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Assessment of ICCM Implementation Strength and Quality of Care in Oromia, Ethiopia

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STUDY TEAM

Study conception: Nathan Miller, Agbessi Amouzou, Jennifer Bryce, Cesar Victora, Robert Black
Study implementation: Nathan Miller, Mengistu Tafesse, Agbessi Amouzou, Elizabeth Hazel, Markos Feleke, Eyob Kifle, Taye Tolera
Report writing: Nathan Miller
Report editing: Agbessi Amouzou, Jennifer Bryce, Cesar Victora, Robert Black, Elizabeth Hazel

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CONTENTS

ACRONYMS

ABH	Alliance for Better Health
ACT	Artemisinin-Based Combination Therapy
CCM	Community Case Management of Common Childhood Illnesses
CI	Confidence Interval
CIDA	Canadian International Development Agency
FMOH	Federal Ministry of Health
HDA	Health Development Army
HEP	Health Extension Program
HEW	Health Extension Worker
HF	Health Facility
HSA	Health Surveillance Assistant
ICCM	Integrated Community Case Management of Common Childhood Illnesses
IFHP	Integrated Family Health Program
IIP-JHU	Institute for International Programs at Johns Hopkins University
IMNCI	Integrated Management of Newborn and Childhood Illnesses
L10K	Last 10 Kilometers Project
MUAC	Middle Upper Arm Circumference
ORHB	Oromia Regional Health Bureau
ORS	Oral Rehydration Salts
OTP	Outpatient Therapeutic Program
PRCM	Performance Review and Clinical Mentoring
RDT	Rapid Diagnostic Test
RUTF	Ready-To-Use Therapeutic Food
SAM	Severe Acute Malnutrition
SNNP	Southern Nations, Nationalities and Peoples
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VCHW	Volunteer Community Health Workers

EXECUTIVE SUMMARY

INTRODUCTION

Following the national policy change supporting community-based treatment of childhood pneumonia, Ethiopia is scaling-up integrated community case management of childhood illnesses (iCCM). Community case management of childhood pneumonia with cotrimoxazole and zinc for treatment of diarrhea are being introduced in addition to the existing management of malaria with artemisinin-based combination therapy or chloroquine, diarrhea with oral rehydration salts, and severe acute malnutrition with ready-to-use therapeutic foods. The program intends to strengthen the capacity of Health Extension Workers (HEWs) to assess, classify, and treat iCCM illnesses through refresher trainings, strengthened supervision, improved supply chain management for essential drugs and supplies, and improved monitoring and evaluation.

The Institute for International Programs at the Johns Hopkins Bloomberg School of Public Health (IIP-JHU) was commissioned by CIDA and UNICEF to conduct an independent prospective evaluation of the implementation of iCCM in Ethiopia. The evaluation will assess the impact of the rapid scale-up of iCCM on increases in coverage of child survival interventions, reductions in child mortality, and improvement in nutritional status among children under five years of age. The evaluation is being conducted in Jimma and West Hararghe zones of Oromia region. Within each zone, rural woredas were randomly assigned to intervention and comparison arms, with 16 intervention and 15 comparison woredas. Intervention woredas received the iCCM program, while the comparison areas continued implementation of the routine CCM program. Data collection for the evaluation consists primarily of baseline and endline household surveys measuring child mortality and coverage of child health interventions.

As part of the iCCM evaluation, IIP-JHU and ABH Services, PLC, a private research firm, conducted an assessment of the strength of the iCCM through an "implementation snapshot" and quality of care study in health posts. The survey was conducted in Jimma and West Hararghe zones of Oromia region and assessed the scale-up and the intensity of the iCCM program and measured the quality of iCCM services provided by HEWs.

The primary elements assessed in the Oromia implementation snapshot and quality of care assessment were:

1. Access and availability of deployed HEWs
2. Training of HEWs in iCCM
3. Availability of essential iCCM commodities, supplies, and job aids
4. Supportive supervision of HEWs
5. Health promotion and demand generation activities
6. Quality of services provided by HEWs
7. Utilization of iCCM services

METHODS

We conducted a cross-sectional survey in a random sample of health posts, stratified by intervention and comparison arms, in Jimma and West Hararghe zones. A total of 150 health posts were selected; 104 were selected from intervention woredas and 46 were selected from comparison woredas. Data collection consisted of direct observation of HEW consultations with sick children; caretaker exit interviews; gold standard re-examinations of sick children; examinations of iCCM commodities, supplies, and job aids; register reviews; and HEW interviews.

RESULTS

Of the 150 selected health posts, one was excluded because the health post was closed. This gave a final sample of 103 health posts in the intervention areas, 46 in the comparison areas and 149 total. Within selected health posts, all HEWs that were present on the day of data collection and that normally provide clinical services to children were included in the survey. This produced a sample of 201 HEWs: 137 in intervention health posts and 64 in comparison health posts. A total of 257 children (all from intervention areas) were included in the study.

Implementation Strength

For this study, implementation strength refers to key program processes that must be completed for the program to have the desired impact on under-five mortality. Indicators of essential program activities include 1) population coverage of HEWs providing iCCM services; 2) HEWs trained in iCCM; 3) HEW receiving supportive supervision for iCCM; 4) adequate and consistent stocks of essential iCCM commodities, supplies, and job aids; and 5) activities to create demand for iCCM services.

In the intervention areas, there are a reported 2.4 HEWs deployed for every 1,000 children under five. Similarly, there are 2.5 HEWs per 1,000 children under five in the comparison areas.

ICCM training coverage was nearly complete (98%) in the intervention areas. Only 46% of HEWs in the intervention areas had received the planned follow-up training in the health post within six weeks of receiving the iCCM training, but 89% had attended a performance review and clinical mentoring meeting.

Supervision coverage was quite high, with 87% of intervention health posts receiving at least one supervision visit related to iCCM in the previous three months. Nearly all supervisions included clinical reinforcement through observation of consultations or register review. Fifty-eight percent of HEWs also received instruction on iCCM during visits to health centers in the previous three months.

Intervention health posts were well stocked with essential iCCM drugs, ready-to-use therapeutic foods (RUTF), rapid diagnostic tests for malaria (RDTs), supplies, and job aids. Most health posts (69%) had all seven essential iCCM commodities (cotrimoxazole, ORS, zinc, ACT, chloroquine, RUTF, and RDTs). The proportion of health posts with individual items in stock ranged from 99% (cotrimoxazole) to 80% (RUTF). Health posts had an average of 6.4 out of the seven essential commodities in stock on the day of data collection. Fifty-two percent of health posts had no stockout of any of the seven essential commodities of more than seven consecutive days in the previous three months.

Comparison health posts scored much lower on every measure of program implementation strength. As expected, no HEWs in the comparison areas had received the iCCM training and only two had attended performance review and clinical mentoring meetings. Only 43% of health posts had received supervision related to routine CCM in the previous three months and 19% had received supervision with clinical reinforcement. Only 4% of comparison health posts had all five essential commodities needed for routine CCM (ORS, ACT, chloroquine, RUTF, RDT) in stock on the day of data collection. On average, there were less than three out of the five essential commodities in stock. No comparison health posts were free of stockouts of seven consecutive days or more for the five essential commodities in the previous three months.

Quality of Care

Quality of care refers to whether health workers correctly assess, classify, and manage (treat and/or refer) children with iCCM illnesses and provide counseling to caretakers based on Ethiopia iCCM clinical algorithms.

Observation of HEW consultations with sick children, caretaker exit interviews, and re-examinations of children were carried out in intervention health posts only. All children observed received a consultation from an iCCM-trained HEW.

A large majority of children (81%) were assessed for the presence of cough, diarrhea, fever, and malnutrition. Virtually all children (98%) had their vaccination status assessed. Fewer children (62%) were assessed for four general danger signs. Out of 11 key assessment tasks, HEWs completed an average of 9.2. Although most children were checked for key signs of iCCM illnesses, HEWs often failed to look for signs of severe illness such as stridor, inability to drink or drinking eagerly, bulged fontanel, stiff neck, edema, and no appetite.

Just over half of children (53%) were classified correctly for all major iCCM illnesses. Of children with pneumonia, 74% were classified correctly by the HEWs. The proportion of children with diarrhea correctly classified with diarrhea was 75%. Children with malnutrition were correctly classified for malnutrition only about half the time (53%). Although HEWs measured MUAC (for children six months or older) or checked visible severe wasting (for children under six months) for nearly all children, HEWs rarely conducted a complete assessment for malnutrition (including checking for edema and conducting an appetite test). When a complete malnutrition assessment was done, 75% of children were correctly classified for malnutrition. On the other hand, when a complete assessment of malnutrition was not completed, only 25% of children were correctly classified for malnutrition. Sample sizes of children with malaria (three children) and measles (five children) were too small to be able to draw any meaningful conclusions about management of these illnesses.

The majority of children (64%) were correctly managed (received correct treatment or referral, including correct dose, duration and schedule, and did not receive any unnecessary treatments) for all iCCM illnesses. Nearly three-quarters (72%) of children with pneumonia were correctly managed. Similarly, 79% of children with diarrhea were correctly managed. Only 59% of malnourished children were correctly managed. Just over half (54%) of children needing referral were referred by the HEW and only

14% of children received the first dose of all needed treatments in the health post in the presence of the HEW.

Analyses of clinical errors (appendix 2) show that when children with pneumonia or diarrhea received a complete assessment for a given illness, they were classified correctly about three-quarters of the time. Children with these illnesses who were correctly classified usually received correct management. On the other hand, children who received an incorrect classification were often managed incorrectly.

For malnutrition, which was the most problematic in terms of correct classification and management, children were less likely to receive complete assessment, including assessment of edema and appetite. Children who were assessed completely were likely to be correctly classified. However, unlike children with pneumonia or diarrhea, whether a child with malnutrition was correctly managed was less dependent on correct classification. Children with uncomplicated malnutrition were generally managed correctly, whether or not they were correctly classified. On the other hand, children with complicated malnutrition were usually managed incorrectly, regardless of whether classification was correct.

HEWs rarely provided routine supplementation of vitamin A or routine anti-helminth treatment. Only 18% of those needing routine vitamin A supplementation received the supplement and 20% of children needing mebendazole were given a dose of mebendazole.

Over-treatment of children was rare. Just 6% of children received an antibiotic when it was not indicated and no child received unnecessary antimalarials. A high proportion (83%) of caretakers correctly described how to give all treatments during the exit interview. Follow-up of sick children was rarely recorded in iCCM registers.

ICCM Service Provision and Utilization

Utilization of iCCM services is generally low. Intervention health posts had an average of 16 sick child consultations per health post in the previous month. Nearly all of these children were between 2-59 months of age, with virtually no children under two months seen in the previous month. There was wide variation in utilization among health posts, with a range of consultations in the previous month from zero to 95. Although utilization in intervention areas was low, it was over three times higher than in comparison health posts, which saw an average of only five children per health post in the previous month.

Regression analysis on data from intervention health posts showed that variables that are strongly positively associated with utilization include: availability of iCCM commodities, supplies, and job aids (p-value = 0.01) and malaria risk of kebele (p-value = 0.03). Supervision of the health post (p-value = 0.06) and the number of hours the health post was open in the previous week (p-value = 0.06) were marginally associated with utilization.

According to the HEWs, health posts were open and offering clinical services an average of 23.3 hours in the previous week. HEWs also reported that in the previous day, they spent about half their time (four hours) providing/offering clinical services in the health post. Reported opening hours were similar in

comparison health posts.

DISCUSSION

The Ethiopia iCCM program has been scaled up to a very high level in a short period of time. In the evaluation intervention woredas, iCCM started in March 2011 and training was completed by July 2011. The results of the quality of care assessment show that HEWs are for the most part providing high quality services, with most children receiving correct treatment for their illnesses. Despite the overall high quality, assessment of danger signs, referral of children with severe illness, management of complicated malnutrition, and provision of vitamin A and mebendazole are priority areas for improvement. Quality of care provided by HEWs compares favorably to that provided by community-based health workers in other countries as well as to higher-level health workers in Ethiopia. However, without a large increase in utilization of iCCM services, population coverage of effective treatments will remain low. The iCCM program is also failing to reach sick children under two months of age, who are precisely the children who are most vulnerable to preventable mortality.

High quality case management services are now available at the community level as a result of the successful scale-up of the iCCM program. It is now imperative to focus on increasing utilization of iCCM services to ensure high coverage of treatment of childhood illnesses, leading to reductions in child mortality.

Table 1: Key indicators of iCCM implementation strength, quality of care, utilization of iCCM services, and service provision in intervention and comparison health posts in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Intervention Areas		Comparison Areas	
	n/N	% (95% CI)	n/N	% (95% CI)
HEW trained in iCCM	134/137[a]	98 (93-99)	0/64	0 -
Health post received supervision on iCCM in the previous three months	87/100[b]	87 (79-93)	18/42[c]	43 (28-59)
Health post received supervision on iCCM that included register review or observation of consultations in the previous three months	85/100	85 (77-91)	8/42	19 (9-34)
All essential iCCM commodities[d]	71/103	69 (59-78)	2/46	4 (1-15)

[a] The three HEWs that were not trained in iCCM were not providing clinical services.
[b] Three health posts excluded because HEWs reported not being present for majority of previous three months.
[c] Four health posts excluded because HEWs reported not being present for majority of previous three months.
[d] Cotrimoxazole, ORS, zinc, ACT, chloroquine, RUTF, RDT.

All essential supplies and job aids for iCCM[e]	40/103	46 (36-56)	0/46	0 -
Child checked for presence of cough, diarrhea, fever, and malnutrition	207/257	81 (74-86)	-	-
Child correctly classified for all iCCM illnesses[f]	136/257	53 (46-60)	-	-
Child correctly managed for all iCCM illnesses[g]	165/257	64 (57-71)	-	-
Caretaker can correctly describe how to give all treatments	131/158	83 (75-89)	-	-
	Mean (95% CI)	**Range**	**Mean (95% CI)**	**Range**
Average number of sick child consultations in the previous month	16.0 (13.2-18.8)	0-95	5.0 (2.3-7.7)	0-32
Average number of hours health post was open in previous week	23.3 (21.0-25.5)	0-40	20.2 (17.0-23.5)	0-40

[e] Functional timer, thermometer, weighing scale, clean water, MUAC, supplies to mix ORS, iCCM chart booklet, iCCM patient register.
[f] Danger signs, respiratory illness, diarrhea, malaria, measles, malnutrition.
[g] Includes danger signs, respiratory illness, diarrhea, febrile illness, measles, malnutrition.

1. INTRODUCTION

1.1 BACKGROUND

The Ethiopian government launched the Health Extension Program (HEP) in 2003 to improve access to basic health services for the rural population. The program has trained around 35,000 female Health Extension Workers (HEWs) to provide preventive and curative care in communities. Although the HEP includes an urban program, the vast majority of HEWs work in rural areas. HEWs work within the structure of the primary health care unit, which comprises one health center and five satellite health posts. Each health post is typically run by two HEWs and serves one kebele, with a population of approximately 5,000 people.[h] Within the community, volunteer community health workers (VCHWs) have assisted HEWs with the tasks of community education and mobilization to promote better health.

The HEP initially emphasized preventive activities, but was later expanded to include basic curative interventions as well. The program included treatment of children under five years of age with diarrhea with oral rehydration salts (ORS), malaria with artemisinin-based combination therapy (ACT) (*p. falciparum*) or chloroquine (*p. vivax*), and severe acute malnutrition (SAM) with ready-to-use therapeutic foods (RUTF). Pneumonia cases were referred to higher-level health facilities for treatment.

Following the national policy change supporting community-based treatment of childhood pneumonia in late 2009, Ethiopia is scaling-up integrated community case management of common childhood illnesses (iCCM) within the pre-existing HEP in six regions of the country (Amhara, Benishangul-Gumuz, Gambela, Oromia, SNNP, and Tigray) with support from the Canadian International Development Agency (CIDA), the United Nations Children's Fund (UNICEF), the United States Agency for International Development (USAID), and other partners. This initiative aims to accelerate reductions in under-five mortality in Ethiopia by strengthening the health system and increasing equity in access to high-impact, cost-effective preventive and curative interventions. In the focus regions, treatment of childhood pneumonia with cotrimoxazole and zinc for treatment of diarrhea are being introduced in addition to the already existing CCM of malaria, diarrhea (with ORS only), and malnutrition (routine CCM).[1] As part of the iCCM program, HEWs in the intervention areas receive training on management of pneumonia, diarrhea, malaria, and malnutrition among children 2-59 months. Complicated cases as well as most cases among children under two months of age are given pre-referral treatment, if applicable, and referred to the nearest health center. The program was designed to strengthen the capacity of HEWs to assess, classify, and treat malaria, diarrhea, and SAM through refresher trainings, strengthened supervision, improved supply chain management for essential drugs and supplies, and improved monitoring and evaluation. Table 2 provides a comparison of the iCCM and routine CCM programs.

[h] Kebele is the lowest administrative unit, followed by woredas (districts), zones, and regions.

Table 2: Comparison of case management guidelines and program inputs for the Ethiopia iCCM program versus routine CCM.

	ICCM	Routine CCM
Management of iCCM illnesses for children 2-59 months		
Pneumonia	– Cotrimoxazole	– Referral to health center
Severe pneumonia	– Pre-referral treatment with cotrimoxazole – Referral to health center	– Referral to health center
Diarrhea (some dehydration, no dehydration)	– ORS/ORT – Zinc	– ORS/ORT
Severe diarrhea (severe dehydration, persistent diarrhea, severe persistent diarrhea, dysentery)	– ORS – Vitamin A (for persistent and severe persistent diarrhea only) – Referral to health center	– ORS – Vitamin A (for persistent and severe persistent diarrhea only) – Referral to health center
Malaria	– Antimalarial	– Antimalarial
Severe febrile disease	– Pre-referral treatment with cotrimoxazole – Referral to health center	– Referral to health center
Uncomplicated malnutrition	– RUTF or supplementary feeding program	– RUTF or supplementary feeding program
Severe complicated malnutrition	– Pre-referral treatment with amoxicillin and vitamin A – Referral to health center	– Pre-referral treatment with amoxicillin and vitamin A – Referral to health center
Program inputs		
Training	– 7-day training on iCCM	– No additional training
Supervision	– Standardized supportive supervision on iCCM supported by partner NGOs plus standard government supervision – Bi-annual Performance Review and Clinical Mentoring meetings (PRCM)	– Standard government supervision
Supply of commodities	– Support for purchase and supply of drugs and other commodities by UNICEF and partners – Provision of iCCM registers, iCCM chart booklets, timers, and other supplies	– Standard government commodity supply chain system – No additional supplies or job aids
Monitoring and evaluation	– Enhanced data collection during supervisions and PRCM meetings – Data management support by UNICEF	– Standard government monitoring and evaluation

To date, there are few examples of large-scale iCCM programs, especially in sub-Saharan Africa,[2, 3] and rigorous evaluations of the programs that exist are rare.[4] The effectiveness of iCCM varies across specific country contexts and depends largely on the strength of program implementation.[5-8] It is therefore essential to evaluate the effectiveness of the scale-up strategy to provide a basis for future program improvement in the country and to provide global evidence on effective strategies for scaling up high-impact child survival interventions to accelerate reductions in under-five mortality. To this end, the Institute for International Programs at the Johns Hopkins Bloomberg School of Public Health (IIP-JHU) was commissioned by CIDA and UNICEF to conduct an independent prospective evaluation of the implementation of iCCM in Ethiopia. The independent evaluation will assess the impact of the rapid scale-up of iCCM on increases in coverage of child survival interventions, reductions in child mortality, and improvement in nutritional status among children under five years of age.

The evaluation is being conducted in the Oromia region, where iCCM implementation is phased in, allowing the identification of randomly selected intervention and comparison areas. Within the Oromia region, the evaluation is being conducted in Jimma and West Hararghe zones and uses a cluster-randomized design with stratification by zone. Within each zone, rural woredas were randomly assigned to intervention and comparison arms. A total of 16 woredas were randomly assigned to intervention areas and 15 woredas to comparison areas using a constrained randomization. Data collection for the evaluation consists primarily of baseline and endline household surveys measuring child mortality and coverage of child health interventions. Following the end of the baseline survey in mid-February 2011, the intervention woredas began implementation of iCCM and were fully scaled-up as of July 2011. The comparison woredas are scheduled to begin implementation of iCCM following the completion of the endline survey in early 2013. During the evaluation period, the comparison woredas will continue to offer routine CCM (Table 2).

With program implementation fully under way, the IIP-JHU evaluation team, in collaboration with UNICEF, the Oromia Regional Health Bureau (ORHB) and the Federal Ministry of Health (FMOH), conducted an “implementation snapshot” and quality of care assessment in the two evaluation zones to assess the strength of the program and provide appropriate feedback to the FMOH and implementing partners. The survey allows the FMOH, UNICEF, and implementing partners to assess the scale and the intensity of the iCCM program so that it can be further strengthened. Furthermore, program evaluators need measures of iCCM implementation strength to assess the relationship between the program and expected outcomes. For evaluators to be able to confidently make conclusions about the program’s success or impact, they must have information on whether the program’s key components were strongly implemented (see definitions of implementation strength, quality of care, and other key terms in table 3), as well as information on intermediate outputs, such as quality of care and utilization of services. It is also necessary to have measures of implementation strength in comparison areas to be able to document the strength of implementation of the routine CCM program.

The effectiveness of the iCCM program requires that each component of the program (coverage and availability of HEWs; whether HEWs are trained in iCCM; supportive supervision; continued availability of drugs and supplies; and demand generation activities, such as community education and mobilization) be delivered at a high level of intensity that is sustained throughout the program in the

intervention woredas. Likewise, improvements should be seen in the quality of services provided by HEWs and in utilization of services by the community. The adequacy of program inputs, processes and outputs needs to be assessed early after the inception of the program to ensure that necessary adjustments and corrections are made. See appendix 1 for the iCCM program impact model.

Table 3: Definitions of key terms as applied in this study.

