

Implementation Fidelity and Quality of the Community Health Information System at Primary Health Care Level in Rural Ethiopia: A Historical Process Evaluation of the 2016 CHIS Implementation

Mesaud Mohammedbirhan Adem

mesaud2000@yahoo.com

Tigray Regional Health Bureau

Kiros Demoz

Tigray Health Research Institute

Taddele Weldeslassie Awalom

Mekelle University College of Health Sciences

Mengistu Hagazi Tequar

Mekelle University College of Health Sciences

Tesfay Gebregzabher

Mekelle University College of Health Sciences

Research Article

Keywords: Community Health Information System, Routine Health Information System, Implementation Fidelity, Process Evaluation, Primary Health Care, Ethiopia

Posted Date: October 19th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10653394/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Community Health Information Systems (CHIS) are essential for generating reliable household-level information to support planning, monitoring, and evidence-informed decision-making at the primary health care level. Although Ethiopia introduced CHIS to strengthen community-based health information, evidence on its implementation fidelity remains limited. This study assessed the implementation fidelity and quality of CHIS during its early implementation phase, providing baseline evidence on the performance of the system.

Methods

A retrospective facility- and household-based cross-sectional process evaluation was conducted using data collected between January and June 2016 in the South-East Zone of Tigray Regional State, Ethiopia. The evaluation included 17 health posts and 634 randomly selected family folders with corresponding households from four randomly selected rural woredas. Data were collected through observation, document review, household verification, and interviews with Health Extension Workers. Implementation fidelity was evaluated across four dimensions: availability of CHIS resources, compliance with implementation standards, completeness of household registration, and consistency of recorded information. Descriptive statistics and weighted composite scores were used for analysis.

Results

The overall availability score was 88.7%, while household registration completeness reached 95.8% (24,569 of 25,639 expected households). Compliance with CHIS implementation standards was 92.5%. However, the consistency dimension scored 68.2%, reflecting gaps in updating household information, sanitation records, and reporting practices. Applying the predefined evaluation framework (Excellent: $\geq 95\%$; Very Good: 85–94%; Good: 75–84%; Poor: $< 75\%$), the overall weighted implementation score was 87.5%, indicating that CHIS implementation achieved a very good level despite weaknesses in data consistency.

Conclusions

CHIS demonstrated strong structural readiness, high household registration coverage, and good adherence to implementation standards, but important weaknesses remained in data consistency and routine updating. These findings provide historical baseline evidence on the early implementation of CHIS in Ethiopia and highlight the need for continued supportive supervision, refresher training, routine

data quality assessments, and strengthened information verification to improve implementation fidelity and the use of community health information for decision-making.

Introduction

Health information systems (HIS) are fundamental to strengthening health systems by supporting the systematic collection, analysis, dissemination, and use of health information for planning, monitoring, evaluation, and evidence-informed decision-making (1). As one of the six WHO health system building blocks, a functional HIS enables health managers and policymakers to monitor population health, allocate resources efficiently, evaluate program performance, and improve service delivery (1). Despite considerable investments in strengthening routine health information systems, many low- and middle-income countries continue to face challenges related to poor data quality, fragmented reporting systems, inadequate data management, and limited use of routine health information for local decision-making (1; 2). These challenges are particularly evident at the community level, where timely and reliable household information is essential for delivering effective primary health care (PHC).

To strengthen community-based health information, the Ethiopian Federal Ministry of Health introduced the Community Health Information System (CHIS) as part of the national Health Management Information System (HMIS) reform. The CHIS was designed to standardize household-level data collection, improve data quality, reduce fragmented community recording systems, and promote evidence-based planning and decision-making at the primary health care level (3; 4). The system is centered on the family folder approach and includes complementary tools such as the Master Family Index, health cards, tickler files, tally sheets, field books, and reporting formats. These tools enable Health Extension Workers (HEWs) to register households, document demographic and health information, monitor service delivery, facilitate client follow-up, and generate routine community health information (5; 6).

Previous studies and program evaluations in Ethiopia have mainly focused on routine data quality, reporting completeness, household registration coverage, and the performance of the family folder system, with findings indicating variability in the accuracy and completeness of recorded information across different indicators (5). Similarly, national assessments identified challenges related to incomplete updating of household records, inconsistent use of CHIS tools, shortages of essential supplies, and limited use of community health information for local decision-making (7). However, these studies mainly evaluated individual components or outputs of CHIS and provide limited evidence on whether the system was implemented according to national standards and operational guidelines.

Implementation fidelity refers to the extent to which an intervention is delivered as intended and according to established standards (8). Assessing implementation fidelity extends beyond routine data quality assessment by determining whether the required resources are available, implementation procedures are followed, target populations are adequately covered, and recorded information is consistently maintained and verified. Such evaluations distinguish implementation failures from program

design limitations and identify operational bottlenecks that may compromise the effectiveness and sustainability of community health information systems (8; 9).

To address this evidence gap, this study aimed to evaluate the implementation Fidelity and Quality of the Community Health Information System at Primary Health Care Level in Rural Ethiopia. This provides important historical baseline evidence on CHIS implementation during Ethiopia's national scale-up phase. Documenting implementation strengths and operational gaps during this formative period remains valuable for understanding the evolution of the CHIS, interpreting subsequent improvements in community health information systems, and informing future health information system strengthening initiatives in Ethiopia and similar low-resource settings.

