EVALUATION

Assessing Training Approaches and a Supportive Intervention for Managing Febrile Illness in Tanzania

Tibu Homa Performance Evaluation Report

Emily Weaver, Team Leader
Milissa Markiewicz, Gideon Kwesigabo, and **Joe Lugalla**

May 2017

TRE-17-1

USAID
FROM THE AMERICAN PEOPLE

MEASURE Evaluation

EVALUATION

Assessing Training Approaches and a Supportive Intervention for Managing Febrile Illness in Tanzania

Tibu Homa Performance Evaluation Report

Emily Weaver, PhD, MEASURE Evaluation (Team Leader)
Milissa Markiewicz, MPH, MEASURE Evaluation
Gideon Kwesigabo, PhD, Health and Development International Consultants
Joe Lugalla, PhD, Health and Development International Consultants

May 2017

MEASURE Evaluation
University of North Carolina at Chapel Hill
400 Meadowmont Village Circle, 3rd Floor
Chapel Hill, NC 27517 USA
Phone: +1 919-445-9350
measure@unc.edu
www.measureevaluation.org

This publication was produced with the support of the United States Agency for International Development (USAID) under the terms of MEASURE Evaluation cooperative agreement AID-OAA-L-14-00004. MEASURE Evaluation is implemented by the Carolina Population Center, University of North Carolina at Chapel Hill in partnership with ICF International; John Snow, Inc.; Management Sciences for Health; Palladium; and Tulane University. Views expressed are not necessarily those of USAID or the United States government. This report was prepared independently by Emily Weaver, MEASURE Evaluation (team leader); Milissa Markiewicz, MEASURE Evaluation; and Gideon Kwesigabo and Joe Lugalla, both of Health and Development International Consultants. TRE-17-1

ISBN: 978-1-9433-6445-9

USAID
FROM THE AMERICAN PEOPLE

MEASURE Evaluation

ACKNOWLEDGMENTS

MEASURE Evaluation thanks the United States Agency for International Development (USAID) for supporting this evaluation.

We also thank the following people for their support: Raz Stevenson, George Greer, Jema Bisimba, Todd Koppenhaver, and Moses Busiga, of USAID/Tanzania; Sigsbert Mkude, of the National Malaria Control Program; and Georgina Msemo, Mary Azayo, and Felix Bundala, of the Ministry of Health, Community Development, Gender, Elderly, and Children. We appreciate the contributions of Mwiru Sima and Daniel Michael, of Population Services International.

We are especially indebted to the data collection team of the Health and Development International Consultants for their hard work and dedication.

Finally, our sincere thanks to the gracious people of Tanzania who participated in clinical observations, key informant interviews, and focus group discussions.

Cover photo: A mother and infant in Tanzania waiting to see their health provider for a well child visit.

CONTENTS

Additional appendixes are available upon request from measure@unc.edu.

FIGURES

TABLES

ABBREVIATIONS

CHIF	Community Health Insurance Fund
CHMT	council health management team
CHW	community health worker
CQIT	community quality improvement team
CSG	community social group
dIMCI	distance integrated management of childhood illnesses
DMO	district medical officer
FGD	focus group discussion
GOT	government of Tanzania
HCW	healthcare worker
HDIC	Health and Development International Consultants
HFS	Health Facility Survey(s)
IMCI	integrated management of childhood illnesses
IRB	internal review board
KI/SGI	key informant or small-group interview
MoHCDGE&C	Ministry of Health, Community Development, Gender, Elderly & Children
MOHSW	Ministry of Health and Social Welfare
mRDT	malaria rapid diagnostic test
PQIT	pediatric quality improvement team
PSI	Population Services International
ORS	oral rehydration solution
OVC	orphans and vulnerable children
QI	quality improvement
QOC	quality of care
R/CHMT	regional/council health management team
SCM	supply chain management
SS&M	supportive supervision and mentoring
TOT	training of trainers
TZ	Tanzania
U5	under five years of age
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
VEO	village executive officer
WHO	World Health Organization

EXECUTIVE SUMMARY

Integrated management of childhood illnesses (IMCI) is an approach to case management that includes a detailed algorithm for how to assess a child, classify the child's illness, determine if referral is necessary, treat the child, counsel the mother, and provide follow-up care (World Health Organization [WHO], 2014). Developed by WHO and the United Nations Children's Fund (UNICEF), IMCI was introduced in Tanzania in 1996. While under-five (U5) mortality in Tanzania has declined over the past two decades, socioeconomic disparities in child mortality persist and are especially prominent in rural areas. The Lake Zone of Tanzania, which surrounds Lake Victoria, has the highest U5 mortality rate in the country. The chief causes of postneonatal deaths in children 1–59 months in Tanzania are estimated to be pneumonia (22%) and malaria (16%) (Liu, et al., 2015). Because severe febrile illness is a key symptom both of malaria and pneumonia, accurate diagnosis and treatment of severe febrile illness is critical to efforts to reduce U5 mortality.

To reduce U5 morbidity and mortality owing to diseases that cause severe febrile illness, the United States Agency for International Development (USAID) Tanzania established the Tibu Homa project (Swahili for "Treat Fever") in the Lake Zone through a cooperative agreement with University Research Co., LLC. The goals of the project were these: (1) increase availability and accessibility of fundamental facility-based curative and preventive child health services; (2) ensure sustainability of critical child health activities; and (3) increase linkages with the community to promote healthy behaviors and increase knowledge and use of child health services. Tibu Homa was implemented from March 2011–September 2015.

Tibu Homa worked with health facilities to train healthcare workers (HCWs) in IMCI. During Phase 1 of Tibu Homa (2011–2012), HCWs were trained on IMCI through an abbreviated three-day, in-person training focused on febrile illness. This was a modified version of the standard 11-day in-person IMCI training. Beginning in 2013 (Phase 2 of Tibu Homa), distance integrated management of childhood illnesses (dIMCI) replaced the in-person training as required by guidelines at that time of Tanzania's Ministry of Health and Social Welfare (MOHSW)— now the Ministry of Community Development, Gender, Elderly, and Children (MoHCDGE&C]).

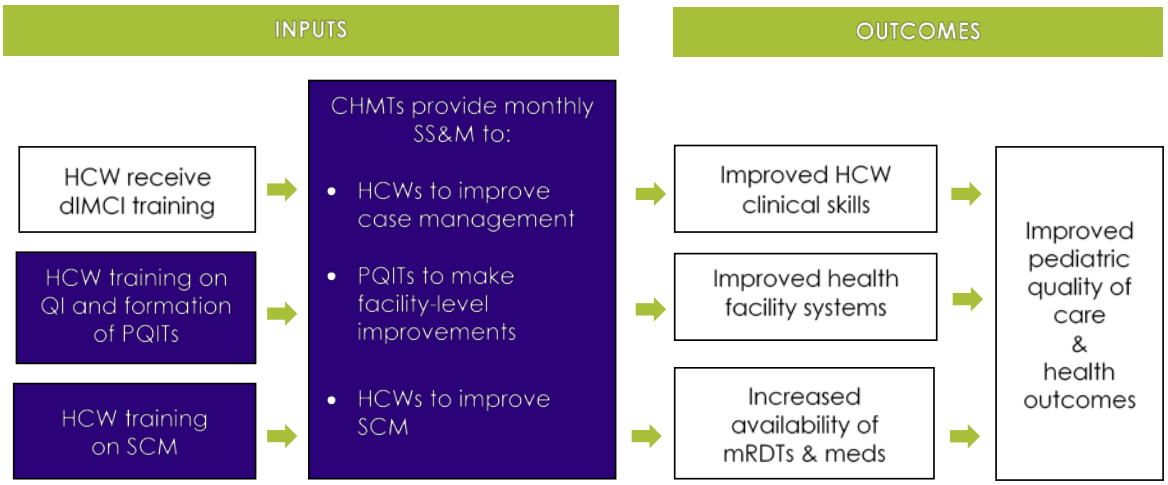
The following additional components supported Tibu Homa's approach:

- Quality improvement (QI): Tibu Homa provided training to HCWs on QI methods and facilitated the formation of pediatric quality improvement teams (PQITs) at participating health facilities. The PQITs focused on identifying and addressing facility-level gaps in services for children.
- Supply chain management (SCM): Tibu Homa provided additional training to HCWs on SCM to improve inventory management and ordering of essential medicines and supplies for children.
- Tibu Homa trained members of council health management teams (CHMTs) on supportive supervisions and mentoring (SS&M) methods and helped CHMTs provide monthly SS&M to HCWs. The CHMTs are comprised of senior district health administrators who support the district medical officer (DMO) in the management and coordination of local health services. Supportive supervision and mentoring efforts had the following goals:
    - Improve HCWs' case management skills and adherence to the IMCI algorithm
    - Monitor and facilitate the work of PQITs as they implemented facility-level improvements

- Improve HCWs' supply-chain management skills to increase the availability of essential medicines and equipment, such as malaria rapid diagnostic tests (mRDTs), antibiotics, and antimalarials

The QI interventions, HCW training on SCM, and the accompanying SS&M provided to healthcare workers by CHMT members are referred to as Tibu Homa's "supportive components." Figure 1 illustrates the Tibu Homa logic model; the shaded boxes highlight the supportive components.

Figure 1. Tibu Homa logic model



USAID/Tanzania asked the USAID-funded MEASURE Evaluation to conduct a performance evaluation of the association between (1) the training modalities and (2) supportive components implemented by Tibu Homa, with quality of care (QOC). The results are intended to inform the selection of future supportive interventions that may be implemented by USAID/Tanzania or the government of Tanzania (GOT) in conjunction with dIMCI training to enhance HCW compliance with the IMCI algorithm. The broad objectives of the evaluation were to estimate the added value of Tibu Homa's supportive components.

The evaluation uses a retrospective, mixed-methods approach. Data sources are a cross-sectional quantitative health facility survey, qualitative and costing data collection, secondary time series data, and project document review. Primary outcomes are measures of QOC, which are defined by the WHO Health Facility Survey (HFS) and include the Index of Integrated Assessment (called the "IMCI score"); correct classification; and correct treatment of cases observed or reviewed in patient records.

The IMCI score was the primary outcome of the study. It is a count index, between 0–10, of the number of assessment steps completed as required by IMCI guidelines. These steps are (1-3) checking for three danger signs; (4) checking for cough; (5) checking for fever; (6) asking about diarrhea; (7) weighing the child; (8) checking the weight against a growth chart; (9) reviewing vaccination status; and (10) checking palmar pallor. Results indicate the following (see also Table 1):

- Training modality (three-day, in-person IMCI versus dIMCI) was not associated with different levels of QOC as measured by the IMCI score. The QOC on this measure improved significantly over the course of the project regardless of training modality (by 77.4% in Phase 1 facilities and by

84.6% in Phase 2 facilities), but had dropped by the time of follow-up during the evaluation's HFS.

- Tibu Homa facilities had higher QOC for all cases measured by the IMCI score, and higher rates of correct classification and treatment for pneumonia cases than did comparison group facilities. This result is amplified by the fact that Tibu Homa facilities had a vastly smaller proportion of trained HCWs than did comparison facilities.
- Both Tibu Homa and comparison facilities performed well on accurate classification and treatment of malaria cases.

Table 1. Summary of IMCI scores (QOC) from Tibu Homa Phase 1 and Phase 2 performance monitoring data and HFS intervention and comparison facilities

	Project/phase baseline	Project/phase endline	Follow-up HFS
Tibu Homa Phase 1: 3-day IMCI			--
Overall	5.3	8.9	
Malaria	5.4	9.2	
Pneumonia	5.3	9.4	
Tibu Homa Phase 2: dIMCI			
Overall	5.5	8.2	6.3
Malaria	6.1	8.4	6.8
Pneumonia	5.2	9.6	6.5
Comparison: dIMCI	--	--	
Overall			5.5
Malaria			5.7
Pneumonia			5.6
Data source (method)	Performance data (chart review)	Performance data (chart review)	HFS (patient-provider observations)

Related findings indicated that:

- SS&M, as part of the Tibu Homa package, was well received by facility staff; however, SS&M was not continued with the same intensity after the project ended.
- Availability of tracer medications and supplies improved greatly during Tibu Homa; however, measures of supply chain management between intervention and comparison facilities were generally similar, as measured at the time of the HFS.
- Health facility staff viewed PQITs favorably as a means to improve QOC in their facilities and to provide staff motivation based on data collected by the team.
- Many structural factors in the health system need additional support to fully leverage investments in IMCI training.
- The community mobilization approach was successful in disseminating salient messages about the importance of early care-seeking for fever.

The cost analysis estimated that the cost of a supportive supervision visit was $271 and the cost of training and supervision per child assessed in full compliance with the IMCI algorithm (that is, IMCI

score = 10/10) was $3.52–$8.21 per visit. These costs may be viewed as prohibitive in terms of sustaining this important practice.

Recommendations to improve QOC and address structural barriers to improve service provision appear below. These recommendations draw on evaluation results and stakeholder feedback.

Supportive Supervision and Mentorship

- Expand training for CHMT members to transform the standard supervision to include clinical mentorship, as in the Tibu Homa approach.
- Provide regular clinical mentorship in classification and management of pneumonia, with emphasis on steps to check for stridor/wheezing, and determine the respiratory rate.
- In resource-constrained settings, one or more of the following may be considered to address cost concerns:
    - Explore cost containment strategies for SS&M visits.
    - Conduct pilot check-ins via cellular technology for SS&M, by CHMT members unable to make monthly in-person visits.
    - Explore training options for district-level staff responsible for budgeting and scheduling transportation for SS&M visits.
    - Explore other methods of creating accountability for healthcare workers and healthcare management, such as the use of performance-based incentives to promote good QOC and attention to detail.

Training

- Continue dIMCI training with high coverage density among HCWs who manage U5 children.

Structural Factors

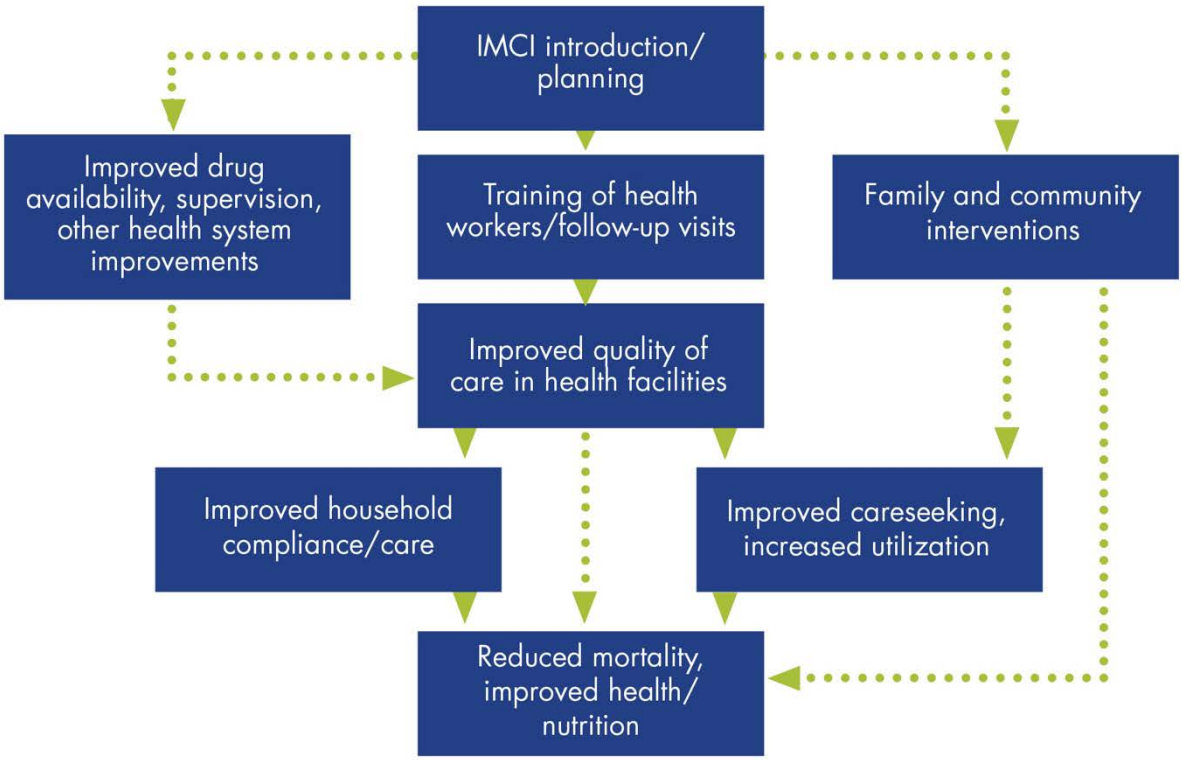
- Continue to emphasize the importance of referral for severely ill children and determine structural barriers that may be mitigated.
- Expand community health promotion.
- Investigate low-cost innovations in diagnostics for pneumonia.
- Identify funding to ensure supply of essential oral treatments and equipment.
- Support projects with potential for sustainability.
- Require development and implementation of a sustainability plan prior to project's end.

INTRODUCTION

Integrated management of childhood diseases is an approach to case management developed by WHO and UNICEF that includes a detailed algorithm to assess a child, classify the child's illness, determine if referral is necessary, treat the child, counsel the child's mother, and provide follow-up care (WHO, 2014). The clinical guidelines employ a syndromic approach and are designed for use in outpatient clinical settings with limited diagnostic tools and medications (WHO, 2005). The IMCI approach also calls for strengthening health systems and improving community care-seeking behaviors related to child health. Figure 2 depicts the IMCI model in practice (Bryce, Victora, Habicht, Vaughan, & Black, 2004).

The IMCI approach was introduced in Tanzania in 1996. While U5 mortality in Tanzania has declined over the past two decades, socioeconomic disparities in child mortality persist and are especially prominent in rural areas. The Lake Zone of Tanzania, which surrounds Lake Victoria, has the highest U5 mortality rate in the country. The chief causes of postneonatal deaths in children 1–59 months in Tanzania are estimated to be pneumonia (22%) and malaria (16%) (Liu, et al., 2015). Because severe febrile illness is a key symptom both of malaria and pneumonia, accurate diagnosis and treatment of severe febrile illness is critical to efforts to reduce U5 mortality.