Community case management	CCM is defined for this study as management, including assessment, classification, and treatment of childhood illnesses and counseling of caretakers, carried out by a paraprofessional health worker at the community level (including at health posts in communities).
Integrated community case management	ICCM in this context is defined as integrated community case management carried out by a paraprofessional health worker at the community level of *all* of the following childhood illnesses: pneumonia, diarrhea, malaria, and malnutrition.
Implementation strength	For this study, this term refers to key program processes that must be completed for the program to have the desired impact on under-five mortality. Indicators of essential program activities include 1) population coverage of HEWs providing iCCM services; 2) HEWs trained in iCCM; 3) HEW receiving supportive supervision for iCCM; 4) adequate and consistent stocks of essential iCCM commodities, supplies, and job aids; and 5) activities to create demand for iCCM services.
Quality of care	Quality may be measured through indicators of outcomes (patient health outcomes), processes (healthcare provider actions), or structure (adequacy of facilities and equipment, qualifications of health workers, administrative structure).[9] For this assessment, we will measure quality based on processes. The term quality will refer to whether health workers correctly assess, classify, and treat/refer children with iCCM illnesses and provide counseling to caretakers based on Ethiopia iCCM clinical algorithms. We will also measure indicators of structure, or readiness to deliver services (drug supplies, trained health workers, supervision, etc.), but these will be considered as measures of implementation strength rather than quality of care.
Functional health post	A functional health post is defined as a location where at least one HEW is currently assigned to provide services to the community. A health post was considered functional even if the physical health post structure had not been constructed.

The primary elements assessed in the Oromia implementation snapshot and quality of care assessment were:

1. Access and availability of deployed HEWs
2. Training of HEWs in iCCM
3. Availability of essential iCCM commodities, supplies, and job aids
4. Supportive supervision of HEWs
5. Health promotion and demand generation activities
6. Quality of services provided by HEWs
7. Utilization of iCCM services

This survey was the first to evaluate the scale-up of iCCM and the first rigorous assessment of quality of iCCM services provided by HEWs in Ethiopia. It also adds to a limited evidence base regarding large-scale

implementation of iCCM and of the ability of community health workers in sub-Saharan Africa to provide high-quality case management services.

1.2 SURVEY OBJECTIVES

The objectives of the survey are to:
(1) Assess the strength of iCCM program implementation in intervention woredas;
(2) Assess the quality of iCCM services provided by HEWs in intervention woredas; and
(3) Document the strength of implementation for the routine CCM program in comparison woredas.

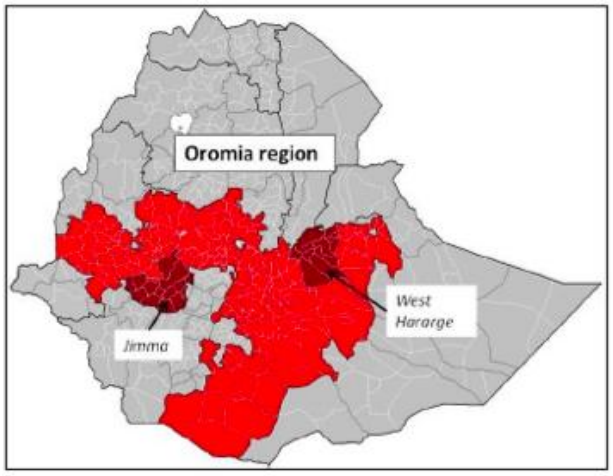
1.3 SURVEY ORGANIZATION

Funding for the survey was provided by UNICEF. IIP-JHU was responsible for the conception, design, and implementation of the study. IIP-JHU identified and contracted a private Ethiopian research firm, ABH Services, PLC, to conduct the fieldwork, including recruitment and training of data collectors and data collection. IIP-JHU provided oversight for all aspects of the survey.

1.4 STUDY POPULATION

The implementation snapshot and quality of care assessment was conducted in the evaluation intervention and comparison woredas in Jimma and West Hararghe zones of Oromia region (figure 1). Table 4 presents the iCCM evaluation intervention and comparison woredas.

Figure 1: Map of Ethiopia showing Oromia region and Jimma and West Hararghe zones.



The study sampled functional health posts as primary units. Study participants included:
1. HEWs performing case management of childhood illnesses;
2. Sick children 2-59 months of age presenting at health posts for consultations and their caretakers; and

3. Sick children 2-59 months in the communities surrounding health posts and their caretakers.

Table 4: ICCM evaluation intervention and comparison woredas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

Jimma		West Hararghe	
Intervention Woredas	**Comparison Woredas**	**Intervention Woredas**	**Comparison Woredas**
Chora Botor	Dedo	Boke	Anchar
Gera	Gumay	Chiro	Burka Dimtu
Goma	Limu Seka	Doba	Daro Labu
Kersa	Nono Benja	Gemechis	Habro
Limu Kosa	Seka Chokorsa	Guba Koricha	Mesela
Mana	Sokoru	Hawi Gudina	Mieso
Shebe Senbo	Tiro Afeta	Oda Bultum	Tulo
Omo Nada	Sigamo		
Setema			

1.5 INCLUSION CRITERIA

a. Health posts: All functional health posts in the study zones were included in the sampling frame. In cases where an HEW was providing clinical services, but an official health post structure had not been constructed, the HEW's primary location for providing case management services was considered as the health post.

b. HEWs: All HEWs present and providing case management services in selected health posts were included.

c. Patients (in intervention health posts only) presenting spontaneously or presenting as a result of mobilization by the HEWs at selected health posts had to meet the following criteria:

   i. Between 2 and 59 months of age (inclusive). Children younger than two months were excluded because we did not expect to obtain a sufficient sample size of children in this age group to be able to draw meaningful conclusions.

   ii. Described as sick by the caretaker. Sick children had to have at least one of the following complaints: danger signs (change in consciousness/lethargy, convulsions, vomiting everything, not eating or drinking), fever/malaria, cough, fast/difficulty breathing, pneumonia, diarrhea/vomiting, ear problem, measles, nutrition or feeding problems.

   iii. Initial consultation: the first time the patient had been seen at the health post or by either of the HEWs (including in the home/community) for the current illness episode.

d. Recruited patient consultations: In cases where fewer than two eligible children presented spontaneously or as a result of HEW mobilization at a health post for a consultation on the day of data collection, data collectors recruited sick children in the surrounding community to receive consultations by the HEWs. Children recruited for consultations had to meet the same eligibility

criteria as children spontaneously presenting at the health post. Additionally, the child could not have already received a consultation from any appropriate health care provider (government health facility, HEW, or private health clinic) for the current illness episode.

e. Data collectors observed/re-examined a maximum of five sick children per health post.

1.6 SAMPLING DESIGN & SAMPLE SIZE

1.6.1. Sampling Frame & Sample Selection

We conducted a cross-sectional survey in a random sample of health posts, with stratification by intervention and comparison arms. The sampling frames were made up of all functional health posts within intervention and comparison woredas in the two zones and were obtained from the zonal health officials with confirmation from the iCCM implementing partners and woreda health officials. The sampling frames of health posts in intervention and comparison areas consisted of 490 and 448 health posts, respectively. The sample of the survey was designed to provide estimates of indicators of interest within intervention and comparison areas separately. Selection of health posts within each stratum (intervention and comparison areas) was done through systematic random sampling.

1.6.2. Sample Size

Some indicators, such as drug stock-outs, supervision, etc. were calculated at the health post level. Other indicators, such as training of HEWs and the proportion of patients to receive correct assessment, classification, and treatment, were calculated at the HEW level and patient level, respectively. Since there was more than one HEW per health post on average and teams obtained at least two patients per health post, determining the sample size based on a sample of health posts guaranteed a large enough sample size for the primary indicators at the health post, HEW, and patient levels.

We assumed that the proportions of the variables of interest were 50%, as this gave the most conservative sample size for an absolute margin of error expressed in percentage points. The confidence level was set at 95%. Non-response of 5% was factored in for the sample of health posts. We assumed a design effect of 1.3 and non-response of 10% for HEW-level and patient-level indicators.

A total of 150 health posts were selected: 104 from intervention woredas and 46 from comparison woredas. This sample size allowed for estimates of the primary health post-level indicators in intervention health posts with precision of at least +/- 10 percentage points. Precision of primary HEW and patient-level indicators is at least +/- 9 percentage points. Due to budget constraints, we were not able to select an equally large sample size in the comparison areas. In the comparison woredas, the smaller sample allows for less precise estimates of indicators of implementation strength for the routine CCM program. In comparison areas, the primary indicators are estimated with a precision of at least +/- 15 percentage points. The study was not powered to conduct hypothesis tests, such as testing for differences in levels of various indicators between intervention and comparison areas.

1.7 QUESTIONNAIRES

The survey used six questionnaires (see appendix 4) to collect data in the health posts:

a) The ***Health Post Questionnaire Panel*** was used to collect basic information about the health post and the health post catchment area.
b) The ***Observation Checklist*** was used to record the actions taken and decisions made by the HEW in assessing, classifying, and treating sick children and in counseling the caretaker.
c) The ***Caretaker Exit Interview*** was administered to assess how well the caretaker understood the prescriptions given by the HEW.
d) The ***Re-examination Form*** was used to conduct a gold standard re-examination of the sick child, which was used to evaluate the HEW's performance.
e) The ***Equipment, Supplies, and Support Checklist*** was used to collect information about availability of essential iCCM commodities, supplies, and job aids; supervision received at the health post; service provision; and health promotion and demand generation activities. This questionnaire also includes a register review to measure utilization of iCCM services and to assess management of sick children and completeness of registration.
f) The ***HEW Questionnaire*** was used to interview HEWs about their demographic profile, training received, and time spent on different work-related activities.

Table 5 shows the questionnaires used in intervention and comparison health posts. Questions in the survey tools that were posed directly to respondents were translated into Afan Oromo, the local language of Oromia region. Lenovo tablet computers were used for data collection.

Table 5: Survey questionnaires implemented in selected intervention and comparison health posts in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

Questionnaire	Intervention	Comparison
Health Post Questionnaire Panel	Yes	Yes
Observation Checklist	Yes	No
Caretaker Exit Interview	Yes	No
Re-examination Form	Yes	No
Equipment, Supplies, and Support Checklist	Yes	Yes
HEW Questionnaire	Yes	Yes

1.8 DATA COLLECTION PROCEDURES

1.8.1. Pre-testing

Two pre-tests were completed in a total of four health posts in Chancho woreda, Finfinne Special Zone (40 kilometers north of Addis Ababa) by ABH investigators with support from IIP-JHU. The first pre-test was conducted on February 7-9, 2012. Following the pre-test, necessary changes were made to the questionnaire, protocol, and training materials. A second pre-test was conducted on April 25-27, 2012 that focused mainly on testing data collection using tablet computers.

1.8.2. Recruitment and Training of Survey Personnel

A total of 20 data collectors were recruited based on the following criteria: minimum qualification of bachelor's degree in nursing or a Health Officer with training in iCCM and Integrated Management of Newborn and Childhood Illnesses (IMNCI), knowledge of the HEP, ability to speak Afan Oromo, readiness to be deployed to rural locations, prior experience in quantitative data collection and availability for the entire period of training and field deployment. Most data collectors were iCCM trainers or supervisors.

Training of survey teams was held from April 30 to May 6, 2012 and was conducted by ABH in collaboration with IIP-JHU. Twenty people participated in the seven-day training, which covered the study procedures, the questionnaire, data collection techniques, iCCM clinical guidelines, quality assurance procedures, and study ethics. The training focused heavily on role-play and simulations of data collection. Concordance testing was conducted to assess observation and re-examination skills of data collectors. Data collectors were assigned roles (supervisor, observer, re-examiner) based on their performance on the assessments. Training continued until all observers and re-examiners achieved at least 90% concordance with gold standard results on three consecutive exams. A programmer from the Johns Hopkins School of Public conducted the training of the data collectors in the proper use of the tablet computers used for data collection.

1.8.3. Piloting the Survey

Following the in-class training, the survey was piloted to test the survey procedures and tools and to further train the survey personnel under conditions that simulated the actual survey. The pilot took place from May 7-9, 2012 in 18 health posts in Chancho woreda, Finfinne Special Zone. All data collectors and supervisors that participated in the training also participated in the pilot. The pilot followed the procedures of the study to replicate actual data collection to the extent possible. Each survey team collected data in three health posts during the pilot. At the end of the pilot, 18 of the 20 participants were selected for the survey.

1.8.4. Data Collection

Six survey teams were deployed for data collection. Each team was made up of one supervisor and two data collectors (observer and re-examiner). Data collectors did not carry out data collection in the same woreda in which they normally work to avoid influencing the behavior or performance of the HEWs as much as possible. Two coordinators (one for each zone) provided coordination and logistical support to the survey teams. Finally, study researchers from IIP-JHU and ABH provided supervision, quality control, and support to data collection teams. ABH was responsible for recruiting and hiring survey personnel and other human resources and logistical matters.

Data collection began on May 20, 2012 and took 42 days. Survey procedures were as follows:

a. HEWs were notified of upcoming study visits and were told the exact date of the visit. Since HEWs do not spend all of their time in the health post, we expected a large non-response due to absent HEWs if they were not informed ahead of time and instructed to be present. Additionally, utilization of health posts for clinical services is low and we did not expect to achieve a sufficient sample of sick children with unannounced visits. To overcome this limitation, HEWs were asked to mobilize

caretakers of children in their catchment area to bring sick children to the health post on the day of the survey visit.

b. On the day of the survey visit, survey teams arrived at each health post before regular working hours began (around 8:00am).

c. All HEWs working in selected health posts that provide clinical services were included in the study. The survey team met with the HEWs and introduced themselves and explained the purpose of the visit (emphasizing that results would be used to assess and improve health services—not to individually assess or punish HEWs). The supervisors asked each HEW to give verbal consent to participate in the study. The survey team explained that after patients were re-examined, the treatments prescribed to the patient and other care may be altered if the HEW's prescription was not consistent with the gold standard re-examination.

d. *Enrolling children*: As patients arrived at the health post, the supervisor screened the children for eligibility. If the child was eligible, the supervisor read the informed consent to the caretaker in Afan Oromo and requested verbal consent.

e. *Health post information*: Prior to the first consultation, the team asked the HEWs to provide basic information about the health post and the HEWs. This information was entered in the Health Post Questionnaire Panel. One Health Post Questionnaire Panel was completed per health post.

f. *Observation of the consultation*: The supervisor randomly selected (with a coin toss) one of the HEWs to provide the first consultation with an eligible patient. The observer silently observed the consultation and used the Observation Checklist to record the HEW's assessment, classification, treatment, and counseling of the patient. One Observation Checklist was completed per eligible patient.

g. *Caretaker exit interview:* Once the HEW's consultation was completed, the observer took the patient and caretaker to a separate location away from the HEW. The observer asked the caretaker about the medicines that were prescribed for home treatment to assess the caretaker's understanding of the prescription. The caretaker was asked to explain the dose, schedule, and duration of the treatments, as well as when to return for follow-up.

h. *Patient re-examination*: Following the HEW consultation and caretaker exit interview, the re-examiner performed a consultation with the patient and caretaker using the Re-examination Form that closely followed the Ethiopia iCCM clinical guidelines. The re-examination was used to obtain gold standard classifications and treatments with which the HEW's classifications and treatments were compared. One Re-examination Form was completed per eligible patient.

i. *Malaria testing*: If a rapid diagnostic test (RDT) was performed by the HEW, the observer recorded the result of the test and whether the HEW performed the test correctly. During the re-examination, if an RDT was required according to the iCCM guidelines, the re-examiner would check if an RDT was performed by the HEW. If the RDT was performed correctly, the re-examiner would use the result of the HEW's RDT in the re-examination. If the RDT was not performed by the HEW when it was indicated or if the RDT was performed incorrectly, the re-examiner would perform an RDT for the child and record the result for the gold standard classification.

j. Before releasing the patient, the re-examiner checked the treatment prescribed by the HEW. If a

patient received incorrect treatment or did not receive a needed treatment, the re-examiner would discuss the error with the HEW and ensure that the patient received all needed treatments. If any needed treatments were out of stock in the health post, the re-examiner provided the treatments from a reserve supply that was carried by the survey team.

k. When the first patient had finished the consultation by the HEW, the exit interview, and the re-examination, the next eligible patient would receive a consultation by the HEW that did not perform the first consultation. The data collectors would then perform the caretaker exit interview and re-examination. This procedure was continued up to a maximum of five patients per health post.

l. If fewer than two children presented at the health post within the first two hours or so, the supervisor, along with an HEW or community volunteer, would recruit additional sick children from the community so that at least two children were observed/re-examined, including spontaneous, mobilized, and recruited consultations. The supervisor would locate a sick child and assess the child's eligibility. If the child was eligible, the data collector would ask the caretaker if he/she was willing to take the child to the health post to receive a consultation by the HEW and a re-examination. If the caretaker agreed, verbal consent would be obtained. The child would then be brought to the health post and would undergo a consultation with the HEW and re-examination as detailed above.

m. *Equipment, Supplies, and Support Checklist*: The data collectors asked the HEWs to show them all drug stocks and other iCCM commodities, supplies, and job aids. The data collectors completed the Drugs and Supplies Module by inspecting iCCM commodities, supplies, and job aids. Stockouts of drugs and diagnostics in the previous three months were based on the HEWs' recall. The data collectors interviewed the HEWs about the functioning of the health post, health promotion and demand generation activities, supervision received, and referral of severely ill children. One Equipment, Supplies, and Support Checklist was filled out per health post.

n. *Register review*: Data collectors recorded information on sick child consultations in the previous month from the iCCM patient registers. Then, data for the most recent consultations of sick children under two months of age and 2-59 months of age were extracted from the patient registers. Data collectors recorded information for the children that were seen by the HEWs on the day of data collection plus the last three children 2-59 months and the last three children under two months seen prior to the day of data collection.

o. *HEW Questionnaire*: Data collectors interviewed each HEW about their socio-demographic background, their history as an HEW, and their time allocation. One HEW Questionnaire was completed per HEW.

p. Data were entered by data collectors as they were collected using tablet computers.

q. Once all data collection was finished in the health post, the team thanked the HEWs and provided feedback. Before leaving the health post, the supervisor reviewed all data collected in the health post to ensure completeness and consistency. Any missing or inconsistent data were rectified before leaving the health post.

r. The procedures above apply to health posts in the *intervention* woredas. For selected health posts in the comparison woredas, data collectors did not carry out observation of consultations, caretaker

exit interviews, or re-examination of sick children. All other procedures were the same as in the intervention areas.

1.8.5. Quality Assurance

Survey personnel at each level were assigned specific tasks and responsibilities to ensure data quality.

Data collectors:

- Reviewed completed forms for accuracy, completeness, and consistency immediately following data collection.

Supervisors:

- Edited each completed questionnaire for completeness and consistency before leaving the health post;
- Noted missing data or potentially incorrect recording of key variables, and ensured that these omissions or errors were addressed, where possible;
- Observed data collection to ensure that it was properly conducted, that the questions were asked correctly, and that responses were recorded correctly;
- Provided help to data collectors to resolve problems that arose during the course of data collection and to understand key concepts contained in the tools;
- Met with data collectors to review all forms completed that day and to discuss any problems, challenges, and/or questions.

Study researchers/senior supervisors:

- Checked randomly selected health posts to ensure that the data collectors visited the correct health posts and correctly completed data collection;
- Observed data collection to ensure that it was properly conducted, that the questions were asked correctly, and that responses were recorded correctly;
- Provided help to data collectors to resolve problems that arose in the course of data collection and to understand key concepts contained in the tools;
- Met with data collectors to review completed forms and to discuss any problems, challenges, and/or questions.

Survey teams recorded the HEWs' phone numbers and photographed the visited health posts and patient registers. This allowed study researchers to ensure that study teams had visited assigned health posts and to contact the HEWs to confirm information and clarify any inconsistencies in the data.

1.8.6. Data Management

Data entry was conducted by the data collectors in the field using electronic tablet computers. Open Data Kit (ODK) software was used to create the survey instruments for the tablet computers. The data were sent periodically to the data manager via email. The data were then uploaded to a web-based database (Research Electronic Data Capture (RedCap)) and edited by a study researcher. Any missing data or inconsistencies were sent to the supervisor, who would correct the errors through discussion with the data collectors or by contacting the HEWs.

1.8.7. Data Analysis

There are three main units of analysis for the indicators: health posts, HEWs, and children. The analysis was stratified, and results are presented separately for the intervention and comparison woredas. Results are also shown for each zone within the intervention and comparison areas. Standard errors and associated 95% confidence intervals for HEW and child-level variables were calculated using the Taylor linearization method to account for clustering of HEWs and children within health posts. All analyses were carried out in Stata 12.[10]

1.8.8. Ethical Considerations

Ethical approval was obtained from the Oromia Regional Health Bureau and the Institutional Review Board of the Johns Hopkins University Bloomberg School of Public Health.

Verbal informed consent was obtained from all study participants. There was no monetary compensation or out-of-pocket costs for participants. Confidentiality of every participant was protected and information on individual participants was only available to the study team.

If an HEW failed to prescribe needed treatments according to the gold standard classification or if the HEW prescribed any harmful treatments, the data collectors would discuss any discrepancies with the HEW and ensure that the correct treatment was provided. Survey teams carried a stock of iCCM drugs and RDTs in case the health post was out of stock. If necessary, the survey team would facilitate referral to a health facility for children with severe illness.

2. SAMPLE CHARACTERISTICS

2.1 ENROLLMENT

Of the 150 selected health posts, one was excluded because the health post was closed indefinitely and not providing services. This gave a final sample of 103 health posts in the intervention areas. All 46 health posts selected in the comparison areas were successfully surveyed. Within selected health posts, all HEWs that were present on the day of data collection and that provide clinical services were included in the survey. This produced a sample of 201 HEWs: 137 in intervention health posts and 64 in comparison health posts. A total of 257 children were included in the study. All of these were in intervention health posts, as data collection in comparison health posts did not include observation and re-examination of sick children.

2.2 CHARACTERISTICS OF THE SAMPLE OF HEALTH POSTS

Table 6 presents the characteristics of the sample of health posts in intervention areas. Table 7 presents the characteristics of the comparison health posts.

Population of children under five

There were an average of 741 children under five per health post catchment area, according to demographic statistics available at the health posts. This number was somewhat larger in Jimma (783) than in West Hararghe (688). The number was similar in intervention (744) and comparison (733) areas.