Methods and materials

Methods

Study design and setting

A retrospective analysis of a facility- and household-based process evaluation conducted between January and June 2016. The evaluation assessed the early implementation fidelity of the Community Health Information System (CHIS) during its national scale-up phase in the South-East Zone of Tigray Regional State, Ethiopia. The study was conducted in four rural woredas: Enderta, Hintalo Wajerat, Saharti Samre, and Dogua Tembien, where CHIS was implemented through 87 health posts under the Health Extension Program. At the time of evaluation, the zone had 109,523 registered family folders, providing an appropriate setting to assess CHIS performance and identify operational gaps.

Description of the Community Health Information System program

The Community Health Information System (CHIS) is a standardized community-based health information system developed by the Ethiopian Federal Ministry of Health (FMoH) to strengthen household-level health information management and integrate community-generated data into the national Health Management Information System (HMIS). Introduced through the Health Extension Program (HEP), CHIS was designed to replace fragmented community recording systems with a unified approach for household registration, service documentation, reporting, and information use (3).

The family folder (FF) is the central component of CHIS and serves as a longitudinal household record maintained by Health Extension Workers (HEWs). Each family folder contains demographic information, household characteristics, maternal and child health information, communicable and non-communicable disease records, environmental health indicators, and health service utilization history. Supporting CHIS tools include the Master Family Index (MFI), male, female, and integrated health cards, tickler files, field books, tally sheets, reporting formats, household numbering systems, and implementation guidelines.

Health Extension Workers are responsible for registering all households within their catchment areas, assigning unique household and individual identification numbers, updating family folders following births, deaths, migration, and other demographic changes, preparing routine reports, and using CHIS information for community-level planning and follow-up. Data generated through CHIS are reported from health posts to health centers and subsequently incorporated into the national HMIS. During the period of this evaluation (January–June 2016), CHIS was in the early phase of regional scale-up in Tigray and served as the principal community-level information system supporting primary health care delivery.

Evaluation design and framework

A normative process evaluation approach was applied to assess whether CHIS activities were implemented according to established standards and guidelines. The evaluation assessed the relationship between program inputs, implementation processes, outputs, and expected outcomes using a program logic model.

The evaluation framework consisted of four major dimensions:

1. **Availability:** Assessment of whether essential CHIS tools and resources required for implementation were available at health posts.
2. **Completeness:** Assessment of whether households within health post catchment areas were fully registered using family folders.
3. **Compliance:** Assessment of whether HEWs implemented CHIS activities according to national CHIS guidelines, including proper recording, filing, updating, and reporting procedures.
4. **Consistency:** Assessment of agreement between information recorded in different CHIS tools and between family folder records and household-level information.

The evaluation criteria and weighting system were developed jointly with CHIS stakeholders from the Tigray Regional Health Bureau. Availability and completeness were assigned 30% each, while compliance and consistency were assigned 20% each. The overall implementation status was calculated using the weighted score of the four dimensions.

Study population and sampling procedures

The source population comprised all health posts implementing the Community Health Information System (CHIS) and all family folders registered between 2013 and 2016 in the South-East Zone of Tigray Regional State. The study population included selected health posts, family folders, and corresponding households.

A multistage sampling approach was used. The South-East Zone was purposively selected because it was an early CHIS implementation area and had been identified by the Tigray Regional Health Bureau for

implementation evaluation. At the time of the evaluation, the zone had 87 health posts across four rural woredas (Hintalo Wajirat, Saharti Samre, Dogua Tembien, and Enderta).

Approximately 20% of health posts from each woreda were selected using proportional allocation based on feasibility and resource availability, resulting in 17 health posts (five in Hintalo Wajirat, four in Saharti Samre, five in Dogua Tembien, and three in Enderta). Within each woreda, health posts were selected by simple random sampling.

Health posts without functional buildings were excluded because observation of CHIS infrastructure and documentation systems was not feasible. This exclusion may have introduced selection bias by excluding facilities with operational challenges.

Sample size determination

The household sample size was calculated using the single population proportion formula assuming a 95% confidence level, 5% margin of error, and 50% expected proportion. A design effect of 1.5, and 10% allowance for non-response, yielding a final sample of 634 family folders and corresponding households. The sample was proportionally allocated to selected health posts, and family folders were selected by simple random sampling from household registration lists for household verification.

Data collection tools and procedures

Data were collected using standardized instruments adapted from the Ethiopian Community Health Information System (CHIS) Implementation Guideline, Health Management Information System (HMIS) manuals, and national supervision checklists (3, 4). The tools included structured observation checklists, document review forms, household verification checklists, and interviewer-administered questionnaires.

Data collection involved four components: (1) observation of CHIS resources and infrastructure; (2) review of family folders and CHIS records to assess registration completeness and compliance; (3) household verification of randomly selected family folders to assess data consistency; and (4) interviews with Health Extension Workers on CHIS implementation practices.

Data were collected by trained Health Information Technicians and HMIS focal persons who were independent of routine CHIS implementation. Data collectors received two days of training, while the principal investigator supervised fieldwork and conducted daily quality checks to ensure data completeness and consistency.

Measurement of Evaluation Dimensions

Implementation fidelity was assessed using a multidimensional process evaluation framework developed from the Ethiopian CHIS Implementation Guideline and established implementation fidelity

principles (2,3; 8). Four complementary dimensions were evaluated to determine whether CHIS had been implemented according to national standards.

Availability (Structural Readiness)

Availability assessed the structural readiness of health posts by determining the presence of essential CHIS resources required for routine implementation. Assessed items included family folders, Master Family Indexes, male, female, and integrated health cards, tickler files, field books, reporting formats, tally sheets, implementation guidelines, shelves, and household coding materials. The availability score was calculated as the proportion of available resources relative to the total number of expected resources across all assessed health posts.

