implementation study. The study was conducted in randomly selected public health facilities of the Jigjiga Woreda in the Somalia Regional State.

### Sample Size, Study Population and Sampling Techniques

A single population proportion with a finite population correction formula was used to estimate the level of health data quality using the following assumption: 57.9% proportion of good health data quality (14), 95% confidence level, 80% power, and a 0.05 margin of error, and a 5% non-response. The total number of health care workers in the study setting was 420. Thus, a correction formula was used. Finally, a randomly selected 179 health care workers (HCWs were participated on the study. Initially, three public health facilities were randomly selected from the Woreda for the DDCF project in consultation with the regional health bureau. Furthermore, the study included these health facilities (Kara Mara hospital, Jigjiga and Ayardaga health centers), and the health care workers, working in the facilities and who had a direct involvement at least in data recording, compilation and reporting, Jigjiga Woreda Health Office, and the Regional Health Bureau of Somali Regional State who were available in the health facilities during the data collection periods were involved in the study.

### Data Collection Tools and Techniques

A semi-structured and pre-tested questionnaire and check list were used for data collection. The questionnaire was adapted from previous studies (PRISM) (6, 14) and a WHO document. The questionnaire included questions regarding socio-demographics, knowledge and perception of HIS, HIS training, and basic data analysis and data quality checking related questions. A pretest was conducted in the neighboring Harorays district, Harorays health center. The data was collected through a guided self-administered survey, a desk review, and an open observation. The data quality status of the health facilities was assessed using accuracy/consistency, report/ content completeness, and timeliness of the reports. The quality of RHIS data was measured using eight selected main indicators (antenatal care, institutional birth, immunization, VCT, inpatient, tuberculosis, pneumonia and sever acute malnutrition)(11). The assessment focused on examining four data quality dimensions: content accuracy and report completeness, data element timeliness, data usage skills, and data gathering methods.

The data was collected by six trained and experienced Public Health professionals and three supervisors. The document review assessed the previous three-month reports of the survey for data accuracy/consistency and content completeness, and the previous six-month reports for timeliness and report completeness for the facilities and offices.

The desk review was made in all the units where the quantitative data was collected. It focused on checking the availability of registry and documentation, and other HIS materials.

### Operational Definitions

Data accuracy: measured as a similarity between what was in the report and what was in the registrations and/tally sheets. A 10% tolerance level was used to judge the accuracy of data. Based on the 10% tolerance for accuracy, data was classified as follows: Over reporting (<90%), Acceptable limit (90%-110%), Underreporting (>110%) respectively (11).

Completeness of facility reporting: percentage of expected monthly facility reports received for a specified period time (22).

Completeness of facility reporting: Percentage of expected monthly facility reports received for a specified period time. Total number of facility reports received at the unit/total number of expected facility reports at that unit (11).

Data Completeness on data recording tools (Registers, cards/forms): This refers to all necessary data elements on registers/forms/cards which should be filled immediately after provision of the service by the care provider.

Timeliness: Information, especially clinical information, should be documented as an event occurs, treatment is performed or results noted (22).

Level of HIS Knowledge: A health workers said to have good knowledge if he/she responds knowledge questions above respondents mean score. The knowledge questions consist of 27 item questions. It is coded as "1" if it is correctly answered, otherwise it is coded as "0".

Skills for data analysis and presentation: the ability to use descriptive statistical tests and presentations including calculating indicators and preparing tables and graphs. Each skill was assessed independently.

**Data Quality Assurance**

Both the questionnaire and the desk review check list were pretested. Training was provided for data collectors and supervisors, and a pretesting was done in a neighboring district, Harorays health center. According to the pretest results, the flow of some questions was rearranged and rephrased; and it was also used to align the data collection time, including the desk review, to the flow of patients or clients in the facility. There was continuous supervision and monitoring of the data collection process.