Distance from health post to referral facility

Data on distance from the health post to the nearest health center or other referral facility was available in health posts. Intervention health posts were an average of 12 kilometers from the nearest referral facility (health center or hospital). Half of intervention health posts are 10 kilometers or more from a referral facility and 16% are 20 or more kilometers away. Distances are generally greater in Jimma, with an average of 14 kilometers to the referral facility compared to nine kilometers in West Hararghe. Average distance to the referral facility was shorter in comparison health posts, at nine kilometers. Again, the average distance in Jimma (11 km) was greater than in West Hararghe (6 km).

Availability of transportation and accessibility of health posts vary. In some cases, caretakers could obtain vehicle transportation directly to the referral facility. In other cases, they would have to walk. Many times a caretaker and child would use a combination of walking and motor vehicle. HEWs reported that the average travel time to the nearest referral facility (using the most common means of transportation for the local population) was just over two hours. The average time was 2.4 hours in Jimma and 1.7 hours in West Hararghe. Reported travel time in comparison areas was somewhat shorter, at 1.6 hours.

These distances may indicate difficulty in reaching referral facilities for children and caretakers with severe illness who are referred from the health post.

Malaria and malnutrition profiles of kebele

Intervention health posts were most commonly classified as low malaria risk (45%). The remaining intervention health posts were fairly evenly divided between high malaria risk (28%) and no malaria (27%). Malaria risk seems to be higher in Jimma zone, where 44% of health posts were classified as high malaria risk, compared to only 9% in West Hararghe. Comparison health posts had slightly lower malaria risk, with 24% in high-risk areas, 50% in low risk areas, and 26% in areas with no malaria.

Nearly 60% of intervention health posts are in woredas designated as priority high-malnutrition areas. This includes all health posts in West Hararghe and a quarter of Jimma health posts. The proportion of comparison health posts in high malnutrition areas was smaller, at 46%. All comparison health posts in West Hararghe were in priority malnutrition woredas, but no comparison health posts in Jimma were in high malnutrition woredas.

Table 6: Characteristics of the sample of health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total N = 103		**Jimma N = 57**		**W. Hararghe N = 47**	
	Mean	**Range**	**Mean**	**Range**	**Mean**	**Range**
Distance from referral facility (km)	11.8	0-72	13.8	0-72	9.3	0.1-36
	N	**%**	**n**	**%**	**n**	**%**
<5km	16	16	6	11	10	22
5-<10km	37	36	17	30	20	44
10-<15km	18	18	14	25	4	9
15-<20km	16	16	10	18	6	13
≥20km (max 72km)	16	16	10	18	6	13
Malaria risk of kebele						
High	29	28	25	44	4	9
Low	46	45	21	37	25	54
No malaria	28	27	11	19	17	37
Health posts in priority high-malnutrition woredas	61	59	14	25	47	100
	Mean	**Range**	**Mean**	**Range**	**Mean**	**Range**
Children <5 in HP catchment area	744	203-1626	807	203-1626	665	225-1487

Table 7: Characteristics of the sample of health posts in comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total N = 46		Jimma N = 25		W. Hararghe N = 21	
	Mean	**Range**	**Mean**	**Range**	**Mean**	**Range**
Distance from referral facility (km)	8.7	0.3-35	10.8	0.5-35	6.2	0.3-18
	n	**%**	**n**	**%**	**n**	**%**
<5km	11	24	3	12	8	38
5-<10km	18	39	10	40	8	38
10-<15km	8	17	5	20	3	14
15-<20km	6	13	4	16	2	10
≥20km (max 72km)	3	7	3	12	0	0
Malaria risk of kebele						
High	11	24	9	36	2	10
Low	23	50	7	28	16	76
No malaria	12	26	9	36	3	14
Health posts in priority high-malnutrition woredas	21	46	0	0	21	100
	Mean	**Range**	**Mean**	**Range**	**Mean**	**Range**
Children <5 in HP catchment area	733	191-1468	729	191-1375	739	335-1468

2.3 CHARACTERISTICS OF THE SAMPLE OF HEWS

Tables 8 and 9 present the characteristics of the sample of HEWs for the intervention and comparison areas, respectively.

HEW age & marital status

The large majority of HEWs in intervention (87%) and comparison (83%) health posts were between 21 and 26 years old. The percent of married HEWs was similar in intervention (58%) and comparison (61%) areas. All HEWs are women.

HEW experience & residence

The HEWs in the sample had an average of four years experience as an HEW. This is similar between intervention and comparison areas and between zones. Ninety-one percent of HEWs in intervention areas and 86% in comparison areas reported living in the same kebele as the health post in which they work. However, only 12% of HEWs in intervention health posts and 6% of HEWs in comparison health posts reported living in the kebele one year prior to completion of their training as an HEW, suggesting that they were not selected from the community in which they work.

Table 8: Characteristics of the sample of HEWs in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total N = 137		Jimma N = 79		W. Hararghe N = 58	
	n	%	n	%	n	%
Age						
18-20	13	10	6	8	7	12
21-23	83	61	47	60	36	74
24-26	35	26	22	28	13	22
27-29	4	3	3	4	1	2
30-32	2	2	1	1	1	2
Marital status						
Married	80	58	40	51	40	69
Single	56	41	38	48	18	31
Separated/divorced	1	1	1	1	0	0
HEW lives in same kebele as health post	125	91	68	86	57	98
HEW lived in kebele one year prior to completing HEW training	16	12	16	20	0	0
	Mean	**Range**	**Mean**	**Range**	**Mean**	**Range**
Years of experience as an HEW	4.3	0.7-7.7	4.3	0.7-7.7	4.2	0.8-7.6

Table 9: Characteristics of the sample of HEWs in health posts in comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total N = 64		Jimma N = 33		W. Hararghe N = 31	
	n	%	n	%	n	%
Age						
18-20	9	14	6	18	3	10
21-23	35	55	20	61	15	48
24-26	18	28	6	18	12	39
27-29	1	2	0	0	1	3
30-32	1	2	1	3	0	0
Marital status						
Married	39	61	24	73	15	48
Single	25	39	9	27	16	52
Separated/divorced	0	0	0	0	0.0	0
HEW lives in same kebele as health post	55	86	29	88	26	84
HEW lived in kebele one year prior to completing HEW training	4	6	4	12	0	0
	Mean	**Range**	**Mean**	**Range**	**Mean**	**Range**
Years of experience as an HEW	4.3	0.8-10.7	4.2	0.9-6.7	4.3	0.8-10.7

2.4 CHARACTERISTICS OF THE SAMPLE OF CHILDREN

As mentioned previously, observation and re-examination of children was done only in health posts in the intervention areas. Therefore, all information about the sample of children refers to intervention health posts only. Table 10 presents the characteristics of the sample of children.

Method of recruitment

Spontaneous consultations accounted for only 18% of the sample of children. Without intervention by the researchers, we would have obtained a sample of only 45 children, which would have been insufficient to estimate the indicators of interest with acceptable precision. Another 37% of children were mobilized by the HEWs. Active recruitment of sick children in the community by the survey team accounted for the largest portion of children (45%). The proportion of spontaneous consultations was higher in Jimma (21%) than in West Hararghe (12%). In Jimma, most children (53%) were obtained through recruitment by the survey team, while in West Hararghe the majority (54%) was obtained through HEW mobilization.

Age and sex

The majority of children (72%) were between two and 24 months of age. The sample was evenly split between males and females.

Disease classification and severity

According to the classification provided by the gold standard examiner, diarrhea was by far the most common gold standard disease classification, applying to 66% of children. Pneumonia was the next most common classification, including 15% of children. Thirteen percent of children had malnutrition and 12% had ear infection. Few children presented with malaria (1%), measles (2%), or anemia (4%). Disease burden differed by zone. Pneumonia was more common in Jimma (22%) than West Hararghe (5%). On the other hand, diarrhea, malnutrition, and ear infection were more common in West Hararghe (78%, 16%, and 18%, respectively) compared to Jimma (57%, 10%, and 7%). The survey was carried out during the rainy season in Jimma and West Hararghe, which is typically the high season for pneumonia and malnutrition (particularly in West Hararghe) and non-peak season for diarrhea and malaria. Data was collected simultaneously in the two zones, so differences between the two zones in frequency of illnesses are not due to seasonality.

One quarter of children needed referral to a health center and 15% of children in the sample had a severe illness. Children needing referral for ear infection or non-severe anemia were not considered as having severe illness. Severity of illness was much higher in West Hararghe, where 36% of children needed referral and 22% had severe illness. This is compared to Jimma where 17% needed referral and 10% had severe illness. Among children with severe illness, the most common classifications were dysentery (45%), severe complicated malnutrition (32%), and persistent or severe persistent diarrhea (29%). Table 11 presents the gold standard disease classifications among children with severe illness.

Table 10: Characteristics of the sample of sick children in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total N = 257		Jimma N = 152		W. Hararghe N = 105	
	n	%	n	%	n	%
Method of recruitment						
Spontaneous	45	18	32	21	13	12
Mobilized by HEWs	96	37	39	27	57	54
Recruited by survey team	116	45	81	53	35	33
Age						
2-11 months	94	37	57	38	37	35
12-23 months	92	36	55	36	37	35
24-35 months	39	15	21	14	18	17
36-47 months	22	9	12	8	10	10
48-59 months	10	4	7	5	3	3
Sex						
Male	129	50	75	49	54	51
Female	128	50	77	51	51	49
Gold standard disease classifications						
Pneumonia	39	15	34	22	5	5
Diarrhea	169	66	87	57	82	78
Malaria/Sev. febrile disease	3	1	2	1	1	1
Measles[i]	5	2	4	3	1	1
Malnutrition	32	13	15	10	17	16
Ear infection	30	12	11	7	19	18
Anemia	11	4	6	4	5	5
Severe illness[j]	38	15	15	10	23	22
Needs referral[k]	63	25	25	17	38	36

Table 11: Gold standard disease classifications among surveyed children with severe illness in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total N = 38		Jimma N = 15		W. Hararghe N = 23	
	n	%	n	%	n	%
Severe pneumonia	3	8	2	13	1	4
Persistent/severe persistent diarrhea	11	29	3	20	8	35
Dysentery	17	45	5	33	12	52
Severe febrile disease	1	3	0	0	1	4
Severe complicated malnutrition	12	32	7	47	5	22

[i] Current or in the last three months.

[j] Danger signs; severe pneumonia or very severe disease; diarrhea, severe dehydration; severe persistent diarrhea; persistent diarrhea; dysentery; very severe febrile disease; severe complicated measles; severe complicated malnutrition; severe anemia.

[k] Includes referral for acute ear infection and anemia, which are not considered severe illnesses.

Child characteristics by method of recruitment

There were important differences between children presenting for spontaneous consultations, those mobilized by HEWs, and those recruited by the survey team. Table 12 presents the gold standard disease classifications for children by recruitment method. The highest proportion of children with severe illness was seen among those mobilized by HEWs (27%), followed by those who presented spontaneously (11%). Only 6% of children recruited by the survey team had severe illness.

Diarrhea was more common among children mobilized by HEWs (76%) and those recruited by the survey team (62%) than among children presenting spontaneously (53%). Conversely, pneumonia was more common among children presenting spontaneously (22%) and least common among those mobilized by HEWs (12%). Malnutrition and ear infection were more common among children mobilized by HEWs (20% and 14%, respectively) and those presenting spontaneously (11% and 13%) and least common among those recruited by the survey team (7% and 10%).

A multivariate logistic regression analysis showed that the association between recruitment method and probability of severe illness is not statistically significant when controlling for zone and illness type (pneumonia, diarrhea, malaria, malnutrition, measles, ear infection, anemia). The p-value for recruitment method as a predictor for severe illness was 0.15. When looking at active recruitment methods compared to spontaneous consultations, children mobilized by HEWs had 2.5 times the odds of having severe illness (p-value = 0.11) and children recruited by the survey team had 0.6 times the odds of having severe illness (p-value = 0.38), controlling for zone and illness type.

Table 12: Gold standard disease classifications of surveyed children by recruitment method in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n/N	%	n/N	%	n/N	%
Spontaneous consultation						
Severe illness	5/45	11	2/32	6	3/13	23
Pneumonia	10/45	22	10/32	31	0/13	0
Diarrhea	24/45	53	12/32	38	12/13	92
Malaria/Sev. febrile disease	1/45	2	1/32	3	0/13	0
Measles	1/45	2	1/32	3	0/13	0
Malnutrition	5/45	11	2/32	6	3/13	23
Ear infection	6/45	13	4/32	13	2/13	15
Anemia	1/45	2	0/32	0	1/13	8
Mobilized by HEWs						
Severe illness	26/96	27	7/39	18	19/57	33
Pneumonia	11/96	12	8/39	21	3/57	5
Diarrhea	73/96	76	24/39	62	49/57	86
Malaria/Sev. febrile disease	1/96	1	0/39	0	1/57	2
Measles	0/96	0	0/39	0	0/57	0
Malnutrition	19/96	20	5/39	13	14/57	25
Ear infection	13/96	14	2/39	5	11/57	19
Anemia	7/96	7	3/39	8	4/57	7
Recruited by survey team						
Severe illness	7/116	6	6/81	7	1/35	3
Pneumonia	18/116	16	16/81	20	2/35	6
Diarrhea	72/116	62	51/81	63	21/35	60
Malaria/Sev. febrile disease	1/116	1	1/81	1	0/35	0
Measles	4/116	4	3/81	4	1/35	3
Malnutrition	8/116	7	8/81	10	0/35	0
Ear infection	11/116	10	5/81	6	6/35	17
Anemia	3/116	3	3/81	4	0/35	0

3. IMPLEMENTATION STRENGTH

3.1 COVERAGE OF ICCM

Of the 104 selected health posts in the intervention areas, 100 were providing iCCM services. Four health posts were not providing any iCCM services. Three of these health posts had never initiated iCCM services and the HEWs had not been trained in iCCM. In the other health post, the only HEW providing clinical services was away on maternity leave. All four of the health posts not providing services were in West Hararghe zone. The three health posts that were open, but not providing iCCM services were included in the analysis, although no children were observed/re-examined in these health posts. The health post that was closed because the HEW was on maternity leave was not included in the analysis except for the indicator of coverage of iCCM. No health posts in the comparison area were providing iCCM services.

3.2 COVERAGE OF DEPLOYED HEWS

In the intervention areas, there are a reported 2.4 HEWs deployed for every 1,000 children under five. Coverage is similar in the two zones, with 2.5 HEWs per 1,000 children under five in Jimma and 2.4 per 1,000 children under five in West Hararghe. There are 2.5 HEWs per 1,000 children under five in the comparison areas.

3.3 TRAINING

All HEWs surveyed in both intervention and comparison areas had received the initial one-year HEW training. Nearly all HEWs in the intervention areas (98%) had received the standardized iCCM training. In contrast, no HEWs in the comparison areas had received the iCCM training.

According to the iCCM training plan, HEWs were supposed to receive a follow-up training in the health post within six weeks of the iCCM training. In the intervention areas, only 46% of HEWs had received this follow-up training within six weeks. This percentage was substantially larger in Jimma (65%) than in West Hararghe (20%).

ICCM performance review and clinical mentoring (PRCM) meetings are held bi-annually and all HEWs are meant to attend. A large majority (89%) of HEWs in the intervention areas reported having attended at least one PRCM meeting. In Jimma, 99% of HEWs had attended a PRCM meeting, while 76% of HEWs in West Hararghe had attended. Only two HEWs (3%) in the comparison area reported having attended a PRCM meeting.

3.4 SUPERVISION

In the intervention areas, 87% of health posts had received at least one supervision visit related to iCCM in the previous three months. Furthermore, nearly the same percentage (85%) received supervision on iCCM that included clinical reinforcement (observation of consultations or register review). Supervision was slightly more common in Jimma, with 91% of health posts receiving supervision and the same proportion receiving supervision with clinical reinforcement, compared to 82% of West Hararghe health posts receiving supervision and 77% receiving supervision with clinical reinforcement.

In addition to supervision received in the health posts, HEWs frequently visited health centers and some received clinical guidance during these visits. Overall, 58% of HEWs in intervention health posts reported having received iCCM instruction or iCCM clinical practice in a health center in the previous three months.

Supervision was much less frequent in comparison health posts. Only 43% of comparison health posts had received supervision related to routine CCM in the previous three months and 19% had received supervision with clinical reinforcement. Clinical instruction in the health center was also less common, with only 8% of HEWs reporting having received instruction on case management of childhood illnesses in the health post. Tables 13 and 14 present information on training and supervision received in intervention and comparison health posts, respectively.

Table 13: Training and supervision received by HEWs in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)
HEW received initial one-year training	137/137	100 -	79/79	100 -	58/58	100 -
HEW trained in iCCM	134/137[l]	98 (93-99)	79/79	100 -	55/58	95 (85-98)
HEW received follow-up training within six weeks of iCCM training	62/134[m]	46 (37-56)	51/79	65 (52-76)	11/55	20 (11-33)
HEW has attended iCCM performance review and clinical mentoring meeting	122/137	89 (82-94)	78/79	99 (91-100)	44/58	76 (63-85)
Health post received supervision on iCCM in the previous three months	87/100[n]	87 (79-93)	51/56	91 (80-97)	36/44	82 (67-92)
Health post received supervision on iCCM that included register review or observation of consultations in the previous three months	85/100	85 (77-91)	51/57	91 (80-97)	34/46	77 (62-89)
HEW received instruction in iCCM clinical practice at a health center in the previous three months	79/137	58 (49-66)	48/79	61 (49-71)	31/58	54 (40-67)

[l] The three HEWs that were not trained in iCCM were not providing clinical services.
[m] Excludes HEWs that did not receive iCCM training.
[n] Three health posts excluded because HEWs reported not being present for majority of previous three months.

Table 14: Training and supervision received by HEWs in health posts in comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)
HEW received initial one-year training	64/64	100 -	33/33	100 -	31/31	100 -
HEW trained in iCCM	0/64	0 -	0/33	0 -	0/31	0 -
HEW has attended iCCM/CCM performance review and clinical mentoring meeting	2/64	3 (1-12)	2/33	6 (1-23)	0/31	0 -
Health post received supervision on CCM in the previous three months	18/42[o]	43 (28-59)	13/25	52 (31-72)	5/21	29 (10-56)
Health post received supervision on CCM that included register review or observation of consultations in the previous three months	8/42	19 (9-34)	8/25	32 (15-54)	0/21	0 -
HEW received instruction in CCM clinical practice at a health center in the previous three months	5/64	8 (3-18)	5/33	15 (6-33)	0/31	0 -

3.5 AVAILABILITY OF COMMODITIES, SUPPLIES, & JOB AIDS

Health posts in the intervention areas had fairly complete stocks of essential iCCM commodities on the day of data collection. For individual items, the proportion of health posts with the item in stock ranged from 99% (cotrimoxazole) to 80% (RUTF). Sixty-nine percent of health posts had all of the seven essential commodities for iCCM (cotrimoxazole, ORS, zinc, ACT, chloroquine, RUTF, RDT). Availability was slightly higher in Jimma, with 72% of health posts having all seven essential commodities, compared to 65% in West Hararghe.

Commodities were also mostly available when looking at a longer time period. The proportions of health posts with no stockout of the seven essential commodities for iCCM lasting longer than seven consecutive days in the previous three months were similar to the proportions of health posts with items in stock on the day of data collection. Fifty-two percent of health posts had no stockout of any of the seven essential items. Proportions of health posts with no stockout of individual items were high, ranging from 99% (cotrimoxazole) to 78% (RUTF).

[o] Four health posts excluded because HEWs reported not being present for majority of previous three months.

Availability of commodities was much lower in the comparison areas. Proportions of comparison health posts with individual items for routine CCM in stock ranged from 63% (RDT and vitamin A) to 7% (folic acid). Only 4% of health posts had all five essential commodities for routine CCM (ORS, ACT, chloroquine, RUTF, RDT[p]) in stock on the day of data collection. No comparison health posts were free of stockouts of seven consecutive days or more of the five essential commodities in the previous three months. Table 15 presents information on the availability of iCCM commodities in intervention health posts. Table 16 shows availability of iCCM commodities in comparison health posts. Figure 2 compares the availability of five essential routine CCM commodities in intervention and comparison health posts.

Table 15: Availability of essential iCCM commodities on the day of data collection and over the last three months in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Available on day of data collection						No stockout of more than 7 days in last 3 months					
	Total N = 103		Jimma N = 57		W. Hararghe N = 46		Total N = 103		Jimma N = 57		W. Hararghe N = 46	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
All essential iCCM commodities[q]	71	69 (59-78)	41	72 (59-83)	30	65 (50-79)	53	52 (41-61)	33	58 (44-71)	20	44 (29-59)
Cotrimoxazole	102	99 (95-100)	57	100 -	45	98 (89-100)	102	99 (95-100)	57	100 -	45	98 (89 -100)
ORS	100	97 (92-99)	56	98 (91-100)	44	96 (85-100)	93	90 (83-95)	56	98 (91-100)	37	80 (66-91)
Zinc	99	96 (90-99)	56	98 (91-100)	43	94 (82-99)	83	81 (72-88)	50	88 (76-95)	33	72 (57-84)
ACT	91	88 (81-94)	49	86 (74-94)	42	91 (79-98)	90	87 (79-93)	48	84 (72-93)	42	91 (79-98)
Chloroquine	92	89 (82-95)	52	91 (81-97)	40	87 (74-95)	91	88 (81-94)	52	91 (81-97)	39	85 (71-94)
RUTF	82	80 (71-87)	47	83 (70-91)	35	76 (61-87)	80	78 (68-85)	42	74 (60-85)	38	83 (69-92)
RDT	92	89 (82-95)	50	88 (76-95)	42	91 (79-98)	91	88 (81-94)	50	88 (76-95)	41	89 (76-96)

[p] Cotrimoxazole and zinc are not part of the routine CCM package in comparison areas, so they are not included in this calculation.

[q] Cotrimoxazole, ORS, zinc, ACT, chloroquine, RUTF, RDT.