Compliance (Implementation Processes)

Compliance assessed adherence to national CHIS implementation standards by evaluating whether Health Extension Workers correctly implemented recommended procedures. Indicators included appropriate household and individual numbering systems, provision of family folders and health cards, use of the Master Family Index, organization and shelving of family folders, use of tickler files, maintenance of field books, routine updating of family folders following births, deaths, and migration, and preparation of routine reports using standardized CHIS tools.

Completeness (Implementation Coverage)

Completeness measured the extent to which households within each health post catchment area had been registered using family folders. The expected number of households was estimated using projected population data and the national average household size of 4.4 persons per household. Completeness was calculated as the percentage of registered family folders relative to the expected number of households.

Consistency (Information Verification)

Consistency assessed the accuracy and reliability of recorded information through cross-verification among CHIS tools and household observations. Indicators included agreement between the Master Family Index and family folders, consistency of household identifiers, household composition, sanitation information, and household characteristics, as well as verification of routine reporting practices and Lot Quality Assurance Sampling (LQAS) implementation. This dimension represented the information verification component of implementation fidelity by determining whether recorded information accurately reflected household conditions.

To generate an overall implementation fidelity score, predefined weights developed in consultation with the Tigray Regional Health Bureau were assigned to each evaluation dimension. Availability and completeness each contributed 30%, while compliance and consistency each contributed **20%** of the total score. Overall implementation performance was classified using predefined judgment criteria as Excellent ($\geq 95\%$), Very Good (85–94%), Good (75–84%), **or** Poor ($< 75\%$). This multidimensional

approach enabled simultaneous assessment of structural readiness (availability), implementation processes (compliance), implementation coverage (completeness), and information verification (consistency), providing a comprehensive evaluation of CHIS implementation fidelity.

Data quality assurance

Data quality was ensured through standardized training of data collectors, supervision by the principal investigator, and daily review of completed questionnaires and checklists. The data collection instruments were pretested before the actual evaluation. Data collectors were instructed on confidentiality, accurate document review, and household verification procedures. Completed questionnaires were checked for completeness and consistency before data entry. Errors identified during data collection were corrected through immediate verification.

Data management and analysis

Data were entered, cleaned and exported to SPSS version 20 for analysis. Descriptive statistics including frequencies, proportions, and percentages were calculated to summarize the findings.

Results were presented using tables and figures according to the four evaluation dimensions. Composite scores were calculated by applying predefined weights to each dimension. The overall CHIS implementation status was classified based on predefined judgment criteria: Excellent: $\geq 95\%$, Very good: 85–94%, Good: 75–84%, Poor: $< 75\%$.

Ethical considerations

Ethical approval

was obtained from the Mekelle University College of Health Sciences, School of Public Health Institute of Ethical Review board (IRB) (Ref: 53/1418/08). Permission letters were obtained from Mekelle University and the Tigray Regional Health Bureau before data collection. Written informed consent was obtained from all participants before interviews and household verification. Participants were informed about the purpose of the study, their voluntary participation, and their right to refuse or withdraw at any time. All collected information was kept confidential and used only for the purpose of the evaluation. The research complied with ethical guidelines from the Declaration of Helsinki and the Belmont Report, emphasizing confidentiality and beneficence.

Results

Characteristics of the Study

The study included 17 health posts from four woredas. Overall, 634 family folders were reviewed and verified through household visits involving 634 households. These study units formed the basis for evaluating the implementation status of the Community Health Information System across the selected health posts (Table 1).

Table 1
Characteristics of the Study Setting in South-East Zone, Tigray,
Ethiopia

Variable	Frequency (n)	Percentage (%)
Woredas included	4	100
Health posts assessed	17	100
Family folders reviewed	634	100
Households visited	634	100

Availability of Community Health Information System (CHIS) Resources

Availability of essential CHIS resources was assessed in all 17 health posts. Family folders, tickler files, reporting formats, shelves, Master Family Indexes, and the four standard tally sheets were available in all health posts (100%). Field books were available in 16 (94.1%) health posts, while male, female, and integrated health cards were available in 15 (88.2%) health posts. CHIS implementation guidelines were available in 13 (76.5%) health posts, whereas ink and brushes for household coding were available in only 5 (29.4%) health posts.

Overall, 151 of the 170 expected CHIS resources were available, corresponding to an overall availability score of 88.7% according to the predefined evaluation criteria (Table 2).

Table 2
Availability of Community Health Information System (CHIS) Tools
among Health Posts in South-East Zone, Tigray, Ethiopia (n = 17)

CHIS Tool	Available (n)	Available (%)
Family folders	17	100
Tickler files	17	100
Reporting formats	17	100
Shelves	17	100
Master Family Index	17	100
Four tally sheets	17	100
Field books	16	94.1
Male/female/integrated cards	15	88.2
CHIS guideline/manual	13	76.5
Ink and brushes	5	29.4
Overall availability score 151/170 88.7		

The assessment of Community Health Information System (CHIS) tool availability across the four study woredas showed a high level of availability, with an overall availability score of 88.7%. Among the assessed woredas, Dogua Tembien achieved the highest availability score (92.0%), followed by Saharti Samre and Enderta, each scoring 90.0%. Hintalo Wajirat recorded the lowest availability score (84.0%), although its score remained above 80%, indicating that most essential CHIS tools were available across the assessed health posts (Table 3).

Table 3
Availability of Community Health Information
System (CHIS) Tools by Woreda in South-East Zone,
Tigray, Ethiopia (n = 17 Health Posts)

Woreda	Availability Score (%)
Hintalo Wajirat	84
Saharti Samre	90
Dogua Tembien	92
Enderta	90
Overall availability score	88.7

Compliance with Community Health Information System Implementation Standards

Compliance with national CHIS implementation standards was assessed using 13 predefined implementation indicators. Fifteen of the seventeen health posts (**88.2%**) met the overall compliance criteria.