Figure 2. The IMCI model



Source: Bryce, Victora, Habicht, Vaughan, & Black (2004)

IMCI in Tanzania

The IMCI approach was originally introduced in Tanzania through an 11-day, in-person, in-service training curriculum in 1996. After its implementation, a 2004 study of IMCI in rural Tanzania found that child mortality was 13 percent lower in IMCI-trained facilities than in facilities in selected comparison districts (Armstrong, Schellenberg, 2004). A multi-country evaluation of IMCI found Tanzania to be the only country to have successfully implemented IMCI at scale (Bryce, Victora, Habicht, Black, & Scherpbier, 2005). However, these gains were not sustained, and a later assessment of IMCI in Tanzania found that while 86 percent of districts had carried out at least one IMCI training, national coverage was estimated at only 14 percent of HCWs—well below the 60 percent recommended by WHO (Prosper, Macha, & Borghi, 2009). The assessment attributed the low coverage in part to the high cost of in-person training coupled with a reduction in global aid funds for IMCI training. The assessment further determined that there was poor adherence to the IMCI algorithm owing to HCWs' time constraints, poor follow-up supervision, frequent rotation of staff, lack of IMCI-related drugs and job aids, and poor layout of facilities.

Despite significant efforts, quality of care did not improve much following the training. Results from the 2006 and 2014–2015 Service Provision Assessment Surveys in Tanzania indicate that a minority of healthcare workers performed the most basic tasks related to assessment using the IMCI guidelines of sick children (see Table 2).

Table 2. Assessment tasks completed by healthcare workers in 2006 and 2014–2015, Tanzania Service Provision Assessment

	2006 SPA	2014–2015 SPA
All children		
Child checked for three danger signs	11%	8%
Child checked for the presence of diarrhea, cough, and fever	46%	46%
Number of observations	2,272	4,961
Malaria-specific		
Child checked for three danger signs†	14%	9%
Child checked for the presence of diarrhea, cough, and fever	53%	49%
Number of observations	1,434	1,641
Pneumonia-specific		
Child checked for three danger signs	14%	13%
Child checked for the presence of diarrhea, cough, and fever	46%	53%
Number of observations	442	575

†The three danger signs are cough/difficulty breathing, diarrhea, and fever.

In order to reduce training costs and improve coverage of training for HCWs, the MOHSW rolled out the dIMCI training modality in 2014, after the curriculum had been piloted in South Africa (2010) and Tanzania (2011). The dIMCI training involved a one-day, in-person orientation followed by three to four weeks of self-study; a second one-day, in-person review meeting followed by six to eight weeks of additional self-study; and a final one-day, in-person synthesis meeting (WHO, 2014). One additional in-service facility follow-up supervision visit was also prescribed for HCWs four to six weeks after completing the dIMCI training.

The Tibu Homa Project

Tibu Homa was a cooperative agreement between USAID and University Research Co., LLC to reduce U5 morbidity and mortality owing to severe febrile illness in the Lake Zone of Tanzania (Kagera, Mwanza, Mara, Geita, Shinyanga, and Simiyu regions). The project was funded from March 1, 2011–September 30, 2015 for $23,988,103 (Award #621-A-00-11-00011-00). The Tibu Homa project (Swahili for "Treat Fever") aimed to accomplish the following goals: (1) increase the availability and accessibility of fundamental facility-based curative and preventive child health services; (2) ensure the sustainability of critical child health activities; and (3) increase linkages with the community to promote healthful behaviors and increase knowledge and use of child health services. Tibu Homa was implemented from March 2011–September 2015n collaboration with the MOHSW, primarily through regional and council health management teams (R/CHMTs). A central component of Tibu Homa was training HCWs from selected health facilities in districts with relatively high malaria prevalence on IMCI. During Phase 1 of Tibu Homa (2011–2012), HCWs were trained on IMCI through a three-day, in-person training focusing on febrile illness, which was a modified version of the standard 11-day, in-person IMCI training mentioned above. Beginning in 2013 (Phase 2 of Tibu Homa), dIMCI replaced the in-person training.

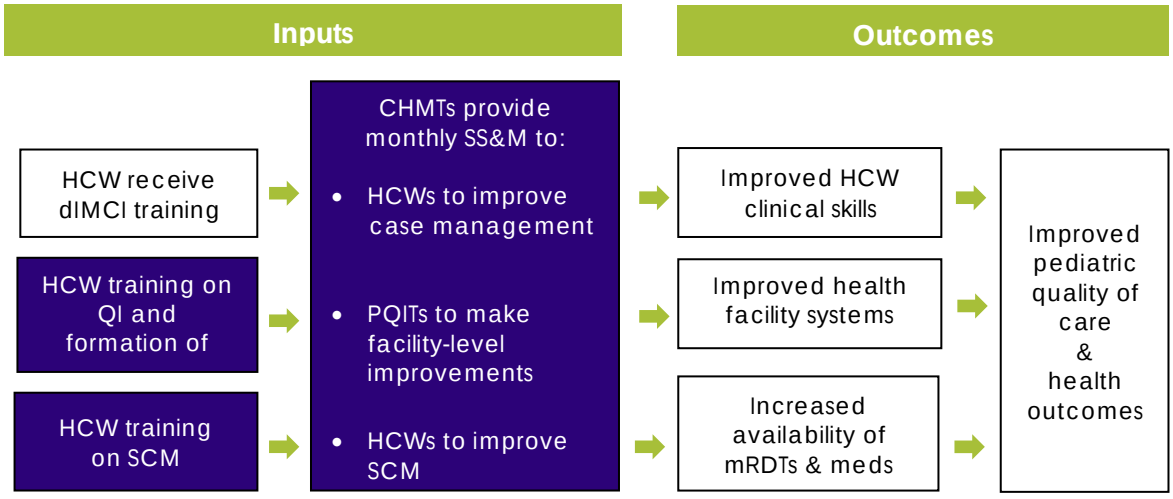
The Supportive Components

In addition to the three-day, in-person IMCI and dIMCI training in Phase 1 and Phase 2 respectively, Tibu Homa worked with health facilities throughout the project to address factors associated with reduced adherence to the IMCI algorithm. Tibu Homa supported the following trainings to address specific needs:

- QI: Tibu Homa provided training to HCWs on QI methods and facilitated the formation of PQITs at participating health facilities. The PQITs focused on identifying and addressing facility-level gaps in services for children, such as long waiting periods and a lack of triage systems for children.
- SCM: Tibu Homa provided additional training to HCWs on SCM to improve inventory management and ordering of essential medicines and supplies, in order to reduce stockouts of IMCI-related drugs and equipment.
- SS&M: To enhance mentoring of HCWs, Tibu Homa trained members of CHMTs on SS&M methods and facilitated CHMTs to provide monthly SS&M to HCWs. Monthly SS&M had the following goals:
    - Improve case management skills and HCW adherence to the IMCI algorithm
    - Monitor and facilitate the work of PQITs as they implemented facility-level improvements
    - Improve SCM skills to increase availability of essential medicines and equipment, such as mRDTs, antibiotics, and antimalarials

The QI interventions, HCW training on SCM, and the accompanying SS&M provided to HCWs by CHMT members are referred to as the Tibu Homa's "supportive components." Figure 3 illustrates the Tibu Homa logic model; the shaded boxes highlight the supportive components.

Figure 3. Tibu Homa logic model



Community Mobilization Activities

In addition to the supportive components already described, Tibu Homa also implemented community mobilization activities in a small number of communities. For the purposes of this evaluation, the community mobilization activities are considered separate and distinct from the other supportive components. In both phases of Tibu Homa, community mobilization activities involved educating community members on the importance of taking children to a health facility within 24 hours of the onset of fever, and creating a community referral system to identify and track children with fever.

Evaluation of Tibu Homa's Supportive Components and Training Modalities

USAID/Tanzania asked the USAID-funded MEASURE Evaluation to assess the two training modalities used during Tibu Homa and to estimate the value added by the supportive components. This retrospective, mixed-methods evaluation is intended to inform future supportive interventions that may be implemented by USAID/Tanzania in conjunction with dIMCI training. The evaluation has seven research questions (listed below) that are related to two main components: (1) estimating quality of care and (2) describing project implementation.

Research Questions

Quality of Care

1. What is the value, i.e., marginal QOC, associated with dIMCI training and Tibu Homa's supportive components versus the QOC provided in comparison facilities that received dIMCI training without the supportive components?
2. What factors are associated with improved QOC? Do these factors differ between Phase 1 (three-day IMCI plus supportive components) and Phase 2 (dIMCI plus supportive components) facilities?
3. What are the costs of the intervention components associated with improved QOC?

Project Implementation

4. What have been the facilities' experiences implementing program activities?
5. What support did Tibu Homa provide to CHMTs?
6. What program activities have been sustained?
7. What was Tibu Homa's approach to community mobilization and how was the project successful (if it was) in creating referral networks for children with fever and for orphans and vulnerable children (OVC)?[1]

[1] Research related to research question #7 was designed by MEASURE Evaluation but carried out by Population Services International (PSI).

METHODS

A mixed-methods approach was employed to draw on several sources of data to triangulate findings regarding the value added by Tibu Homa's supportive components. Table 21, in Appendix A, illustrates the research questions and associated methods.

The evaluation included two quantitative components. The first component estimated the differential QOC provided in facilities that received dIMCI training with Tibu Homa's supportive components (that is, intervention facilities) versus the QOC provided in facilities that received dIMCI training without the supportive components (that is, comparison facilities). Primary data collection via a cross-sectional HFS was implemented in both intervention and comparison facilities. Quality of care was measured using three constructs: HCW assessment, classification, and treatment of U5 children with fever. A HCW assessment (called the "IMCI score") was the primary measure for QOC; it was used to triangulate with results from the second quantitative component, as described below.

The second quantitative component involved secondary data analysis of a subsample of Tibu Homa's performance monitoring data. This analysis aimed to compare and contrast changes in QOC over time in Phase 1 versus Phase 2 Tibu Homa facilities. The main distinction between these two phases was training modality: three-day, in-person IMCI training in Phase 1 versus dIMCI training in Phase 2. Thus, the main goal of the secondary analysis was to assess whether outcomes were related to type of training modality (three-day, in person IMCI versus dIMCI) on QOC. During the second phase, a predetermined set of QI interventions were suggested to facilities during the QI training. This "change package" is also thought to have quickened the pace of change in outcomes in those Phase 2 facilities. The supportive components were implemented similarly in both phases.

A cost analysis entailed primary data collection from CHMTs and local organizations on QI, SCM training, and SS&M costs in order to estimate the marginal cost of implementing the project's supportive components. This was measured as the cost per U5 child receiving fully compliant care at Tibu Homa facilities.

Two qualitative studies complemented the quantitative analyses. The first involved key informant or small-group interviews (KI/SGIs) with CHMT members and HCWs at health facilities. This study took place in four districts where Tibu Homa was implemented, to gain an understanding of the Tibu Homa approach, in practice. The research questions related to this component were to describe health facilities' experiences implementing Tibu Homa activities, understand how Tibu Homa worked with the CHMTs, and describe how well Tibu Homa activities have been sustained.

The second qualitative component employed a case study method to describe the community engagement activities carried out during Phase 2 of Tibu Homa. The Phase 2 community engagement component was considered to be more effective by the implementing partner than the approach employed in Phase 1. The Phase 2 approach included outreach to active community social groups, which enabled the project to reach many community members. The objectives of this component were to understand how the community mobilization component functioned and describe how and if it was successful in creating community referral networks for children with fever and OVC.

The data collection team consisted of seven trained clinicians, six qualitative researchers, and five supervisors. Health and Development International Consultants (HDIC) trained the team in collaboration with MEASURE Evaluation. Data collection occurred from April 19–May 27, 2016.

Health Facility Survey

Data Collection

The main mode of data collection was an HFS. The WHO HFS was adapted for the evaluation and consisted of (1) patient-provider observations of children ages 2–59 months; (2) gold standard reexaminations to record the case classification from an IMCI expert; and (3) an equipment-and-supply checklist to determine availability of essential medicines, equipment, and materials. The WHO HFS and guidebook can be accessed here: http://www.who.int/maternal_child_adolescent/documents/9241545860/en/ (WHO, 2003).

Sampling

An estimated 42 facilities and 126 patient-provider observations for each the intervention and comparison groups were needed to measure a difference of two to three steps in adherence in the IMCI score. This sample size estimate was determined using the WHO HFS sampling guidelines provided in the survey manual along with Tibu Homa project data. A minimum of three patient-provider observations per facility was assumed.

All Phase 2 districts from Tibu Homa were included in the HFS except those in the Mara region.[2] A sample of comparison districts and health facilities was selected from Kigoma and Tabora Regions. HCWs in these comparison districts had received dIMCI training from another GOT partner during the same two-year period as Tibu Homa implemented dIMCI training, but they were not part of the Tibu Homa intervention.[3] Four districts were purposively selected from a sample provided by the MOHSW based on proximity to the Lake Zone, in order to maximize the comparability of study sites, the timing of dIMCI training, and the feasibility of reaching the sites during data collection, which occurred during the rainy season.[4]

Facility eligibility required at least one currently employed HCW to have received dIMCI training, but any HCWs attending children on the day of the survey were observed. A total of 86 facilities were surveyed during data collection, resulting in 440 patient-provider observations. Table 3 provides dIMCI training dates and sampling results by region and group. The lag between training and the HFS was shorter for the comparison group than for the intervention group.

[2] Facilities in the Mara region were excluded for logistical reasons and because no health centers from this region participated during Phase 2.

[3] HCWs in comparison facilities did not receive any additional support aside from the dIMCI training and one prescribed follow-up visit. The sampling frame for the comparison group was determined in collaboration with the MOHSW.

[4] Gender was not a factor related to purposive sampling of comparison districts.

Table 3. Health facility survey training dates and sampling results by study group

Sample characteristics	Comparison		Intervention	
Regions	**Kigoma, Tabora**		**Kagera, Shinyanga, Simiyu**	
dIMCI training dates	April 2014–September 2015		February 2014–May 2015	
Facility type	**Planned**	**Actual**	**Planned**	**Actual**
Health centers	7	7	16	15
Average number of cases observed	3	5.0	3	5.2
Dispensaries	35	36	26	28
Average number of cases observed	3	5.5	3	4.6
Total facilities surveyed	**42**	**43**	**42**	**43**
Total cases observed	**126**	**232**	**126**	**208**

Analysis

Descriptive and bivariate statistics were generated for (1) facility, HCW, and case review characteristics; (2) select WHO HFS indicators, including the IMCI score—the primary measure of QOC; and (3) other measures of QOC. Multivariate models were then used to identify characteristics and indicators associated with QOC. District-level fixed effects controlled for unobserved variation at the district level. Standard errors were adjusted for facility-level clustering, and a threshold of $p \leq 0.05$ was used to assess statistical significance. For small sample sizes $p \leq 0.10$ is also indicated.

The IMCI score is the main QOC outcome of these analyses; it measures the number of assessment tasks the clinician completed during the observation. These include checking for the three danger signs (cough, fever, and diarrhea); weighing the child and referencing a growth chart; checking for palmar pallor; and reviewing vaccination status. Other measures of QOC are whether or not the case was classified correctly and subsequently treated correctly.

Secondary Analysis Using Tibu Homa Performance Monitoring Data

The Tibu Homa Performance Monitoring Database

Tibu Homa's performance monitoring database was used to generate information about HCW performance during the project. The database captures IMCI case review data from monthly supportive supervision visits and facility-level indicators recorded by the project, either at monthly or quarterly intervals. See Appendix B for a list of indicators. Monthly case review data were compiled by CHMT members with the support of Tibu Homa staff. During monthly supervision, IMCI scores were recorded using patient records for up to five outpatient visits for U5 children with fever, including age and diagnosis. No inpatient or outpatient case reviews for children ages 0–1 month were used in the evaluation. Information for facility-level performance indicators was also extracted from and maintained in the performance monitoring database for the duration of the project.

Sampling

MEASURE Evaluation extracted performance monitoring data from a random sample of 15 percent of all project facilities in Phases 1 and 2 that had received four or more months of SS&M (n=57). A total of 4,233 outpatient case reviews for children ages 2–59 months were extracted; 71.2 percent were from

Phase 1 project facilities, and 28.8 percent were from Phase 2 project facilities. Table 4 provides a breakdown of case reviews by region.

Table 4. Sampling results by region from Tibu Homa performance monitoring data

Region	Number of districts sampled	Number of case reviews extracted	Percentage
Kagera	6/8	1,418	33.5
Mara	4/6	823	19.4
Mwanza	7/8	1,199	28.3
Shinyanga	2/2	350	8.3
Simiyu	3/3	443	10.5
Total	**22/27**	**4,233**	**100.0**

Analysis

Descriptive and bivariate statistics were produced from the project monitoring data and used to compare results between project phases and over time. Generalized estimating equation modeling with facility-level clustering was used to assess the time trend of the IMCI score throughout the project. A threshold of $p \leq 0.05$ was used to assess statistical significance. For small samples, $p \leq 0.10$ is also noted.

The primary outcome of the analyses was the IMCI score, as recorded from patient chart reviews during SS&M visits. Full compliance with the index of integrated assessment is also reported, which is the proportion of cases that had an IMCI score of 10/10.

Cost Study

The cost study aimed to provide cost data that could be used to estimate the cost of implementing the supportive components conducted by Tibu Homa in the future. Specifically, we estimated the marginal cost of implementing the supportive components (in terms of the cost per U5 child receiving fully compliant care). The assumption is that these supportive components would be implemented in conjunction with dIMCI training (see Table 5).

Data and Methods

Since Tibu Homa ended prior to its evaluation, cost data were collected from former staff, other implementing partner staff, and local health officials (during qualitative interviews with a former Tibu Homa trainer, HDIC staff, MEASURE Evaluation Tanzania associate award staff, and CHMT members). An interview guide was developed to estimate the basic costs elements (see Appendix E), and cost information was gathered on the supportive components. Interviews were conducted by MEASURE Evaluation in April–May, 2016 in Mwanza and Dar es Salaam. The average number of children seen per facility each month was obtained from MEASURE Evaluation's HFS estimates. Noncost data were extracted from the Tibu Homa final report and project training reports that included the percentage of U5 children with fever estimated to receive fully compliant care, the average number of people trained, and trainers required per training session (Table 4). There were differences in the completeness of the data across respondents and in some of the data elements. Therefore, in the analysis phase, the data were triangulated in order to come up with best estimates based on the information provided.

During implementation, Tibu Homa developed the training materials, supportive supervision guidelines, and other tools needed to implement the Tibu Homa supportive components. Therefore, the development costs for these materials were considered "sunk costs" and did not figure in estimates of the costs for the GOT or an implementing partner to implement the Tibu Homa supportive components in the future. Specifically, the cost study determined the *extra* costs of implementing the Tibu Homa supportive components. These components were the following: training HCWs in QI and SCM, training for R/CHMT members on SS&M, and travel costs for SS&M visits associated with the Tibu Homa supportive components. It was assumed that all staff who might implement the supportive components would already be employed by the implementing partner or agency. So while some task shifting may be expected, extra labor costs, such as salaries, were not considered, because the package would be implemented as part of the existing duties. Therefore, there would be no opportunity costs (that is, costs of implementing the supportive components instead of another task).