Vitamin A	84	82 (73-89)	45	79 (66-89)	39	85 (71-94)	87	85 (76-91)	46	81 (68-90)	41	89 (76-96)
Amoxicillin	97	94 (88-98)	54	95 (85-99)	43	94 (82-99)	90	87 (79-93)	49	86 (74-94)	41	89 (76-96)
Folic acid	92	89 (82-95)	54	95 (85-99)	38	83 (69-92)	82	80 (71-87)	49	86 (74-94)	33	72 (57-84)
Mebendazole	93	90 (83-95)	53	93 (83-98)	40	87 (74-95)	90	87 (79-93)	53	93 (83-98)	37	80 (66-91)
Tetracycline ointment	90	87 (89-93)	49	86 (74-94)	41	89 (76-96)	81	79 (70-86)	46	81 (68-90)	35	76 (61-87)
Paracetamol	97	94 (88-98)	55	97 (98-100)	42	91 (79-98)	89	86 (78-92)	52	91 (81-97)	37	80 (66-91)

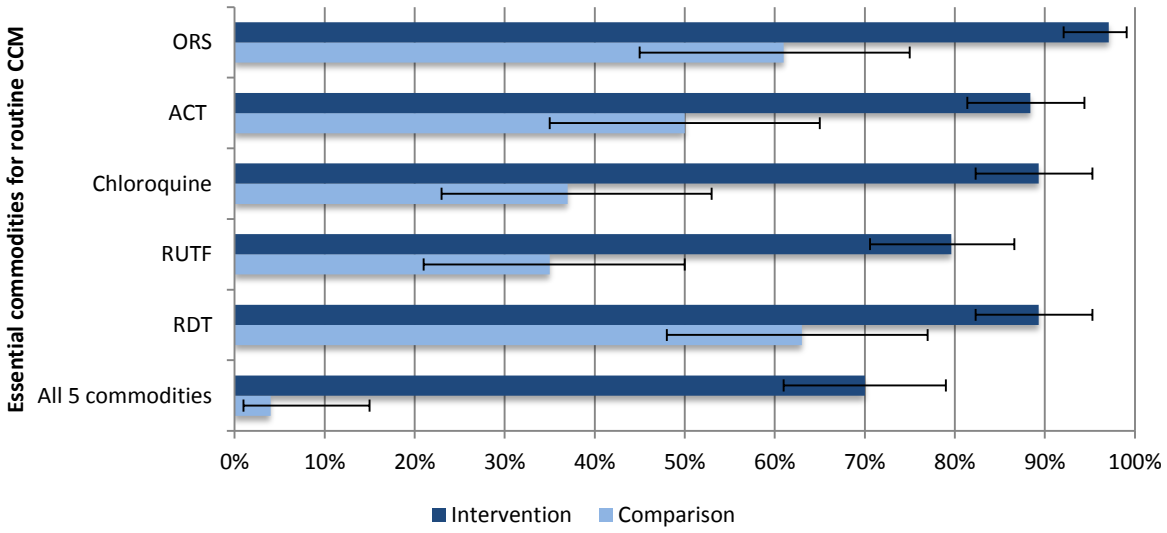
Table 16: Availability of essential iCCM commodities on the day of data collection and over the last three months in health posts in comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Available on day of data collection						No stockout of more than 7 days in last 3 months					
	Total N = 46		Jimma N = 25		W. Hararghe N = 21		Total N = 46		Jimma N = 25		W. Hararghe N = 21	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
All essential CCM commodities[r]	2	4 (1-15)	0	0 -	2	10 (1-30)	0	0 -	0	0 -	0	0 -
Cotrimoxazole	1	2 (0-12)	0	0 -	1	5 (0-24)	2	4 (1-15)	0	0 -	2	10 (1-30)
ORS	28	61 (45-75)	17	68 (47-85)	11	52 (30-74)	28	61 (45-75)	17	68 (47-85)	11	52 (30-74)
Zinc	0	0 -	0	0 -	0	0 -	0	0 -	0	0 -	0	0 -
ACT	23	50 (35-65)	10	40 (21-61)	13	62 (38-82)	26	57 (41-71)	12	48 (29-69)	14	67 (43-85)
Chloroquine	17	37 (23-53)	12	48 (28-69)	5	24 (8-47)	18	39 (25-55)	13	52 (31-72)	5	24 (8-47)

[r]ORS, ACT, chloroquine, RUTF, RDT.

RUTF	16	35 (21-50)	0	0 (0-14)	16	76 (53-92)	14	30 (18-46)	0	0 -	14	67 (43-85)
RDT	29	63 (48-77)	11	44 (24-65)	18	86 (64-97)	29	63 (48-77)	14	56 (35-76)	15	71 (48-89)
Vitamin A	29	63 (48-77)	11	44 (24-65)	18	86 (64-97)	29	63 (48-77)	11	44 (24-65)	18	86 (64-97)
Amoxicillin	16	35 (21-50)	0	0 -	16	76 (53-92)	14	30 (18-46)	0	0 -	14	67 (43-85)
Folic acid	3	7 (1-18)	0	0 -	3	14 (3-36)	5	11 (4-24)	0	0 -	5	24 (8-47)
Mebendazole	18	39 (25-55)	5	20 (7-41)	13	62 (38-82)	19	41 (27-57)	5	20 (7-41)	14	67 (43-85)
Tetracycline ointment	8	17 (8-31)	4	16 (5-36)	4	19 (5-42)	10	22 (11-36)	5	20 (7-41)	5	23 (8-47)
Paracetamol	21	46 (31-61)	12	48 (28-69)	9	43 (22-66)	21	46 (31-61)	10	40 (21-61)	11	52 (30-74)

Figure 2: Proportion of health posts with essential routine CCM commodities available on day of data collection in intervention and comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.



An index of essential iCCM commodities for intervention health posts is composed of seven items: cotrimoxazole, ORS, zinc, ACT, chloroquine, RUTF, and RDT for malaria. Health posts in intervention

areas had an average of 6.4 of these commodities in stock. The number was similar for Jimma (6.4) and West Hararghe (6.3).

For comparison health posts, the index includes only five commodities, since cotrimoxazole and zinc are not part of the routine CCM program. Comparison health posts had on average half of the five essential commodities. Jimma had a lower average number of commodities (2.0) than did West Hararghe (3.0). Table 17 presents the indices for iCCM commodities in intervention health posts and routine CCM commodities in comparison health posts.

Table 17: Index of essential iCCM commodity availability on day of data collection in health posts in intervention and comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	Mean (95% CI)	Range	Mean (95% CI)	Range	Mean (95% CI)	Range
Essential iCCM commodities available in intervention health posts	6.4/7 (6.2-6.6)	0-7	6.4/7 (6.2-6.7)	3-7	6.3/7 (6.0-6.7)	0-7
Essential routine CCM commodities available in comparison health posts	2.5/5 (2.1-2.9)	0-5	2.0/5 (1.5-2.5)	0-4	3.0/5 (2.5-3.6)	0-5

Expired essential iCCM commodities (cotrimoxazole, ORS, zinc, ACT, chloroquine, RUTF, and RDTs) were found frequently in health posts. Table 18 presents the proportion of health posts with *no* expired essential iCCM/routine CCM commodities in intervention and comparison health posts. Only 40% of intervention health posts had no expired commodities. Expired commodities were less common in West Hararghe, where 61% of health posts had no expired commodities, compared to 23% in Jimma. Even fewer comparison health posts (24%) had no expired commodities.

Table 18: Health posts with no expired essential iCCM commodities on the day of data collection in health posts in intervention and comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Intervention health posts	41/103	40 (30-50)	13/57	23 (13-36)	28/46	61 (45-75)
Comparison health posts	11/46	24 (13-39)	4/25	16 (5-36)	7/21	33 (15-57)

Non-pharmaceutical iCCM supplies and job aids were generally in supply in intervention health posts. Just under half (46%) of health posts had all essential supplies and job aids in stock on the day of the visit. Nearly all health posts had a functional timer and tape for measuring middle upper arm

circumference (MUAC). Other supplies (functional thermometer, weighing scale, clean water and supplies to mix ORS) were in stock in 72-80% of health posts.

All intervention health posts had an iCCM chart booklet and an iCCM patient register to assist with patient management and registration of patients. Eighty-six percent had family health cards available. Outpatient therapeutic program (OTP) cards were largely available in West Hararghe (85%), but not in Jimma (4%). This is due to a much larger number of malnutrition priority areas (where OTP cards are needed) in West Hararghe zone.

Supplies and job aids were in shorter supply in comparison health posts. No comparison health posts had all essential supplies and job aids. Few comparison health posts had a functional timer (11%) or clean water (7%) and none had supplies to mix ORS. Only 15% had a patient register and none had a chart booklet. Tables 19 and 20 present information on availability of supplies and job aids in intervention and comparison health posts, respectively. Figure 3 compares the availability of essential iCCM supplies and job aids in intervention and comparison health posts.

Table 19: Availability of ICCM supplies and job aids on the day of data collection in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total N = 103		Jimma N = 57		W. Hararghe N = 46	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
All essential supplies and job aids for iCCM[$]	40	46 (36-56)	31	54 (41-68)	16	35 (21-50)
Functional timer	94	91 (84-96)	53	93 (83-98)	41	89 (76-96)
Thermometer	82	80 (71-87)	41	72 (59-83)	41	89 (76-96)
Weighing scale	79	77 (67-85)	39	68 (55-80)	40	87 (74-95)
MUAC tape	102	99 (95-100)	56	98 (91-100)	46	100 -
Clean water	74	72 (63-81)	53	93 (83-98)	21	46 (31-61)
Supplies to mix ORS (cup & spoon)	77	75 (65-83)	56	98 (91-100)	21	46 (31-61)
ICCM chart booklet	103	100 -	57	100 -	46	100 -
ICCM patient register	103	100 -	57	100 -	46	100 -
Family health card	88	85 (77-92)	44	77 (64-87)	44	96 (85-100)
OTP card	41	40 (30-50)	2	4 (0-12)	39	85 (71-94)

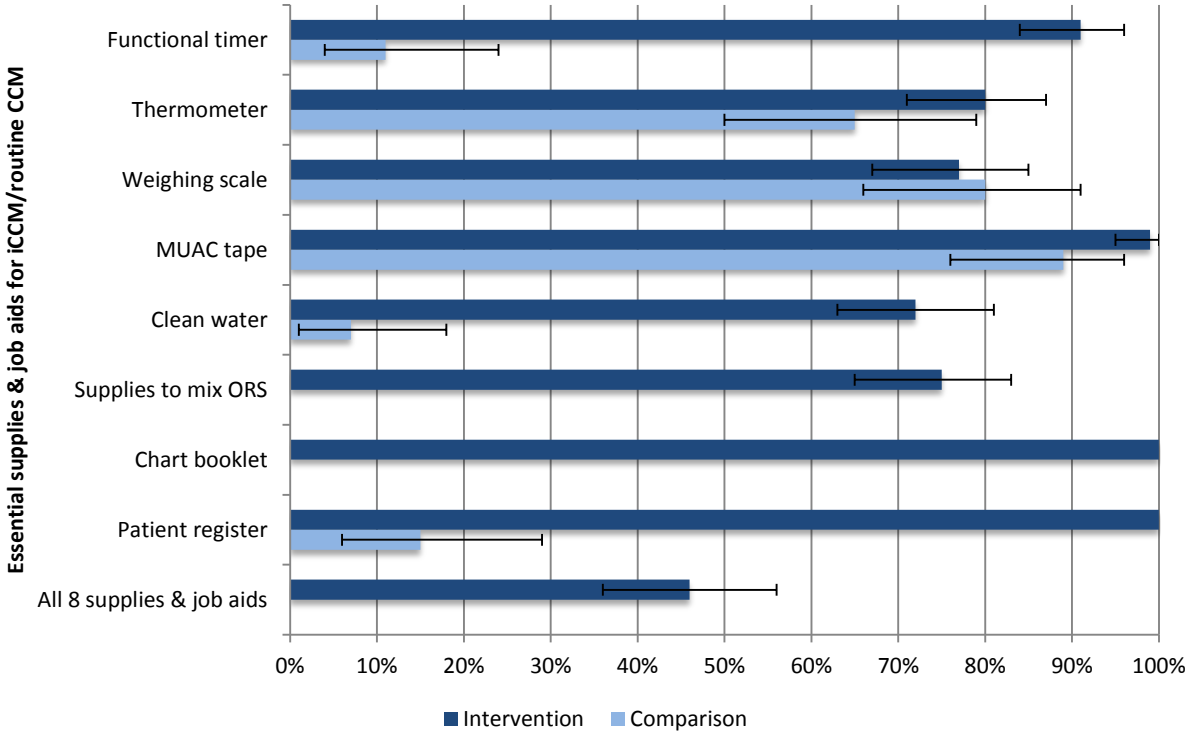
[$] Functional timer, thermometer, weighing scale, clean water, MUAC, supplies to mix ORS, iCCM chart booklet, iCCM patient register.

Table 20: Availability of ICCM supplies and job aids on the day of data collection in health posts in comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total N = 46		Jimma N = 25		W. Hararghe N = 21	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
All essential supplies and job aids for CCM[t]	0	0 -	0	0 -	0	0 -
Functional timer	5	11 (4-24)	4	16 (5-36)	1	5 (0-24)
Thermometer	30	65 (50-79)	14	56 (35-76)	16	76 (53-92)
Weighing scale	37	80 (66-91)	17	68 (47-85)	20	95 (76-100)
MUAC tape	41	89 (76-96)	20	80 (59-93)	21	100 -
Clean water	3	7 (1-18)	3	12 (3-31)	0	0 -
Supplies to mix ORS (cup & spoon)	0	0 -	0	0 -	0	0 -
CCM chart booklet	0	0 -	0	0 -	0	0 -
CCM register	7	15 (6-29)	7	28 (12-49)	0	0 -
Family health card	39	85 (71-94)	18	72 (51-88)	21	100 -
OTP card	19	41 (27-57)	0	0 -	19	91 (70-99)

[t] Functional timer, thermometer, weighing scale, clean water, MUAC, supplies to mix ORS, patient register.

Figure 3: Proportion of health posts with essential iCCM supplies and job aids available on day of data collection in intervention and comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.



4. QUALITY OF CARE

Assessment of quality of care was restricted to the intervention areas. All HEWs performing clinical care for sick children had been trained in iCCM, therefore all children observed received care from an iCCM-trained HEW. HEW consultations with sick children lasted an average of 27 minutes.

4.1 ASSESSMENT OF SICK CHILDREN

HEWs generally checked for signs and symptoms of iCCM illnesses. A large proportion (81%) of children were assessed for the presence of cough, diarrhea, fever, and malnutrition. Virtually all children (98%) had their vaccination status assessed. Fewer children (62%) were assessed for four general danger signs. Out of 11 key assessment tasks (1. checked whether child is able to drink/breastfeed, 2. checked whether child vomits everything, 3. checked whether child has had convulsions, 4. checked whether child has lethargy, 5. checked for cough or fast/difficult breathing, 6. checked for diarrhea, 7. checked for fever, 8. checked for edema, 9. checked for low MUAC or visible severe wasting, 10. checked for palmar pallor, 11. checked child's vaccination status), HEWs completed an average of 9.2. HEWs generally did a good job of doing a basic assessment for each iCCM illness (i.e. asking for respiratory problems, diarrhea, fever, checking respiratory rate, checking MUAC). However, they often did not assess for other signs and symptoms that indicate more severe illness such as stridor, inability to drink or drinking eagerly, bulged fontanel, stiff neck, edema, and no appetite.

Assessments were more complete in Jimma zone, where 93% of children were assessed for cough, diarrhea, fever, and malnutrition, compared to 62% in West Hararghe. Only 45% of children were assessed for general danger signs in West Hararghe. The proportion in Jimma was 74%. HEWs in Jimma completed an average of 10.1 out of 11 assessment tasks and in West Hararghe they completed an average of eight out of 11 assessment tasks.

Of children who needed an RDT according to the iCCM clinical guidelines, HEWs correctly performed an RDT for 63%. Less than half (48%) of children needing an RDT received one in West Hararghe, compared to 70% in Jimma. Respiratory rates counted by HEWs were within five breaths per minute of the respiratory rate counted by the re-examiner 70% of the time. However, the HEW did not count respiratory rate for 14% of children with cough or difficult breathing. MUAC measurement by HEWs was highly consistent with the gold standard, with 94% of HEW MUAC classifications matching the gold standard. Almost all (95%) children needing a MUAC measurement had their MUAC measured.

HEWs should inquire about the child's and the mother's HIV status during consultations. The large majority of mothers (95%) were asked about their HIV status and 88% of caretakers were asked about the child's HIV status.

HEWs referred to the iCCM chart booklet and used the iCCM sick child register during all consultations

observed. Table 21 presents information on the completeness of HEWs' assessment of sick children.

Table 21: Indicators of quality of assessment of sick children by HEWs in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)
Child assessed for 4 general danger signs (able to drink/breastfeed, vomits everything, had convulsions, lethargy)	159/257	62 (53-70)	112/152	74 (62-83)	47/105	45 (31-59)
Child checked for presence of cough, diarrhea, fever, and malnutrition	207/257	81 (74-86)	142/152	93 (89-96)	65/105	62 (50-72)
Child's vaccination status checked (children under 12 months)	92/94	98 (92-100)	56/57	98 (88-100)	36/37	97 (82-100)
Child with fever who needed an RDT for whom RDT was correctly performed	59/94	63 (51-73)	44/63	70 (54-82)	15/31	48 (30-67)
Child's respiratory rate recorded by HEW within five breaths of gold standard respiratory rate	91/130	70 (61-78)	64/93	69 (57-78)	27/37	73 (58-84)
Child's MUAC measurement by HEW matched gold standard MUAC measurement	211/225	94 (90-96)	133/137	97 (92-99)	78/88	89 (81-93)
Child's mother was asked about her HIV status	226/238	95 (90-98)	139/139	100 -	87/99	88 (77-94)
Child's caretaker was asked about child's HIV status	226/257	88 (81-93)	150/152	99 (95-100)	76/105	72 (60-82)
HEW used iCCM chart booklet and iCCM register during the child's consultation	257/257	100 -	152/152	100 -	105/105	100 -
	Mean (95% CI)	**Range**	**Mean (95% CI)**	**Range**	**Mean (95% CI)**	**Range**
Index of 11 key assessment tasks	9.2 (8.9-9.6)	1-11	10.1 (9.7-10.4)	6-11	8.0 (7.4-8.6)	1-11

4.2 CLASSIFICATION OF SICK CHILDREN

Just over half of children (53%) were classified correctly for all major iCCM illnesses. This proportion is substantially higher in Jimma (63%) than in West Hararghe (38%). Children with specific illnesses, according to the gold standard classification, were generally classified correctly. Among children with pneumonia, 74% were classified as having pneumonia by the HEWs. The proportion of children with diarrhea correctly classified with diarrhea was similar, at 75%.

Only 53% of children with malnutrition were classified correctly for malnutrition. In West Hararghe, the proportion was even lower, with only 24% of malnourished children correctly classified. Nearly all children (91%) were assessed for malnutrition either through measurement of MUAC (for children six months or older) or by looking for visible severe wasting (for children under six months), but only 50% of children were assessed for bipedal edema and children were almost never given an appetite test. Children who received a complete malnutrition assessment by the HEW, including assessment of edema and appetite, if recommended, were classified correctly for malnutrition 75% of the time. However, children who did not receive a complete malnutrition were classified correctly for malnutrition only 25% of the time.

Sample sizes of children with malaria (three children) and measles (five children) were too small to be able to draw any concrete conclusions about management of these illnesses.

Although nearly all children were assessed for vaccination status, only 36% of children who were not up-to-date on vaccinations were classified by the HEW as not up-to-date. Higher proportions of children needing routine vitamin A supplementation (62%) and mebendazole (67%) were classified as not up-to-date.

HEWs reliably classified children with fever according to the result of diagnostic testing. Among children with fever who received an RDT, all were correctly classified for malaria according to the result of the RDT. Table 22 presents information on HEWs' classification of sick children.

Table 22: Indicators of quality of classification of sick children by HEWs in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)
Child correctly classified for all iCCM illnesses[u]	136/257	53 (46-60)	96/152	63 (54-72)	40/105	38 (27-50)
Child with danger signs correctly classified for danger signs	0/0	-	0/0	-	0/0	-
Child with pneumonia correctly classified for pneumonia	29/39	74 (59-86)	25/34	74 (57-85)	4/5	80 (30-97)
Child with diarrhea correctly classified for diarrhea	127/169	75 (67-82)	76/87	87 (78-93)	51/82	62 (50-73)
Child with malaria correctly classified for malaria	2/3	67 (2-100)	2/2	100 -	0/1	0 -
Child with measles correctly classified for measles	1/5	20 (0-95)	1/4	25 (3-81)	0/1	0 -
Child with malnutrition correctly classified for malnutrition	17/32	53 (33-72)	13/15	87 (58-97)	4/17	24 (7-54)
Child not up-to-date on immunizations classified as not up-to-date	28/77	36 (26-48)	18/53	34 (23-47)	10/24	42 (21-65)
Child not up-to-date on vitamin A supplementation classified as not up-to-date	41/66	62 (49-74)	16/30	53 (37-69)	25/36	69 (50-84)
Child not up-to-date on mebendazole classified as not up-to-date	20/30	67 (46-83)	9/15	60 (30-83)	11/15	73 (46-90)
Child with fever who received an RDT classified in accordance with RDT result	61/61	100 -	45/45	100	16/16	100

4.3 MANAGEMENT OF SICK CHILDREN

Most children were managed (received correct treatment or referral, including correct dose, duration and schedule, and did not receive any unnecessary treatments) in agreement with the gold standard. Of

[u] Danger signs, respiratory illness, diarrhea, malaria, measles, malnutrition.

the sample of all children, 64% were correctly managed for all iCCM illnesses. Correct management was slightly higher in Jimma (68%) than in West Hararghe (59%). Children with a specific illness generally received correct management for that illness. Seventy-two percent of children with pneumonia received correct management. Similarly, 79% of children with diarrhea received correct management. Children with malnutrition were less likely to receive correct management compared to children with pneumonia or diarrhea. Only 59% of malnourished children were correctly managed. Again, sample sizes of children with malaria and measles were too small to draw meaningful conclusions. Only 54% of children needing referral were referred by the HEW. Children with pneumonia and diarrhea were more likely to receive correct management in Jimma than in West Hararghe, but malnutrition was correctly managed more often in West Hararghe. Only 14% of children received the first dose of all needed treatments in the health post in the presence of the HEW.

Over-treatment of children with antibiotics or antimalarials was very rare. Only 6% of children received an antibiotic when it was not indicated and no children received unnecessary antimalarials.