Full compliance (100%) was observed for organization and shelving of family folders according to household number and *kushet*, retrieval of family folders using the Master Family Index, alphabetical organization of household heads in the Master Family Index, use of CHIS tally sheets, recording of service and disease tally sheets using household numbers, and implementation of the five-digit household numbering system.

Compliance was also high for provision of family folders to households (94.1%), use of tickler files for appointment and defaulter follow-up (94.1%), and routine updating of family folders following births, deaths, and establishment of new households (94.1%). The seven-digit individual numbering system was correctly implemented in 14 (82.4%) health posts.

Lower levels of compliance were observed for independent use of field books by Health Extension Workers (70.6%) and provision of health cards according to the national guideline (64.7%) (Table 4).

Table 4

Compliance with Community Health Information System (CHIS) Implementation Standards among Health Posts in South-East Zone, Tigray, Ethiopia (n = 17)

Compliance Indicator	Compliant n (%)	Non-compliant n (%)
Family folders provided to all households	16 (94.1)	1 (5.9)
Family folders organized and shelved correctly	17 (100.0)	0 (0.0)
Health cards provided according to guideline	11 (64.7)	6 (35.3)
Family folders retrieved using Master Family Index	17 (100.0)	0 (0.0)
Household heads recorded alphabetically in MFI	17 (100.0)	0 (0.0)
CHIS tally sheets used	17 (100.0)	0 (0.0)
Service tally sheets recorded using household number	17 (100.0)	0 (0.0)
Disease tally sheets recorded using household number	17 (100.0)	0 (0.0)
Five-digit household numbering implemented	17 (100.0)	0 (0.0)
Seven-digit individual numbering implemented	14 (82.4)	3 (17.6)
Tickler files used for follow-up	16 (94.1)	1 (5.9)
Family folders routinely updated	16 (94.1)	1 (5.9)
Field books used according to guideline	12 (70.6)	5 (29.4)
Overall compliance	15/17 health posts (88.2%).	

Completeness of Family Folder Registration

Completeness of household registration was assessed by comparing the number of registered family folders with the expected number of households in each woreda and health post. Overall, 24,569 family folders were registered among an estimated 25,639 households, corresponding to an overall registration completeness of 95.8% during the evaluation period.

At the woreda level, completeness ranged from 85.1% in Saharti Samre to 101.8% in Dogua Tembien. Hintalo Wajirat and Enderta achieved registration completeness of 96.8% **and** 97.0%, respectively. Registration completeness exceeding 100% in Dogua Tembien reflects a greater number of registered family folders than projected households, most likely because projected population estimates differed from the actual number of households at the time of the evaluation (Table 5).

Table 5
Completeness of Family Folder Registration by Woreda in South-East Zone, Tigray, Ethiopia

Woreda	Expected Households (n)	Registered Family Folders (n)	Difference (n)	Completeness (%)
Hintalo Wajirat	8,541	8,269	272	96.8
Saharti Samre	5,472	4,655	817	85.1
Dogua Tembien	7,753	7,889	-136	101.8
Enderta	3,873	3,756	117	97.0
Overall completeness score	25,639	24,569	1,070	95.8

Completeness was further examined at the health-post level. Registration completeness ranged from 55.8% at Debre Kebie Health Post to 153.9% at Endama Ernet Health Post. Three health posts (Mai Nebri, Tsehafti, and Mai Tekli) achieved complete household registration (100%), while several others recorded completeness above 95%, including Sisemat (97.8%), Kedamay Weyane (99.5%), Melbe (95.1%), and Freweyni (99.6%).

Three health posts (Endama Ernet, Michael Abiyi, and Aynbirkekin) reported registration completeness greater than 100%, indicating that the number of registered family folders exceeded the projected number of households. These discrepancies most likely reflect differences between projected population estimates and the actual number of households served during the evaluation rather than true over-registration. Conversely, lower registration completeness was observed in Debre Kebie (55.8%), Dekera (74.7%), Weyinjeba (75.3%), and Adi Awso (84.0%) (Table 6).

Table 6
Family Folder Registration Completeness by Health Post in South-East Zone, Tigray, Ethiopia

Woreda	Health Post	Expected Households (n)	Registered Family Folders (n)	Difference (n)	Completeness (%)
Dogua Tembien	Limat	1,287	1,156	131	89.8
Dogua Tembien	Sisemat	1,825	1,785	40	97.8
Dogua Tembien	Aynbirkekin	2,085	2,253	-168	108.1
Dogua Tembien	Michael Abiyi	1,423	1,626	-203	114.3
Dogua Tembien	Mahbere Selassie	1,133	1,069	64	94.4
Enderta	Kedamay Weyane	1,359	1,352	7	99.5
Enderta	Endama Ernet	1,021	1,571	-550	153.9
Enderta	Debre Kebie	1,493	833	660	55.8
Hintalo Wajirat	Mesanu	1,397	1,239	158	88.7
Hintalo Wajirat	Melbe	2,226	2,118	108	95.1
Hintalo Wajirat	Mai Nebri	1,509	1,509	0	100.0
Hintalo Wajirat	Tsehafti	1,866	1,866	0	100.0
Hintalo Wajirat	Freweyni	1,543	1,537	6	99.6
Saharti Samre	Weyinjeba	1,034	779	255	75.3
Saharti Samre	Mai Tekli	1,560	1,560	0	100.0
Saharti Samre	Adi Awso	1,795	1,507	288	84.0
Saharti Samre	Dekera	1,083	809	274	74.7

Woreda	Health Post	Expected Households (n)	Registered Family Folders (n)	Difference (n)	Completeness (%)
Overall	All assessed health posts (n = 17)	25,639	24,569	1,070	95.8

Consistency of CHIS Records and Reporting Practices

Consistency was assessed by comparing information recorded in CHIS tools with household verification findings and by evaluating routine reporting practices across the selected health posts.