Analysis

The underlying theory of change is that if SS&M-trained CHMT members make monthly SS&M visits to facilities where HCWs have been trained on dIMCI, QI, and SCM, there will be increased adherence to the IMCI assessment protocol. Therefore, overall SS&M costs of a visit to a facility by a trained CHMT member were estimated. Specifically, the cost per child treated compliantly according to the IMCI algorithm was estimated as a function of: (1) the annualized training costs of HCWs in QI and SCM; (2) the annualized training costs of SS&M per supervisor; (3) the number of SS&M visits; (4) the cost of an SS&M visit; and (5) the number of children assumed to be seen and treated compliantly. Training costs were estimated based on the information gathered during the evaluation. We used the following formula:

$CC = [(CV+CT)/V] / (KxR)$, where:

CC = cost per child treated compliantly
CV = cost per SS&M visit
CT = average training costs for SS&M per supervisor and per HCW in QI and SCM per time interval
V = number of visits per year to a facility by a supervisor for SS&M
K = average number of U5 children attending a facility per month
R = compliance rate for treatment

Three important inputs that influenced the cost estimate were the frequency of SS&M visits, the number of children seen on average per facility, and the compliance rate. These parameters are presented in Table 5 along with their sources. Two scenarios were considered overall and by facility type. The first scenario is a higher-intensity intervention that assumes that annual training and monthly SS&M visits are supported. The second scenario assumes training every three years and only includes the cost of eight SS&M visits per year. This number of SS&M visits assumes that the GOT will fund and conduct quarterly SS visits per GOT policy, which should already be budgeted in each district.

Table 5. Key inputs used to estimate the cost per child treated compliantly with Tibu Homa's supportive components

Parameter	Scenario 1	Scenario 2	Source of information
Training interval for CHMT members and HCWs (yrs.)	1	3	Assumption
Count of SS&M visits per year (number of times per year)	12	8	Assumption
Children under 5 seen per facility per month (#)	227	227	MEASURE Evaluation HFS
Health facilities	350	350	
Dispensaries	185	185	
Compliance rate (% cases assessed with 10/10 steps of IMCI algorithm)	36	36	Tibu Homa Final Report, Figure

Qualitative Study: Stakeholders' Experience of Tibu Homa

Methods and Analysis

For this component, data were collected in four districts and eight health facilities (one dispensary and one health center in each district). Because of high turnover rates, health facilities were purposively selected in collaboration with district medical officers (DMOs) to include facilities where HCWs who participated in Tibu Homa were still employed.[5] Facilities were also selected based on good performance during the Tibu Homa project. Qualitative KI/SGI guides were developed by MEASURE Evaluation. Nine CHMT members and 18 HCWs participated in interviews.

KI/SGIs were audio-recorded and translated and transcribed into English. Both HDIC and MEASURE Evaluation staff analyzed the transcripts, focusing on identifying relevant themes and patterns of responses related to the implementation of the Tibu Homa supportive components to help explain and supplement quantitative findings.

Qualitative Case Study: Community Mobilization

Methods and Analysis

For the community mobilization component, which was implemented by Population Services International (PSI) and HDIC, data were collected in four communities in two districts of Shinyanga and Simiyu where Tibu Homa community mobilization activities were implemented. These communities were purposively selected in collaboration with DMOs who identified communities where the mobilization had worked well. Within each community, health facility in-charges collaborated with community leaders to identify community members who were involved with Tibu Homa to participate in KI/SGIs and focus group discussions (FGDs). A total of 140 community members participated in interviews.

Interviews and focus groups were also recorded, translated, and transcribed into English. Transcripts were analyzed by both HDIC and MEASURE Evaluation for each case (that is, each community)—and across cases—to develop an understanding of how the community outreach component was implemented. Any variation in implementation across communities was also noted. The analysis focused

[5] Selection criteria did not include gender.

on identifying barriers to care-seeking, and on constructing a depiction of the community referral system for children with fever and OVC.

Limitations

Given the design of the evaluation, it was not possible to quantify the causal effect of the Tibu Homa intervention on QOC. However, triangulation of evidence from various sources (such as quantitative, qualitative, and project data) enabled the evaluation team to validate and enrich the interpretation of results and synthesize findings to assess the contribution of the Tibu Homa supportive components in conjunction with dIMCI.

Challenges Encountered during Data Collection

Despite inclement weather and low patient flow in many facilities, the survey team was able to observe an average of more than five patients per facility during the HFS. In cases where observations were inhibited by such factors, replacement facilities were randomly selected from those in close proximity to the original facility. Overall, 22 facilities out of 86 (25.6%) were replaced, owing to such barriers to observation, with more replacements in the comparison area (14/43, 32.6%) versus intervention areas (8/43, 18.6%).

IRB Clearance and Informed Consent

The Tibu Homa Project evaluation study protocol was reviewed and approved by the University of North Carolina's internal review board (IRB) (study number 15-3209). The study protocol was also reviewed and approved by the National Institute for Medical Research (NIMR) in Tanzania. All data collection personnel (supervisors and interviewers) were trained in the protection of human subjects. Informed consent was obtained from all participants prior to their participation in the study.

QUALITY-OF-CARE RESULTS

The evaluation results are presented below, by research question.

The Value-Added of the Tibu Homa Project

This section addresses research question #1: *What is the value, i.e., marginal QOC, associated with dIMCI training and Tibu Homa's supportive components versus the QOC provided in comparison facilities that received dIMCI training without the supportive components?*

The HFS was the primary data source for this research question. The survey was conducted to compare the QOC provided in intervention facilities that received Tibu Homa's supportive components with comparison facilities that did not receive the supportive components. Although intervention and comparison groups were selected to maximize comparability, some differences existed between the two samples. The main differences that may affect the interpretation of the analysis are (1) the percentage of staff trained in either dIMCI or IMCI and (2) the patient volume for U5 children. Higher volume facilities often have greater time constraints owing to workforce shortages, which limit HCWs' ability to complete the relatively time-consuming IMCI protocol. Comparison facilities had both a higher percentage of trained staff and also a higher patient volume compared with intervention facilities (Table 6).

Table 6. Observed HCW and facility characteristics in facilities participating in the HFS by comparison and intervention groups

Characteristics	Comparison	Intervention
HCW characteristics	**(n=45)**	**(n=49)**
HCW sex		
Sex (% male)	55.5	48.2
HCW type (% of total)		
Physician/clinical officer/assistant medical officer	65.5	52.9
Nursing officer/enrolled nurse/public health nurse	29.3	41.4
Medical assistant	0.0	5.8
Other	5.2	0.0
HCW training		
Any dIMCI (e.g., Tibu Homa or other) (%)	72.5	**48.8
Trained in 2014 (%)	18.6	**94.1
Trained in 2015 (%)	81.4	**5.9
Any IMCI (e.g., 11-day or abbreviated in-person training) (%)	7.4	18.8
Facility characteristics	**(n=43)**	**(n=43)**
Facility type (%)		
Dispensary	83.7	65.1
Health center	16.3	34.9
Accessibility of referral center		
Time to referral center (minutes)	59	52
Staffing		
60%+ staff trained in IMCI (%)	93.0	**44.2
60%+ staff trained in dIMCI (%)	58.1	**14.0
Number of dIMCI-trained staff present today (# staff)	2.5	2.0
Total healthcare workers on staff managing children (any day)(#)	5.5	6.1
Healthcare workers managing children present today (#)	2.8	3.0
Total number of visits made by children from 2 to 59 months† (# visits)	269	**181
Number child visits per HCW/month among HCWs managing children		
Dispensaries (# visits)	86	**42
Health centers (# visits)	51	32
WHO HFS facility indicators		
Index of availability of injectable drugs for pre-referral treatment (count of drugs out of four)	2.4	**2.8
Index of availability of essential oral treatments (count of oral treatments out of 8)	4.3	4.4
Health facility received at least one supervisory visit that included observation of case management during the previous six months (%)	40.0	40.0
Essential equipment and materials (count out of seven)	0.0	2.3
Facility has Tibu Homa-supported items (%)		
Have IMCI chart booklet	100.0	97.7
Documented if patient was seen within first 24 hours onset of fever	0.0	**13.9
Triaged and recorded severity status upon arrival (P 1-2-3)	0.0	11.6
Documented OVC status	0.0	18.6
Maintained patient records	67.4	76.7

** p<=0.05

†Estimate from March 2016 patient registers

To have a valid comparison, case and facilities characteristics in both groups need to be similar. Table 7 provides a description of case characteristics by group, and indicates that case characteristics were similar in both groups for U5 children with fever. The most commonly reported symptoms were respiratory issues (namely fast/difficult breathing, cough, or pneumonia). The most common case classifications were malaria, pneumonia, cough/cold/flu, and acute watery diarrhea (see Table 7). Selected WHO HFS indicators are provided in Appendix A, Table 22.

Table 7. Case observation characteristics from comparison and intervention facilities

Characteristics	Comparison (n=232)	Intervention (n=208)
Patient characteristics		
Age (years)	1.5	1.3
Sex (% male)	47.0	52.4
Symptoms (%)		
Fever	100.0	100.0
Fast/difficult breathing/cough/pneumonia	67.2	** 79.8
Diarrhea/vomiting	38.4	**24.0
Other	47.8	49.0
Ear problem	0.9	1.4
Malaria diagnostic used (%)		
mRDT†	76.3	88.9
Microscopy	3.9	3.4
None	19.8	7.7
Classification		
Correctly classified (%)	56.0	62.3
Gold standard diagnosis (%)		
Fever, no malaria	41.4	**72.0
Cough/cold/flu	37.9	42.8
Malaria	38.4	**18.4
Diagnosed by mRDT	86.9	91.0
Diagnosed by microscopy	10.5	9.0
Diagnosed without diagnostic test	2.6	0.0
Fever, malaria unlikely††	19.0	**9.7
Pneumonia	14.2	**20.8
Anemia	12.5	8.2
Acute watery diarrhea	9.1	5.8
Malnutrition, very low weight	3.0	2.4
Very severe febrile illness	2.6	2.4
Dehydration	2.6	2.9
Acute ear infection	0.8	1.9
Dysentery	0.4	1.0
Mastoiditis	0.4	0.0

Note: Diagnoses not mutually exclusive

†Difference not significant when assessing facilities that had mRDTs in stock
††Selected when no diagnostic test was available, but Malaria was not likely

** p<=0.05

Quality of Care

Quality of care was assessed in several ways. The primary outcome measure, the IMCI score, is a measure of how thoroughly patients were assessed according to the IMCI protocol. Average IMCI scores were calculated as a measure of QOC with a maximum score of ten steps completed. Then, the frequency of accurate classification and treatment for malaria and pneumonia cases was determined.

Observations were conducted with any HCW managing children on the day of the survey regardless of IMCI/dIMCI training status. Figure 4, Panel A shows the average IMCI scores in intervention and comparison facilities for dIMCI-trained and non-dIMCI-trained HCWs. Average IMCI scores were higher in intervention facilities for both trained and un-trained HCWs relative to HCWs in comparison facilities. Figure 4, Panel B depicts average IMCI scores in intervention and comparison facilities for combined IMCI/dIMCI-trained HCWs and untrained providers. The difference in the IMCI scores are not as large when combining IMCI and dIMCI-trained HCWs together.[6] IMCI scores also did not vary significantly by type of HCW between or within comparison and intervention facilities for physicians and nurses (see Appendix A, Table 23).

Figure 4. Average IMCI scores for HCWs with and without dIMCI (Panel A) and for HCWs with and without any IMCI/dIMCI training (Panel B) training in intervention and comparison facilities, April–May 2016

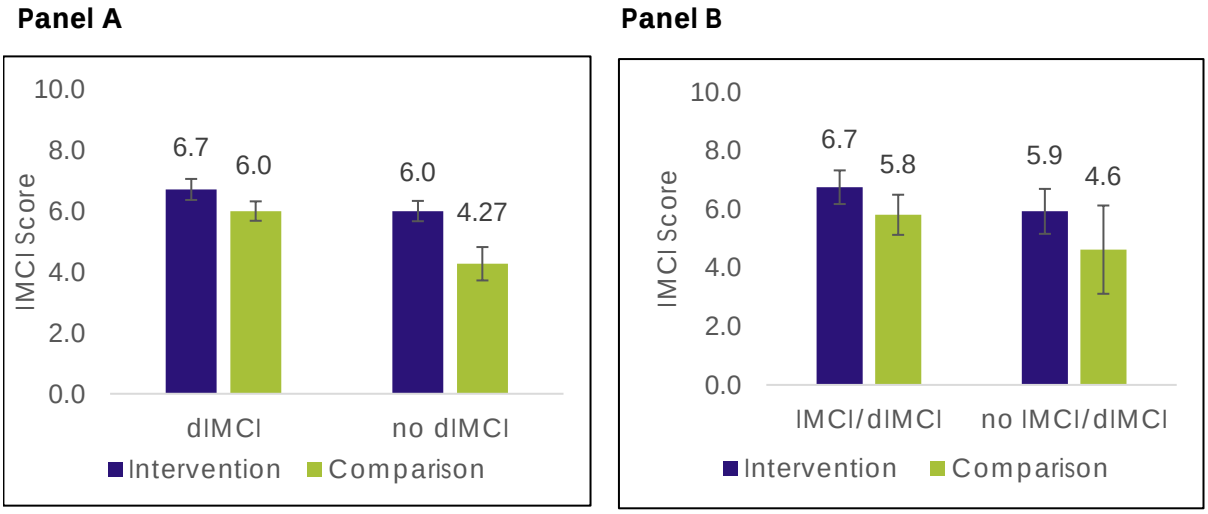


Table 8 provides a snapshot of the 10 components of the IMCI score and the frequency with which these components (steps) were completed, on average, by HCWs during observations in comparison and intervention facilities. The HCWs in intervention facilities completed the steps at a greater rate than HCWs in comparison facilities, for 5 (of 10) components: weighing the child; checking for cough; checking for diarrhea; checking for fever; and vaccination status. The least frequently completed step by far was weighing the child, with 8.6 percent and 15.4 percent of cases weighed in comparison and intervention facilities, respectively.

[6] IMCI training was provided at an earlier period than was dIMCI.

Table 8. Breakdown of IMCI score in comparison and intervention facilities

Component	Comparison	Intervention
Checked for 3 danger signs	26.7	**16.8
Can drink/breastfeed	49.1	57.2
Vomits everything	46.6	41.3
Convulsions	56.0	57.2
Checked for cough, diarrhea, and fever	51.3	**74.5
Cough	89.7	**98.1
Diarrhea	67.7	**81.3
Fever	81.9	**90.9
Weighed and weight checked against growth chart	8.6	**15.4
Vaccination status	53.4	**71.2
Palmar pallor	42.7	48.1

** p<=0.05

Table 9 provides a summary of QOC in intervention and comparison facilities for two priority diagnoses: malaria and pneumonia. Most malaria cases were accurately classified and treated; mRDTs were almost universally conducted. For pneumonia cases, disparities exist with regard to QOC. A higher percentage of pneumonia cases were correctly classified in intervention versus comparison facilities. Of those correctly classified (though the number of cases is small), a higher percentage were also treated correctly in intervention facilities. First- and second-line drugs to treat pneumonia, specifically amoxicillin and cotrimoxazole, were available in one-third of facilities where patients were incorrectly treated, meaning that appropriate treatments were available for those cases, but not prescribed. Most incorrectly classified pneumonia cases were assigned a classification of respiratory infection (see Table 10). One main indicator in the differential diagnosis of pneumonia and respiratory infection is the respiratory rate. Anecdotal evidence from the HFS indicates that, although most HCWs had a device for counting the respiratory rate, taking time to set up the stopwatch on their (nonsmart) cell phones was a barrier owing to the time required.

Table 9. Quality of care summary for malaria and pneumonia cases

Indicator	Comparison		Intervention	
	Malaria (n=89)	Pneumonia / severe pneumonia (n=33)	Malaria (n=38)	Pneumonia / severe pneumonia (n=42)
IMCI score	5.6	5.7	**6.7	*6.5
Received diagnostic test (%)	89/89 (100%)	--	37/38 (97.4%)	--
Correctly classified, n (%)	89/89 (100%)	9/33 (27.3%)	38/38 (100%)	20/42 (47.6%)
Correctly treated, n (%)	77/89 (86.5%)	4/9 (44.4%)	36/38 (94.7%)	17/20 (85.0%)
Among incorrectly treated, appropriate drugs available, n (%)†	4/12 (33.3%)	3/5 (60.0%)	2/2 (100.0%)	1/3 (33.3%)

†Includes 1st and 2nd line drugs

Difference between comparison and intervention facilities significant at: **p≤0.05; *p≤0.10

Table 10. Summary of incorrectly classified pneumonia cases*

Group	Number
Comparison	
Total cases pneumonia / severe pneumonia	33
Incorrectly classified	22/33 (66.7%)
Incorrectly treated (%)	14/33 (42.4%)
Average IMCI score	5.2
Facility has watch or timing device (%)**	58.3
Misclassification assigned***	9 respiratory infections 5 malaria 1 acute watery diarrhea 1 bacterial infection
Intervention	
Total cases pneumonia / severe pneumonia	42
Incorrectly classified (%)	22/42 (52.4%)
Incorrectly treated (%)	11/42 (26.2%)
Average IMCI score	6.6
Facility has watch or timing device (%)**	63.6
Misclassification assigned***	7 respiratory infections 2 urinary tract infections 1 intestinal worms 1 tonsillitis 1 bronchial asthma

*Three cases of pneumonia misdiagnosed as severe pneumonia, and four cases of severe pneumonia misdiagnosed as nonsevere are not counted toward misclassification statistics.

** The primary method for diagnosing pneumonia includes counting breaths per minute for which a timing device is generally used.

***Other accurate classifications also may have been assigned and are not counted here.

Table 11 below provides summary results of IMCI assessment steps completed over time using SPA and HFS data. The SPA observed providers assessing children presenting with any ailment, while the evaluation HFS only observed providers assessing children presenting with fever. The SPA data from 2006 and 2014–2015 show few changes in the completeness of assessments for all children, including those with malaria and pneumonia. Providers observed in the evaluation's HFS, during the same general time period as the 2014–2015 SPA, completed a higher percentage of assessment steps for all measures except for the following: checking three danger signs among children with malaria in the comparison facilities and among children with pneumonia in intervention facilities. In general, providers in the evaluation sample completed a greater percentage of assessment tasks (significance not tested), with a higher percentage of children in intervention facilities checked for the presence of diarrhea, cough, and fever and a lower percentage of children in intervention facilities checked for three danger signs.