Very few children needing routine vitamin A supplementation and mebendazole received them. Only 18% of children needing a vitamin A supplement received vitamin A and 20% of children needing an anti-helminth dose received mebendazole. Children were more likely to receive vitamin A and mebendazole in Jimma (27% and 33%, respectively) than in West Hararghe (11% and 7%).

Among children who were referred, most (75%) received a referral note from the HEW. None, however, received assistance from the HEW with transportation to the referral facility. Table 23 and figure 4 present indicators of management of sick children by HEWs in intervention health posts.

Table 23: Indicators of quality of management of sick children by HEWs in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)
Child correctly managed for all iCCM illnesses[v]	165/257	64 (57-71)	103/152	68 (59-75)	62/105	59 (48-69)
Child needing referral correctly referred	34/63	54 (41-67)	18/25	72 (51-86)	16/38	42 (27-59)
Child with pneumonia correctly managed for pneumonia	28/39	72 (56-84)	25/34	74 (57-85)	3/5	60 (19-90)
Child with diarrhea correctly managed for diarrhea	134/169	79 (72-85)	75/87	86 (76-92)	59/82	72 (60-82)
Child with malaria correctly managed for malaria	2/3	67 (2-100)	2/2	100 -	0/1	0 -

[v] Includes danger signs, respiratory illness, diarrhea, febrile illness, measles, malnutrition.

Child with measles correctly managed for measles	1/5	20 (0-95)	1/4	25 (3-81)	1/1	100 -
Child with malnutrition correctly managed for malnutrition	19/32	59 (40-76)	7/15	47 (23-73)	12/17	71 (45-87)
Child received first dose of all needed treatments in presence of HEW[w]	22/153	14 (9-22)	17/92	19 (11-30)	5/61	8 (4-18)
Child received an antibiotic that wasn't needed	14/257	6 (3-10)	9/152	6 (3-11)	5/105	5 (2-14)
Child received an antimalarial that wasn't needed	0/257	0 -	0/152	0 -	0/105	0 -
Child needing vitamin A supplementation received vitamin A	12/66	18 (10-31)	8/30	27 (13-46)	4/36	11 (4-30)
Child needing mebendazole received mebendazole	6/30	20 (9-39)	5/15	33 (15-59)	1/15	7 (1-36)
Caretaker of referred child received referral note	33/44	75 (56-87)	20/24	83 (62-94)	13/20	65 (36-86)
Caretaker of referred child received transportation assistance from the HEW	0/44	0 -	0/24	0 -	0/20	0 -

Appendix 2 presents analyses of pathways to correct treatment of iCCM illnesses and where clinical errors were made. For pneumonia cases, nearly all children were assessed completely for pneumonia. However, about one-quarter of those children were incorrectly classified. All children with pneumonia who were correctly classified were also correctly managed. On the other hand, most children who were incorrectly classified were also managed incorrectly.

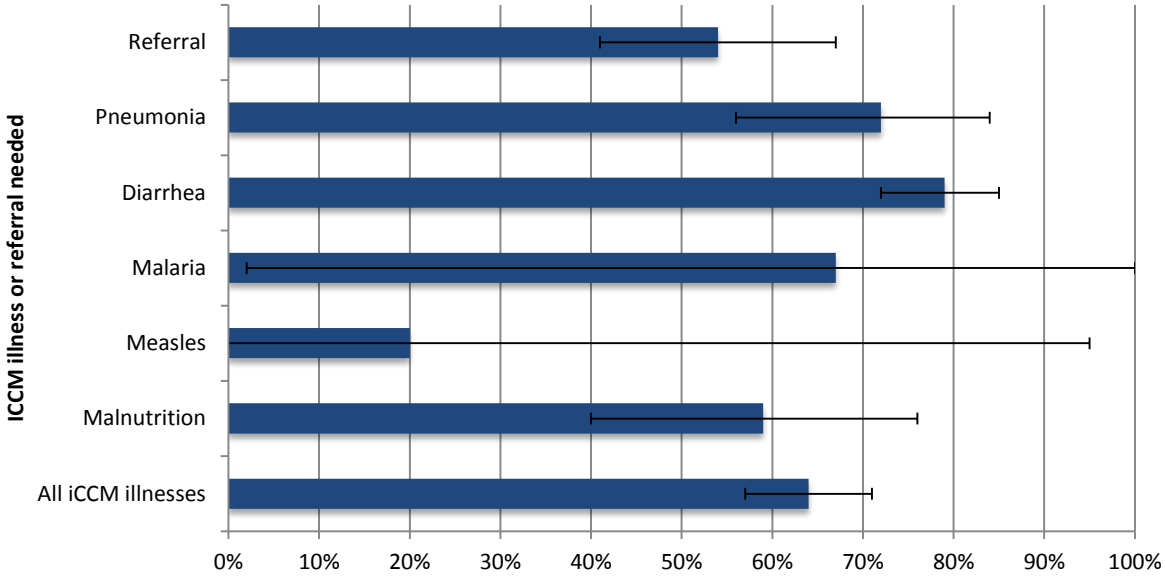
All children with non-severe diarrhea were assessed for diarrhea. Three-quarters of those children were classified correctly. Most children who were classified correctly and who were misclassified were managed correctly (80% and 76%, respectively). Only 26% of children with severe diarrhea were assessed completely for severe diarrhea. Of those who were assessed completely for severe diarrhea, 57% were correctly classified. Only 30% of children who did not receive a complete assessment for severe diarrhea were correctly classified. All children correctly classified were managed correctly. Those children incorrectly classified generally received correct treatment, but were not referred.

Only 40% of children with uncomplicated malnutrition were assessed completely for malnutrition. Three-quarters of children assessed completely were correctly classified and 83% of those were correctly managed. Only 25% of children not assessed completely were correctly classified. Most

[w] Includes cotrimoxazole, ORS, zinc, vitamin A, ACT, chloroquine, and amoxicillin. Excludes children who were referred.

children with uncomplicated malnutrition were correctly managed, whether they were correctly classified or not. In contrast, children with complicated malnutrition were very rarely managed correctly. Among children with complicated malnutrition, only 33% were assessed completely. All of those children that received a complete assessment were correctly classified and 63% who were not assessed completely were correctly classified. However, most children who were correctly classified, as well as those who were incorrectly classified, were managed incorrectly.

Figure 4: Proportion of children with an iCCM illness or needing referral correctly managed by HEWs (by specific illness) in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012



4.4 COUNSELING

A large majority of caretakers (77%) received demonstration on how to administer all treatments by the HEW. However, only 30% of caretakers were asked to repeat back how to administer the treatment. A very high proportion (83%) of caretakers correctly described how to give all treatments during the exit interview. Most caretakers (85%) were advised to give extra fluids and continue feeding a child with diarrhea, but only 36% were advised to return immediately if the was unable to drink/breastfeed or if the child became sicker. A large majority (93%) was advised when to return to the health post for follow-up. Table 24 shows information on counseling of caretakers by HEWs.

Table 24: Indicators of quality of counseling of caretakers of sick children by HEWs in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.[x]

	Total		Jimma		W. Hararghe	
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)
Caretaker received demonstration of how to administer all treatments by HEW[y]	119/154	77 (67-85)	78/89	88 (73-95)	41/65	63 (47-77)
Caretaker asked by HEW to repeat back how to administer treatment[z]	45/149	30 (21-41)	33/88	38 (26-51)	12/61	20 (9-37)
Caretaker correctly described how to give all treatments	131/158	83 (75-89)	78/90	87 (76-93)	53/68	78 (65-87)
Caretaker advised to give extra fluids and continued feeding for diarrhea	119/140	85 (78-90)	64/74	87 (76-93)	55/66	83 (72-91)
Caretaker advised to return Immediately if child cannot drink/breastfeed or becomes sicker[aa]	77/213	36 (27-46)	71/128	56 (42-68)	6/85	7 (3-16)
Caretaker advised on when to return for follow-up[bb]	199/213	93 (88-97)	120/128	94 (86-97)	79/85	93 (84-97)

[x] Denominators are caretakers of children who received a given treatment from the HEW, rather than children who needed a treatment according to the gold standard classification.
[y] Includes cotrimoxazole, ORS, zinc, vitamin A, ACT, chloroquine, and amoxicillin. Excludes children who were referred.
[z] Includes cotrimoxazole, ORS, zinc, vitamin A, ACT, chloroquine, and amoxicillin. Excludes children who were referred.
[aa] Excludes children that were referred.
[bb] Excludes children that were referred.

5. ICCM UTILIZATION & SERVICE PROVISION

5.1 UTILIZATION

Utilization of iCCM services is low. Intervention health posts had an average of 16 sick child consultations per health post in the previous month. Nearly all of these children were between 2-59 months of age, with virtually no children under two months seen in the previous month. There was large variation in utilization among health posts, with a range of consultations per month from zero to 95. The most common classifications among children seen by HEWs were diarrhea (an average of 6.4 cases per month) and pneumonia (an average of four cases per month).

Although utilization in intervention areas was low, it was over three times higher than in comparison health posts, which saw an average of only five children per health post in the previous month. The number of children seen ranged from zero to 32. See tables 25 and 26 (and figure 5) for information on utilization of iCCM/routine CCM services at intervention and comparison health posts, respectively.

Data collectors asked HEWs if they had treated any children in the previous month that were not registered in the iCCM registers. Only one child out of all intervention health posts was reportedly treated in the community, but not recorded in the iCCM register. In the comparison health posts, a total of six children were reportedly treated in the community, but not recorded in a registration book.

Table 25: Mean number and range of sick child consultations in the previous month in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	Mean (95% CI)	Range	Mean (95% CI)	Range	Mean (95% CI)	Range
Total	16.0 (13.2-18.8)	0-95	17.4 (13.1-21.7)	0-95	14.3 (11.0-17.7)	0-51
Age						
<2 months	0.3 (0.1-0.5)	0-9	0.4 (0.0-0.7)	0-9	0.2 (0.1-0.4)	0-2
2-59 months	15.7 (13.0-18.4)	0-94	17.0 (12.9-21.1)	0-94	14.1 (10.8-17.4)	0-50
Sex						
Female	8.0 (6.6-9.5)	0-40	8.7 (6.4-10.9)	0-40	7.3 (5.5-9.1)	0-28
Male[cc]	7.9 (6.4-9.4)	0-57	8.7 (6.4-11.0)	0-57	6.9 (5.3-8.6)	0-20
Disease classifications						
Pneumonia	4.0 (3.1-5.0)	0-31	5.4 (3.9-6.9)	0-31	2.4 (1.3-3.5)	0-20
Diarrhea	6.4 (5.3-7.6)	0-28	6.3 (4.7-7.9)	0-28	6.6 (4.9-8.2)	0-20
Malaria	1.6 (1.1-2.1)	0-13	2.4 (1.6-3.2)	0-13	0.6 (0.1-1.1)	0-9
Malnutrition	1.1 (0.6-1.5)	0-12	0.2 (0.0-0.4)	0-4	2.1 (1.2-2.9)	0-12
Anemia	0.1 (0.0-0.1)	0-2	0.1 (0.0-0.2)	0-2	0.1 (0.0-0.2)	0-2
Ear infection	0.3 (0.1-0.5)	0-7	0.1 (0.0-0.2)	0-2	0.6 (0.2-1.0)	0-7
Referred	1.0 (0.7-1.3)	0-8	1.1 (0.6-1.5)	0-8	1.0 (0.5-1.5)	0-8

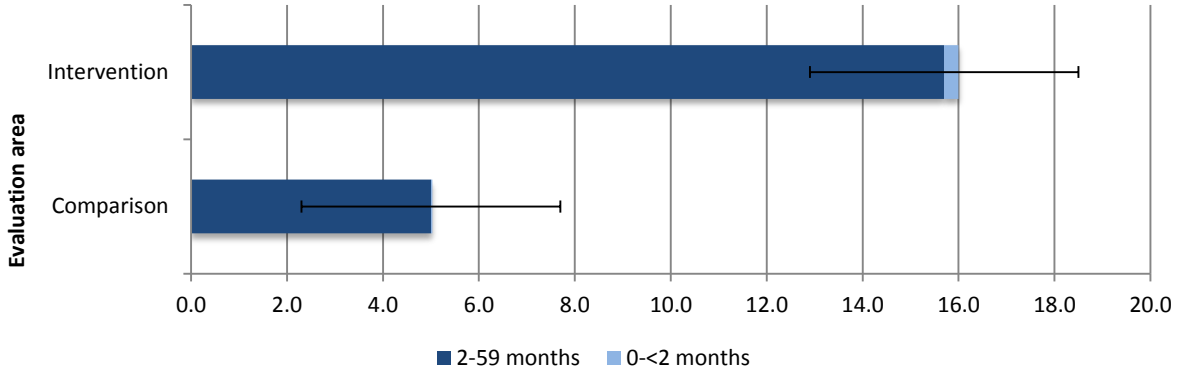
[cc] 0.1 children per health post were missing information on sex.

Table 26: Mean number and range of sick child consultations in the previous month in health posts in comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	Mean (95% CI)	Range	Mean (95% CI)	Range	Mean (95% CI)	Range
Total	5.0 (2.3-7.7)	0-32	4.8 (1.6-8.0)	0-32	5.5 (2.8-10.6)	0-29
Age						
<2 months	0.03 (0.0-0.1)	0-1	0.04 (0.0-0.1)	0-1	0.0 -	0
2-59 months	5.0 (2.4-7.6)	0-31	4.8 (1.7-7.9)	0-31	5.5 (0.3-10.6)	0-29
Sex						
Female	2.3 (0.7-3.9)	0-19	1.9 (0.1-3.7)	0-19	3.2 (0.0-6.6)	0-19
Male[dd]	2.4 (1.2-3.7)	0-13	2.5 (0.9-4.1)	0-13	2.3 (3.1-4.2)	0-10
Disease classifications						
Pneumonia	0.0 -	0	0.0 -	0	0.0 -	0
Diarrhea	1.9 (0.4-3.4)	0-20	2.4 (0.3-4.5)	0-20	0.9 (0.0-2.0)	0-5
Malaria	1.0 (0.3-1.8)	0-10	1.2 (0.1-2.2)	0-10	0.7 (0.0-1.6)	0-4
Malnutrition	0.3 (0.0-0.5)	0-3	0.0 -	0	0.8 (0.1-1.5)	0-3
Anemia	0.0 -	0	0.0 -	0	0.0 -	0
Ear infection	0.0 -	0	0.0 -	0	0.0 -	0
Referred	0.3 (0.0-0.7)	0-7	0.4 (0.0-1.0)	0-7	0.1 (0.0-0.3)	0-1

[dd] 0.2 children per health post were missing information on sex.

Figure 5: Mean number of sick child consultations for children 2-59 months and under two months in the previous month in health posts in intervention and comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.



During the HEW interviews, data collectors asked HEWs what they thought were the main reasons caretakers do not bring their sick children to the health post for care. Responses are summarized in Table 27. The most common response among HEWs in intervention health posts was that caretakers are not aware of the availability of case management services in the health posts (30%).

Table 27: Reasons given by HEWs for why caretakers do not bring sick children to the health post in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	n N=137	%
Not aware of case management services	41	30
Distance from home to health post	32	23
Want injectable drugs	18	13
Health post not always open	15	11

Regression analysis of associations between utilization of iCCM services in intervention areas and key variables provides some insight into the characteristics of health posts with higher and lower rates of utilization. The results of linear regression analyses (presented in Table 28) examining the association between utilization and covariates, controlling for the population of children under five in the kebele, show that variables with strong to moderately strong associations with utilization include:

- Availability of iCCM commodities, supplies, and job aids (p-value = 0.01)
- Malaria risk of kebele (p-value = 0.03)
- Health post received supervision (p-value = 0.06)
- Hours the health post was open in the previous week (p-value = 0.06)

Utilization is strongly positively associated with availability of iCCM commodities, supplies, and job aids, with an increase of 1.9 children seen per month for every one unit increase in the index of commodity, supply, and job aid availability (with a total of 15 items). In other words, a health post with all 15 items

available saw on average 19 more children in the month than did a health post with only five items available.

Health posts in high malaria risk kebeles had a higher average number of consultations than health posts with low or no malaria risk. High malaria risk health posts had an average of 22.2 consultations per month, compared to 13.7 for low malaria risk health posts and 13.4 for health posts in kebeles with no malaria. One possible explanation for this observation is that although there were few children diagnosed with malaria, caretakers in malarious areas may consider fever (and perhaps other signs and symptoms) to be more serious, and therefore are more likely to bring children to the health post.

Health posts that received supervision on iCCM in the previous three months had a higher average number of consultations and those that received no supervision and health posts that received supervision that included clinical reinforcement (register review or observation of case management) had even higher utilization. Health posts that received no supervision saw an average 8.9 children in the previous month, compared to 15 for health posts that received supervision without clinical reinforcement and 17.6 for health posts that received supervision with clinical reinforcement.

Finally, health posts that were open and offering clinical services for more hours in the previous week had a higher average number of consultations. The average number of consultations increased by 0.24 for every hour increase in the time the health post was open. Therefore, a health post that was open 40 hours in the previous week saw 7.2 more children than did a health posts that was open for 10 hours.

Table 28: Associations from multiple linear regression of utilization of iCCM services on key covariates, controlling for population of children under five in the kebele, in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

Dependent variable	Independent variable	p-value	Comments
Number of sick child consultations at intervention health posts in the previous month	Zone	0.45	Higher in Jimma
	Distance from nearest referral facility	0.84	Lowest for health posts closest to health center
	Malaria risk	0.03	Higher for kebeles with high malaria risk
	Index of iCCM drug, RDT, supply, and job aid availability	0.01	Increases with higher drug availability
	Hours health post was open in previous week	0.06	Increases with higher opening hours
	Number of VCHWs	0.76	Decreases with more VCHWs
	Number of documented demand generation activities	0.21	Increases with more activities
	Health post received supervision	0.06	Higher for supervised health posts and highest if supervised with clinical reinforcement

5.2 SERVICE PROVISION

According to the HEWs, intervention health posts were open and offering clinical services an average of 23 hours in the previous week. This number was somewhat higher in West Hararghe (26 hours) than in Jimma (21 hours). HEWs also reported that in the previous day, they spent about four hours providing or offering clinical services in the health post. They spent only half an hour providing clinical services in the community and nearly one hour carrying out community mobilization/education activities. In total, they reported spending an average of about six hours on work-related activities in the previous day.

HEWs in comparison health posts reported that the health post was open about the same number of hours in the previous week (20 hours) as in intervention health posts. However, the difference between the two zones was much greater in the comparison area. Jimma health posts were reportedly open only 12 hours in the previous week, compared to 30 hours in West Hararghe. HEWs reported spending only two hours in the previous day providing/offering clinical services in the health post. They spent more time (1.5 hours) doing community mobilization/education in the community. HEWs in the comparison areas reported spending a total of 5.5 hours on work-related activities in the previous day. See tables 29 and 30 (and figure 6) for information on service provision in intervention and comparison health posts, respectively.

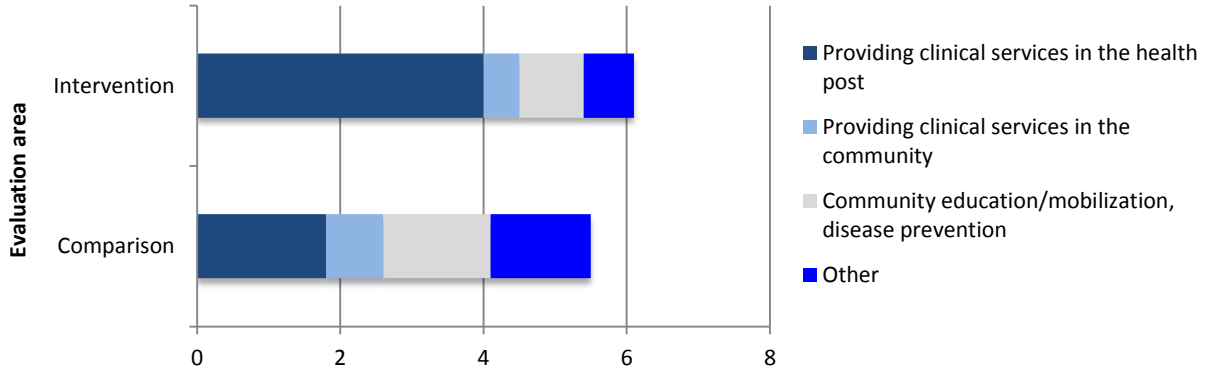
Table 29: Mean number of hours health post was open in the previous week and mean number of hours spent by HEWs on work-related activities the previous day in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	Mean (95% CI)	Range	Mean (95% CI)	Range	Mean (95% CI)	Range
Hours health post was open in previous week	23.3 (21.0-25.5)	0-40	21.1 (18.8-23.4)	0-40	26.0 (21.9-30.1)	0-40
Hours spent by HEW in the previous day						
Providing clinical services in the health post	4.0 (3.5-4.5)	0-10	3.9 (3.3-4.6)	0-9	4.1 (3.3-5.0)	0-10
Providing clinical services in the community	0.5 (0.3-0.6)	0-7.5	0.5 (0.3-0.8)	0-7.5	0.4 (0.2-0.6)	0-4
Community education/mobilization, disease prevention	0.9 (0.6-1.1)	0-8	0.8 (0.6-1.1)	0-6	0.9 (0.4-1.3)	0-8
Other health-related activities	0.8 (0.5-1.1)	0-8	0.6 (0.4-0.9)	0-6	1.0 (0.4-1.6)	0-8
Other non health-related activities	0.2 (0.1-0.4)	0-8	0.3 (0.1-0.6)	0-8	0.1 (0.0-0.1)	0-2
Travel outside kebele	0.7 (0.3-1.2)	0-12	0.7 (0.2-1.2)	0-12	0.8 (0.0-1.6)	0-12
Total work-related activities	6.1 (5.6-6.6)	0-11	5.9 (5.3-6.5)	0-11	6.4 (5.7-7.1)	0-10

Table 30: Mean number of hours health post was open in the previous week and mean number of hours spent by HEWs on work-related activities the previous day in comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	Mean (95% CI)	Range	Mean (95% CI)	Range	Mean (95% CI)	Range
Hours health post was open in previous week	20.2 (17.0-23.5)	0-40	12.2 (10.5-13.8)	0-17	29.9 (26.2-33.5)	16-40
Hours spent by HEW in the previous day						
Providing clinical services in the health post	1.8 (1.1-2.5)	0-8	0.9 (0.4-1.4)	0-6	2.8 (1.6-4.0)	0-8
Providing clinical services in the community	0.8 (0.3-1.2)	0-5	0.5 (0.2-0.8)	0-3	1.1 (0.2-1.9)	0-5
Community education/mobilization, disease prevention	1.5 (0.9-2.2)	0-8	1.9 (1.0-2.7)	0-7.5	1.2 (0.3-2.1)	0-8
Other health-related activities	1.4 (0.7-2.1)	0-8	1.8 (0.8-2.8)	0-8	1.0 (0.1-1.9)	0-8
Other non health-related activities	0.4 (0.1-0.8)	0-7	0.5 (0.2-0.9)	0-4	0.4 (0.0-0.9)	0-7
Travel outside kebele	0.5 (0.1-0.9)	0-8	0.3 (0.0-0.7)	0-6	0.8 (0.1-1.5)	0-8
Total work-related activities	5.5 (4.9-6.2)	0-9	5.1 (4.0-6.1)	0-9	6.1 (5.2-7.0)	0-8

Figure 6: Mean number of hours spent by HEWs on work-related activities in the previous day in health posts in intervention and comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.



