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Special Issue:

Integrated Community Case Management (iCCM) at Scale in Ethiopia: Evidence and Experience

Guest Editors:

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Elizabeth Hazel
Rory Nefdt

Foreword

INTEGRATED COMMUNITY CASE MANAGEMENT OF SICK CHILDREN IN ETHIOPIA

Kesetebirhan Admasu, MD, MPH [1]

In the last decade, the under-five mortality (U5MR) was halved in Ethiopia, with a current estimate of 68/1000 live births, according to the 2012 report from UN Inter-agency Group for Child Mortality Estimation (IGME). Decentralizing preventive, promotive, and basic curative maternal, newborn, and child health and nutrition services through the platform of the Health Extension Programme has significantly contributed to the reduction alongside advances made in economy, education and other aspects of social development. To accelerate the trend of U5MR reduction, it is essential to scale up all the evidence-based interventions feasible at household, community and health facility levels.

Since its inception, the Health Extension Programme has been going through a process of evolution. In the beginning, Health Extension Workers (HEW) mainly focused on scaling up preventive and promotive health services, such as hygiene and sanitation, breast-feeding, family planning (condoms and pills), and distribution and promotion of the use of insecticide-treated bed nets. Gradually, HEWs became involved with services that required more skills, such as long-term family planning (Depo-Provera and Implanon), treatment of malaria and diarrhea, antenatal care and clean delivery, after receiving in-service training. The demand from the rural people has been changing, too. There is more awareness of the benefit of modern health services. However, recent policy debates focused on balancing preventive and curative care, avoiding misuse of antibiotics, and deciding when to expand HEWs' repertoire of curative care beyond community treatment of malaria and diarrhea.

After the success of the Malaria Control Programme, pneumonia, diarrhea, severe acute malnutrition, and newborn complications contributed to a higher proportion of the U5MR. To reach Millennium Development Goal 4 and end preventable deaths, it became essential to scale-up community-based pneumonia management and essential newborn care. The deployment of 36,000 rural HEWs throughout Ethiopia presents a unique opportunity for integrated case management of childhood illnesses (iCCM) at scale. In addition to international evidence, the local pilot of community-based case management of pneumonia in Bolososorie and Liben Districts, supported by JSI and Save the Children USA with USAID funding, documented that community health workers and HEWs were able to assess, classify, and treat childhood pneumonia correctly. In addition, the provision of basic curative health services by HEWs gained more trust from the community members also to accept HEWs' messages related to preventive health care.

The national iCCM programme was officially launched on 23 February 2010. The programme started in areas that had scaled up the HEP preventive and promotive packages, and gradually reached national coverage. The iCCM programme can save thousands of young lives every year in Ethiopia. Based on the modeling done by the Life Saved Tool (LiST), if community based case management of pneumonia is scaled up, more than 40,000 deaths could be prevented every year (1). Since 2010, nearly 30,000 HEWs have been trained and supported to provide iCCM services in over 14,000 health posts. The speedy and good quality implementation has benefitted from government leadership, coordinated implementation support by the development partners, skill-based training and clinical mentoring, enhanced supervision, and improved supply and logistics systems to avoid stock-outs of essential drugs and commodities. This supplement of the *Ethiopian Medical Journal* collects 22 articles that present the achievements, experience, and lessons of the iCCM programme so far. We wish to share our experience with other countries that are planning or implementing iCCM programs.

1. Pearson L, Hazel E, Tam Y. Modeling potential reduction of child mortality after national scale-up of community-based treatment of childhood illness in Ethiopia. *Ethiop Med J* 2014;52 (Supp 3): 129-136.

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David R. Marsh, Rory Nefdt, Elizabeth Hazel. *Ethiop Med J, 2014,Vol. 52, Sup. 3*

INTRODUCTION TO A SPECIAL SUPPLEMENT: DELIVERING INTEGRATED COMMUNITY CASE MANAGEMENT TO TREAT CHILDHOOD ILLNESS AT SCALE IN ETHIOPIA

David R. Marsh, MD, MPH[1]; Rory Nefdt, PhD[2]; Elizabeth Hazel, MHS[3]

Globally The good news for children is that in 2012 only an estimated 6.6 million under-fives died of largely preventable causes, which represents a dramatic decrease from the 12.6 million who died in 1990 (1).Three of the five leading causes of death in this age group remain pneumonia, diarrhea and malaria. More good news is that the global health community has evidence-based preventive and treatment interventions to control these killers. Yet over two million children continue to die from these infections. The challenge is to deliver these interventions to families and children who need them.

To accomplish this, one strategy is integrated community case management (iCCM) is a strategy to do this. More precisely, iCCM is a strategy to select, train, supply, deploy, support and supervise community health workers to deliver curative interventions to sick children who reside in communities that lack access to health facilities – and to mobilize families to appropriately seek care. High mortality countries are widely introducing and scaling up iCCM, supported by global policy endorsement and implementation tools, such as *CCM Essentials* and recommended indicators and evidence (2-5).