**Data Processing and Analysis**

Data was entered into EpiData 3.1 and exported to SPSS 22.0 Version. Descriptive statistical tests like frequency of the outcome variables and other categorical independent variables, as well as mean and standard deviation of continuous independent variables was computed. Bivariate analysis using odds ratio was used to compute the strength of the association and the statistical significance of the categorical independent variables and the binary outcome variables. Furthermore, the level of HIS knowledge of the workers, data analysis and presentation skills, socio-demographic variables and data accuracy variables were considered. The likert scale/ five scales, ranges from strongly disagree to strongly agree. These responses were dichotomized into disagree if answered 1 to 3 and agree for other codes.

Variables with a P value of 0.25 at bivariate were used as a cutoff point for including independent variables in the final binary logistic regression model. Finally, multivariable binary logistic regression with the enter method was used to identify predictors of the data quality. The odds ratio was calculated with a 95 percent confidence interval to determine the relationship between the dependent and independent variables, and statistical significance was fixed at 0.05. Multi-collinearity was checked using standard errors, all the variables in the model had less than 2.0; and model fitness was checked using the Hosmer-Lemshow model fitness test, which resulted in a P value > 0.34.

**Ethical Considerations**

The Haramaya University College of Health and Medical Sciences Institutional Health Study Ethics Review Committee (IHRERC) granted ethical approval and permission for this research project. Permission was obtained from all concerned health facilities and offices. All of the study participants were included after obtaining their informed consent; and confidentiality was ensured during and after data collection. This study was conducted in consideration of the COVID-19 pandemic intervention measures.

**Results**

***Socio-demographic characteristics for the study participants:*** A total of 179 health workers were involved in the study (108 from Kara Mara hospital, 33 from Jigjiga health center, and 38 from Ayardaga health center). The mean age of the respondents was 28.08 (±7.6) years old, with a range of 19 to 59 years (table 1).

Table 1. **Socio demographic characteristics of the health workforces in public health facilities, Somali Regional State, eastern Ethiopia 2021.**

| Variables | Frequency | Percentage (%) |
|---|---|---|
| Sex | | |
| Male | 78 | 43.6 |
| Female | 101 | 56.4 |
| Age categories (years) | | |
| ≤ 30 | 138 | 80.7 |
| 31 – 40 | 20 | 11.7 |
| 41 – 50 | 7 | 4.1 |
| 50 – 60 | 6 | 3.5 |
| Professions | | |
| Medical doctors | 9 | 5.0 |
| Health officers | 17 | 9.5 |
| Nurses | 66 | 36.9 |
| Midwifery | 40 | 22.3 |
| Pharmacy | 21 | 11.7 |
| MLT | 14 | 7.8 |
| HIT | 3 | 1.7 |
| Others | 8 | 4.5 |

| | | |
|---|---|---|
| Educational status | | |
| Masters | 5 | 2.8 |
| First Degree | 133 | 74.3 |
| Diploma | 40 | 22.3 |
| Others | 1 | 0.6 |
| Role and responsibility | | |
| Staff | 156 | 87.2 |
| Facility & department heads, coordinators | 21 | 11.7 |
| Others | 1 | 0.6 |
| Work experience (years) | | |
| ≤ 5 | 99 | 61.2 |
| 6 – 10 | 43 | 26.5 |
| ≥ 11 | 20 | 12.3 |

**Knowledge of health information systems and data quality perception:** Of the total 27 item knowledge questions, the study participants answered between 2 and 25 questions correctly. From the total respondents, 160 (89.4%) had more knowledge (above mean score) about data quality, and the remaining 19 (10.6%) had less (below mean score) knowledge of data quality. Out of the total respondents, 135 (76.27) of the respondents agreed on the relevance of health data in order to improve operational and management decisions (table 2).