Table 11. Comparison of SPA and Evaluation HFS IMCI assessment results, 2006 SPA, 2014–2015 SPA, and 2015 HFS

	SPA		Evaluation HFS†	
	2006	2014–2015	Comparison 2015	Intervention 2015
All children				
Child checked for three danger signs (%)	11	8	27	17
Child checked for the presence of diarrhea, cough, and fever (%)	46	46	51	75
Number of observations	2,272	4,961	232	208
Malaria-specific				
Child checked for three danger signs† (%)	14	9	28	16
Child checked for the presence of diarrhea, cough, and fever (%)	53	49	47	82
Number of observations	1,434	1,641	89	38
Pneumonia-specific				
Child checked for three danger signs (%)	14	13	33	12
Child checked for the presence of diarrhea, cough, and fever (%)	46	53	61	79
Number of observations	442	575	33	42

†The SPA observed children with any/all symptoms, while the HFS observed children with fever.

Table 12 provides results from four separate multivariate linear regression models that identify factors associated with the IMCI score. The models are adjusted for HCW, patient, and facility characteristics, and they employ district fixed effects. Standard errors are adjusted for facility-level clustering. Because of key differences in patient volume between the intervention and comparison groups, the analysis also controls for the number of children seen per month in each facility. The coefficient of interest varies for each model.

Model 1 provides results from the sample of both treatment and comparison facility observations, and the coefficient of interest is "intervention facility," which shows the differential IMCI score associated with cases observed in intervention group facilities. Cases observed in intervention facilities received more thorough assessment than cases observed in comparison facilities. Specifically, cases observed in intervention facilities had, on average, IMCI scores that were two steps higher (out of 10) relative to the

comparison group facilities, after adjusting for other factors ($p<0.05$). This model also shows that other predictors of a higher IMCI score are that the HCW had received dIMCI training (1.08 steps higher, $p<0.05$) and that the patient tested positive for malaria (0.64 steps higher) (Table 12, Model 1). If the provider under observation referenced the IMCI chart booklet during the patient visit, it was generally associated with a lower IMCI score (1.1 step lower score, $p<0.05$). Patient age, gender, health facility characteristics, and health facility volume were not significantly related to IMCI scores.

Model 2 includes an additional interaction term between "intervention facility" and "HCW trained in dIMCI." This allows the effect of dIMCI training on IMCI score to vary by study group (intervention versus comparison group). The interaction term was not predictive of a higher IMCI score (Table 12, Model 2). This observation is important, because it strengthens the assumption that differences in outcomes across study groups were not due to differences in the dIMCI training itself (or its effects); differences were likely due to other factors, including those influenced by Tibu Homa.

In this model, dIMCI training and being seen in an intervention group facility were both independently and significantly associated with higher IMCI scores, with notably stronger effects than in Model 1. Being observed in the intervention group was associated with 2.53 more assessment steps completed ($p<0.05$). Having received dIMCI training in both intervention and comparison groups was associated with 1.69 more assessment steps completed ($p<0.05$).

Models 3 and 4, respectively, provide results of models that test for factors associated with IMCI scores for comparison and intervention groups separately. Modeling the results separately provides an opportunity to examine whether there may be some effects in one group or another that are not captured in the combined models (such as, the effects are averaged or washed out by the larger and more diverse sample). These stratified analyses show that observing an HCW who had received dIMCI training resulted in consistently higher scores in both groups, independently. Other factors varied by group (Table 12, Models 3 and 4). These models do show some different predictors of IMCI score. In the comparison group (Model 3), HCW characteristics were significantly associated with the IMCI score, which is consistent with Models 1 and 2. The major difference in this model is that facility volume, specifically 100–150 children per month, shows a large and negative effect on the IMCI score. Further investigation of this result reveals that there were just two facilities in the comparison group sample with this patient volume, and that HCWs observed in both facilities completed few assessment steps, specifically an average 2.5 assessment steps per patient-provider interaction observed. Thus, this result is not of practical significance. The outcome of a clinical malaria test was not a predictor of IMCI scores in comparison facilities, indicating that the significance of this characteristic on IMCI score was driven by the results of observations in the intervention group for Models 1 and 2.

Model 4 provides results from this analysis in intervention facilities, only. The results indicate the following: (1) assessments completed by HCWs trained in dIMCI were associated with slightly higher IMCI scores than HCWs who did not receive training (0.72 more assessment steps completed, $p<0.05$); (2) older children were also associated with fewer assessment scores completed (0.25 fewer assessment steps completed per month in age of the patient, $p<0.05$); (3) a lab-confirmed malaria diagnosis was associated with 1.09 more assessment steps completed ($p<0.05$); and (4) having an IMCI chart book was associated with 1.52 more assessment steps completed ($p<0.10$). Contrary to Models 1–3, the HCW referencing the IMCI chart was not associated with the IMCI score, indicating that the significance of this effect is mainly driven by the results of observations completed in comparison facilities in the other models.

Table 12. Factors associated with appropriate assessment (IMCI score) controlling for HCW, patient, and facility characteristics, 2015 HFS

	Model 1	Model 2	Model 3	Model 4
Characteristic	**All (n=439)**	**All (n=439)**	**Comparison (n=232)**	**Intervention (n=208)**
Intervention facility (versus comparison)	**1.99	**2.53	--	--
Intervention facility * HCW trained in dIMCI	--	-1.14	--	--
HCW characteristics				
HCW trained in dIMCI (versus not trained in dIMCI)	**1.08	**1.69	**1.86	**0.72
HCW referenced IMCI chart (versus did not reference)	**-1.10	**-1.10	**-1.14	-0.46
Patient characteristics				
Patient age in years	-0.11	-0.11	-0.03	**-0.25
Patient is male	0.03	0.06	0.16	-0.01
Patient has lab-confirmed positive malaria diagnosis (versus negative diagnosis)	**0.64	**0.59	0.48	**1.09
Facility characteristics				
Facility is health center (versus dispensary)	0.61	0.45	0.30	0.54
Facility has working baby scale	0.44	0.49	0.39	1.86
Facility has microscope	-0.27	-0.11	0.05	-0.19
Facility has IMCI chart book	1.20	1.44	0.00	*1.52
Facility volume of children age 2-59 months in one month (March 2016)				
100-150 children (versus 0–99 children)	-0.85	-0.79	**-3.56	-0.49
150-200 children (" ")	0.14	0.08	-0.07	-0.55
200-325 children (" ")	0.06	0.05	-0.35	0.37
325+ children (" ")	0.87	0.98	0.86	0.53

* p<=0.10; ** p<=0.05; *** p<=0.001

Stratified analysis for malaria and pneumonia diagnoses also showed that dIMCI training was associated with higher IMCI scores for those cases independently (Appendix A, Table 24).

Supply Chain Management

Few differences were noted in comparison and intervention groups with regard to the facilities' equipment and supplies. A greater percentage of intervention facilities had baby scales and were recording the use of an mRDT in the patient register. Notably lacking in less than half of all facilities were a microscope and supplies to mix oral rehydration solution (ORS). Less than one-fifth of facilities in both groups had a designated triage area, and transportation for referrals. About two-thirds of facilities in both groups had a clean source of water. See Table 13.

Table 13. Inventory of equipment and supplies in comparison and intervention facilities, 2015 HFS

Item	Comparison (%)	Intervention (%)
Equipment and supplies		
mRDTs	95.4	93.0
Baby scale	88.4	*97.7
Timing device	62.8	72.1
Supplies to mix ORS	32.6	30.2
Microscope	30.2	46.5
Materials		
Patient register	100	100
Patient register for U5 children	2.3	7.0
Stock cards/drug book	90.7	83.7
Child vaccination cards	93.0	*100.0
Mothers' counseling cards	86.1	79.1
Recording mRDT status	69.8	*93.0
Infrastructure		
Refrigerator	90.7	97.7
If no refrigerator, ice packs and cold boxes	100	75.0
Sterilizer, cooker, stove	86.1	81.4
Electricity	81.4	81.4
Clean water source	65.1	67.4
Transport for referral	18.6	27.9
Designated triage area	18.6	14.0
Number of facilities	43	43

* p<=0.10; ** p<=0.05

Table 14 provides information about medicines available and stockout documentation in facilities on the day of the visit. The first-line treatment for malaria was more available in intervention facilities (95.4%) than in comparison facilities (65.1%). Just over half of all facilities had amoxicillin, the first-line drug for pneumonia. Record-keeping for drug stockouts was relatively high for medications related to IMCI treatment and also generally similar across comparison and intervention facilities. Drugs for pediatric HIV treatment were infrequently available and less frequently tracked in stockout forms.

Table 14. Inventory and tracking of medications in comparison and intervention facilities, 2015 HFS

	Comparison	Intervention	Comparison	Intervention
Drug	**In stock (%)**		**If stocked out, reflected in stockout form (%)**	
Oral rehydration solution (ORS)	95.4	93.0	100	100
Pneumonia				
Amoxicillin Syrup/Tablets	55.8	54.5	88.9	78.9
Erythromycin	39.5	44.2	100	91.7
Cotrimoxazole antibiotic tablets/syrup	67.4	67.4	100	92.9
Dysentery				
Zinc	83.7	81.4	100	87.5
Cotrimoxazole antibiotic tablets/syrup (dysentery)	65.1	62.8	100	87.5
Metronidazole tablets/syrup	32.6	34.9	100	*89.3
Another antibiotic recommended for dysentery	41.9	41.9	100	*88.5
Malaria				
Artemether-Lumefantrine	65.1	**95.4	93.3	100
Dihydroartemisinin plus Piperaquine (DPQ)	4.7	0.0	9.8	2.3
Quinine tablets	11.6	**37.21	57.9	53.6
Another antimalarial	51.2	53.5	4.8	5.0
HIV				
Ped Combivir (60mg/3TC 30mg)	25.6	37.2	9.4	7.1
Ped Ducvir N (AZT 60 mg/3TC 30mg/NVP 50mg)	34.9	51.2	3.6	13.6
Triomune Baby (c4t 6mg/3TC 30mg/NVP 50mg)	7.0	18.6	0.0	0.0
Efaverenz (200mg)	34.9	*53.5	7.1	0.0
Triomune Junior (c4T 12mg/ 3TC 30mg/ NVP 100mg)	4.7	**18.6	4.9	0.0
Other				
Vitamin A	69.8	**88.4	92.3	50.0
Iron	88.4	93.0	60.0	100
Paracetamol/aspirin	93.0	93.0	66.7	100
Mebendazol/albendazole	74.4	81.4	81.8	100
Tetracycline eye ointment	67.4	60.5	92.9	70.6
Gentian violet	2.3	9.3	14.3	5.0
Other vitamins	41.9	32.6	48.0	**10.0
Number of facilities	43	43	43	43

* p<=0.10; ** p<=0.05

Changes in Quality of Care during Tibu Homa

This section addresses research question #2: *What factors are associated with improved QOC? Do these factors differ between Phase 1 (three-day IMCI plus supportive components) and Phase 2 (dIMCI plus supportive components) facilities?*

Project performance-monitoring data provide information about changes in IMCI scores and compliance rates in Phase 1 (three-day IMCI training) and Phase 2 (dIMCI training) districts during Tibu Homa. The primary purpose of the analyses was to assess time trends over the course of the project and compare outcomes across the two different training modalities used by Tibu Homa. One additional difference between Phase 1 and Phase 2 was the QI implementation process: in Phase 1, QI approaches were tested and proven (or disproven). The most effective QI interventions were suggested for facilities participating during Phase 2. However, these QI efforts are likely to have small indirect effects on the main outcome here (IMCI score).[7] These data derive from case reviews completed by CHMT members and Tibu Homa staff reviewing patient records during SS&M visits.

Facility characteristics, case characteristics, and quality of care should be similar to make comparisons between Phase 1 and Phase 2 based on training modality. Table 12 shows the results of a comparison of these characteristics for Phase 1 and Phase 2 facilities engaged in the project. We found that HCWs' IMCI scores and full compliance rates were not statistically different at baseline for facilities in Phase 1 and Phase 2. Yet, some contextual differences are important for interpreting the results that follow. First, the Phase 1 facilities began the project two years earlier than Phase 2 facilities, and thus, in most cases participated for a longer period in the project (10 months versus 5.5 months participation in Phase 1 and Phase 2 facilities and districts, respectively). Second, Phase 1 districts and facilities were selected by the project based on having relatively high malaria prevalence, and thus the share of malaria cases was significantly higher in Phase 1 facilities (64.8%) compared with Phase 2 (35.5%), while the share of other illnesses were higher in Phase 2 facilities (46.3%) compared to Phase I (28.9%). There was also a higher proportion of dispensaries in the Phase 2 sample. Except for these differences, Phase 1 and Phase 2 cases were very similar based on case review characteristics at the first (baseline) visit (Table 15).

Table 15. Case review, diagnosis, and facility characteristics at baseline and 6-month follow-up SS&M visits in Phase 1 and Phase 2 Tibu Homa facilities, Tibu Homa performance monitoring data

Characteristics	Baseline†		Six months	
Case review characteristics	Phase 1	Phase 2	Phase 1	Phase 2
IMCI full compliance (%)††	1.4	1.7	27.8	29.9
IMCI score	5.3	5.5	7.5	**7.4
Male (%)	50.7	52.5	51.3	51.9
Diagnosis				
Malaria (%)	64.8	**35.5	54.1	**40.5
Pneumonia (%)	17.6	14.0	13.7	14.1
Diarrhea (%)	5.6	14.9	10.0	**13.5
Other (%)	28.9	**46.3	33.8	**41.9
Facility characteristics				
Dispensary (%)	62.0	**91.7	60.9	**87.0
Health center (%)	38.0	**8.3	39.1	**13.0
# months in Tibu Homa	0.0	0.0	10.0	**5.5
# Cases	**142**	**121**	**3,045**	**1,189**

[7] QI interventions were mainly focused on patient flow and supply chain, and would be expected to indirectly improve quality of care and/or availability of necessary equipment and/or supplies.

†Characteristics at first SS&M visit where facility had retained patient records

††Full compliance is defined as the percentage of cases that were assessed with all 10/10 steps in the IMCI algorithm.

**p≤0.05 for differences between Phase 1 and Phase 2 cases; reviewed at baseline and again at six months

Because very few facilities received more than six months of SS&M during Phase 2 of Tibu Homa, we present results comparing indicators across the two training modalities at their first month of SS&M (baseline) and at the 6-month SS&M visit (Table 16). Few indicators varied across project phases with regard to the project's performance indicators; this suggests that training modality (and QI approach) were not significant influences on these indicators. At baseline, Phase 2 facilities had a higher percentage of IMCI-trained staff and had received an SS&M visit in the previous month more frequently than Phase 1 facilities. After six months of receiving SS&M, Phase 2 facilities also had a higher percentage of U5 children who were tested for malaria by lab diagnostic (mRDT or microscopy), but fewer (lab-confirmed) positive malaria diagnoses.

Table 16. Performance indicators at baseline and six months of SS&M in Phase 1 and Phase 2 Tibu Homa facilities, Tibu Homa performance monitoring data

Performance indicators	Baseline		Month 6	
	Phase 1	Phase 2	Phase 1	Phase 2
Children U5 w/ fever attending facilities seen by skilled provider w/in 24 hours of onset of fever (%)	34.5	38.7	48.3	56.0
Children U5 w/ fever tested w/ lab (mRDT or microscopy) (%)	76.5	83.1	68.0	**95.1
Children U5 w/ fever w/ lab-confirmed malaria (mRDT or microscopy) (%)	54.6	49.4	57.0	**31.9
Children U5 w/ lab-confirmed malaria who received treatment w/ antimalarial (%)	89.7	95.5	90.4	95.3
Eligible OVC provided with a minimum of one CORE care service in the last month (#)	3.2	6.0	6.5	1.5
Tracer medications in stock today (#)	15.1	10.4	15.9	14.2
Health facilities reporting no stockout of key commodities during the reporting period (proportion)	0.70	0.53	0.60	0.46
Health facilities collecting and using data to improve management of febrile illnesses (proportion)	0.47	0.60	0.60	0.55
Health facilities with at least 60% of healthcare workers managing children trained in IMCI (proportion)	0.32	**0.68	0.37	**0.62
Staff who received a supervisory visit during reporting period (%)	59.5	**84.5	51.7	51.5
# Facilities	**30**	**27**	**30**	**11**

†Characteristics at first SS&M visit

**Difference between Phase 1 and Phase 2 indicator is significant at p≤0.05 at baseline and at the 6-month SS&M visit

Quality of Care Scores

Scores in both phases of Tibu Homa began at about 5/10 steps completed and improved over time to above 8/10 steps (Figure 5). In the first six months of the case review data collection (project months 0–5 for Phase 1 and 14–19 for Phase 2), Phase 1 facilities improved an average of 0.43 steps per month; Phase 2 facilities improved an average of 0.58 steps per month. During months 6–11 of supportive

supervision, Phase 1 facilities continued to improve at a slower rate (0.17 steps per month average improvement), while Phase 2 facilities leveled off (0.01 steps per month improvement).