Among the 634 household records reviewed, 543 (85.7%) were consistent between family folders and household verification, whereas 91 (14.3%) showed discrepancies. Agreement was highest for Health Extension Workers' knowledge of the Lot Quality Assurance Sampling (LQAS) consistency threshold (100.0%), followed by consistency between the Master Family Index and family folders (97.9%) and consistency of household head names (99.2%). Household numbers were consistent in 91.8% of records, while household member information showed 83.3% agreement.

Lower consistency was observed for household sanitation indicators. Agreement was 78.2% for latrine information, 70.2% for waste disposal information, and 62.5% for handwashing facility information. Monthly implementation of LQAS was documented for 84.1% of records, whereas random selection of records during LQAS was documented for 69.1%.

Assessment of reporting practices showed that 12 (70.6%) health posts maintained additional reporting formats beyond the standard CHIS tools, while 13 (76.5%) reported using additional reporting pages and additional reporting days. Parallel registration systems were identified in 10 (58.8%) of the assessed health posts. The overall consistency score, calculated as the mean of the predefined consistency indicators described in the evaluation framework, was 68.2% (Table 7).

Table 7

Consistency of Community Health Information System (CHIS) Records and Reporting in South-East Zone, Tigray, Ethiopia (n = 634 household records unless otherwise stated)

Indicator	Consistent n (%)	Inconsistent n (%)
Monthly LQAS conducted	533 (84.1)	101 (15.9)
Random record selection during LQAS	438 (69.1)	196 (30.9)
Correct knowledge of LQAS consistency threshold	634 (100.0)	0 (0.0)
Consistency between Master Family Index and Family Folder	621 (97.9)	13 (2.1)
Household head name	629 (99.2)	5 (0.8)
Household number	582 (91.8)	52 (8.2)
Household members	528 (83.3)	106 (16.7)
Latrine information	496 (78.2)	138 (21.8)
Handwashing facility	396 (62.5)	238 (37.5)
Waste disposal information	445 (70.2)	189 (29.8)
Health posts without additional reporting formats (n = 17)	5 (29.4)	12 (70.6)
Health posts without additional reporting pages (n = 17)	4 (23.5)	13 (76.5)
Health posts without additional reporting days (n = 17)	4 (23.5)	13 (76.5)
Health posts without parallel registration systems (n = 17)	7 (41.2)	10 (58.8)
Summary of Record Consistency		
Overall household record consistency	543/634	85.7%
Overall consistency score (mean of predefined indicators)	68.2%	

Overall Implementation Fidelity of the Community Health Information System

The overall implementation fidelity of the Community Health Information System (CHIS) was assessed using four predefined evaluation dimensions: availability, compliance, completeness, and consistency. Each dimension was scored independently and combined using the predetermined weighting system established in the evaluation framework (availability, 30%; compliance, 20%; completeness, 30%; and consistency, 20%).

Across the four study woredas, the overall weighted implementation fidelity score was 87.5%, indicating that, according to the predefined evaluation criteria, CHIS implementation achieved a high level of implementation fidelity during the 2016 evaluation period.

Among the four dimensions, completeness of household registration achieved the highest overall score (95.8%), followed by compliance with CHIS implementation standards (92.5%) and availability of essential CHIS resources (88.7%). In contrast, consistency of CHIS records and reporting practices had the lowest score (68.2%).

Variation in implementation fidelity was observed across the four woredas. Dogua Tembien achieved the highest overall implementation score (87.7%), followed by Enderta (87.2%) and Hintalo Wajirat (86.1%). Saharti Samre recorded the lowest overall score (83.9%). Dimension-specific performance also varied among woredas. Dogua Tembien had the highest scores for availability (92.0%) and completeness (101.8%), whereas Enderta achieved the highest compliance score (97.5%). Saharti Samre recorded the highest consistency score (74.0%) (Table 8).

Table 8

Implementation Fidelity Scores by Evaluation Dimension and Woreda, South-East Zone, Tigray, Ethiopia (2016)

Woreda	Availability (%)	Compliance (%)	Completeness (%)	Consistency (%)	Overall Score (%)
Hintalo Wajirat	84.0	92.3	96.8	71.1	86.1
Saharti Samre	90.0	86.5	85.1	74.0	83.9
Dogua Tembien	92.0	93.9	101.8	63.3	87.7
Enderta	90.0	97.5	97.0	64.5	87.2
Overall	88.7	92.5	95.8	68.2	87.5

Overall Performance of Each Evaluation Dimension

Application of the predefined weighting system demonstrated differences in the contribution of each implementation dimension to the overall implementation fidelity score. Completeness contributed the largest weighted score (28.74 percentage points), followed by availability (26.61 percentage points) and compliance (18.51 percentage points). Consistency contributed the smallest weighted score (13.63 percentage points) because of lower agreement between recorded information and household verification.

The weighted scores produced an overall implementation fidelity score of 87.48% (rounded to 87.5%), indicating a high level of implementation fidelity according to the evaluation criteria established before data collection (Table 9).