Table 2. **Perceptions of the health workforces on data quality and use in public health facilities.**

| Variables | Perceptions towards HIS | |
|---|---|---|
| | Don't agree (%) | Agree (%) |
| Feel discouraged when the data that I collect /record are not used for taking action (either for monitoring or decision making) | 41 (23.03) | 137 (76.97) |
| HMIS data collecting /recording is tedious | 57 (32.57) | 118 (67.43) |
| Collecting data is useful for me | 26 (15.66) | 140 (84.34) |
| Data are important for monitoring facility and or service performance | 21 (11.93) | 155 (88.07) |
| Collecting data is appreciated and valued by supervisors and gets feedback | 42 (24.0) | 133 (76.0) |
| Data collection/recording is not the responsibility of health care providers | 119 (68.39) | 55 (31.61) |
| Can check data accuracy | 45 (25.86) | 129 (74.14) |
| Can check data completeness | 38 (22.49) | 131 (77.51) |
| Can register the data in time (timelessness) | 46 (26.44) | 128 (73.56) |
| Can calculate percentages/rates correctly | 42 (25.46) | 123 (74.54) |
| Can plot disease or service trend on a chart | 49 (28.66) | 122 (71.34) |
| Can explain the findings of the data analysis and their implications | 52 (29.21) | 126 (70.79) |
| Can use data for identifying performance gaps | 35 (20.0) | 140 (80.0) |
| Can use data for making operational/ management decisions, | 42 (23.73) | 135 (76.27) |
| The recording and reporting tools in the department is complex | 57 (32.39) | 119 (67.61) |

**HIS Training and Skills related Questions**

In the study facilities, the majority of the respondents, 141 (83.4%) had no HIS related training. In addition, most of the respondents 155 (87.6%) lacked skills for basic data quality- checking and knowledge of internal data quality for the surveillance data (Table 3).

Table 3. **Data quality checking related skills of the health workers in public health facilities.**

| Variables | Frequency | Percentage (%) |
|---|---|---|
| Ability to describe data quality problems | | |
| Correctly Answered | 0 | 0.0 |
| Not answered | 177 | 100 |
| Identifying reasons of data quality problems | | |
| Correctly Answered | 0 | 0.0 |
| Not answered | 177 | 100 |
| Identify major activities to improve data quality | | |
| Correctly Answered | 3 | 1.7 |
| Not answered | 172 | 98.3 |
| Identify challenges of due reporting time | | |
| Yes | 9 | 5.1 |
| No | 169 | 94.9 |
| Identify reasons of report difference b/n registry and patient | | |

| | | |
|---|---|---|
| chart | | |
| Correctly Answered | 4 | 2.2 |
| Not answered | 175 | 87.8 |
| Identify report content completeness | | |
| Yes | 22 | 12.4 |
| No | 155 | 87.6 |
| Ability to calculate percentage | | |
| Correctly Answered | 125 | 69.8 |
| Not answered | 54 | 30.2 |
| Ability to calculate average | | |
| Correctly Answered | 57 | 31.8 |
| Wrongly answered | 122 | 68.2 |
| Not answered | | |
| Ability to calculate ratio | | |
| Correctly Answered | 107 | 61.1 |
| Not answered | 68 | 38.9 |
| Ability to draw a line graph | | |
| Correctly Answered | 8 | 4.5 |
| Not answered | 171 | 95.5 |
| Ability to explain a bar graph | | |
| Correctly Answered | 35 | 20.8 |
| Not answered | 133 | 79.2 |
| Ability to compute rate of boys | | |
| Correctly Answered | 1 | 0.6 |
| Not answered | 178 | 99.4 |
| Ability to compute rate of girls | | |
| Correctly Answered | 3 | 1.7 |
| Not answered | 176 | 98.3 |
| Ability to disaggregate data | | |
| Correctly Answered | 6 | 3.4 |
| Not answered | 173 | 96.6 |
| Ability to use disaggregated data for service provision | | |
| Correctly Answered | 7 | 3.9 |
| Not answered | 172 | 96.1 |