Figure 5. IMCI score over time in Phase 1 and Phase 2 facilities from start of the project, Tibu Homa performance monitoring data

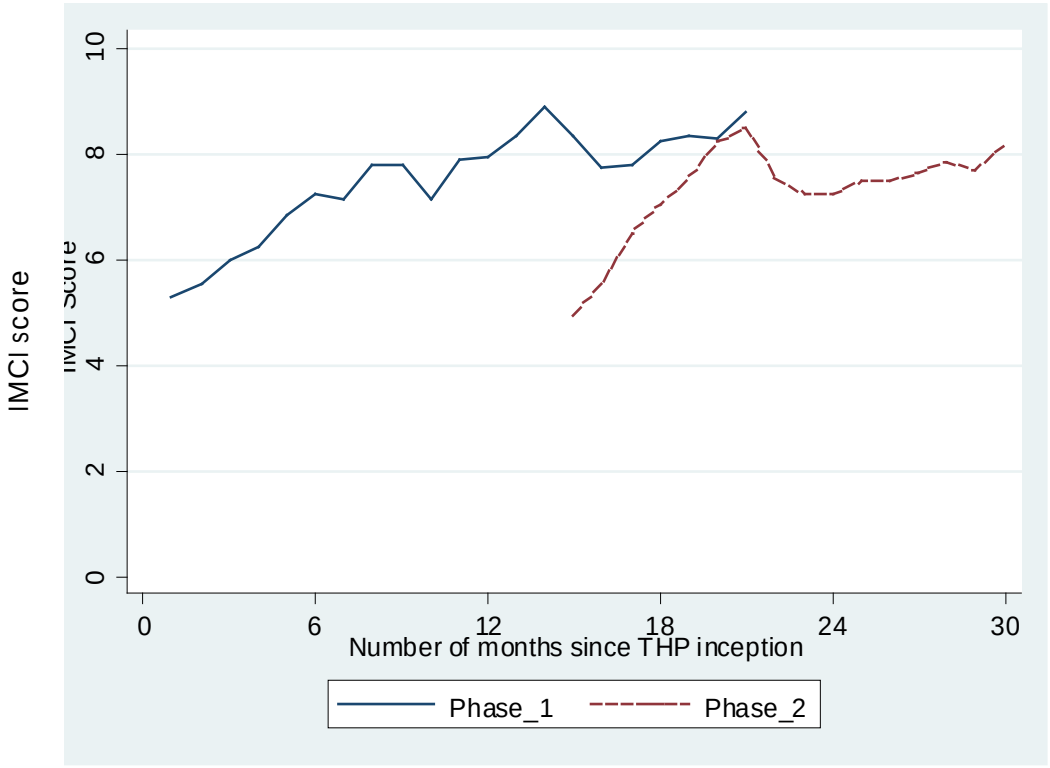


Table 17 provides information about factors associated with changes in IMCI scores, adjusting for project phase (training modality), case characteristics, facility characteristics, and time. Factors associated with higher IMCI scores are malaria, diarrhea, and pneumonia diagnoses (compared to all other diagnoses), number of months receiving SS&M, and being seen in a dispensary compared to a health facility. The percentage of children with fever seen within 24 hours of onset and the percentage of lab-confirmed positive malaria cases were also associated with IMCI scores, although with very small effect sizes.

Table 17. Factors associated with IMCI score over time in Tibu Homa facilities, Tibu Homa performance monitoring data

Variable	Coefficient
Training modality	
dIMCI (versus in-person 3-day IMCI training)	0.53
Sex	
Female	0.02
Diagnosis	
Malaria diagnosis (versus other diagnosis)	***0.62
Diarrhea diagnosis (versus other diagnosis)	***0.56
Pneumonia diagnosis (versus other diagnosis)	**0.44
Months receiving SS&M (#)	**0.11
Months since Tibu Homa began (#)	0.02
Facility type	
Dispensary (versus health center)	***1.16
Facility-level project indicators	
Children U5 with fever seen within 24 hours of onset (%)	**0.01
Children U5 with fever with lab-confirmed positive malaria diagnosis (%)	***-0.01
≥ 60% HCWs trained in IMCI/dIMCI	0.44
Tracer medicines in stock (#)	0.00
Proportion HFs reporting no stockout of key commodities	0.11
Facility is collecting and using data to improve case management	0.33

**p≤0.05; ***p≤0.001

IMCI scores for malaria and pneumonia diagnoses were also examined separately. Pneumonia cases' IMCI scores saw the greatest improvement during Tibu Homa, rising from 5.3 and 5.2 at baseline to 6.5 and 7.6 after six months, and with an overall average of 8.0 and 8.4 steps completed in Phase 1 and Phase 2 facilities, respectively. Pneumonia cases in Phase 2 facilities had higher IMCI scores at six months and overall compared with pneumonia cases in Phase 1 facilities.

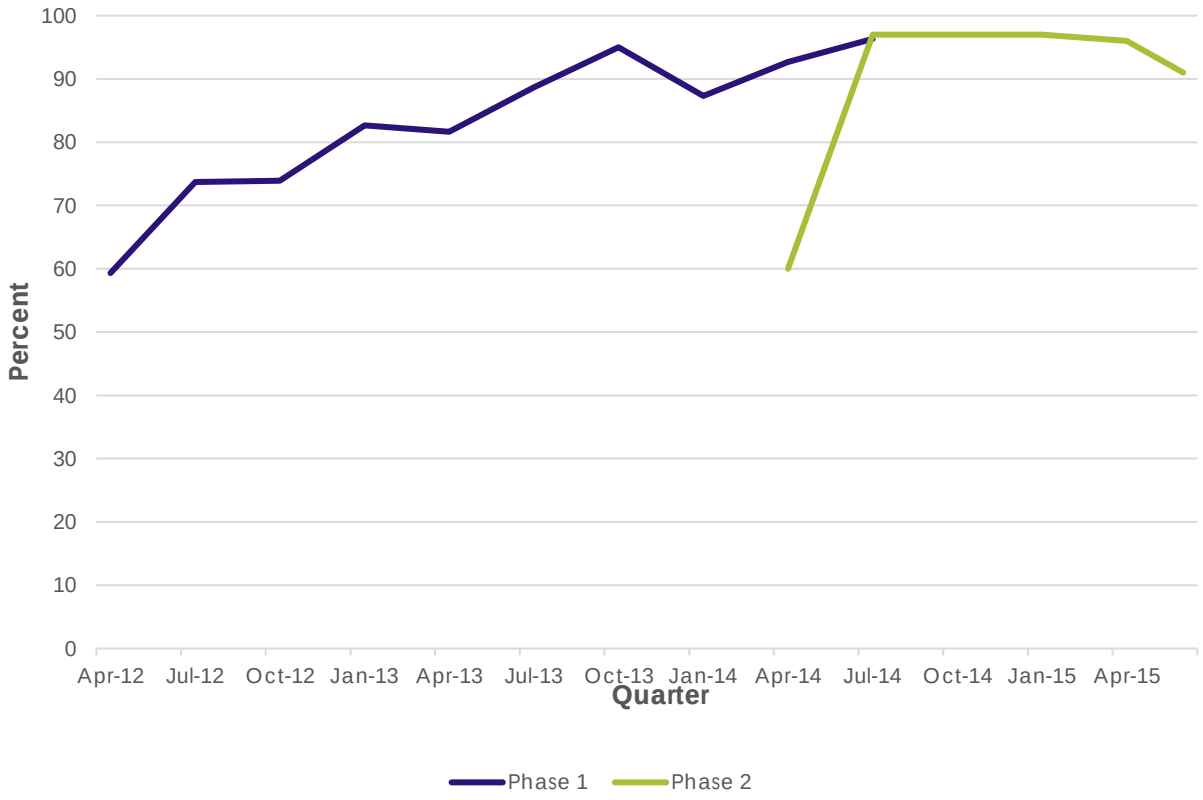
Supply Chain Management

Participating facilities' SCM staff received specialized training in managing commodities and logistics. They also received SS&M to monitor the management of the facilities' inventory tracking and ordering systems. Both training and SS&M were meant to serve as vehicles for improving availability of medicines and supplies in the facilities. The PQITs may also have tracked some of the SCM data, enabling improvements through that mechanism as well.

Figure 6 shows improvements made in the availability of medicines and diagnostics over the course of the program. Availability in facilities in both phases of Tibu Homa increased during the project to more than 90 percent of facilities having 10+ tracer first-line medicines and supplies. Assessing stockouts for specific medicines and supplies is not possible with program data. No practical difference existed in the

rate of improvement over time between Phase 1 and Phase 2 facilities in the first six months of entering the program.[8]

Figure 6. Percentage of facilities stocked with 10+ tracer first-line medicines and supplies at the time of visit (quarterly) by project phase, Tibu Homa performance monitoring data April 2012–June 2016

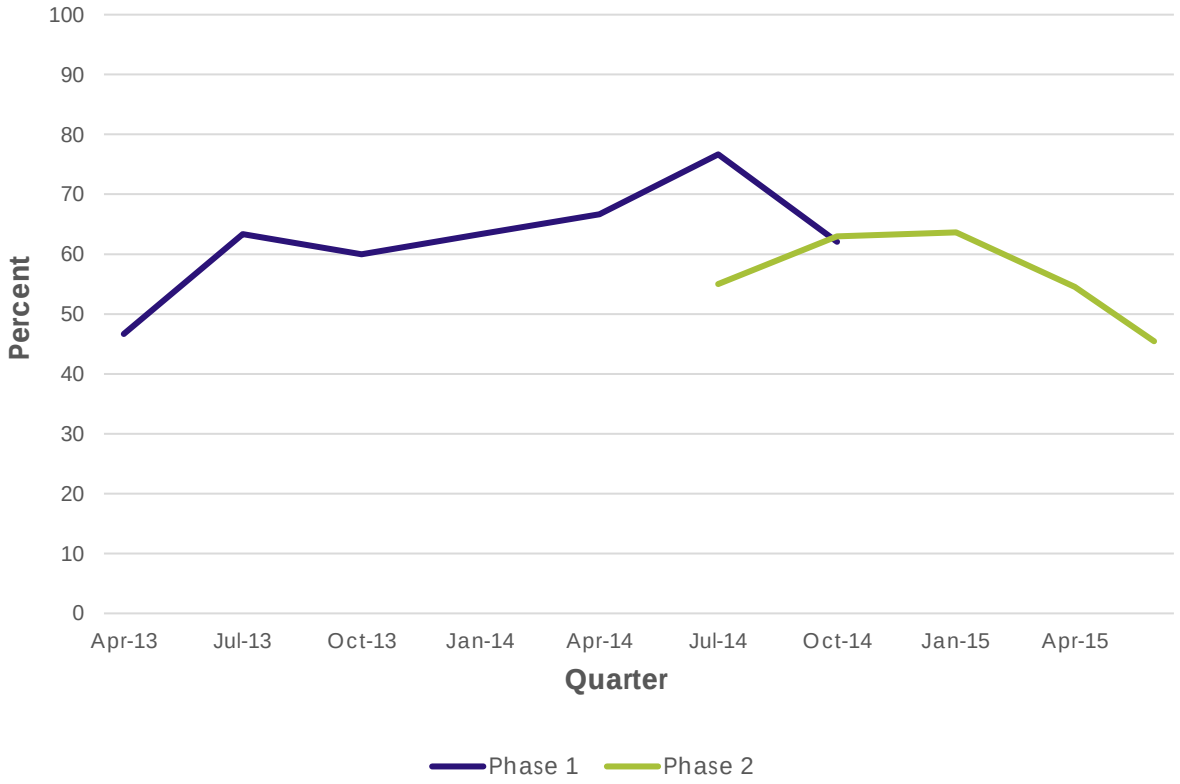


Pediatric Quality Improvement Teams

Program data included one indicator related to performance of PQITs: the percentage of facilities collecting and using data to improve management of febrile illness. The PQITs were the main vehicles for collecting and using data in facilities to improve febrile illness during the project. The time trend of this indicator is displayed in Figure 7 separately for Phase 1 and Phase 2 facilities. During Phase 1, facilities identified and tested improvements through the PQITs. In Phase 2, Tibu Homa staff developed a list of most successful improvements made by PQITs during Phase 1 and provided it to the facilities involved in Phase 2 as suggested options for improvement. Phase 2 facilities could choose to follow the information provided to them based on learning during Phase 1, or they could identify and test their own improvements.

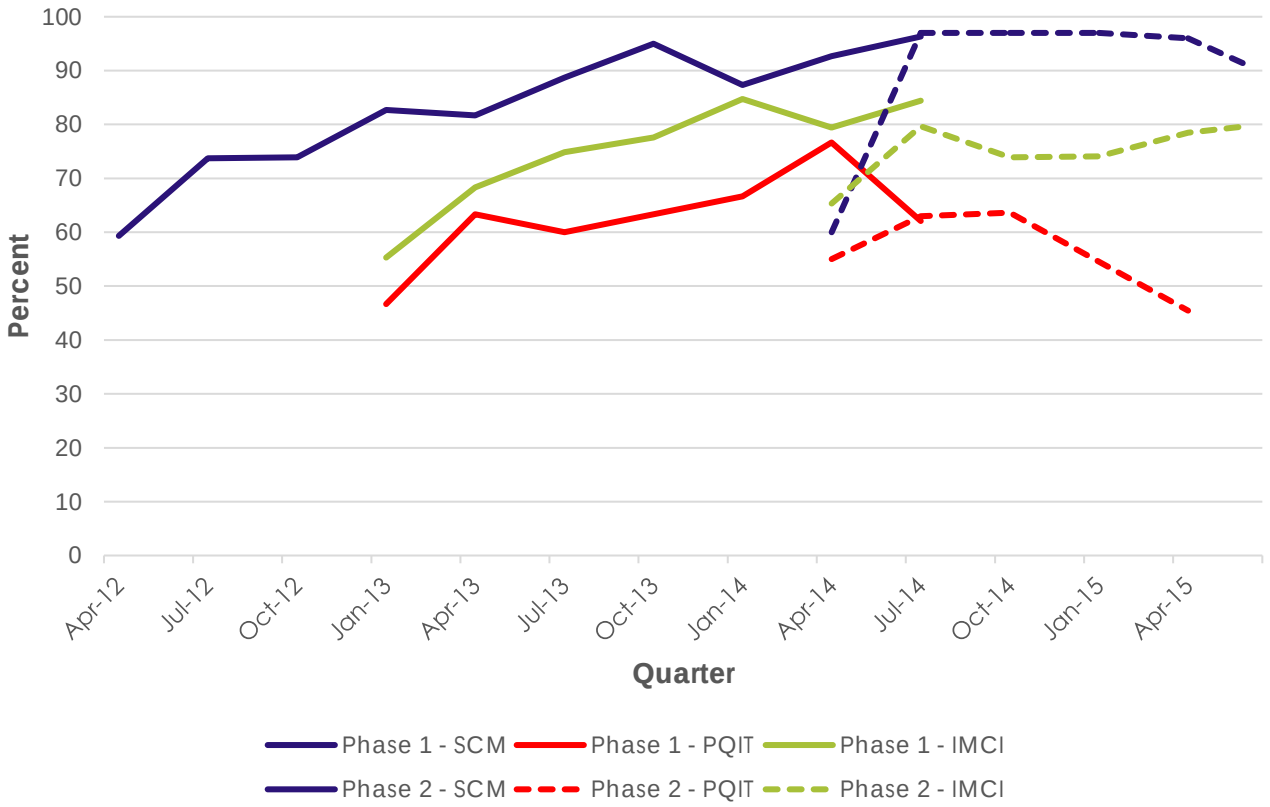
[8] A comparison is made between the two phases during the first six months of their respective program participation because Phase 1 lasted much longer than Phase 2. Phase 1 facilities had, on average, a greater number of tracer items at baseline and at six months, but the difference in the rate of improvement was less than 0.01 medicines per quarter in Phase 1 versus Phase 2 facilities.

Figure 7. Percentage of facilities collecting and using data to improve febrile illness, Tibu Homa performance monitoring data



Typical PQIT activities were: improving patient flow; implementing a triage system; collecting additional data on the time of onset of fever, mRDT results, and OVC status; introducing job aids; and improving record keeping and data management. Because many of these PQIT-related activities were designed to support improvements in QOC, it is informative to visualize whether the indicator shown in Figure 7 (percentage of facilities collecting and using data to improve febrile illness) trends with improvements in other areas. Figure 8 shows trends of PQIT performance, as measured by this indicator; supply chain management (the percentage of facilities with 10+ tracer items in stock); and QOC, or IMCI (the average percentage of IMCI steps completed in Phase 1 and Phase 2 facilities). Although there is a strong upward time trend for these indicators, no clear pattern emerges between PQIT performance and SCM, or PQIT performance and IMCI score. Because the Tibu Homa project was consistently implemented across facilities, it is not possible to parse the individual contribution of PQITs.

Figure 8. Quarterly trends in PQIT performance, SCM, and IMCI assessments during Tibu Homa, April 2012–April 2015



The Marginal Cost of Implementing the Tibu Homa Supportive Components

This section addresses research question #3: *What are the costs of the intervention components associated with improved QOC?*

Table 18 summarizes results from the cost study. It shows cost estimates per child receiving a full assessment (compliant with the IMCI Index of Integrated Assessment where the IMCI score is 10/10). It also shows costs where SS&M was provided and training was based on the Tibu Homa approach ("supportive components"). These two costs per child treated compliantly were calculated for dispensaries and health centers, and for an overall average of all facilities. The first cost was simply the cost per child treated compliantly for SS&M visits. For Scenario 1, this amounted to 8,140 TZ shillings per child for annual trainings and monthly SS&M (1 USD = 21,844.4804 TZS). The estimate for Scenario 2 is 7,695 TZ shillings for training every three years and eight SS&M visits per year. The second estimate added the costs of training to the costs for SS&M. Estimates that include supervisor and HCW training costs (exclusive of dIMCI training) are more than double the estimated cost per child: 17,964 TZ shillings for annual trainings and monthly SS&M (Scenario 1) and 10,970 TZ shillings for training every three years and eight SS&M visits per year (Scenario 2). Because the average number of children seen is higher in health facilities than in dispensaries, the package costs less per compliantly treated child in health facilities.

Table 18. Cost study summary

Item	Scenario 1*		Scenario 2**	
	TZS	USD***	TZS	USD***
Cost per SS&M visit	592,500	$270.74	592,500	$270.74
Training costs				
Average cost per TOT participant	872,800	$398.82	872,800	$398.82
Average cost per HCW participant	802,800	$366.83	802,800	$366.83
Average cost per supervision participant	868,800	$396.99	868,800	$396.99
Annualized overall SS&M training cost per supervisor	872,898	$398.86	290,966	$132.95
Average cost per compliant child in dispensaries				
For SS&M	9,989	$4.56	9,943	$4.54
For SS&M + training	22,043	$10.07	13,461	$6.15
Average cost per compliant child in health centers				
For SS&M	5,280	$2.41	4,991	$2.28
For SS&M + training	11,651	$5.32	7,115	$3.25
Average cost per compliant child in all facilities				
For SS&M	**8,140**	**$3.72**	**7,695**	**$3.52**
For SS&M + training	**17,964**	**$8.21**	**10,970**	**$5.01**

* Assumes annual training and support for monthly SS&M

** Assumes training every 3 years and 8 additional SS&M visits above the quarterly visits already in place

*** Exchange rate: 1 USD = 21,844.4804 TZS

PROJECT IMPLEMENTATION RESULTS

In this section, we summarize results from research question #s 4-7:

4. What have been the facilities' experiences implementing program activities?
5. What support did Tibu Homa provide to CHMTs?
6. Among phase one facility clusters, how well have program activities been sustained?

What was Tibu Homa's approach to community mobilization and how (and if) was the project successful in creating referral networks for children with fever and for orphans and vulnerable children (OVC)?[9]

Tibu Homa was designed to address many known barriers to successful implementation of the IMCI approach in Tanzania. This section summarizes strategies that were identified through our project document review and KI/SGIs with CHMT members and HCWs.