5.3 HEALTH PROMOTION AND DEMAND GENERATION

HEWs are tasked with recruiting and training volunteer community health workers (VCHWs) to assist with community education and mobilization efforts. Specific responsibilities of VCHWs include promotion of improved health behaviors, such as nutrition, sanitation, hygiene, immunization, antenatal care, and care seeking practices.[1] HEWs in intervention health posts reported an average of 21 VCHWs associated with each health post, equivalent to 30 VCHWs per 1,000 children under five. Coverage of VCHWs is 33 per 1,000 children under five in Jimma and 28 per 1,000 under fives in West Hararghe.

HEWs also reported an average of nine community education/mobilization activities carried out by HEWs or VCHWs in the previous month. An average of 347 people reportedly attended these activities. The number of activities documented in activity reports was substantially smaller, with an average of only three activities reaching an average of 138 people per health post.

There are about the same number of VCHWs per health post in the comparison area, with an average of 20 associated with each health post or 29 per 1,000 children under five. HEWs in comparison health posts reported fewer community education/mobilization activities (an average of seven) and people reached (223, on average) in the previous month than those in intervention health posts. Documented activities and people reached in comparison health posts averaged two and 111, respectively. Tables 31 and 32 present information on VCHWs and demand generation activities in intervention and comparison health posts, respectively.

At the time of data collection, zonal health bureaus were engaged in training a new cadre of community volunteers called the Health Development Army (HDA, also known as the Women's Development Army). The VCHWs have been incorporated into the HDA along with a target of one out of every five women in rural communities. It is unclear at this point how the HDA will work to promote care seeking for childhood illnesses.

Table 31: Mean number of health promotion activities focused on iCCM illnesses carried out by HEWs or VCHWs and people attending iCCM-related health promotion activities in the previous month in health post catchment areas in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	Mean (95% CI)	#/1,000 children <5	Mean (95% CI)	#/1,000 children <5	Mean (95% CI)	#/1,000 children <5
Volunteer community health workers in the health post catchment area	20.5 (17.2-23.8)	30.4 (26.0-34.8)	23.7 (18.2-29.3)	32.5 (25.4-39.5)	16.4 (14.2-18.6)	27.7 (23.2-32.1)
Reported[ee] community education/mobilization activities	9.2 (7.9-10.6)	15.4 (12.3-18.5)	11.7 (10.1-13.3)	19.4 (14.9-23.9)	6.1 (4.2-8.0)	10.5 (6.9-14.0)
Documented[ff] community education/ mobilization activities	2.5 (1.6-3.4)	3.9 (2.4-5.3)	1.6 (0.9-2.2)	2.0 (1.1-2.9)	3.7 (1.9-5.5)	6.2 (3.2-9.1)
Reported people attending community education/mobilization activities	347 (266-428)	-	366 (300-432)	-	323 (160-485)	-
Documented people attending community education/mobilization activities	138 (62-215)	-	56 (32-81)	-	240 (75-405)	-

Table 32: Mean number of health promotion activities focused on iCCM illnesses carried out by HEWs or VCHWs and people attending iCCM-related health promotion activities in the previous month in health post catchment areas in comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	Mean (95% CI)	#/1,000 children <5	Mean (95% CI)	#/1,000 children <5	Mean (95% CI)	#/1,000 children <5
Volunteer community health workers in the health post catchment area	19.7 (15.5-23.9)	28.6 (22.1-35.1)	24.5 (17.7-31.3)	35.9 (25.3-46.5)	14.0 (11.2-16.7)	20.0 (15.5-24.6)
Reported community education/mobilization activities	6.6 (4.7-8.5)	11.3 (6.1-16.5)	9.5 (6.9-12.1)	17.1 (8.5-25.6)	3.2 (1.2-5.2)	4.4 (1.2-7.6)
Documented community education/ mobilization	2.3 (1.5-3.2)	3.3 (2.0-4.6)	2.2 (1.2-3.1)	3.1 (1.8-4.5)	2.5 (1.0-4.1)	3.4 (1.0-5.8)
Reported people attending community education/mobilization activities	223 (140-306)	-	266 (164-368)	-	172 (36-307)	-
Documented people attending community education/mobilization activities	111 (48-174)	-	76 (37-115)	-	152 (23-282)	-

[ee] Self-reported by the HEWs.
[ff] Documented in written activity reports.

6. REGISTER REVIEW

Data collectors recorded information on sick children's signs and symptoms, classification, treatment, referral, and follow-up from patient registers. Information was recorded for the children that were observed by the study team on the day of data collection. Additionally, data collectors recorded information for the three most recent children 2-59 months of age seen prior to the day of data collection. Tables 33 and 34 present information from patient registers on classification and treatment of children 2-59 months in intervention and comparison health posts, respectively. Finally, information on the last three children under two months of age (if available) in the register was documented. Table 35 shows the characteristics of children under two months from register review and table 36 presents information from patient registers on classification and treatment of children under two months in intervention health posts. Figure 7 presents a graphical comparison of quality of care indicators from register review for children 2-59 months in intervention and comparison health posts and for children under two months in intervention health posts. In total, information on 545 children 2-59 months and 101 children under two months was recorded from registers in intervention health posts. In comparison health posts, information for 61 children 2-59 months was documented. Only one child under two months was found in registers in comparison health posts. Therefore, no information on children under two months in comparison health posts is presented.

Most children (67%) 2-59 months in intervention health posts were correctly classified according to the information recorded in the iCCM registers (classification was consistent with recorded signs and symptoms). However, the proportion of children correctly treated and/or referred (treatment and referral matches signs and symptoms and correct dose, schedule, and duration recorded) was much lower, at only 39%. Recorded signs and symptoms, classification, and treatment/referral were all consistent for 31% of children 2-59 months. The outcome of follow-up was recorded for 26% of children. Among children needing referral, outcome was recorded in the register only 8% of the time. As with the indicators of quality of care based on direct observation and re-examination, the indicators of quality of care from register review suggest that quality is somewhat higher in Jimma than in West Hararghe.

In comparison health posts, the register review suggests lower quality of care (or poorer registration) than in intervention health posts. Classification was consistent with signs and symptoms for half of children 2-59 months in comparison health posts. Treatment was consistent with signs and symptoms for only 15% of children and signs and symptoms, classification, and treatment/referral were all consistent for 13% of children. Outcome of follow-up was not recorded for any children in comparison health posts.

Table 33: Indicators of quality of classification and management of children 2-59 months of age from register review in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)
Child whose recorded signs and symptoms, results of diagnostic testing, and classification(s) were consistent	364/545	67 (61-72)	232/309	75 (67-82)	132/236	56 (49-63)
Child whose recorded signs and symptoms, results of diagnostic testing, and treatment/referral were consistent	212/545	39 (34-44)	129/309	42 (36-48)	83/236	35 (28-43)
Child whose recorded signs and symptoms, results of diagnostic testing, classification(s), and treatment/referral were all consistent	168/545	31 (26-36)	107/309	35 (29-41)	61/236	26 (20-34)
Children with outcome of follow-up recorded	134/509	26 (21-32)	69/235	23 (17-29)	65/205	32 (23-42)
Child needing referral with outcome of follow-up recorded	6/73	8 (3-19)	0/36	0 -	6/37	16 (7-35)

Table 34: Indicators of quality of classification and management of children 2-59 months of age from register review in health posts in comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)
Child whose recorded signs and symptoms, results of diagnostic testing, and classification(s) were consistent	30/61	49 (29-69)	20/49	41 (21-64)	10/12	83 (36-98)
Child whose recorded signs and symptoms, results of diagnostic testing, and treatment/referral were consistent	9/61	15 (7-29)	6/49	12 (5-27)	3/12	25 (7-61)
Child whose recorded signs and symptoms, results of diagnostic testing, classification(s), and treatment/referral were all consistent	8/61	13 (6-28)	5/49	10 (4-26)	3/12	25 (7-61)
Children with outcome of follow-up recorded	0/61	0 -	0/49	0 -	0/12	0 -
Child needing referral with outcome of follow-up recorded	0/0	-	0/0	-	0/0	-

Because of the extremely low utilization of iCCM services among children under two months of age, the sample of the last three consultations encompassed most sick children in this age group that were recorded in registers in intervention health posts. There were more females than males recorded in registers (60% and 40%, respectively). The most common disease classifications were very severe disease (29%), diarrhea (28%), and feeding problem/underweight (20%). A large proportion of children (39%) were classified with a severe disease needing referral.

Table 35: Characteristics of the sample of sick children under two months from register review in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total N=101		Jimma N=52		W. Hararghe N=49	
	n	%	n	%	n	%
Sex						
Male	38	40	21	41	17	40
Female	56	60	30	59	26	61
Missing	7	7	1	2	6	12
Disease classifications						
Very severe disease	29	29	20	39	9	18
Local bacterial infection	8	8	4	8	4	8
Jaundice	2	2	2	4	0	0
Diarrhea	28	28	18	35	10	20
Feeding problem or underweight	20	20	7	14	13	27
Severe illness[gg]	39	39	25	48	14	29

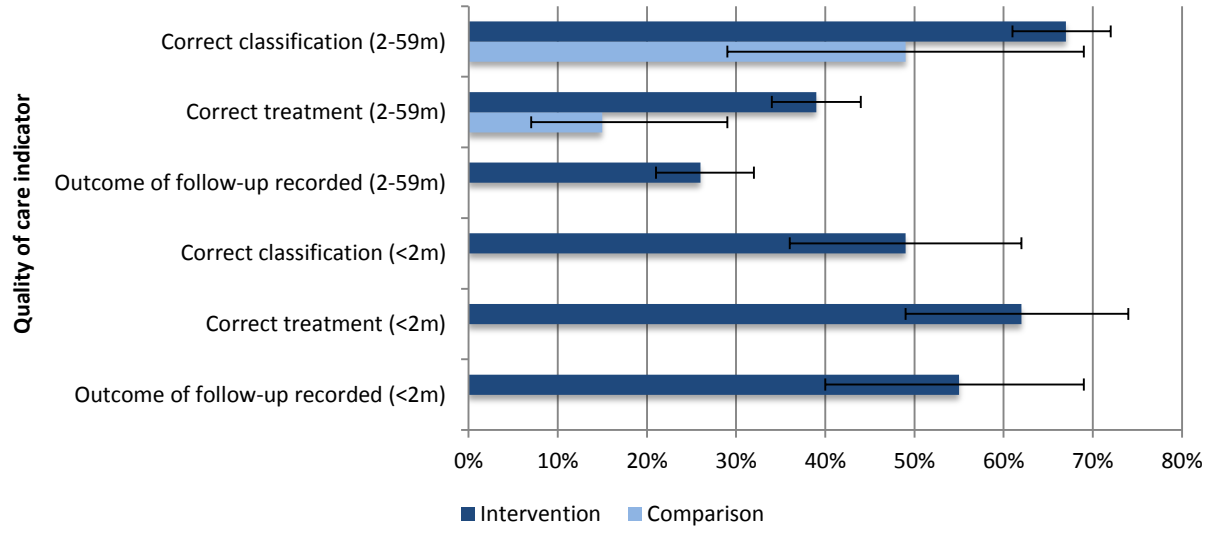
Nearly half (49%) of children under two months in intervention health posts were correctly classified (classification consistent with signs and symptoms and RDT result). A higher proportion (62%) was correctly treated (treatment and/or referral consistent with signs and symptoms and RDT result). Because many classifications for children under two years call for referral only, it is likely that HEWs may have misclassified children, but then correctly referred them, explaining the better performance for treatment/referral than for classification. Signs and symptoms, result of diagnostic testing, classification, and treatment/referral were all consistent for 39% of children. Outcome of follow-up was recorded for just over half (55%) of children and for 36% of children needing referral.

[gg] Severe illness defined as: very severe disease, local bacterial infection, severe jaundice, diarrhea with severe dehydration, severe persistent diarrhea, or dysentery.

Table 36: Indicators of quality of classification and management of surveyed children under two months of age from register review in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)
Child whose recorded signs and symptoms, results of diagnostic testing, and classification(s) were consistent	49/101	49 (36-62)	31/52	60 (42-75)	18/49	37 (20-57)
Child whose recorded signs and symptoms, results of diagnostic testing, and treatment/referral were consistent	63/101	62 (49-74)	36/52	69 (49-84)	27/49	55 (37-72)
Child whose recorded signs and symptoms, results of diagnostic testing, classification(s) and treatment/referral were all consistent	39/101	39 (26-53)	25/52	48 (29-68)	14/49	29 (15-48)
Children with outcome of follow-up recorded	55/100	55 (40-69)	24/51	47 (29-66)	31/49	63 (43-80)
Child needing referral with outcome of follow-up recorded	14/39	36 (17-60)	5/25	20 (8-43)	9/14	64 (28-72)

Figure 7: Consistency of classification and treatment with recorded signs and symptoms and result of diagnostic testing and recording of follow-up for children 2-59 months in health posts in intervention and comparison areas and under two months in health posts in intervention areas from register review in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.



7. DISCUSSION

The scale-up of iCCM in Ethiopia is a rare example of rapid large-scale implementation of iCCM covering the large majority of a country's population. Tremendous resources have been invested in the iCCM program with the goal of increasing access to life-saving medical care and reducing child mortality. This survey provides valuable information on the implementation of iCCM as well as the capacity of HEWs to provide high quality care to sick children. Data was collected in only two zones in one region of the country, and it is possible that the iCCM program was unusually strong in the evaluation intervention areas. However, program implementation throughout the country was reportedly highly standardized, so it is reasonable to draw some conclusions about the iCCM program in Ethiopia as a whole from the results of this study.

7.1 DISTRIBUTION OF ILLNESSES

The distribution of illnesses among the sample of enrolled children shows many more diarrhea cases than other illnesses. Pneumonia and malnutrition are moderately frequent and there are almost no cases of malaria or measles. The reasons for the observed distribution of illnesses are not clear. Seasonality does not provide a satisfactory explanation since the survey was conducted in what is normally high pneumonia and malnutrition season, but low diarrhea season. Jimma and West Hararghe have many cool highland areas and the survey was not conducted in the high malaria season, so the low occurrence of malaria is not entirely surprising.

A striking finding was the high proportion of children with severe illness. This is particularly surprising since most children were mobilized or recruited from the areas surrounding the health posts. These children and their caretakers had relatively easy access to free care, but did not seek care even though they were severely ill.

There were also marked differences in the distribution of illnesses between the two zones. The higher proportion of malnutrition in West Hararghe is consistent with prior knowledge of the zones, but the differences in diarrhea, pneumonia, and severe illness are harder to explain.

7.2 RECRUITMENT OF SICK CHILDREN

Both mobilization by HEWs and recruitment by the survey teams proved to be feasible methods of obtaining a sufficiently large sample of sick children. Furthermore, fears that these methods of active recruitment would yield a sample of children with less severe illness proved unfounded.

The highest proportion of children with severe illness was found in the children mobilized by the HEWs, followed by spontaneous consultations. Children recruited by the survey team were less likely to have

severe illness. The differences observed between the three groups of children may be at least partially attributable to the fact that the distributions of children by recruitment method varied substantially between Jimma and West Hararghe zones. In West Hararghe, the majority of children were mobilized by HEWs. Children in West Hararghe were also more likely to have severe illness, diarrhea, malnutrition, and ear infection. In Jimma, most children were recruited by the survey team and children were less likely to have severe illness and more likely to have pneumonia. However, important differences in illness classification are still seen within each zone. In both Jimma and West Hararghe, children mobilized by the HEWs had the highest proportion of severe illness (18% and 33%, respectively). In Jimma, the proportion of children with severe illness was similar among those recruited by the survey team (7%) and those presenting spontaneously (6%). However, in West Hararghe children presenting spontaneously had a much higher proportion of severe illness (23%) than those recruited by the survey team (3%).

Regression analysis, controlling for zone and illness type, showed that recruitment method was not a statistically significant predictor of illness severity. These results suggest that both active methods of recruitment produced a sample of children that was relatively similar in terms of illness severity to the sample obtained by waiting for spontaneous consultations at the health post.

In circumstances where low utilization of case management services makes it unlikely to obtain a sufficient sample of sick children from spontaneous consultations to assess quality of care, alternative methods of obtaining sick children are required. The results of this survey support the use of both mobilization by community health workers and recruitment of children by survey teams to obtain a larger sample of sick children. Mobilization by HEWs provided more children with severe illness and saves time for the survey team, but has the disadvantage that HEWs must be informed of the survey visit ahead of time.

7.3 IMPLEMENTATION STRENGTH

Overall, the iCCM program has been implemented remarkably well. Training for HEWs in iCCM was virtually universal and all children observed were managed by an iCCM-trained HEW. Coverage of supportive supervision on iCCM was also very high and nearly all supervision included clinical reinforcement. This is in sharp contrast with comparison health posts, where fewer than half of health posts received supervision in the previous three months and supervision rarely included clinical reinforcement.

Availability of iCCM commodities, supplies, and job aids was also very high. Most health posts had all essential commodities in stock on the day of data collection. A slightly higher proportion of health posts had experienced stockouts in the previous three months, but commodities were generally available both at the time of the survey and continuously over the past three months. Again, the results show a dramatic improvement in the iCCM health posts versus the comparison health posts, where virtually no health posts had all essential CCM commodities in stock.

One area of concern was the lack of iCCM services in four health posts in intervention woredas.

Although the number of health posts in intervention areas that were missed by the iCCM program was small, the lack of any clinical services in a health post has a significant impact on the accessibility of essential care for the surrounding population.

7.4 QUALITY OF CARE

Overall, quality of care provided by HEWs was high. HEWs performed most key assessment tasks according to Ethiopia iCCM guidelines. Assessment of danger signs and signs of severe illness were less consistent. HEWs also did not perform RDTs for a number of febrile children who should have received an RDT.

Classification was largely correct for most individual illnesses, although only about half of children received correct classification for all iCCM illnesses. Classification of malnutrition was problematic with just over half of malnourished children receiving correct classification. Misclassification seems to be largely due to incomplete assessment of signs of severe illness.

Most children (64%) received correct management for all iCCM illnesses, including correct dose, schedule, and duration of drugs and referral if needed. In fact, the proportion of children receiving correct treatment was slightly higher than the proportion receiving correct classification. Management of severe malnutrition was usually incorrect. Another important area of concern was that just over half of children needing referral to a health center were actually referred by the HEW. Also, children needing a routine vitamin A supplement or mebendazole rarely received these. Furthermore, few children received the first dose of all needed drugs in the presence of the HEW.

Counseling on prescribed treatments was good and a large majority of caretakers understood how to give the medicines. However, most caretakers were not told about danger signs to look for that indicate the child should be brought back to the health post for urgent care. The outcome of follow-up was typically not recorded in registers, suggesting that follow-up may not be carried out as often as expected.

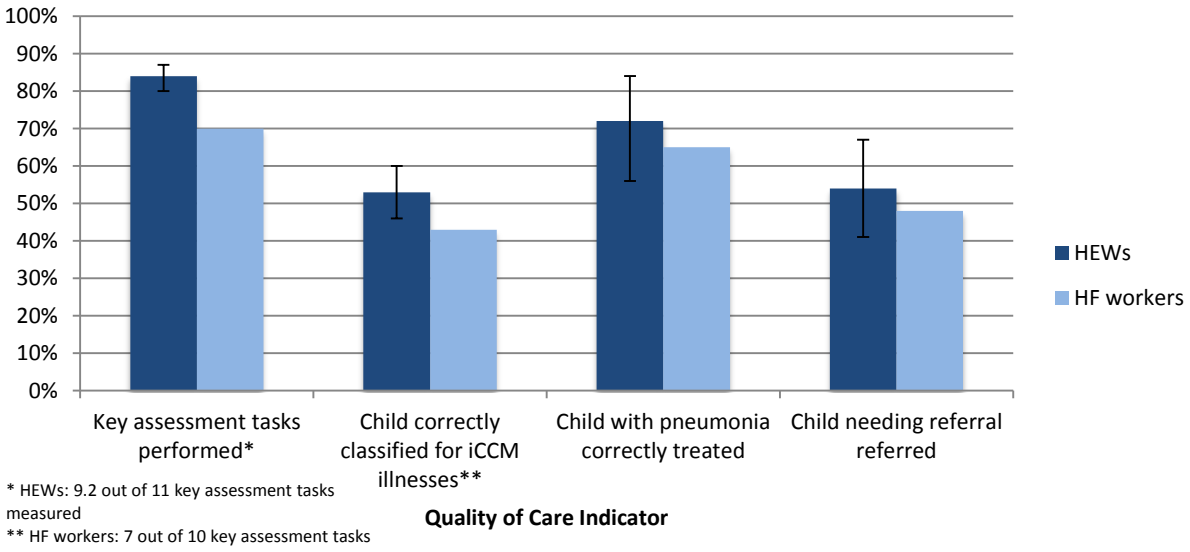
Rational use of medications was excellent, with an extremely small number of children prescribed an unnecessary antibiotic or antimalarial.

Indicators of quality of care, as well as implementation strength, were somewhat higher in Jimma zone than in West Hararghe. The reasons for this difference are not entirely clear. Each zone had a different implementing partner and a different source of funding for iCCM, so it is possible that implementation was not carried out with the same intensity in each zone.