Table 9
Overall Implementation Fidelity of the Community Health Information System According to the
Predefined Evaluation Framework

Evaluation Dimension	Weight (%)	Performance Score (%)	Weighted Score
Availability	30	88.7	26.61
Compliance	20	92.5	18.51
Completeness	30	95.8	28.74
Consistency	20	68.2	13.63
Overall Implementation Fidelity	100		87.48

Discussion

This process evaluation examined the implementation fidelity of the Community Health Information System (CHIS) during its early regional scale-up in the South-East Zone of Tigray, Ethiopia, in 2016. Overall, the findings show that the system was implemented successfully in most health posts, with high levels of structural readiness, household registration, and adherence to the national implementation procedures. These findings indicate that the basic requirements for establishing a standardized community health information system at the primary health care level were largely achieved during the initial implementation phase.

Despite this positive performance, implementation fidelity varied across the evaluated dimensions. Household registration and the availability of CHIS tools performed better than routine updating and verification of household information. The lower consistency between family folders and household verification suggests that maintaining accurate and up-to-date records was more challenging than establishing the recording system itself. In addition, implementation performance differed across the four woredas, indicating that local management capacity, supervision, and operational conditions influenced the quality of implementation. Overall, the findings demonstrate that implementation fidelity depends not only on the availability of resources but also on sustained implementation support and routine quality assurance.

The findings are consistent with the broader experience in Ethiopia, where community health information systems have generally achieved satisfactory structural implementation while continuing to face challenges related to routine data quality and utilization. The high availability of CHIS tools observed in this study reflects the progress made in institutionalizing standardized household-based information systems within primary health care through the family folder approach (7; 12). Nevertheless, the comparatively lower consistency score indicates that the presence of recording tools alone does not guarantee accurate, complete, and regularly updated information. Similar observations have been reported in routine health information systems, where inconsistencies frequently arise despite adequate

infrastructure because records are not consistently updated or harmonized across different data sources (1; 14).

The present findings also correspond with recent evidence from Tigray demonstrating that the family folder system performs well in capturing relatively stable demographic characteristics but is less reliable for recording service-related events and dynamic health indicators (5). In that study, high agreement was observed for demographic variables such as total population, women of reproductive age, and children under five years of age, whereas considerably lower accuracy was reported for child health events and live births. Likewise, the current study found strong agreement between family folders and the Master Family Index, as well as high consistency in recording household identifiers, while sanitation-related variables and routine follow-up practices showed weaker performance. This similarity suggests that information requiring frequent updating is more vulnerable to recording errors than relatively static household characteristics.

The study findings are also supported by the wider literature on health information systems in Ethiopia and other low-resource settings, which indicates that routine systems commonly perform better in establishing reporting structures than in ensuring data quality and promoting effective information use. Reviews of routine health information systems have identified inadequate supportive supervision, limited feedback mechanisms, insufficient local ownership, and heavy workloads among frontline health workers as major barriers to maintaining data quality (14; 2). These challenges may explain why health posts in the present study achieved high levels of tool availability and household registration while demonstrating comparatively lower consistency across records. The findings therefore suggest that CHIS implementation has successfully expanded system coverage but continues to face challenges in achieving high implementation fidelity and sustained data quality.

Similar implementation challenges have been documented across sub-Saharan Africa. An assessment of health information systems in fourteen African countries reported persistent deficiencies in data management, dissemination, and utilization despite considerable investments in strengthening national health information systems (2). Likewise, findings from the African Health Initiative highlighted that strengthening health information systems required more than introducing standardized recording tools; continuous supportive supervision, routine data quality assessments, feedback mechanisms, and active engagement of frontline health workers and managers were equally important for achieving sustainable improvements (13). The coexistence of standardized CHIS tools with parallel documentation practices observed in some health posts in the current study may therefore reflect a common implementation challenge experienced across decentralized community health programs rather than a context-specific problem.

The results further support established frameworks emphasizing the importance of implementation fidelity in determining the effectiveness of health information systems. According to the WHO framework for country health information systems, an effective information system requires not only standardized data collection tools but also robust processes for data verification, analysis,

dissemination, and utilization for decision-making (1). Similarly, process evaluation frameworks emphasize that successful implementation depends on the extent to which interventions are delivered consistently and according to established standards, supported by regular monitoring and supervision (8). The contrast observed in this study between very high availability of CHIS resources and substantially lower consistency scores illustrates the distinction between structural readiness and effective implementation. While the necessary infrastructure was largely available, organizational practices and routine user behavior appeared insufficient to ensure consistent data quality.

Differences between the present findings and studies reporting higher CHIS performance may be explained by several factors. Variations in the intensity of supportive supervision, frequency of refresher training, and follow-up by health centers or woreda health offices can substantially influence implementation quality (13). Differences in workload, experience, and technical competency among Health Extension Workers may also affect routine documentation practices (24). Furthermore, many previous evaluations have focused primarily on tool availability or household registration coverage, whereas the present study incorporated household verification to assess record consistency, providing a more rigorous evaluation of implementation fidelity (5). Finally, the use of projected household population estimates for measuring registration completeness may contribute to differences in reported performance across studies.

Overall, the available evidence indicates that the findings of this study reflect a common stage in the evolution of community health information systems rather than an isolated implementation problem. Although Ethiopia has made substantial progress in expanding standardized community-level information systems, ensuring that these systems consistently generate accurate and actionable information remains an ongoing priority (7; 3). Consequently, this study highlights the importance of evaluating CHIS not only in terms of infrastructure availability and registration coverage but also through measures of data consistency, routine updating, and practical utilization for decision-making.

The findings indicate that CHIS have significant potential to provide reliable household-level information for planning, monitoring, and improving primary health care services. However, this potential can only be fully realized through strengthened recording practices, routine updating of household information, and continuous data quality improvement activities. Health posts therefore require more than standardized recording tools; they also need regular supportive supervision, practical refresher training, and systematic feedback mechanisms that promote accurate and timely documentation. Particular attention should be given to improving household health card distribution, increasing the routine use of field books, and strengthening the recording of sanitation and other dynamic household indicators.