Time and Financial Cost of Training

The original 11-day IMCI training was challenging because of the cost per HCW and the time spent away from patient care (Ahmed, Mitchell, & Hedt, 2010; Goga & Muhe, 2011; WHO, 2014). The Tibu Homa project reduced the IMCI training time in Phase 1 to three in-person days, and converted to the three-day dIMCI training during Phase 2. Tibu Homa also embedded the expectation that trained HCWs would return to their posts and train their colleagues on IMCI guidelines.

Funding cuts and early project completion stymied Tibu Homa's initial plan to train more HCWs per facility. While some PQIT improvements resulted in time efficiencies, Tibu Homa was not designed to address workforce shortages. Frequent staff transfers and turnover resulted in a reduction of IMCI-trained staff, sometimes leaving a facility with no IMCI-skilled staff. Transferring staff also limited the ability of trained HCWs to practice IMCI skills (Goga & Muhe, 2011; Prosper, Macha, & Borghi, 2009).

Adherence to the IMCI Protocol

Studies have found that adherence to the IMCI protocol has been inadequate because of poor supervision, inadequate HCW motivation, reluctance to refer severely ill patients, lack of required drugs, and inconvenient facility layout (Kiplagat, Musto, Mwizamholya, & Morona, 2014; Prosper, et al., 2009; Leonard, Masatu, & Vialou, 2007; Walter, et al.,, 2009). We found that Tibu Homa's approach sought to address many of these problem areas. Some of these activities are noted in this section, and highlighted with quotes from study participants.

Supervision

Tibu Homa provided training on SS&M for R/CHMT members. The project also provided resources and support to conduct monthly SS&M that covered case management for IMCI. Qualitative respondents described their understanding of SS&M as a way to identify challenges and solutions:

[9] Detailed results regarding Tibu Homa's community mobilization activities have been provided separately by PSI.

You observe what a person is doing and through that, you can identify gaps and correct them. —CHMT member

You sit with HCWs and pass through the challenges they have and discuss the way forward and later put in an action plan. —CHMT member

HCWs also reported very positive experiences with SS&M:

With only distance learning, I was not yet competent, but with supportive supervision, I continued gaining experience. —HCW

Distance learning takes some time. We differ in rates of understanding…whenever supportive supervision comes, it continues to build him and gives him confidence. —HCW

Motivation

Regular SS&M was designed to motivate HCWs to adhere to the protocol. The SS&M also served as an accountability mechanism. The CHMTs charted IMCI compliance levels and reported that setting goals and tracking progress motivated HCWs. The HCWs reported they were motivated to achieve goals as a result of this process.

They had graphs which they affixed to the wall…for self-assessment…and when he or she looks at the graph, it motivates him or her if the graph is low to make it high. —HCW

At the end of the day, they tell us that your health centre has scored so and so marks. That means we get motivated – now we have 80 marks, let us take care so we do not lose performance. —HCW

It gives us the spirit to work even harder. —HCW

Facility-Level Inefficiencies

The PQITs identified structural and system-level gaps in services for children. With the support of Tibu Homa staff and SS&M provided by council health management teams, PQITs identified and implemented improvements during the project. Common facility-level improvements reported by respondents were as follows:

- Restructuring patient flow to reduce wait time at the lab by administering mRDTs in the consultation room
- Implementing a triage system
- Working with community leaders to create a community referral system for children with fever (see previous section on Community Mobilization)
- Collecting data on time of onset of fever, mRDT results, and OVC status
- Enhancing well-child clinic visits by including education about early care-seeking for children with fever
- Introducing job aids, such as IMCI flow charts
- Improving record keeping and data management

The CHMT members and HCWs reported that PQITs were an effective means for problem solving, and had a team-building effect. They also reported that CHMTs helped PQITs set goals and monitor progress.

This is the team that evaluates the functioning of the facility. It evaluates the weaknesses; it also evaluates our progress…It is the only team that solves problems at the facility.—HCW

We were documenting progress, so if we come this month and observe something and try to correct it, the next month we will observe to what extent has the situation changed.—CHMT member

If you have quality improvement, there must be indicators which you set and at the end you want to evaluate yourself … That is a very important thing in delivering services…It is better that HCWs…set their indicators and they will know at the end of the day what they have achieved. —CHMT member

Early Care-Seeking

The importance of early care-seeking was promoted both through SS&M and community engagement activities. Health promotion also was conducted at health facilities while patients waited. Although Tibu Homa supported referral systems at both facility and community levels, lack of transport and financing were persistent barriers.

Lack of Medicines

Lack of medicines was addressed through SCM training and SS&M for appropriate facility staff to track medicines and ensure timely ordering. Project staff also communicated with the Medical Stores Department to advocate for needed drugs and promote redistribution of drugs within districts where shortages existed or where drugs were reaching expiration. The Community Health Fund was promoted in several communities to raise resources for purchasing drugs in the private sector when needed.

Healthcare workers reported positive experiences with SS&M in building their skills in SCM:

We were recording our mRDT uses…we were able to identify our needs using the same forms. —HCW

We had forms to fill daily. Therefore, we actually knew what we had to order the day of ordering. —HCW

We are buying medicine according to the needs of the facility contrary to past days. —HCW

Tibu Homa activities did not focus on strengthening the capacity of the Medical Stores Department, the sole source of medicines to public facilities in the Lake Zone. Thus, even with high SCM performance in facilities, timely supplies of essential medicines were not guaranteed.

Sustainability

Sustainability for Tibu Homa hinges on financial resources for SS&M, and on conducting SS&M in a way that continues to work with HCWs in clinical mentorship that holds the facility and HCWs accountable. In addition, transport is a major challenge (insufficient fuel and vehicles).

The problem is, when the supportive supervision comes from the district, it depends on car transport. Whenever there is no fuel, they cannot make it.

Respondents report that SS&M is currently less comprehensive, and there is less focus on IMCI.

Supervision on IMCI has decreased.

We are still doing supportive supervision but what I should say is that what we do now is the routine supervision that is done in all other places because it is dictated by the availability of resources from the government…it is no longer as deep, comprehensive, and serious as *during the project.*

Community Health Promotion

A main component of IMCI is improving family and community health-seeking behaviors. Tibu Homa staff reported that the community mobilization activities implemented in Maswa District (Simiyu Region) and Kishapu District (Shinyanga Region) were highly effective in promoting early care-seeking because they incorporated outreach to active community social groups (CSGs) and traditional healers. In their final project report, Tibu Homa reported that the percentage of children under five identified with fever that were taken to a health facility within 24 hours of onset increased from 46% in March 2015 to 80% in June 2014 in Maswa District, and from 67% in July 2014 to 91% in June 2015 in Kishapu District (USAID & URC, 2015).

Community mobilization results derive mainly from qualitative data collection and are supplemented with information from Tibu Homa's performance monitoring data and the 2015 HFS. The primary purpose of exploring Tibu Homa's community mobilization approach is to describe the approach and to draw out lessons learned and to identify any successful strategies used to promote early care-seeking behavior for children under five with fever.

Roles of Various Actors

The findings of this qualitative component of the evaluation revealed that the main actors involved in implementing Tibu Homa activities at the community level were local leaders – elected or appointed officials – and volunteer community health workers (CHWs). These individuals educated community members and traditional healers on the importance of early care-seeking for children with fever and created a system for referring such children when identified in the community. Table 16 describes the roles of the various actors.

Table 19. Tibu Homa community mobilization actors and roles, focus group and KII discussions

Tibu Homa role	Position in the community	Role in community mobilization
Community coach	Elected or appointed political leaders such as village and hamlet chairpersons, village executive officers (VEOs)	• Oversaw the implementation of the community component in their jurisdiction • Convened village and hamlet meetings to promote early care seeking • Delivered early care-seeking messages at churches and mosques • Identified CHWs to work on the project • Sometimes assisted CHWs by attending meetings of CSGs to promote early care-seeking, by visiting households and by meeting with traditional healers • Formed and often served on the CQIT
CHW	Community volunteers	• Visited households to identify and refer children with fever; kept data on referrals • Identified OVC, referred if fever detected • Conducted outreach to traditional healers • Conducted outreach at CSG meetings • Formed art/drama/dance groups to promote early care seeking
Supervisor of CHW	VEOs	• Monitored and assisted CHWs • Aggregated data collected by CHWs, CSGs, and traditional healers on a monthly basis • Analyzed the data for trends (increases or decreases in percent of children seen in 24 hours of onset of fever, and in number of U5 deaths)
Community quality improvement team (CQIT) member	Same as community coaches	• Overlapped with community coaches; did not have a clearly defined separate role • Supposed to verify/approve the monthly data, but VEOs usually did this
Community social group (CSG) member	Community members of existing savings groups or income-generating groups	• Belonged to CSGs with 15–30 members; most were mixed male/female groups though some were all-female • Involved in income-generating activities or savings and lending • Agreed to be visited by CHWs and community coaches for sensitization on early care seeking • Agreed to gather monthly data on number of members' children with fever and number taken to a health facility within 24 hours • Encouraged by Tibu Homa to have a system for assisting members' children with fever with funds for transport
Traditional healer	Traditional healers	• Were mostly male • Usually saw about 5 children per week, fewer since Tibu Homa • Usually saw children brought for convulsions ("*degedege*") or worms ("*mchango*") • Agreed to be visited by CHWs and community coaches and to be sensitized on importance of referring children with fever to a health facility • Agreed to gather monthly data on number of children with fever brought for care and number referred to a health facility

We saw little variation in how Tibu Homa community mobilization activities were implemented across communities. There were some differences regarding the degree of involvement of community coaches and supervisors of CHWs in assisting CHWs with their work.

Early Care-Seeking Messages Delivered

The CHWs, community coaches, and supervisors worked together to educate the community on the importance of early care-seeking for children with fever. Tibu Homa messages were delivered at hamlet and village meetings convened by chairpersons, at monthly meetings of CSGs, and at churches and mosques. This information was also delivered through visits to households and traditional healers. In addition, CHWs formed art/drama/dance groups to promote early care-seeking.

Key informants and focus group participants readily recounted the main messages delivered by Tibu Homa. What follows are four primary messages and direct quotations from interviews and focus groups:

- Caregivers should take children with fever to a heath facility within 24 hours of onset of fever. This was reported repeatedly (and enthusiastically) by respondents of all types. *When a child suffers from fever in 24 hours, we must rush them to a health centre!* —CSG member
- Community members and caregivers should recognize the early signs of malaria and the consequences of not getting timely care. *Those symptoms…you find a child loses appetite, becoming weak, high temperature, vomiting…these were symptoms we were told.* —CSG member. *You can lose a child for no reason.* —CSG member
- Caregivers should not get medicine directly from pharmacies or visit a traditional healer; they should visit a health facility to determine the cause of fever. *In case of high temperature, one should rush to the hospital for diagnosis and treatment and not use herbs.* —CSG member. *You need to take him/her to hospital to test so that you know the specific illness he/she suffers from.* —CSG member
- Caregivers should share this information with their families and neighbors to educate them on the importance of early care-seeking.

Traditional healers from KIIs/SGIs reported receiving similar messages regarding the urgency of getting children checked by a health facility before receiving treatment. Here are a few examples:

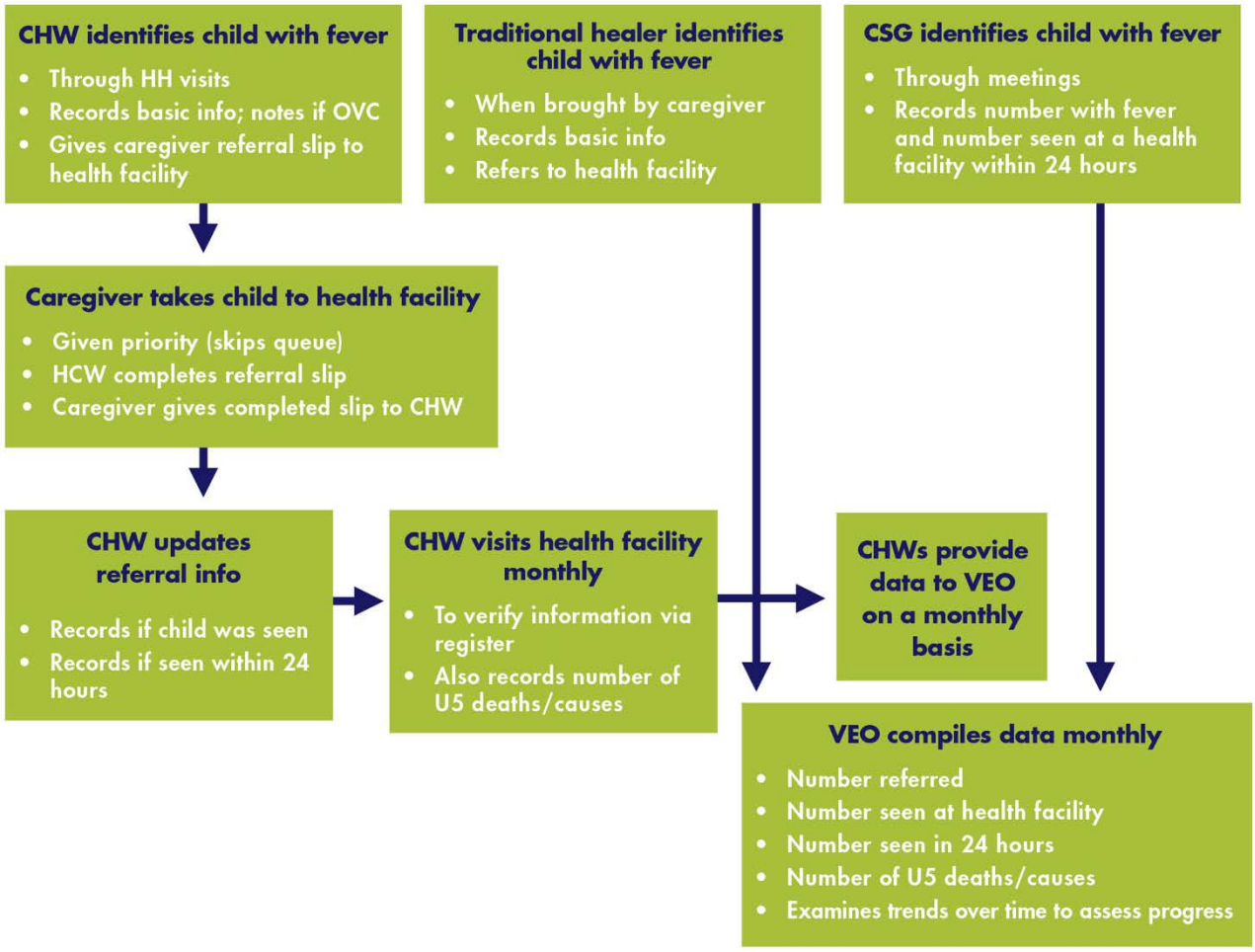
- *If there is fever, I will not take them [children] in. I tell them to go the hospital.* —Traditional healer
- *They told us if we observe these symptoms then we should immediately refer them to the hospital, then if they fail to treat them, they can return to us.* —Traditional healer
- *They told us that when you treat a person without being checked, there is the possibility of treating a disease the person is not suffering from and you can find yourself accelerating the disease or even causing death.* —Traditional healer

Community Referral for Children with Fever and OVC

Tibu Homa established a community referral system for children with fever. The intention was to refer OVC for care and support (in addition to treatment). However, respondents reported there were no special services for OVC, so they were folded into the system for referring all children with fever. Figure 9 shows how the referral system should work when fully functional. In practice, respondents reported variations across communities regarding the degree of data collection. Moreover, even though all

communities identified and referred children, only two of the four communities in the study reported they used referral forms; the other two relied on verbal referrals. The two that relied on verbal referrals collected data but used informal notebooks books to track referrals along with health facility registers. All communities reported that they continued to identify and refer children after Tibu Homa ended. However, only one community reported they were still using referral forms. None was still compiling and analyzing data.

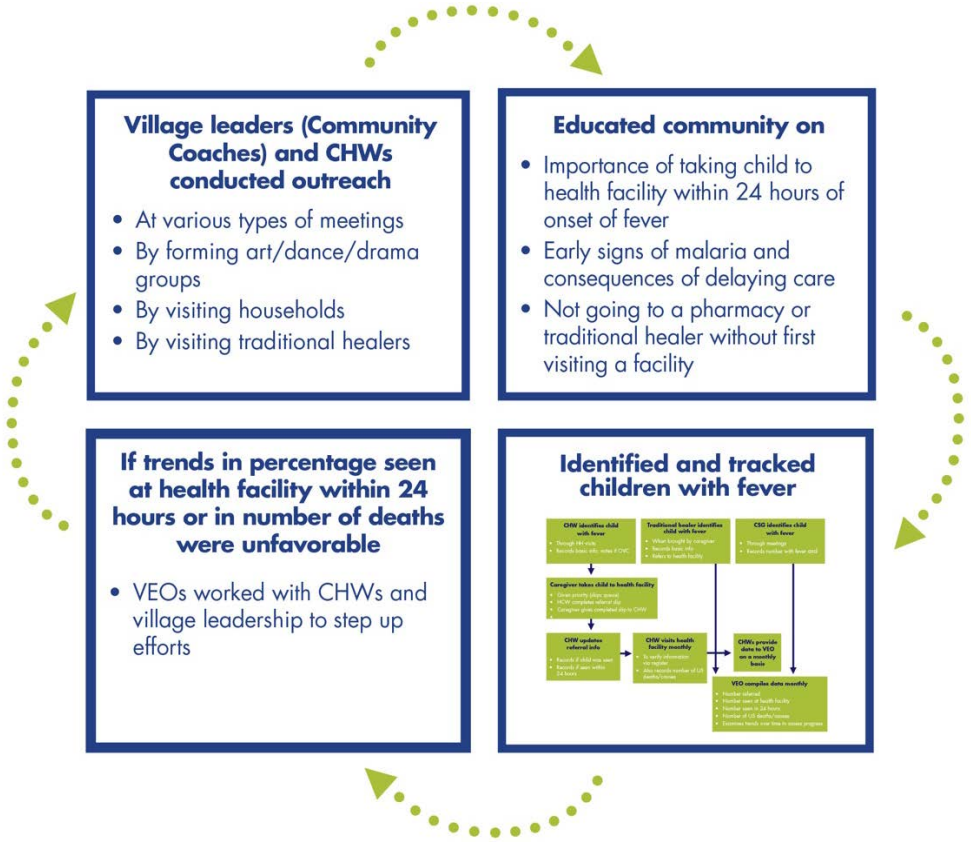
Figure 9. Community referral system for children with fever, focus group and KII discussions



Putting It All Together

When we examined the roles of the actors, messages, and community referral systems, a quality improvement approach to community mobilization emerged (see Figure 10; note that the box at the bottom right reproduces Figure 9, above, and is readable there). Village leaders and CHWs conducted outreach; the community was educated on the importance of early care-seeking for children with fever; children were referred and tracked; data were analyzed to track progress; and efforts were stepped up as needed.