The results of the quality of care assessment show that HEWs are for the most part providing high quality services, with most children receiving correct management for their illnesses, with some gaps. Comparison of these results with those from an IMNCI quality of care assessment conducted in hospitals and health centers in Ethiopia[11] show that adherence to clinical guidelines appears at least as high for HEWs as for health workers at higher-level health facilities. Compared to health workers surveyed from

health centers and hospitals, HEWs rated similarly or more favorably in nearly every measure. HEWs performed as well or better in conducting complete assessments of children, correctly classifying pneumonia cases, correctly managing pneumonia cases, correctly referring cases needing referral, and not prescribing unnecessary antibiotics. Caretakers also seem to have had better understanding of how to provide prescribed treatments after being advised by HEWs than did caretakers advised by higher-level health workers. Confidence intervals for the indicators of quality of care for higher-level health workers were not available, so we cannot assess statistical significance of the observed differences for all indicators. Figure 8 presents a comparison of key quality of care indicators for HEWs and health workers surveyed in the health facility survey.

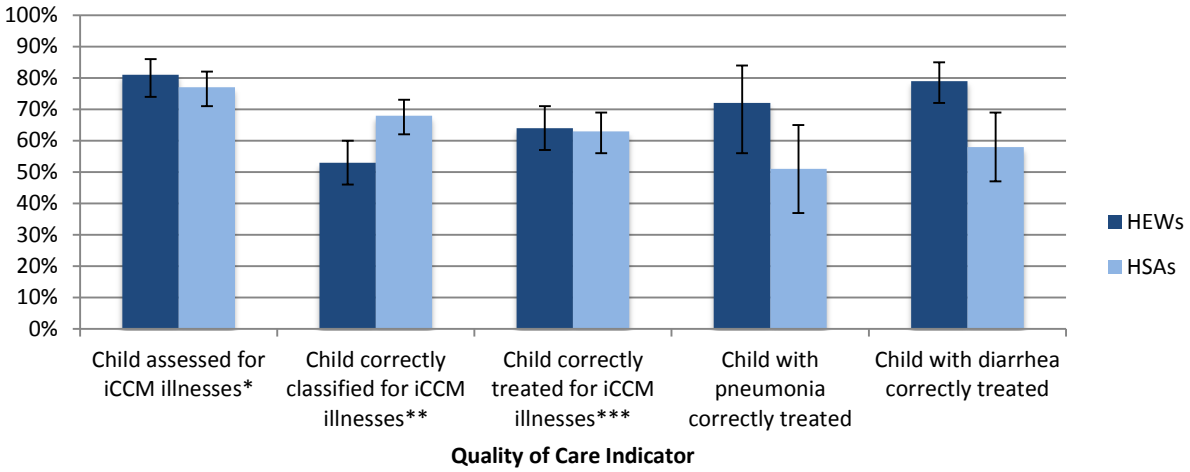
Figure 8: Comparison of quality of care indicators for HEWs and higher-level health workers in Ethiopia.



* HEWs: 9.2 out of 11 key assessment tasks measured
** HF workers: 7 out of 10 key assessment tasks

The strength of the iCCM program in Ethiopia and performance of HEWs also compare favorably to similar programs in other countries. An assessment of quality of iCCM services provided by Health Surveillance Assistants (HSAs) in Malawi[12] shows generally similar or lower levels of both iCCM implementation strength and quality of care than in Ethiopia. Supervision on iCCM was substantially higher for the Ethiopia iCCM program. ICCM drugs were also more consistently available in Ethiopia. Measures of quality of care were fairly consistent between Ethiopia and Malawi, with HEWs performing somewhat better. The proportion of children in each study assessed for iCCM illnesses (81% in Ethiopia and 77% in Malawi) and receiving correct treatment for all iCCM illnesses (64% in Ethiopia and 63% in Malawi) were similar in both countries. The proportion of children correctly classified for all iCCM illnesses was higher in Malawi (68%) than in Ethiopia (53%). However, the indicators are more stringent for HEWs, since they generally include more illnesses than the indicators calculated for the Malawi program. Management of children with pneumonia and diarrhea appears better for HEWs than for HSAs (although not significant for pneumonia). Figure 9 shows comparisons of quality of care indicators for HEWs in Ethiopia and HSAs in Malawi.

Figure 9: Comparison of quality of care indicators for Ethiopian HEWs and Malawian HSAs.



* HEWs: Pneumonia, diarrhea, malaria, malnutrition. HSAs: Pneumonia, diarrhea, malaria.
** HEWs: Danger signs, pneumonia, diarrhea, malaria, malnutrition, measles. HSAs: Danger signs, pneumonia, diarrhea, malaria, eye problem.
*** HEWs: Referral, pneumonia, diarrhea, malaria, malnutrition, measles. HSAs: Pneumonia, diarrhea, malaria.

7.5 UTILIZATION & SERVICE PROVISION

Those responsible for implementation of the iCCM program in Ethiopia and the HEWs providing iCCM services should be commended for the successful scale-up of iCCM. For the first time, Ethiopian children and their caretakers have consistent access to free and effective therapies provided by competent health care providers in their communities. However, low levels of utilization of iCCM services limit the potential impact of the iCCM program. Intervention health posts saw an average of only 16 sick children in the previous month. Furthermore, virtually no children under two months of age, a group with especially high mortality, are being seen by HEWs. At this level of utilization, it is unlikely that the iCCM program will have a significant impact on child mortality. Figure 10 presents an estimation of expected iCCM consultations in intervention health posts and the gap between expected and actual consultations.

Figure 10: Estimation of the gap between expected and actual iCCM consultations in intervention health posts in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

To illustrate the gap between expected and actual rates of utilization of iCCM services in intervention areas, we can conduct a rough hypothetical estimation:

- There is a reported average of 744 children under five per health post in intervention health posts in Jimma and West Hararghe.
- On average a child will have 3.7* episodes of iCCM illnesses per year, totaling 2,753 episodes.
- If we assume that caretakers should seek care for one-third of those illnesses from health posts/HEWs, then we expect 908 iCCM consultations per health post per year.
- The current number of iCCM consultations per intervention health post per year, based on utilization in the month prior to data collection, is 192.
- Using the assumptions above, there is a **gap of 716 consultations** per health post per year. In other words, **79% of expected consultations in health posts are not being seen** in health posts.
- With 192 consultations per year for 744 children, **there are only 0.26 consultations per child per year at health posts**.

*Based on UNICEF-Ethiopia estimates of burden of pneumonia, diarrhea, malaria, and severe acute malnutrition.

Utilization varied considerably between health posts, with some receiving a relatively large number of children and others seeing practically no children. Regression analysis showed that availability of iCCM commodities, supplies, and job aids; malaria risk of the kebele; whether the health post received supervision; and the number of hours the health post was open were strongly or moderately associated with utilization.

Availability of iCCM commodities and frequency of supervision are intuitive drivers of utilization and are factors that are within the control of the iCCM implementers. If implementation strength is consistently strong over time, it is likely that utilization will gradually increase. This is supported by the fact that intervention health posts saw more than three times as many children as comparison health posts.

Opening hours of the health post was moderately associated with the level of utilization. Furthermore, HEWs listed the health post being closed as one of the main reasons caretakers do not bring their sick children for care. Despite a directive from the zonal health bureaus that health posts should be open and offering services 40 hours a week, HEWs report that health posts were open only about half that time on average. As this information was self-reported, it is likely that this may be an over-estimation of the actual opening hours.

It is also evident that HEWs spend many unproductive hours in their health posts waiting for sick children who do not come. The experience of recruiting children from the community for the survey suggests that there are large numbers of children in the communities, within easy access to HEWs, who fail to utilize their services despite being severely ill. Proactive visits to homes in the catchment area would markedly increase the number of sick children seen.

During data collection, only one HEW was commonly present in a health post even though two HEWs were assigned to be working in the health post and the HEWs were informed ahead of time of the visit. This suggests that one of the two HEWs was often outside the kebele, which makes it impossible to simultaneously keep the health post open full-time and to search for sick children in the community. To ensure that services are consistently available at the health post and that sick children are actively being identified, both HEWs must be consistently present and working in the kebele.

Finally, a greater effort must be made to make caretakers aware of the availability of iCCM services and to convince them of the benefit from bringing sick children to health posts. HEWs identified lack of awareness of iCCM services as the number one reason caretakers did not bring their sick children for care. The newly-trained Health Development Army presents a promising platform through which to carry out a large-scale demand creation and community mobilization campaign.

Another important question is whether the positive results on implementation strength and quality of care can be sustained over time. Partner organizations have mobilized tremendous financial and human resources to assist the FMOH and regional health bureaus in the scale-up of iCCM in Ethiopia. In the future, greater responsibility for implementation of the program will be shifted to the government. To gain and retain the trust of the community and to make a substantial impact on child mortality, iCCM implementation strength and quality of care must remain high.

7.6 REGISTER REVIEW

The results of the register review are largely inconsistent with those from observation of HEW consultations and gold standard re-examination. Indicators of quality of classification and management of sick children from register review show much lower levels of quality than do the indicators based on observation and re-examination. There are two alternative explanations for this finding. On one had, HEWs may not record information completely and accurately in registers. Thus, register review may not be a very accurate source of data on quality of care. On the other hand, HEWs may have performed better when they were observed and thus the findings from direct observation did not reflect typical performance.

7.7 METHODOLOGICAL LESSONS AND IMPLICATIONS FOR FUTURE EVALUATIONS

This study has highlighted several issues that should be considered in future evaluations of large-scale health programs. Lessons from this research include:

- It is important to measure the strength of similar programs in comparison areas. Without an understanding of what services are being provided in comparison areas, it will be difficult to attribute differences in outcomes to the intervention being measured.
- Assessments of program implementation and quality of care should include indicators of utilization of services. Measuring supply-side factors without information on utilization will not give a complete picture in terms of the program's potential health impacts.
- Utilization of community-based child health services may be too low to obtain a sufficiently large sample of patients presenting for spontaneous consultations for assessment of quality of care. In this study, the methods of requesting HEWs to mobilize caretakers in the community and direct recruitment of sick children in the community were feasible and provided a large sample of sick children that included a large proportion of severe illness.
- Use of register review to assess quality of care does not appear to be a reliable proxy for direct observation and gold standard re-examination of sick children. The conclusions drawn from the register review in this study would be very different from those drawn from direct observation and re-examination. Each method has different advantages and disadvantages that need to be considered when deciding which methods to employ in assessing quality of care. Data collection through register review can be logistically and financially advantageous. One data collector can collect information on a large number of children in a relatively short amount of time. Register review is also free from bias due to improved performance because the health worker is being observed. On the other hand, information in registers may be incomplete or inaccurate and therefore may not reflect actual performance. If the conclusions based on direct observation and re-examination are different from the results of register review, further assessment of completeness of registers may provide some clarity on which method provided more accurate results.

8. RECOMMENDATIONS

8.1 IMPLEMENTATION STRENGTH

- Ensure complete coverage of iCCM in all health posts. Organize training sessions for any HEWs that were unable to attend the original iCCM training and distribute commodities so that iCCM services can be initiated. If an HEW leaves her position for an extended period of time, ensure that a replacement is available in the health post so that services are not discontinued.
- Continue supportive supervision that includes clinical reinforcement. Use the results of this study and iCCM program monitoring data to focus supervision on identified gaps.
- Systematize the inclusion of clinical instruction on case management during HEW visits to health centers. Although low utilization of health posts often precludes observation of case management during supervision, this can be included in instruction at the health center level.

8.2 QUALITY OF CARE

- During supervision and performance review meetings with HEWs, focus on addressing key gaps identified in the survey: assessment of danger signs and signs and symptoms of severe illness, performing RDTs when indicated, management of malnutrition, referral of severely ill children, providing vitamin A supplementation and mebendazole, providing the first dose of treatments in the health post, counseling on when to return immediately to the health post, and following-up with children to see if their condition improved.
- Investigate reasons for low rates of referral for severely ill children. If the reason is failure to recognize severe illness, then further training and supervision can be targeted to address this gap. However, if the reason has to do with inability of caretakers to accept referral to a higher-level facility, then other health systems constraints will have to be addressed.
- Investigate and address reasons for lower levels of quality of care in West Hararghe.

8.3 UTILIZATION & SERVICE PROVISION

- Ensure that both HEWs are generally present in the kebele and that the health posts are open and providing services for 40 hours a week as directed by the health bureaus.
- Allocate a given number of hours a day in which HEWs visit the community in search of sick children needing care.
- Identify which health posts have the lowest utilization and work with HEWs to determine the reasons for this and address any problems.
- Conduct research in communities to understand barriers to utilization of iCCM services.
- Work with the newly-trained Health Development Army to inform the community of the importance

of care seeking for childhood illnesses and of the availability of iCCM services and to promote prompt care seeking from HEWs for sick children.

- Ensure consistent uninterrupted supplies of essential drugs and other commodities to avoid losing credibility in the eyes of the community.

8.4 REGISTER REVIEW

- Work with HEWs to improve the quality of case registration in iCCM registers.

9. LIMITATIONS

This study has a number of limitations. First, the cross-sectional design of the study precludes an assessment of changes in implementation strength and quality of iCCM services over time. Therefore we cannot address the question of whether the observed levels of implementation strength and quality of care in the intervention areas were and will be sustained throughout the program period.

It is possible that the Hawthorne effect influenced the performance of health workers. The HEWs are likely to perform better when they are under observation than they would under normal circumstances.[13, 14] Furthermore, informing HEWs of upcoming visits by data collectors may further bias the results positively.

Some information was based on self-report by HEWs, which may be biased. For example, HEWs were asked to report how many hours the health post was open in the previous week and how much time they spent on different activities in the previous day. It is likely that some HEWs may have reported information that corresponded with what they knew was expected of them, rather than what actually occurred. More rigorous methods, such as a time-motion study, would be required to validate this information.

The evaluation areas may not be representative of entire country. As the assessment of implementation strength and quality of care was only conducted in the two zones designated as the evaluation areas, it is possible that implementation was stronger than in other regions and the results may not be entirely generalizable.

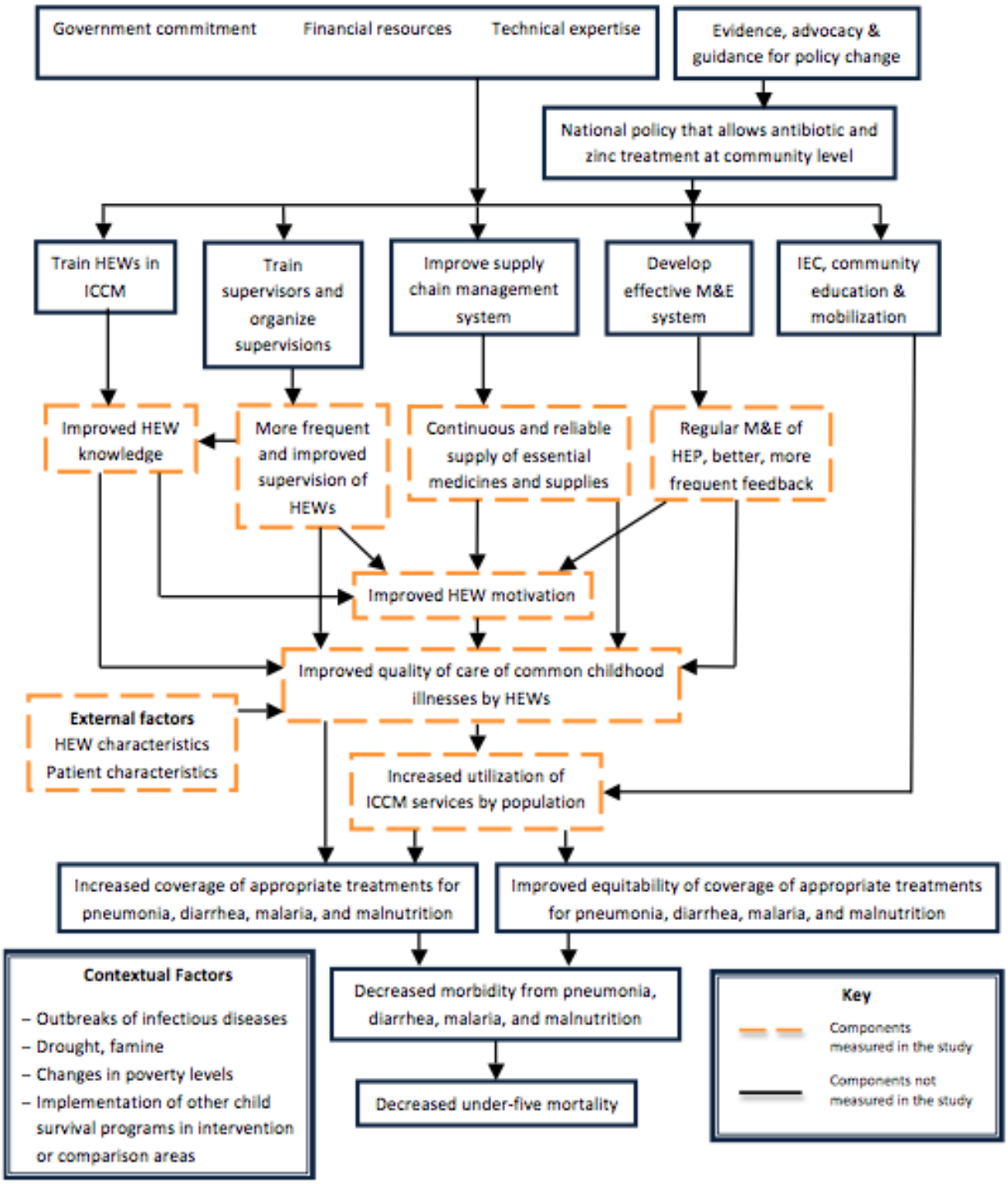
Budget constraints compelled selection of a sample size in the comparison areas that was smaller than what would have been ideal. Therefore, estimates for many indicators in the comparison areas are relatively imprecise. In intervention areas, the numbers of children with malaria and measles were too small to make any conclusions about management of these illnesses.

Direct observation of HEW consultations and re-examination of sick children were not conducted in comparison health posts. Therefore, other than register review, we do not have measures of quality of care for the comparison areas. This somewhat limits our ability to compare the two areas. However, because implementation strength for routine CCM was so low in comparison areas, it is quite reasonable to assume that quality of care is also very low.

Finally, Jimma and West Hararghe zones have a relatively low burden of malaria and the survey was conducted outside of the peak malaria season. There may be different patterns of utilization and quality of care in areas with a high burden of malaria or in the peak malaria season that we were not able to assess in this study.

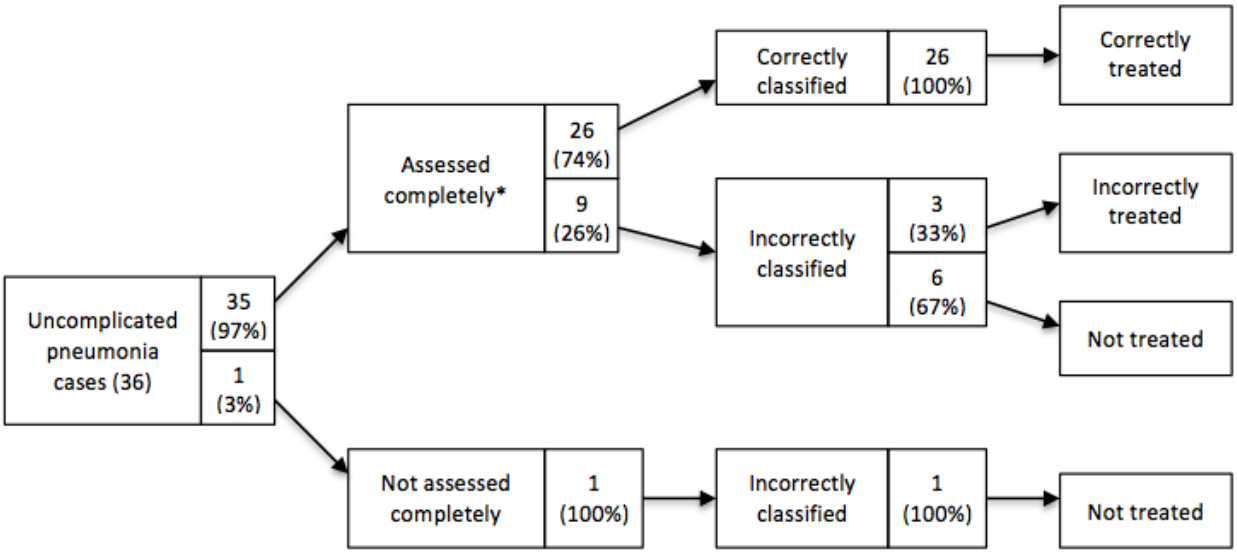
APPENDICES

APPENDIX 1: ICCM IMPACT MODEL



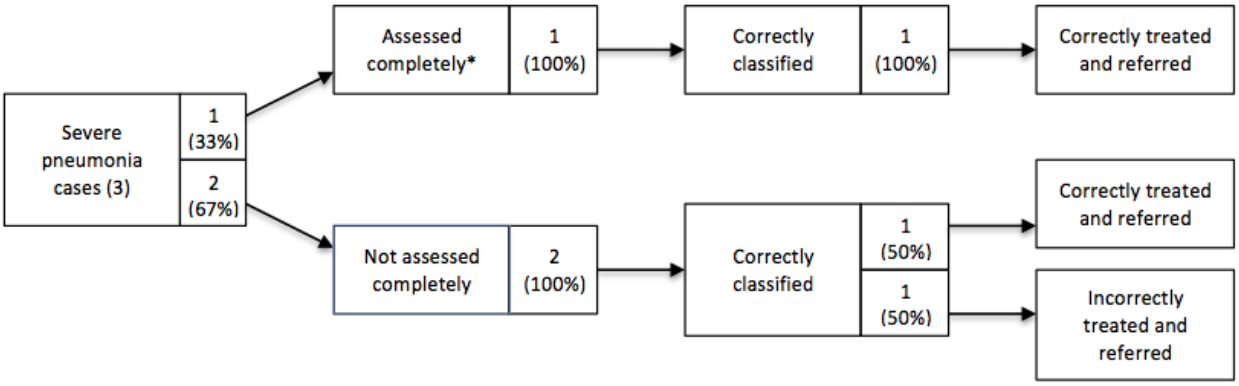
APPENDIX 2: CLINICAL ERRORS ANALYSES[15] FOR CHILDREN WITH ICCM ILLNESSES

Figure A1: Clinical errors analysis for children with non-severe pneumonia according to the gold standard classification in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.