From a policy perspective, implementation fidelity should be incorporated into routine Health Management Information System performance monitoring. Indicators assessing completeness, consistency, timeliness, and record accuracy should receive equal priority alongside service coverage indicators. Ensuring uninterrupted availability of CHIS materials, strengthening the use of tickler files for

client follow-up, and integrating routine household verification into supportive supervision activities may substantially improve the quality and usefulness of community-level health information (7; 3).

Strengths and limitations

This study provides a comprehensive assessment of CHIS implementation by evaluating multiple dimensions, including availability, compliance, completeness, and consistency, rather than focusing on a single performance measure. The combination of document review and household-level verification strengthened the validity of the findings by assessing both recorded information and actual household records. Inclusion of multiple health posts and a substantial number of family folders further enhanced the robustness of the evaluation. Importantly, this study contributes evidence on the quality of community-level health information system implementation in Ethiopia, an area with limited empirical evidence, and provides actionable insights for improving data quality, implementation fidelity, and routine use of health information for decision-making.

Several limitations should be considered. The study was conducted in a single zone, which may limit generalizability to other settings with different implementation conditions. Completeness estimates relied on projected household denominators, which may have introduced some measurement uncertainty. Additionally, the cross-sectional design limited the ability to assess temporal changes or determine causal relationships between implementation factors and CHIS performance. Although household verification improved assessment of data consistency, the evaluation remained dependent on the quality of available records. Despite these limitations, the findings provide important evidence on implementation strengths and operational gaps that can inform efforts to strengthen CHIS in Ethiopia and similar low-resource settings.

Conclusions

Implementation of the Community Health Information System in the study area demonstrated strong performance in terms of infrastructure availability and household registration coverage. Nevertheless, important gaps remain in record consistency, routine updating, and adherence to several operational procedures. These findings indicate that future improvement efforts should focus on strengthening implementation fidelity through regular supportive supervision, continuous refresher training for Health Extension Workers, uninterrupted provision of CHIS supplies, and institutionalized data quality assessment and verification. Strengthening these components will enhance the reliability of community health information and improve its contribution to evidence-informed planning, monitoring, and primary health care decision-making.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Mekelle University College of Health Sciences, School of Public Health Institute of Ethical Review board (IRB) (Ref: 53/1418/08). Permission letters were obtained from Mekelle University and the Tigray Regional Health Bureau before data collection. Written informed consent was obtained from all participants before interviews and household verification. Participants were informed about the purpose of the study, their voluntary participation, and their right to refuse or withdraw at any time. All collected information was kept confidential and used only for the purpose of the evaluation. The research complied with ethical guidelines from the Declaration of Helsinki and the Belmont Report, emphasizing confidentiality and beneficence.

Consent for publication

Not applicable

Availability of data and material

The datasets generated and/or analyzed during the current study are not publicly available because they contain potentially identifiable information from individual participants and household-level health records. De-identified data may be made available from the corresponding author upon reasonable request and subject to approval by the relevant ethical and institutional authorities

Competing interest

The authors declare no competing interest

Funding

No external funding was received for this study.

Author contributions

Adem M.: generates the ideas of the research, Conceived and designed the study, drafted and revised the manuscript.

Demoz K, and Gebrehiwot T.: Provided expertise, contributed to literature review and interpretation and revisions.

Tequar M.: Conducted statistical analysis, data interpretation, and manuscript formatting.

Awalom T.: Project management, team coordination, administrative support, and final approval.

All authors reviewed and approved the final manuscript and are accountable for its content.

Acknowledgement

I extend my gratitude to the Institutional Review Board/Ethical Review Committee for reviewing and approving the study protocol and ensuring that the evaluation was conducted in accordance with ethical principles and standards. I would also like to express my sincere appreciation to the Health Management Information System (HMIS) unit of the Tigray Regional Health Bureau for their valuable support in providing the necessary information and relevant documents required for this evaluation. Furthermore, I am grateful to the Tigray Regional Health Bureau and the HMIS focal persons of the selected woredas (Enderta, Hintalo Wajirat, Dogua Tembien, and Saharti Samre) for their cooperation, permission, and assistance in facilitating the evaluation activities conducted at the selected health posts.

References

1. World Health Organization. Framework and standards for country health information systems. 2nd ed. Geneva: World Health Organization; 2010.
2. Mbondji PE, Kebede D, Soumbey-Alley EW, Zielinski C, Kouvidila W, Lusamba-Dikassa P-S. Resources, indicators, data management, dissemination and use in health information systems in sub-Saharan Africa: Results of a questionnaire-based survey. *J R Soc Med*. 2014;107(Suppl 1):43–53. <https://doi.org/10.1177/0141076814528690>.
3. Federal Ministry of Health Ethiopia. Community Health Information System (CHIS): Implementation guideline. Addis Ababa: Federal Ministry of Health, Ethiopia; 2012.
4. Federal Ministry of Health Ethiopia. Health Management Information System (HMIS): Information revolution and reform documents. Addis Ababa: Federal Ministry of Health, Ethiopia; 2013.
5. John Snow, Inc. (JSI) & Federal Ministry of Health Ethiopia. Community Health Information System (CHIS) scale-up in Ethiopia: Lessons learned from implementation of the family folder approach. Addis Ababa: JSI Research & Training Institute, Inc.; 2013.
6. Perry H. Developing and strengthening community health worker programs at scale: A reference guide for program managers and policy makers. Washington, DC: United States Agency for International Development (USAID); 2014.
7. Federal Democratic Republic of Ethiopia, Ministry of Health. Health Sector Transformation Plan (HSTP) 2015/16–2019/20. Addis Ababa: Federal Ministry of Health, Ethiopia; 2016.
8. Saunders RP, Evans MH, Joshi P. Developing a process-evaluation plan for assessing health promotion program implementation: A how-to guide. *Health Promot Pract*. 2005;6(2):134–47. <https://doi.org/10.1177/1524839904273387>.
9. Covic N, Ndidi N, Hendriks S. (2015). *Achieving a nutrition revolution for Africa: The role of program implementation and fidelity*. AKADEMIYA2063.
10. World Health Organization. Everybody's business: Strengthening health systems to improve health outcomes: WHO's framework for action. Geneva: World Health Organization; 2007.
11. World Health Organization. Primary health care: Now more than ever: The World Health Report 2008. Geneva: World Health Organization; 2008.