Figure 10. Tibu Homa quality improvement approach to community mobilization, focus group and KII discussions



Barriers to Care-Seeking

Study participants were asked to describe ongoing barriers to care-seeking. While some barriers to care-seeking were addressed by community mobilization activities, gaps remain related to quality of service at health facilities, perceptions of the Community Health Insurance Fund (CHIF), distance to health facilities, and poverty. Barriers are grouped in the following six categories, highlighted with examples and quotes from study participants:

- Issues with quality of service at health facilities
    - Medicines are stocked out or clients are told to pay for medicine. *She goes to the dispensary and she will not get medication….she is told no medication; go and buy from a pharmacy…now she finds it is better to go buy directly from the pharmacy.* —CSG member.
    - *At the health center, there is no medication, and even if there is medication, she is told to pay…the parent feels even if I go to the health center it is a nuisance…better to go buy from a pharmacy.* —CSG member
    - Customer service can be poor. *The mother is confused…to be cross-examined why a child has no [child health] card…she decides to avoid and go for traditional medicine [or to] pharmacies to buy maybe Panadol…* —CSG member
    - Hours of service are limited. *You find there are no service providers…some time you go there at 3:00 or 4:00 pm when they are closed and you don't find them…now you decide to go help yourself and go to the pharmacy.* —CSG member

- There can be a language barrier. *When you go there, you find a nurse from Dodoma who does not know Sukuma, when she asks what the child is sick from, they do not understand one another.* —CHW

- Perceptions of the Community Health Insurance Fund and consequences of having no insurance
  - If you do not participate in the CHIF, you will not get care. *He/she goes to the hospital and is told, do you have insurance? No…she abuses you and abuses you and tells you I do not treat you, go home.*—CSG member
  - Medicines are reserved for those participating in the CHIF. *Most people have no health insurance, so when you go to the hospital, you are told that the available medicine is for those who are members, so you will have to buy.* —CSG member
- Lack of health-related knowledge
  - Some community members believe that convulsions (*degedege)* are a sign of being bewitched (*kurogwa*).
  - Some may not be able to identify early signs and symptoms of malaria, or they are not aware of the danger of delaying care.
- Preference for traditional healers
  - Community members may believe that convulsions mean one is bewitched.
  - Traditional healers speak Sukuma.
  - Traditional healers accept payment in-kind, are more affordable, and will accept alternative payments. *Maize or a bowl or cup of millet.* —CSG member
- Distance to health facility
  - Ten kilometers is considered far.
  - Communities have poor roads in general, and impassable roads during rainy season.
- Poverty
  - Community members lack funds to buy medicine (if there is a stockout or are told to buy medicine).
  - Community members lack funds for transport.

The Health Facility Survey collected information about barriers to completing onward referrals that also reflect ongoing barriers with referral networks. Table 20 shows reasons given about why providers were unable to refer a severely ill child. Financial constraints and transport were cited most often.

Table 20. Reasons providers were unable to refer a severely ill child by group, 2015 HFS

Reason reported*	Comparison	Intervention
Financial constraints	17/19 (89.5%)	8/13 (61.5%)
Transport	1/19 (5.3%)	4/13 (30.8%)
Prefer traditional healer	1/19 (5.3%)	1/13 (7.7%)
Parental beliefs	1/19 (5.3%)	0/13 (0%)
Total responses	19/43 (44.1%)	13/43 (30.2%)

Note: Multiple responses permitted

DISCUSSION

The IMCI approach was designed to address major causes of mortality at community, health facility, and health system levels (Gera, Shah, Garner, Richardson, & Sachdev, 2016). Tibu Homa was implemented to enhance the use of IMCI in the Lake Zone for a four-year period: 2011–2015. Evaluation of the project across two phases has revealed improvements in QOC for U5 children in Tibu Homa facilities, and has demonstrated the success of the Tibu Homa training and SS&M approach. However, most improvements were not sustained one year after the project ended. The evaluation also identified ongoing barriers to healthcare access and IMCI implementation.

Quality of Care

To reduce morbidity and mortality among U5 children, QOC must be improved. Tibu Homa has shown that increasing the proportion of IMCI-trained staff, and providing SS&M and SCM on a regular basis, are associated with improved QOC for U5 children. Providing additional training on the differential diagnosis of pneumonia and upper respiratory infection (URI), and improving availability of essential supplies, diagnostics, and equipment, could also improve QOC.

The three-day IMCI or dIMCI training packages combined with the Tibu Homa supportive components were associated with significant improvement in QOC for measures assessed during the project. (There were no significant differences between using in-person IMCI or dIMCI.) The abbreviated three-day training is an appealing alternative for countries that can't afford to saturate their healthcare workforce with the full 11-day IMCI training (Goga & Muhe, 2011). While dIMCI may be less costly than the conventional 11-day IMCI training, little research has been done to assess the use or cost effectiveness of dIMCI over the longer training (Mushi, et al., 2011). Research on this topic is forthcoming in Tanzania.

Evidence from the evaluation HFS shows that one year after Tibu Homa, diagnosis and treatment for malaria were highly accurate and effective. Malaria outcomes were similar in both intervention and comparison facilities, suggesting that dIMCI training and the availability and use of mRDTs may be enough to produce meaningful change. This finding refutes previous research that highlighted over diagnosis of malaria due to factors outside of the treatment guidelines (such as patient expectations and cultural norms) (Chandler, et al., 2008; Mosha, et al., 2010). The role of dIMCI is uncertain in influencing malaria outcomes observed. Perhaps due to mRDTs, children with malaria are receiving a higher standard of care in Tibu Homa facilities than those with pneumonia. At the same time, about one-quarter to one-third of children who do not need an antibiotic still receive a prescription.

Real change is still needed for diagnosing and treating children with pneumonia. Most misdiagnosed pneumonia cases were mistaken for URIs. Although diagnosis and treatment outcomes were better in intervention facilities than in comparison facilities, further improvements are needed in both groups. Pneumonia is the greatest cause of death among children under five years of age (WHO, 2014). The lack of diagnostics in health facilities and dispensaries requires HCWs to assess these children thoroughly.

Other research suggests that HCWs may know the proper assessment steps for pneumonia but fail to conduct them (Lange, Mwisongo, & Mæstad, 2013). Similar findings were observed in neighboring countries, where good-quality IMCI pneumonia case management (determined by counting the respiratory rate) was completed in only 16 percent of the children. This resulted in incorrect classification of 70 percent of children with pneumonia (Bjornstad, et al., 2013). Not counting the respiratory rate in both intervention and comparison facilities may have been because of large caseloads, providers

disregarding the importance of counting, and/or a lack of timing devices. Those who counted used cell phones with stop-watch applications. One intervention in Tanzania that provided additional training and supervision for respiratory illness resulted in worse treatment outcomes (Osterholt, et al., 2006). Any future targeting in this area should be closely monitored for effectiveness and unintended consequences.

Tibu Homa facilities were at a disadvantage when comparing some outcomes with the comparison facilities that may have resulted in underestimation of the project effects. One reason is that a much smaller percentage of HCWs in intervention facilities had been trained, and were trained for a longer time in advance of the survey. Both of these factors could disadvantage project facilities' outcomes and risk an underestimation of the project's association with QOC. However, many outcomes in Tibu Homa facilities were generally better than in comparison facilities, suggesting that the project improved QOC, and that the higher QOC was maintained over one year later compared with comparison group facilities despite these factors.

Supportive Supervision and Mentorship

The IMCI scores in facilities receiving dIMCI rose over the course of Tibu Homa; facilities participating up to 15 months achieved average scores of 8/10 steps completed. One year later, the scores had dropped to 6.3/10 in a sample of these intervention facilities surveyed, highlighting the importance of SS&M in maintaining QOC. The study's qualitative research also suggests that regular SS&M is an important component in maintaining QOC after training occurs. However, the cost study reveals how cost-intensive SS&M can be. While SS&M was provided monthly during Tibu Homa, only 40 percent of intervention and comparison facilities had received a supervision visit in the six months before the HFS.

The importance of regular, quality supervision is well-documented. Supervision can reinforce IMCI skills, stimulate HCW motivation, and enhance accountability (Armstrong Schellenberg, 2004; Steinhardt, et al., 2015; Pariyo, Gouws, Bryce, & Burnham, 2005; Prosper, et al., 2009; Kwesigabo, et al., 2012). Identifying sustainable methods for providing this service is paramount to the success of this strategy.

Findings of the association between SS&M and improved QOC in the Tibu Homa intervention are supported by other work in Tanzania. Research by the Tanzania IMCI multi-country Evaluation Health Facility Survey group showed that, in rural Tanzania, supervisory visits were associated with higher IMCI scores even if the facility was visited only once every six months (Bjornstad, et al., 2013; Goga & Muhe, 2011). These findings imply that there could be a relationship between the frequency of supervision and improvement in quality of care up to a particular optimum level that is yet to be determined in the Tanzanian setting. In the case of Tibu Homa, IMCI scores improved significantly for the first 5–6 months of SS&M, but improvement was slower after that. Testing an intervention with five to six months of intensive monthly SS&M may be a good starting point to determine minimum levels of SS&M required to improve QOC. Implementation of such an intervention requires that at least one member of the R/CHMT be trained in SS&M for IMCI, and that the necessary time, transport, and human resource be made available. Since SS&M within Tibu Homa used existing structures, it is possible that the visits will continue being implemented where resources exist.

The SS&M also supported on-the-job training using logistic mentors to focus on improving quantification and correct forecasting of medicines and supplies. Supply-chain management activities contributed to improving case management, by ensuring increased availability of medicines and supplies at the facility level. Performance monitoring data showed an improvement in the availability of commodities in Tibu Homa-supported facilities. However, Tibu Homa indicators are difficult to attribute to the project given the numerous external factors that also affect availability of medicines and supplies.

Supply Chain Management

Lack of basic equipment and supplies are critical for providing high QOC and for enabling HCWs to follow IMCI guidelines. Other than being able to prescribe medicines that are available in the immediate facility, HCWs should administer the first dose of medication at the facility. This gets the child on a path to wellness and provides an example for the caregiver to follow at home. Basic equipment needed to administer some therapies and treatments was rarely available in all facilities surveyed. In the future, a SCM module will be integrated into the dIMCI curriculum that may support better management and supply of necessary items.

Community Health Promotion

Health systems are complex networks that depend heavily on supply- and demand-side factors to produce healthy outcomes. Care-seeking behavior is one aspect of the demand-side of the health system addressed by Tibu Homa. The project's strategy to promote early care seeking for U5 children with fever seems to have left relevant institutionalized messages in communities. Community health workers, traditional healers, and others are poised to get children into facilities for treatment. However, when QOC in facilities does not live up to clients' expectations, or essential medicines are not available, the gains in health promotion activities may be lost (Leonard, Mliga, & Mariam, 2002). Structural barriers (such as lack of supplies, equipment, workforce shortages, and transport to facilitate referrals) work against improving supply factors in the healthcare system. This longstanding problem needs long-term solutions (Kwesigabo, et al., 2012). During Tibu Homa, HCWs had higher IMCI scores when managing children who were brought within 24 hours' onset of fever. This finding aligns with the continuum of care that exists when (1) a child falls sick with fever; (2) the child is immediately brought to a health facility; and (3) the child will receive good-quality care, and the illness will be managed well.

Other Findings

Based on results from the evaluation's HFS, more education is needed for providers in terms of referral for severe cases. Both groups of facilities only referred severe cases for 2/29 children. The gap of providing referral for severe cases has been observed in other studies, and to some extent may be related to providers' beliefs that the cases can be managed locally (Walter, et al., 2009; USAID, 2012).

Other Tibu Homa factors that may have had an impact on QOC but could not be measured independently for the evaluation were reduced waiting time by improving the patient flow in facilities; introduction of triage systems; new job aids and flowcharts available for patient care; and improvement of record keeping and data management, and the use of data in decision making.

Limitations

This study has used numerous sources of data to triangulate findings and provide evidence about the programmatic approaches used during the Tibu Homa project. However, due to data limitations, it was not possible to quantify the causal effect of the Tibu Homa intervention on QOC.

A comparison of quality of care was made between Tibu Homa facilities and non-Tibu Homa facilities one year after the project ended. The comparison group of facilities was selected in collaboration with stakeholders and was based on dIMCI training dates and geographic location. Other facility characteristics were adjusted in multivariate models to mitigate remaining differences between

comparison and intervention facilities' quality of care. However, unobserved and/or unmeasured differences at facility, patient, or provider-levels may exist that were not captured in the analysis. Further, the main outcome measure, the IMCI score, was measured using patient-provider observations. This is a strong method but is known to be subject to bias due to a potential for the Hawthorne effect.[10] None-the-less, the Hawthorne effect would result in an over-estimation of quality of care using patient-provider observations (as compared to quality of care provided in a typical setting that are not observed). Any Hawthorn effect, however, is expected to effect both comparison and intervention facilities in the same way and should not influence the difference in average IMCI scores between groups.

Although multivariate models were adjusted for the gender of the patient, sample size did not allow for disaggregated gender analyses. Where adjusted, gender was not a significant factor related to quality of care received.

The program collected a wealth performance monitoring data that were based on patient chart abstraction. These data were used in a time series analysis to understand how quality of care changed over the course of the Tibu Homa project. Although there were a large number of observations available to measure these changes, few covariates were available for analysis from the database that are able explain changes in the outcome trends. Given the significant efforts of the Tibu Homa project to improve quality of care, it is likely much of the changes observed were associated with project activities.

Summary

This retrospective evaluation draws on several sources of data to generate insights into the effects of Tibu Homa and its sustainability one year later. Results are generalizable to facilities that received dIMCI in the Lake Zone, and may be adapted for use in other areas. At the time of the evaluation's HFS, QOC was better in Tibu Homa facilities than in comparison facilities on several observed measures in unadjusted and adjusted analyses. Although it is not possible to assign this higher QOC to Tibu Homa activities owing to the post-only assessment, these results are encouraging and are supported by other sources of data. All indications suggest that the effect of Tibu Homa on QOC may be underestimated when compared with comparison facilities in Kigoma and Tabora. Time-series data available from performance monitoring suggest that QOC increased significantly during the project from a baseline level similar to the comparison districts' QOC at the time of the evaluation's HFS. These baseline levels in both sources of data, albeit at different points in time and regions, are consistent and comparable in terms of staff having received training but negligible follow-up or SS&M. A consistent body of evidence shows that provider training is not sufficient to improve QOC, but follow-up supervision and clinical mentorship are viewed as financially prohibitive (Goga & Muhe, 2011; Pariyo, Gouws, Bryce, & Burnham, 2005).

[10] The Hawthorne effect occurs when participants in a study alter their behavior because they are under observation (Lance P, Guilkey D, Hattori A, Angeles G, 2014).

CONCLUSIONS AND RECOMMENDATIONS

Based on this evaluation, we offer the following conclusions and recommendations.

- Tibu Homa's approach was associated with improved QOC both during the project and one year after the project ended. The facilities visited preferred SS&M to standard supervision, and evidence suggests it is effective in improving clinical practice. This aspect of the Tibu Homa approach is a high-cost intervention that may not be reasonably sustained by the GOT without outside funding, especially if it is to be provided monthly. **Recommendation: Expand training for CHMT members to transform the standard supervision to include clinical mentorship (such as the Tibu Homa approach) that aligns with GOT's new guidelines for clinical mentorship.**

  Owing to lack of funding, regularly scheduled SS&M visits are not likely to occur reliably in the near future. The following may be alternative approaches to funding regular SS&M in this context:

  - Identify external sources for supporting the current guidelines: one SS&M visit per quarter per facility with a longer-term goal of increasing the number of visits. This support should include reliable sources of funding for fuel and transportation.[11]
  - Explore cost containment strategies for SS&M visits.
  - Pilot CHMT check-ins via cellular technology for SS&M where in-person visits are not possible.
  - Explore other methods of accountability in the health system to ensure HCWs' and CHMT members' incentives are aligned with producing good quality of care, such as performance-based incentives.

- Results suggest that dIMCI training and mRDTs were sufficient for appropriate management of malaria cases. However, during Tibu Homa, only a small proportion of HCWs were trained per facility, and many were transferred. Although assessment for pneumonia improved the most over the course of Tibu Homa, accurate classification and treatment of pneumonia need more improvement in intervention and comparison facilities. **Recommendation: For HCWs who manage children, use high-coverage dIMCI training or preservice training followed by refresher trainings that are conducted via dIMCI. This approach may be sustainable and cost-effective. Continue supplementing dIMCI training with additional opportunities for clinical mentorship through SS&M and regular facility staff meetings, and consider additional support for improving differential diagnosis of pneumonia and appropriate referral.**

  - Investigate innovations in diagnostics for pneumonia that may be appropriate in Tanzania.
  - Ensure that low-cost timing devices are available at all times.
  - Conduct regular clinical mentorship focused on accurate classification and treatment of pneumonia, emphasizing that HCWs check for stridor/wheezing and count the respiratory rate.

[11] One DMO visited by the evaluation team had worked with four local NGOs to gain agreement for each to cover transportation for SS&M for one quarter per year, thus spreading the cost burden.