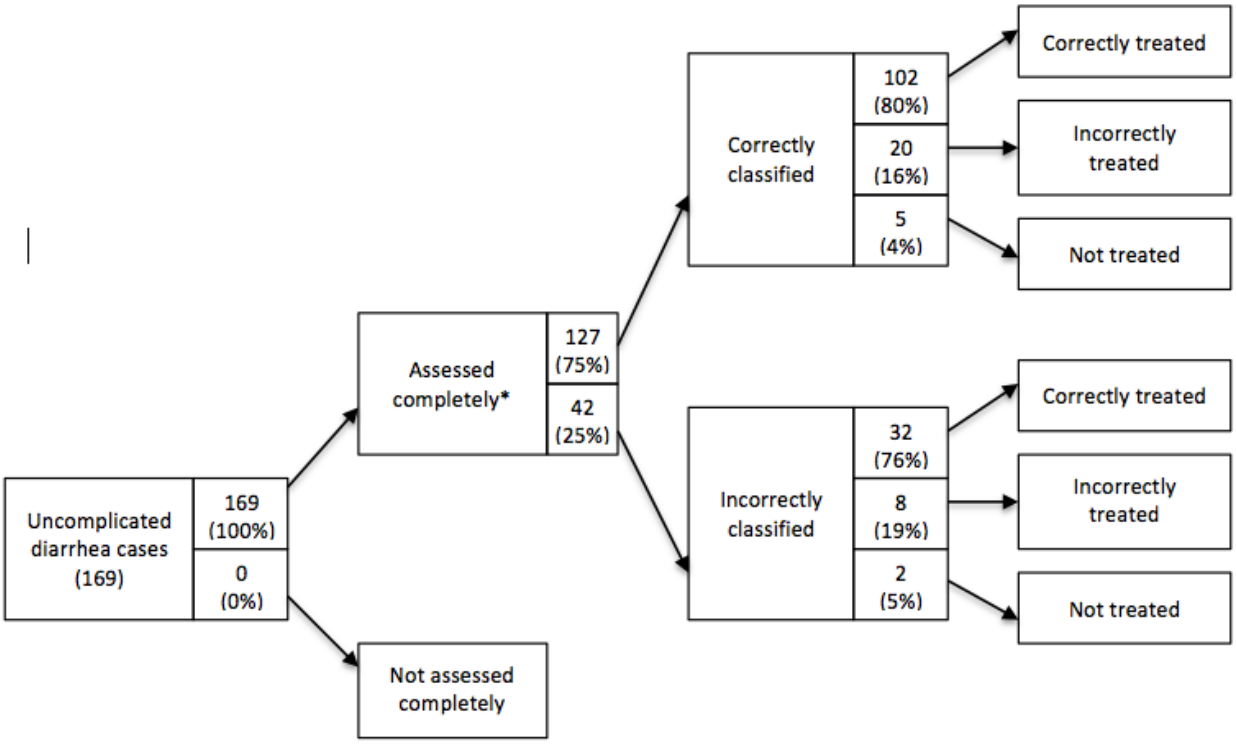
*Assessed completely defined as: HEW asked/checked for cough/difficult breathing and counted respiratory rate with a functional timer.

Figure A2: Clinical errors analysis for children with severe pneumonia according to the gold standard classification in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.



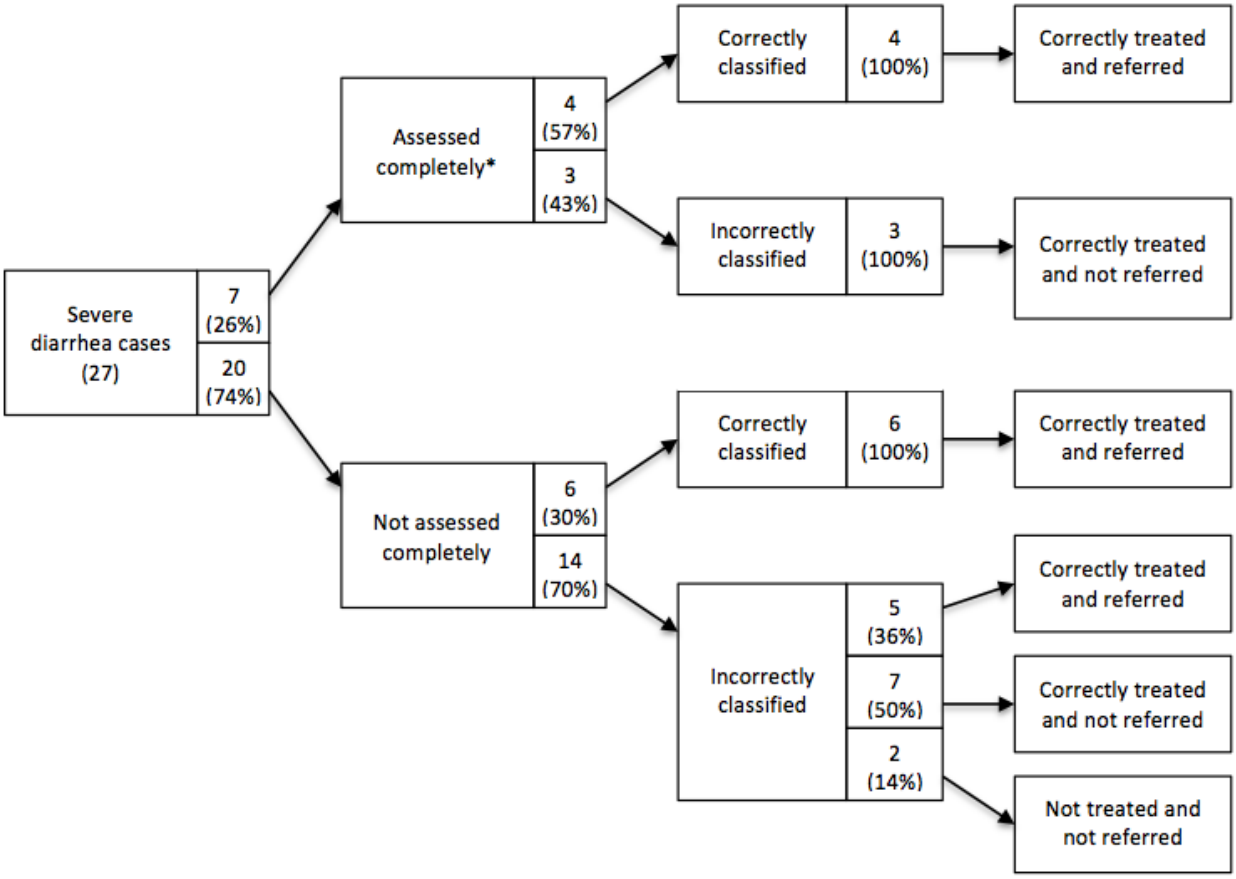
*Assessed completely defined as: HEW asked/checked for cough and difficult breathing, checked for all four general danger signs (not able to drink/breastfeed anything, vomits everything, convulsions, lethargy), looked for chest indrawing, and listened for stridor.

Figure A3: Clinical errors analysis for children with non-severe diarrhea according to the gold standard classification in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.



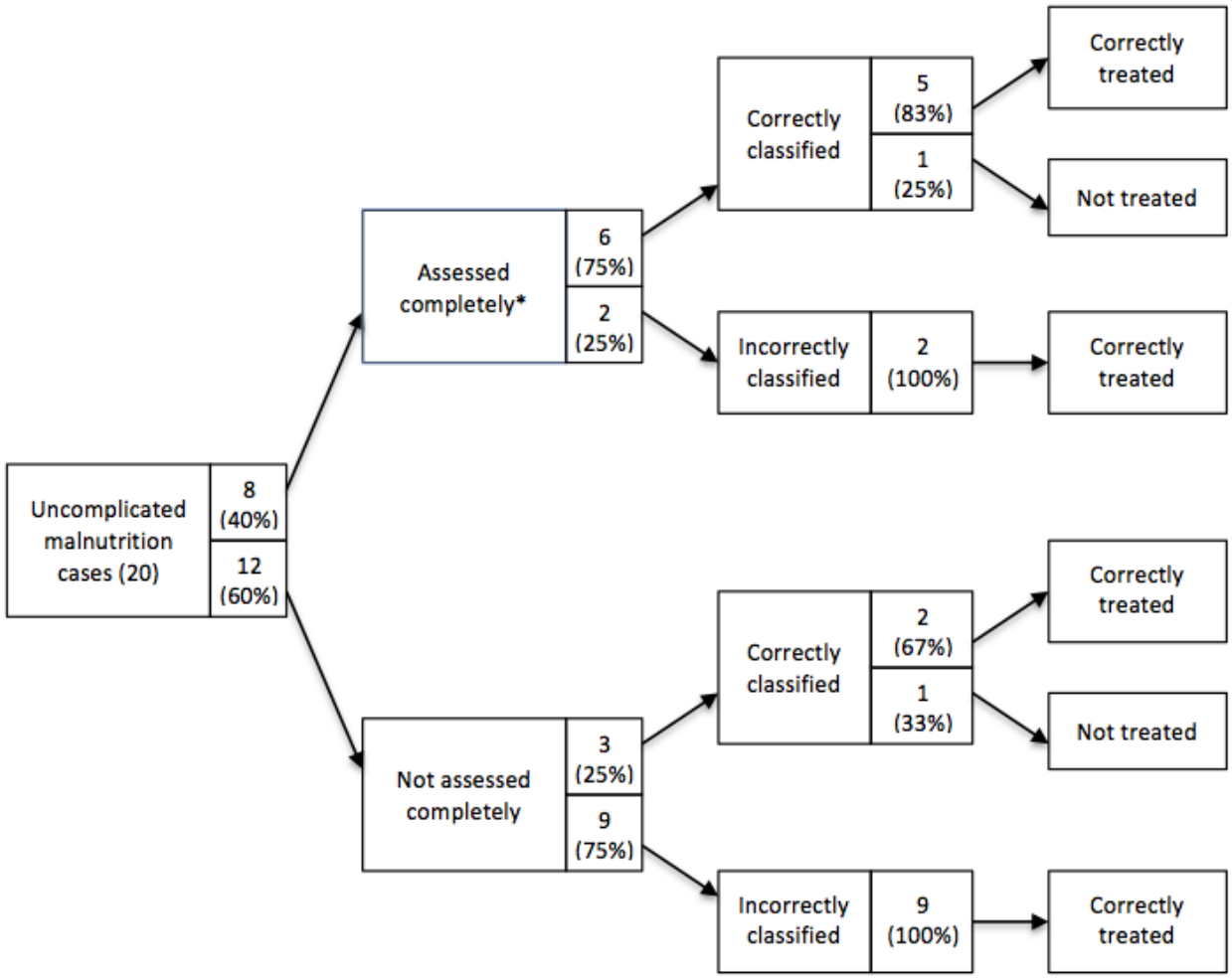
*Assessed completely defined as: asked for diarrhea

Figure A4: Clinical errors analysis for children with severe diarrhea according to the gold standard classification in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.



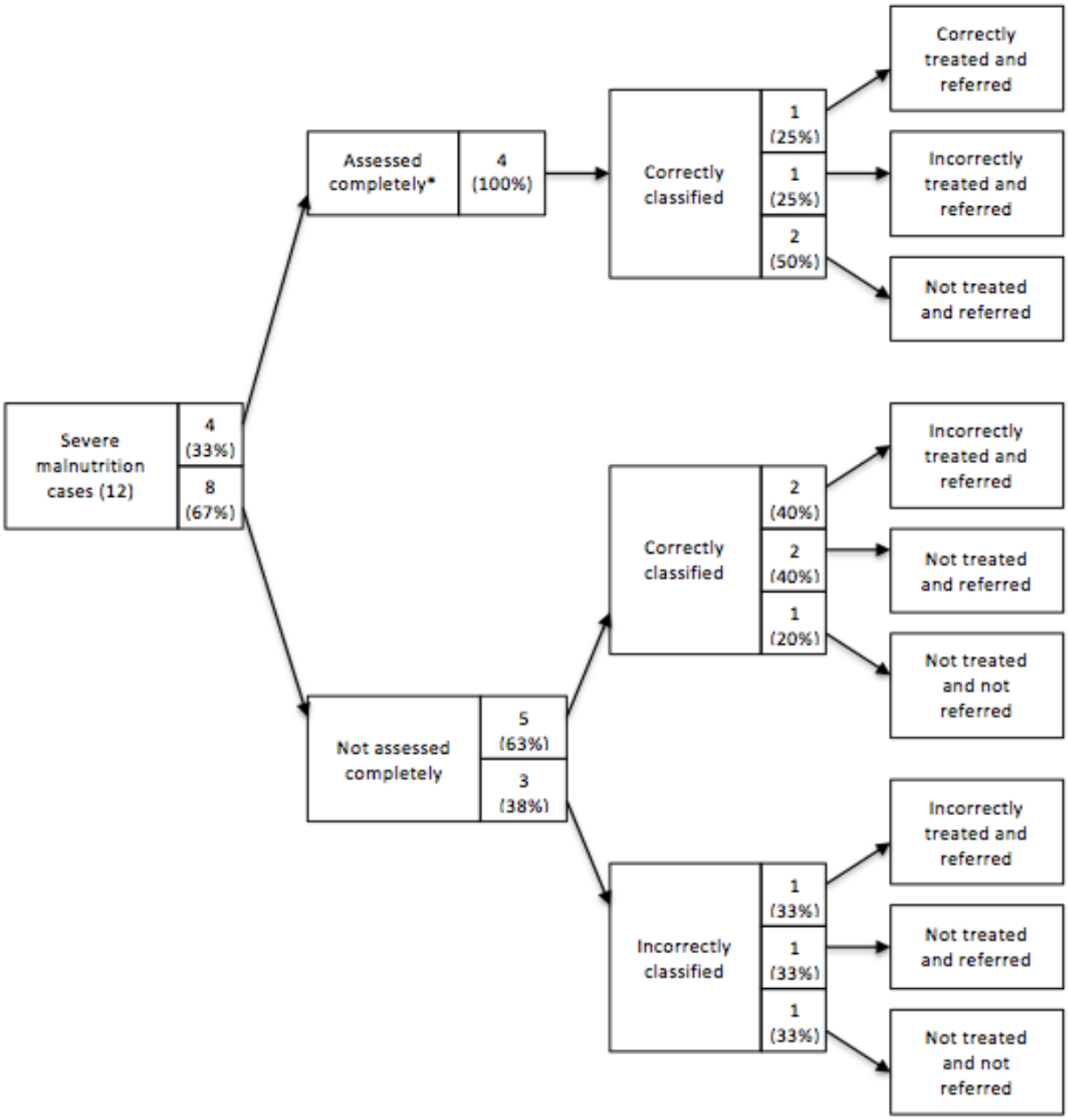
*Assessed completely defined as: asked for diarrhea, asked how long child had diarrhea, asked about blood in stool, checked for restlessness/irritability, checked if child drinks eagerly, did skin pinch.

Figure A5: Clinical errors analysis for children with uncomplicated malnutrition according to the gold standard classification in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.



*Assessed completely defined as: checked for bipedal edema and measured MUAC (children six months or older) or looked for visible severe wasting (children under six months).

Figure A6: Clinical errors analysis for children with complicated malnutrition according to the gold standard classification in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.



*Assessed completely defined as: checked for bipedal edema, measured MUAC (children six months or older) or looked for visible severe wasting (children under six months), gave appetite test (children six months or older and MUAC less than 11cm or edema and no medical complication).

APPENDIX 3: SUPPLEMENTAL DATA TABLES

Table A1: Gold standard disease classifications of surveyed children by age in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n	%	n	%	n	%
2-11 months						
Severe illness	14/94	15	6/57	11	8/37	22
Pneumonia	17/94	18	15/57	26	2/37	5
Diarrhea	53/94	56	28/57	49	25/37	68
Malaria/Sev. febrile disease	1/94	1	0/57	0	1/37	3
Measles	2/94	2	2/57	4	0/37	0
Malnutrition	15/94	16	7/57	12	8/37	22
Ear infection	11/94	12	5/57	9	6/37	16
Anemia	3/94	3	2/57	4	1/37	3
12-23 months						
Severe illness	12/92	13	5/55	9	7/37	19
Pneumonia	15/92	16	15/55	27	0/37	0
Diarrhea	73/92	79	40/55	73	33/37	89
Malaria/Sev. febrile disease	0/92	0	0/55	0	0/37	0
Measles	1/92	1	1/55	2	0/37	0
Malnutrition	7/92	8	3/55	6	4/37	11
Ear infection	13/92	14	5/55	9	8/37	22
Anemia	6/92	7	3/55	6	3/37	8
24-35 months						
Severe illness	6/39	15	1/21	5	5/18	28
Pneumonia	4/39	10	2/21	10	2/18	11
Diarrhea	24/39	62	9/21	43	15/18	83
Malaria/Sev. febrile disease	1/39	3	1/21	5	0/18	0
Measles	1/39	3	0/21	0	1/18	6
Malnutrition	5/39	13	3/21	14	2/18	11
Ear infection	3/39	8	1/21	5	2/18	11
Anemia	0/39	0	0/21	0	0/18	0
36-47 months						
Severe illness	5/22	23	3/12	25	2/10	20
Pneumonia	3/22	14	2/12	17	1/10	10
Diarrhea	14/22	64	7/12	58	7/10	70
Malaria/Sev. febrile disease	1/22	5	1/12	8	0/10	0
Measles	1/22	5	1/12	8	0/10	0
Malnutrition	3/22	14	1/12	8	2/10	20
Ear infection	1/22	5	0/12	0	1/10	10
Anemia	2/22	9	1/12	8	1/10	10
48-59 months						

Severe illness	1/10	10	0/7	0	1/3	33
Pneumonia	0/10	0	0/7	0	0/3	0
Diarrhea	5/10	50	3/7	43	2/3	67
Malaria/Sev. febrile disease	0/10	0	0/7	0	0/3	0
Measles	0/10	0	0/7	0	0/3	0
Malnutrition	2/10	20	1/7	14	1/3	33
Ear infection	2/10	20	0/7	0	2/3	67
Anemia	0/10	0	0/7	0	0/3	0

Table A2: Mean number of sick child consultations in the previous month by distance from referral facility in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Intervention		Comparison	
	Mean (95% CI)	Range	Mean (95% CI)	Range
<5km	11.4 (7.0-15.8)	0-31	2.9 (0.0-5.7)	0-12
5-<10km	17.9 (13.3-22.5)	0-63	6.4 (0.7-12.0)	0-32
10-<15km	21.5 (11.1-31.9)	1-95	5.2 (1.5-8.8)	0-11
15-<20km	12.0 (6.3-17.7)	0-43	7.0 (0.0-15.2)	0-17
≥20km	14.0 (10.0-18.0)	1-34	0.0 -	0

Table A3: HEWs that plan to continue working as an HEW for the coming year in health posts in intervention and comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	n/N	% (95% CI)	n/N	% (95% CI)	n/N	% (95% CI)
Intervention area HEWs	130/137	95 (90-98)	75/79	95 (87-98)	55/58	95 (85-98)
Comparison area HEWs	58/64	91 (76-97)	33/33	100 -	25/31	81 (57-93)

Table A4: Duration of HEW consultations with surveyed children in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total		Jimma		W. Hararghe	
	Mean (95% CI)	Range	Mean (95% CI)	Range	Mean (95% CI)	Range
Consultation time	27.3 (25.7-28.9)	8-60	30.3 (28.4-32.2)	8-60	22.9 (20.9-25.0)	8-48

Table A5: Reasons given by HEWs for why caretakers do not bring sick children to the health post in comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	n N=64	%
Lack of drugs in health post	37	58
Not aware of case management services	19	30
Poor service by HEWs/lack of training	12	19
Distance from home to health post	7	11

Table A6: Characteristics of the sample of sick children 2-59 months from register review in health posts in intervention areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total N=545		Jimma N=309		W. Hararghe N=236	
	n	%	n	%	n	%
Age						
2-11 months	178	33	97	31	81	43
12-23 months	189	35	120	39	69	29
24-35 months	92	17	41	13	51	22
36-47 months	50	9	27	9	23	10
48-59 months	36	7	24	8	12	5
Sex						
Male	265	49	150	49	115	49
Female	277	51	158	51	119	51
Missing	3	0	1	0	2	0
Disease classifications						
Pneumonia	99	18	80	26	19	8
Diarrhea	317	58	162	52	155	66
Malaria/Sev. febrile disease	25	5	23	7	2	1
Measles	10	2	5	2	5	2
Malnutrition	69	13	23	7	46	20
Ear infection	27	5	15	5	12	5
Anemia	16	3	10	3	6	3
Severe Illness						
Child with severe illness	61	11	26	8	35	15
Child needing referral[hh]	79	15	36	12	43	18

[hh] Includes referral for acute ear infection and non-severe anemia, which are not considered severe illnesses

Table A7: Characteristics of the sample of sick children 2-59 months from register review in health posts in comparison areas in Jimma and West Hararghe zones, Oromia region, Ethiopia, 2012.

	Total N=61		Jimma N=49		W. Hararghe N=12	
	n	%	n	%	n	%
Age						
2-11 months	7	12	7	14	0	0
12-23 months	17	28	14	29	3	25
24-35 months	14	23	9	18	5	42
36-47 months	9	15	7	14	2	17
48-59 months	14	23	12	25	2	17
Sex						
Male	30	56	22	52	8	67
Female	24	44	20	48	4	33
Disease classifications						
Pneumonia	1	2	1	2	0	0
Diarrhea	7	12	0	0	7	58
Malaria/Sev. febrile disease	3	5	3	6	0	0
Measles	0	0	0	0	0	0
Malnutrition	0	0	0	0	0	0
Ear infection	0	0	0	0	0	0
Anemia	0	0	0	0	0	0
Severe Illness						
Child with severe illness	0	0	0	0	0	0
Child needing referral[ii]	0	0	0	0	0	0

[ii] Includes referral for acute ear infection and non-severe anemia, which are not considered severe illnesses

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