12. World Health Organization. WHO country cooperation strategy 2012–2015: Ethiopia. Geneva: World Health Organization; 2012.

13. LeFevre AE, Shillcutt SD, Waters H, Haider S, Boccia D, Fenwick A, 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):S9. <https://doi.org/10.1186/1472-6963-13-S2-S9>.

14. Hotchkiss DR, Diana ML, Foreit KGF. How can routine health information systems improve health systems functioning in low- and middle-income countries? Assessing the evidence base. Adv Health Care Manage. 2012;12:25–58. [https://doi.org/10.1108/S1474-8231\(2012\)0000012006](https://doi.org/10.1108/S1474-8231(2012)0000012006).

Figures

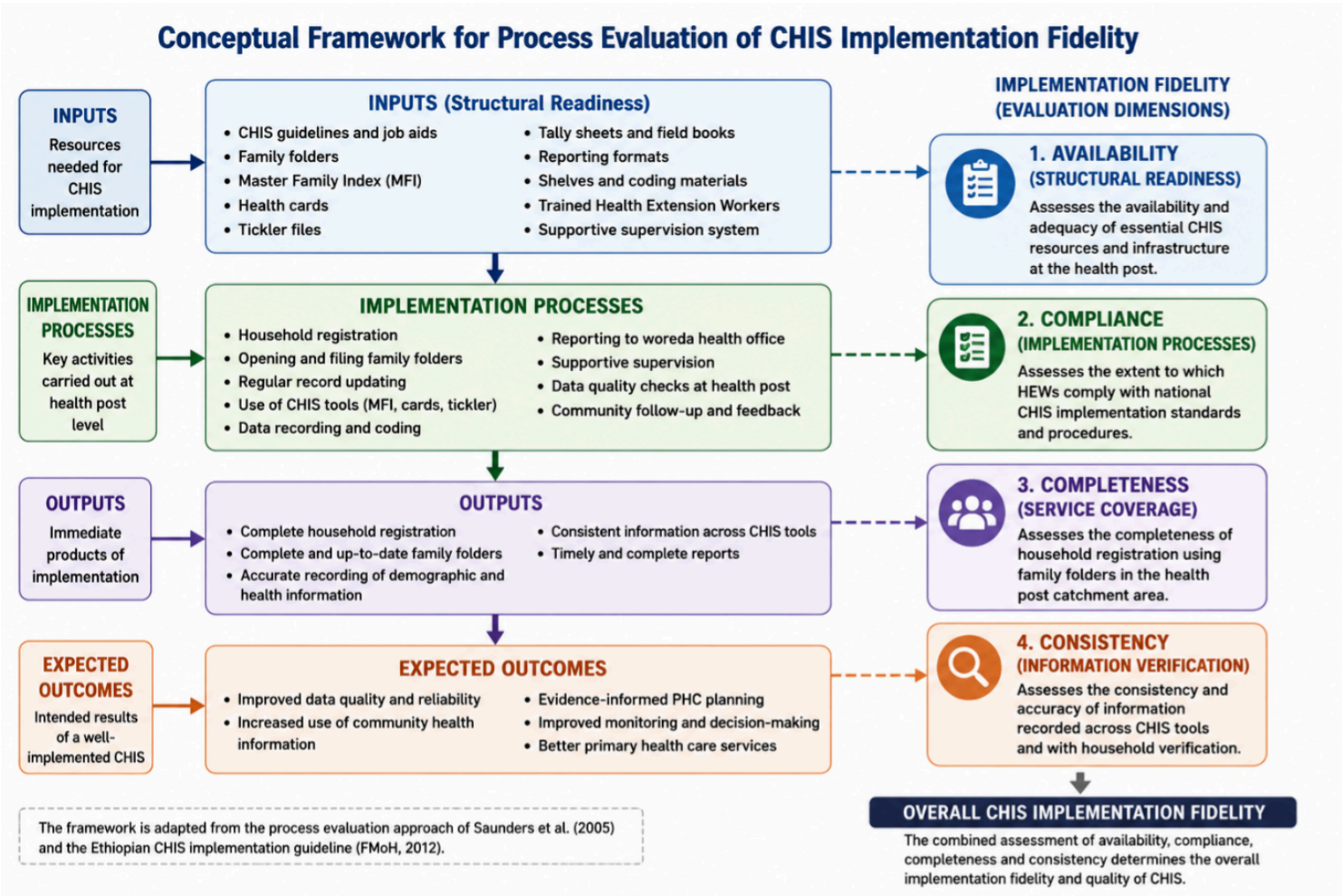


Figure 1

Unnumbered image in the Methods and materials Section

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Tool.pdf](#)