**Data quality status of the health facilities**

The overall data accuracy and content completeness in the studied facilities was 88.12% and 77.75%, respectively. The adult pneumonia report had a data accuracy of 65.14%, while the delivery report had a data accuracy of 98.67%, and the content completeness ranged from 66.86% - 92.03% (Table 4). In addition, average data accuracy was 92.2% in the Karamara Hospital, 83.1% in the Jigjiga Health Center, and 79.8% in the Ayardaga Health Center. Content completeness was 81.6%, 81.2%, and 69.7% in the Karamara Hospital, Jigjiga and Ayardaga health centers, respectively. Both health centers reported that they had received and sent reports before the deadlines, though it was not supported by documentation during desk review. However, at the Kara Mara hospital, the time of reception of reports from the departments was 83.8%, which shows a delay in the reception of reports from a few departments.

Table 4: **Average proportion of data accuracy and content completeness among selected health services**

| Health services | Average data accuracy percentage | Average data content completeness percentage |
|---|---|---|
| ANC | 72.51 | 92.03 |
| Delivery | 98.67 | 66.87 |
| Immunization | 80.63 | 73.7 |
| VCT | 100 | 50.0 |
| Inpatient | 100 | 72.9 |
| Tuberculosis | 91.35 | 95.0 |
| Adult pneumonia | 65.14 | 85.1 |
| SAM | 96.67 | 70.37 |
| Average proportion | 88.12 | 75.75 |

**Factors associated with data accuracy**

Of the studied technical, organizational, and behavioral factors, the following variables were included in the final model: Sex, educational status of the respondents, work experience, knowledge about data quality, value given for data recording and documentation, some basic computational skills (mean), and HIS related training. Of these, the immediate supervisor's value for data recording and documentation was a significant independent predictor of data quality in the study

setting. Those health workers who perceived that their good data recording/documentation was not valued by their immediate supervisors/PMT were less likely to ensure data quality (AOR=0.26; 95%CI: 0.10, 0.66) than their counterparts (Table 5).

Table 5. **Factors independently related with data accuracy in public health facilities**

| Variables | Data accuracy | | COR(95% CI) | AOR (95%CI) |
|---|---|---|---|---|
| | Poor -No (%) | Good -No (%) | | |
| Sex | | | | |
| Male | 33(46.5) | 45(41.7) | 1.22(0.67,2.22) | 1.79(0.84,3.78) |
| Female | 38(53.5) | 63(58.3) | 1 | |
| Educational status | | | | |
| Diploma | 52(73.2) | 86(79.6) | 0.70(0.35,1.42) | 0.52(0.23,1.20) |
| First degree and above | 19(26.8) | 22(20.4) | 1 | |
| Work experiences (years) | | | | |
| 5 and below | 33(52.4) | 66(66.7) | 0.55(0.29,1.05) | 0.58(0.27,1.23) |
| 6 and above | 30(47.6) | 33(33.3) | | |
| Data quality Knowledge | | | | |
| Poor | 3(4.2) | 16(14.8) | 0.25(0.07,0.91) | 0.27(0.07,1.10) |
| Good | 68(95.8) | 92(85.2) | 1 | |
| Good Data recording/documentation value by PMT | | | | |
| Not agree | 7(9.9) | 35(33.7) | 0.22(0.09,0.52) | 0.26(0.10,0.66)* |
| Agree | 64(90.1) | 69(66.3) | | |
| Basic data calculation skills | | | | |
| Correctly answered | 25(35.2) | 32(29.6) | 1.12(0.47,2.64) | 0.98(0.38,2.57) |
| Partially answered | 32(45.1) | 56(51.9) | 0.82(0.36,1.83) | 0.79(0.31,2.01) |
| Wrongly answered | 14(19.7) | 20(18.5) | 1 | |
| HIS training | | | | |
| Yes | 11(15.5) | 15(13.9) | 1.14(0.49, 2.64) | 1.19(0.42,3.34) |
| No | 60(84.5) | 93(86.1) | 1 | |

*Significant at 0.05 level of sig

**Discussion**

This formative survey assessed health data quality using accuracy, content, and report completeness as well as timeliness as indicators of data quality. The findings of the assessment indicated that the overall data accuracy was 88.12% and content completeness was 75.75% in the study facilities. Though regular HMIS is one of the key sources of information for continuous monitoring of health services in the country, there was variance in data accuracy and content completeness by data element and among health institutions(10, 23). The study also indicated that there was a delay in receiving reports from the units and departments of the hospital (83.8%). Though the health centers received routine reports from their respective departments and health posts, this was not supported by written documents. Furthermore, the importance placed on data recording and documentation by direct supervisors was an independent predictor of data quality in the study.