- Health centers provide a higher level of care and are a back-up for many dispensaries when referral is needed or medications are out-of-stock. During Tibu Homa, IMCI scores were lower in health centers than in dispensaries. This suggests that thorough assessment is possible even where resources are limited. Health centers may have more time constraints because of generally higher patient-to-HCW ratios, thus hindering HCWs' ability to spend enough time with each patient. Further research could shed light on potential factors creating this disparity. Comparison facilities with higher staff-to-patient ratios also had lower QOC measures regardless of facility type. Further, facility type was not a significant predictor of QOC when adjusted for facility volume in the multivariate model. Completion of the IMCI protocol is known to be more time-consuming than standard practice, creating barriers at times for providers who are overwhelmed with patients (Prosper, et al., 2009). **Recommendation: Explore this topic further to shed light on which factors related to facility type and patient volume are most important for improving QOC. Assess whether IMCI training could be tailored to differing challenges and settings (such as high- and low-volume facilities, or dispensaries and health centers).**
- Creating and maintaining demand from caregivers seeking medical advice for their children is highly influenced by perceived QOC in facilities (Leonard, Mliga, & Mariam, 2002). Tibu Homa's community promotion activities increased referrals for fever and institutionalized salient messages about care-seeking behavior. However, without good QOC in health facilities, these advances may quickly diminish. Caregivers whose children do not get the care they need at local facilities (because of inadequate assessment, misclassification, treatment, or medicines) may not return. This emphasizes the importance of strengthening the supply and demand sides of the healthcare systems to achieve greatest impact. **Recommendation: Continue to emphasize the importance of community-level referral for severely ill children and determine which structural barriers may be mitigated for HCWs and clients. Perception of HCWs about QOC at their referral facility is also an important component to consider. A more streamlined health promotion approach may attain similar results to the Tibu Homa Project while providing a simpler working approach.**
- Appropriate referral for severe cases from health facilities to higher levels of care is another area in need of support. Our HFS found that only 2/29 cases that needed referral were actually referred to a higher level of care. Many structural factors may inhibit referral for these cases. For example, only 23.3 percent of facilities had transportation for referral at the time of the HFS. **Recommendation: Similar to the above community-level referral recommendation, additional exploration may help determine which, if any, structural barriers may be mitigated both for HCWs and clients.**
- Almost all facilities lacked basic equipment and essential supplies, which can greatly impact QOC. **Recommendation: Continue to identify funding to procure essential supplies, diagnostics, and equipment, focusing on purchases for diagnosis and treatment of pneumonia and diarrhea that have the greatest potential for improving child health outcomes. One possibility would be to form a coordinated effort by CHMTs through the Community Health Fund and/or other funding initiatives such as the Tanzania Social Action Fund that focus on vulnerable children.**

REFERENCES

1. Ahmed, H.M., Mitchell, M., Hedt, B. (2010). National implementation of Integrated Management of Childhood Illness (IMCI): Policy constraints and strategies. *Health Policy*, 96(2), 128–133. Retrieved from: http://www.healthpolicyjrnl.com/article/S0168-8510(10)00028-X/abstract

2. Armstrong Schellenberg, J.R., Adam, T., Mshinda, H., Masanja, H., Kabadi G., Mukasa O., …Victora, C. (2004). Effectiveness and cost of facility-based Integrated Management of Childhood Illness (IMCI) in Tanzania. *The Lancet*, 364(9445), 1583–1594. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/15519628

3. Bjornstad, E., Preidis, G.A., Lufesi, N., Olson, D., Kamthunzi, P, Hosseinipour, M.C., McCollum, E.D. (2013). Determining the quality of IMCI pneumonia care in Malawian children. *Paediatrics and International Child Health,* 34(1), 29–36. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/24091151

4. Bryce, J., Victora, C.G., Habicht, J.P., Black, R.E., Scherpbier, R.W., & Multi-Country Evaluation-IMCI (MCE-IMCI) Technical Advisors. (2005). Programmatic pathways to child survival: Results of a multi-country evaluation of Integrated Management of Childhood Illness. *Health and Policy Planning*, 20 (Supplement 1), i5–i17. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/16306070

5. Bryce, J., Victora, C.G., Habicht, J.-P., Vaughan, J.P., & Black, R.E. (2004). The multi-country evaluation of the integrated management of childhood illness strategy: Lessons for the evaluation of public health interventions. *American Journal of Public Health,* 94(3), 406–415. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1448266/

6. Chandler, C.I., Jones, C., Boniface, G., Juma, K., Reyburn, H., & Whitty, C.J. (2008). Guidelines and mindlines: Why do clinical staff over-diagnose malaria in Tanzania? A qualitative study. *Malaria Journal*, 7:53. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/18384669

7. Gera, T., Shah, D., Garner, P., Richardson, M., & Sachdev, H.S. (2016). Integrated management of childhood illness (IMCI) strategy for children under five. *Cochrane Database of Systematic Reviews*. June, (6), 1–61. Retrieved from: http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD010123.pub2/abstract

8. Goga, A.E., & Muhe, L.M. (2011). Global challenges with scaling up of IMCI strategy: Results of multicountry survey. *BMC Public Health*, June 27, (11), 503. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/21708029

9. Kiplagat,, A., Musto, R., Mwizamholya, D., & Moron, D. (2014). Factors influencing the implementation of integrated management of childhood illness (IMCI) by healthcare workers at public health centers and dispensaries in Mwanza, Tanzania. *BMC Public Health*, 14:277.

10. Kwesigabo, G., Mwangu, M.A., Kakoko, D.C., Warriner, I., Mkony, C.A., Killewo, J., . . . Freeman, P (2012). Tanzania's health system and workforce crisis. *Journal of Public Health Policy,* 33(1), S35–44. Retrieved from: https:/www.ncbi.nlm.nih.gov/pubmed/23254848

11. Lance, P., Guilkey, D., Hattori, A. & Angeles G. (2014). How do we know if a program made a difference? A guide to statistical methods for program impact evaluation. Chapel Hill, North Carolina. MEASURE Evaluation. Retrieved from: https://www.measureevaluation.org/resources/publications/ms-14-87-en

12. Lange, S., Mwisongo, A., & Mæstad, O. (2014). Why don't clinicians adhere more consistently to guidelines for the Integrated Management of Childhood Illness (IMCI)? *Social Science and Medicine.* March (104) 56–63. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/24581062

13. Leonard, K. L., & Masatu, M.C. (2006). Outpatient process quality evaluation and the Hawthorne Effect. *Social Science and Medicine*, 63(9), 2330–2340. Retrieved from: http://econpapers.repec.org/article/eeesocmed/v_3a63_3ay_3a2006_3ai_3a9_3ap_3a2330-2340.htm

14. Leonard, K.L., Masatu, M.C., & Vialou, A. (2007). Getting doctors to do their best: The roles of ability and motivation in health care quality. *Journal of Human Resources,* 42(3), 682–700.Retrieved from: http://jhr.uwpress.org/content/XLII/3/682.short

15. Leonard, K.L., Mliga, G.R., & Mariam, D.H. (2002). Bypassing health centres in Tanzania: Revealed preferences for quality. *Journal of African Economies*, 11(4), 441–471. Retrieved from: https://academic.oup.com/jae/article-abstract/11/4/441/750225/Bypassing-Health-Centres-in-Tanzania-Revealed

16. Liu, L., Oza, S., Hogan, D., Perin, J., Rudan, I., Lawn, J.E., . . . Black, R.E. (2015). Global, regional, and national causes of child mortality in 2000–2013, with projections to inform post-2015 priorities: An updated systematic analysis. *The Lancet*, 385(9966), 430–440. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/25280870

17. Mosha, J.F., Conteh, L., Tediosi, F., Gesase, S., Bruce, J., Chandramohan, D., & Gosling, R. (2010) Cost implications of improving malaria diagnosis: Findings from North-Eastern Tanzania. *PLoS ONE* 5(1), e8707. Retrieved from: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0008707

18. Mushi, H.P., Mullei, K., Macha, J., Wafula, F., Borghi, J., Goodman, C., & Gilson, L. (2010). The challenges of achieving high training coverage for IMCI: Case studies from Kenya and Tanzania. *Health Policy and Planning*; 26(5), 395–404. Retrieved from: https://academic.oup.com/heapol/article/26/5/395/738953/The-challenges-of-achieving-high-training-coverage

19. Osterholt, D.M., Rowe, A.K., Hamel, M.J., Flanders, W.D., Mkandala, C., Marum, L.H., & Kaimila, N (2006). Predictors of treatment error for children with uncomplicated malaria seen as outpatients in Blantyre district, Malawi. *Tropical Medicine and International Health.* 11(8), 1147–1156. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/16903878

20. Pariyo, G.W., Gouws, E., Bryce, J., Burnham, G., & Uganda IMCI Impact Study Team. (2005). Improving facility-based care for sick children in Uganda: Training is not enough. *Health Policy and Planning*, 20 (Supplement 1), i58-i68. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/16306071

21. Prosper, H., Macha, J., & Borghi, J. (2009). *Implementation of integrated management of childhood illness in Tanzania: Success and challenges.* Report. Dar es Salaam: Consortium for Research on Equitable Health Systems and Ifakara Health Institute. Retrieved from: http://www.crehs.lshtm.ac.uk/downloads/publications/Implementation_of_IMCI_in_Tanzania.pdf

22. Rowe, A.K., de Savigny, D., Lanata, C.F., & Victora, C.G. (2005). How can we achieve and maintain high-quality performance of health workers in low-resource settings? *The Lancet*, 366(9490), 1026–1035. Retrieved from: https:/www.ncbi.nlm.nih.gov/pubmed/16168785

23. Steinhardt, L.C., Onikpo, F., Kouamé, J., Piercefield, E., Lama, M., Deming, M.S., & Rowe, A.K. (2015). Predictors of health worker performance after Integrated Management of Childhood Illness training in Benin: A cohort study. *BMC Health Services Research*. July (15), e276. Retrieved from: https://www.ncbi.nlm.nih.gov/pubmed/26194895

24. Tanzania Commission for AIDS (TACAIDS), Zanzibar AIDS Commission (ZAC), National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS), & Macro International Inc.(2008). *Tanzania HIV/AIDS and malaria indicator survey 2007-08*. Dar es Salaam, Tanzania: TACAIDS, ZAC, NBS, OCGS, and Macro International Inc. Retrieved from: https://dhsprogram.com/pubs/pdf/AIS6/AIS6_05_14_09.pdf

25. United States Agency for International Development (USAID). (2012). Report of the Tanzania assessment of community services for childhood illness. Washington, DC: USAID.

26. United States Agency for International Development (USAID) & University Research Company, LLC (URC). (2015). The USAID Diagnosis and Management of Severe Febrile illness Program (Tibu Homa) end of project report, March 2011–September 2015. Washington, DC: USAID.

27. Walter, N.D., Lyimo, T., Skarbinski, J., Metta, E., Kahigwa, E., Flannery, B., . . . Kachur, S.P. (2009). Why first-level health workers fail to follow guidelines for managing severe disease in children in the coast region, the United Republic of Tanzania. *Bulletin of the World Health Organization*; 87(2), 99–107. Retrieved from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2636200/

28. World Health Organization (2003). *Health facility survey: Tool to evaluate the quality of care delivered to sick children attending outpatient facilities*. Geneva, Switzerland: WHO. Retrieved from: http://www.who.int/maternal_child_adolescent/documents/9241545860/en/

29. World Health Organization. (2005). *Handbook: IMCI integrated management of childhood illness*. Geneva, Switzerland: WHO. Retrieved from: http://apps.who.int/iris/bitstream/10665/42939/1/9241546441.pdf

30. World Health Organization (2013). *United Republic of Tanzania: Neonatal and child health profile*. Geneva, Switzerland: WHO. Retrieved from: http://www.who.int/maternal_child_adolescent/epidemiology/profiles/neonatal_child/tza.pdf.

31. World Health Organization. (2014). *IMCI distance learning course: Introduction and rollout*. Geneva, Switzerland: WHO. Retrieved from:

http://apps.who.int/iris/bitstream/10665/104772/14/9789241506823_Introduction_roll-out_eng.pdf.

APPENDIX 1. EVALUATION METHODS AND LIMITATIONS

Table 21. Tibu Homa evaluation research questions, sources of information, key research questions/themes, and responsible organization

Primary research questions	Source of information (method)	Secondary research questions/themes	Org.
QUALITY OF CARE			
What is the value associated with dIMCI training and Tibu Homa's supportive components versus the QOC provided in comparison facilities that received dIMCI training without the supportive components?	Health facility survey (HFS) with primary data collection (Quantitative, cross-sectional bivariate and multivariate analysis)	• What factors are associated with improved QOC as measured by HCW performance using the IMCI algorithm? • Do these factors differ between intervention and comparison facilities? • Do these factors differ by diagnosis (such as malaria, pneumonia)?	MEASURE Evaluation
What factors are associated with improved QOC? Do these factors differ between Phase 1 (three-day IMCI plus supportive components) and Phase 2 (dIMCI plus supportive components) facilities?	Tibu Homa project data (Quantitative, secondary bivariate and multivariate time series analysis)	• Compare and contrast changes in QOC in Phase 1 versus Phase 2 Tibu Homa facilities over time for U5 children with fever. • Compare and contrast changes in QOC in Phase 1 versus Phase 2 Tibu Homa facilities over time for malaria and pneumonia diagnoses.	
What are the costs of the supportive intervention components associated with improved QOC?	Cost data (Cost study)	• What is the marginal cost of implementing the supportive components as measured by the cost per U5 child with fever receiving fully compliant care?	
PROJECT IMPLEMENTATION			
What have been the facilities' experiences implementing program activities?	Key informant/small group interviews (KI/SGIs) with CHMT members and HCWs (Qualitative)	• In what ways has Tibu Homa affected QOC? • What are the pathways through which Tibu Homa activities affected QOC (such as IMCI training, QI, SCM, SS&M)? • What are barriers and facilitators for improving targeted outcomes?	
What support did Tibu Homa provide to CHMTs?	KI/SGIs with CHMT members and HCWs (Qualitative)	• What were the experiences of the CHMT members in supporting improvements in QOC, QI, and SCM?	
What program activities have been sustained?	KI/SGIs with CHMT members and HCWs (Qualitative)	• Which Tibu Homa activities are still in place? • Does involvement of CHMTs contribute to sustainability of project activities?	

Primary research questions	Source of information (method)	Secondary research questions/themes	Org.
What was Tibu Homa's approach to community mobilization and how was the project successful (if it was) in creating referral networks for children with fever and for orphans and vulnerable children (OVC)?	Focus group discussions (FGDs) and KI/SGIs with key actors involved in community mobilization (Qualitative)	• Describe the approach to community mobilization. • How were existing active community groups identified and engaged in health promotion? • What health promotion activities were conducted? • Were community referral networks successfully created?	PSI

APPENDIX 2. ADDITIONAL TABLES

Table 22. Summary of WHO HFS Indicators

Indicator	Comparison	Intervention
Patient care indicators		
Child is correctly classified (%)	56.0	62.3
Child needing referral is referred† (%)	13.3	0.0
Child with malaria correctly treated (%)	96.2	94.7
Child with non-severe pneumonia correctly treated (%)	57.1	71.4
Nonurgent children who need an antibiotic get the correct Antibiotic (%)	**42.7	32.8
Nonurgent children not needing an antibiotic who don't get one (%)	31.0	25.7
Total number of observations	**232**	**208**
Facility indicators		
Availability of equipment and commodities		
Index of availability of essential oral treatments	5.9	**6.3
Index of availability of injectable drugs for prereferral treatment	2.2	2.4
Health facility has essential equipment and materials (%)	0.0	2.3
Support and training		
Health facility received at least one supervisory visit that included observation of case management during the previous six months (%)	40.0	40.0
Health facilities with at least 60% of workers managing children trained in dIMCI (%)	**58.1	14.0
Health facilities with at least 60% of workers managing children trained in IMCI or dIMCI (%)	**93.0	44.2
Number of facilities	**43**	**43**

** p<=0.05

†Cell sizes too small to conduct reliable significance test.

Table 23. IMCI scores by HCW type, 2015 HFS

HCW characteristics	Comparison (n=45)	Intervention (n=49)
HCW type		
Physician/clinical officer/assistant medical officer	5.5	6.5
Nursing officer/enrolled nurse/public health nurse	5.7	6.5
Medical assistant	NA	5.2
Other	4.5	NA
Total	5.5	***6.3

* p<=0.10; ** p<=0.05; *** p<=0.001

Table 24. Provider, patient, and facility characteristics for malaria and pneumonia diagnoses, 2015 HFS

Characteristics	Malaria	Pneumonia
Tibu Homa facility	*1.85	3.07
HCW characteristics		
Provider trained in dIMCI	*1.35	*1.66
Provider referenced IMCI chart	**-1.25	0.65
Patient characteristics		
Patient age in years	-0.05	0.09
Patient is male	0.22	0.52
Facility characteristics		
Facility is health center	0.00	1.10
Facility has working baby scale	1.25	-0.05
Facility has microscope	-0.27	-0.72
Facility has IMCI chart book	1.06	0.65
Facility volume of children 2-59 months (March 2016)		
100–150 children	-0.48	-0.78
150–200 children	1.58	0.64
200–325 children	0.61	-1.03
325+ children	**2.57	1.86
Number of observations	**127**	**66**

* p≤0.10; **p≤0.05;

APPENDIX 3. LIST OF INDICATORS BY SOURCE

Tibu Homa Performance Management Database, Project Indicators

- Percent U5s with fever attending facilities and seen by skilled provider within 24 hours
- Percent U5s with fever tested with lab
- Percent U5s with fever with lab-confirmed malaria
- Percent U5s with lab-confirmed malaria who received antimalarial
- Number of eligible OVC provided with 1+ CORE serve, last month
- Number of tracer meds in stock today
- Quarterly: percent of health facilities reporting no stockout of key commodities
- Quarterly: proportion of HFs collecting and using data to improve management of febrile illness
- Quarterly: proportion of HFs with at least 60% of HCWs managing children trained in IMCI
- Percent of staff received SS in last month
- Percent U5s with fever who received antimalarial after testing

WHO Health Facility Survey, Key Indicators

Service Provision

- Child checked for three general danger signs
- Child checked for the presence of cough, diarrhea, and fever
- Child weight checked against a growth chart.
- Child vaccination status checked
- Index of integrated assessment (IMCI score)

Classification

- Child is correctly classified
- Child with pneumonia correctly classified
- Child with malaria correctly classified

Treatment

- Child with pneumonia correctly treated
- Child with malaria correctly treated
- Child needing an oral antibiotic and/or an antimalarial is prescribed the drug correctly
- Child not needing antibiotic leaves the facility without antibiotic.
- Child needing referral is referred

Health Facility Preparedness

- Health facility received at least one supervisory visit that included observation of case management during the previous six months
- Index of availability of essential oral treatments
- Index of availability of injectable drugs for pre-referral treatment
- Health facilities with at least 60% of workers managing children trained in IMCI
- Health facility has essential equipment and materials

MEASURE Evaluation
University of North Carolina at Chapel Hill
400 Meadowmont Village Circle, 3rd Floor
Chapel Hill, North Carolina 27517
Phone: +1-919-445-9359 • measure@unc.edu
www.measureevaluation.org

This publication was produced with the support of the United States Agency for International Development (USAID) under the terms of MEASURE Evaluation cooperative agreement AID-OAA-L 00004. MEASURE Evaluation is implemented by the Carolina Population Center, University of North Carolina at Chapel Hill in partnership with ICF International; John Snow, Inc.; Management Science Health; Palladium; and Tulane University. Views expressed are not necessarily those of USAID or the United States government. This report was prepared independently by Emily Weaver, MEASURE Evaluation (team leader); Milissa Markiewicz, MEASURE Evaluation; and Gideon Kwesigabo and Joe Lugalla, both of Health and Development International Consultants. TRE-17-1