The overall data accuracy in the study setting was greater than in other studies conducted in the country; East Wollega zone, Oromia Regional State (48%) (15), Dire Dawa (75.3%) (14), Addis Ababa city (69.6%) (24), though these studies included more health facilities, including health posts. Thus, the data accuracy may vary across different levels of facilities and in the regions. Other studies also indicated that the quality of health data varies across the indicators and regions of the country (7, 11). This finding is consistent with other studies in Benin (25), Tanzania (26), and the Massaguet district, Chad (27), where data accuracy varied by facility, service area, indicators, and district. In this study, it was observed that some departments/units were not properly and accurately recording clinical data at the point of care, and the main reason they pointed out was the complexity of the reporting form. This was despite the fact that the study was conducted during the implementation of the capacity building and mentorship program (CBMP) project, which aimed to provide HIS support in the region, including the study area. Despite the efforts made by the regional health bureau and other partners, the quality of routine HMIS data may not be reliable enough to be used for planning and decision making at operational and management levels.

The study found that immunization data accuracy was excellent (80.63 %) and severe acute malnutrition data accuracy was high (96.67 %). This was higher than a study conducted in the south of Ethiopia, where half of the studied facilities reported data accuracy at 55.8% for immunization and 54.6% for SAM (28). The difference may be due to the variation in the number and types of facilities included in the study and the study setting. This study was conducted in an urban area and also included a CBMP project implementation site where regular technical and capacity-building support is provided in an attempt to strengthen HIS in

the region. Therefore, this would improve the quality of data recording and compilation in the facilities as compared with other facilities in the region and in the country.

In the study setting, those health workers who perceived that their data recording/documentation was not valued by their immediate supervisors or PMT were less likely to ensure data quality. This finding was consistent with the results of a study conducted in Addis Ababa where a lack of supervision was reported as reasons for poor data quality (24, 29). A similar study conducted in the Metama Primary Hospital, Amhara region, also revealed gaps in supervision and feedback which had contributed to poor healthcare data quality. This clearly indicates the need for regular supportive supervision which can be program specific or integrated. Other healthcare data quality improvement strategies such as collaborative improvement (30) should be sought because supervision requires not only regularity but also demands a high number of skilled human resources and dedicated time for experts.

Nevertheless, the study facilities were included under the Federal Ministry of Health CBMP initiative which aimed to improve HIS in the health sector of the region. Therefore, the Woreda may not be representative of other woredas in the region. This Woreda may have more supervision, training, and access to other health system supports structures than other district in the region, so the study findings may not be generalizable to other public health facilities in the region. Additionally, the sample size was not enough to detect a statistically significant difference among the studied variables. In this survey, the collection of data using various approaches at individual and systemic levels can be considered as a strength of the study.

## Conclusion

The study reveals that health data accuracy and content completeness was below the national standard in the study setting. Data accuracy and content completeness varied according to service areas, indicators and facilities. Additionally, there was a delay in report submission from the units and departments to the HMIS office for the facilities. Majority of the health workers had no HIS related training and also lacked basic data quality checking skills. Worker's perception on a lack of acknowledgement for their data recording skills their immediate supervisors was an independent predictor of data quality. Therefore, PMTs should conduct continuous supervisions and provide feedback for immediate correction of data quality assurance and tailored HIS training on data recording and documentation for the health workers.

## Conflict of interest

The author(s) declared that they have no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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