Since 2006, the global iCCM Task Force and its Operations Research Working Group, have specified global priorities for iCCM research– initially through ad hoc gatherings (6-8), then upon reflecting on publications in a 2012 special iCCM supplement to the *American Journal of Tropical Medicine and Hygiene* (9), and currently through an on-going global Child Health and Nutrition Research Initiative (CHNRI) systematic prioritization exercise, which the Guest Editors of the 2012 supplement recommended. Ethiopia is a vast, complex, populous country facing many challenges in health. Partly in response, in 2012 the Government of Ethiopia joined the Governments of India and the United States, together with UNICEF, to launch *Committing to Child Survival: A Promise Renewed* (10). Over 170 countries have joined this movement to stop children dying from largely preventable causes. Furthermore, at the national level and with the support of partners, Ethiopia introduced and rapidly scaled up iCCM within the Health Extension Program as a central strategy to mitigate avoidable child death. Part of the national adaptation of iCCM was to prioritize operations or implementation research questions of local relevance (Table 1).

This supplement features Ethiopia's iCCM experience and Ethiopia's research questions, documented largely by Ethiopian public health scientists in an Ethiopian peer-reviewed journal, for an Ethiopian readership – and beyond. We adapted the so-called "Stockholm Framework" to evaluate iCCM that was used in the 2012 iCCM supplement (Figure 1) (8).The framework shows programmatic pathways for reducing under-five mortality (top row) by increasing the use or coverage of life-saving interventions (second row), which in turn requires that the interventions are accessible, of high quality, demanded, and supported by policy (third row)–all of which depend on the activities of eight system components (bottom row). A desirable by-product of strong implementation of iCCM is a strengthened health system (second row). The framework also accommodates external factors (to the right) and unintended consequences (in the background).

In addition to a Foreword, the supplement has 22 papers, including 14 original reports, two brief communications, and four editorials. Ten papers inform Ethiopia's national iCCM research priorities. Indeed, articles in this supplement inform nearly all the elements of the framework (Figure 2). By way of background, Legesse et al. (11) describe the "iCCM story" in Ethiopia, and Marsh et al. assess the health system's performance in delivering iCCM (12). Both papers describe or assess the health system through the same eight components at the bottom of Figures 1 and 2. Miller et al. examine the equitability of baseline **coverage** of preventive interventions, and Teferi et al. describe the change in preventive interventions after introducing iCCM– a prioritized national question (13,14). In a second paper, Teferi et al. describe the utilization of curative services at the health center level after iCCM, an-

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other prioritized health systems question (15). Tadesse et al. further characterize the levels and trends in use of curative services (16). Najjemba et al. illuminate *effective coverage* by examining both the quality of case management and treatment adherence at the household level (17). Ashenafi et al. examine the effect of **access** on utilization (18).

Several reports examine strategies to assure the **quality** of case management delivered by Health Extension Workers, including the effect of integrated training by Wogi et al. (19), the effect of supportive supervision by Ameha et al. (20), and the effect of Performance Review and Clinical Mentoring Meetings by Mengistu et al. (21).Two papers by Tefera et al. examine **demand** factors that might account for low utilization of curative services for both children 2-59 months of age and for young infants less than age two months (22,23).

Several papers inform **policy**. Pearson et al. apply a Lives Saved Tool (LiST) analysis that models iCCM impact, given coverage changes (24). Nefdt et al. assess the cost to deliver iCCM (25). Mamo et al. assess the iCCM monitoring system against global benchmarks (26). An editorial by Hassen et al. advocates for local adaptations for pastoralists and other challenging environments (27); and an editorial by Pearson et al. illuminates the road ahead by advocating for iCCM and HEP to include community-based newborn care, including for sick newborns (28). Two final editorials address underlying health systems **components**. Nigatu et al. propose a strategy to help assure an uninterrupted drug supply (29), and Marsh et al. consider how Health Extension Workers spend their time delivering services (30). Finally, the guest editors glean the lessons learned across the papers and suggest ways forward (31).

This supplement is unique in several ways. It represents an extensive case study from a single country. It responds to prioritized local research questions; thus, not surprisingly, its focus is implementation. Finally, it is the product of a two-part agenda: (a) to publish important program research and (b) to build local capacity in scientific thinking and writing. Regarding the latter, the Guest Editors identified 15 approaches prior to peer review that might have built capacity during the preparation of manuscripts (Table 2). We polled the writing teams regarding the perceived value of these approaches, and found that they agreed – generally strongly – that each was helpful.

We acknowledge the contributions of many to introduce, scale up, evaluate and document iCCM in Ethiopia, including the Federal Ministry of Health, the Canadian International Development Agency and other donors, the United Nations Children's Fund, implementing partners, Health Extension Workers and their support teams, and the families who have and will seek care from them for their sick children.

Table 1: Priorities for iCCM research in Ethiopia

• What is the level of service utilization from the primary health care unit (health post and health center) and what are the determinants?
• What is the best way to supervise iCCM?
• What is the effect of iCCM on coverage of other preventive and promotive components of the Health Extension Program?
• What proportion of children with pneumonia does not respond to five days of cotrimoxazole?

Figure 1: iCCM Evaluation Framework

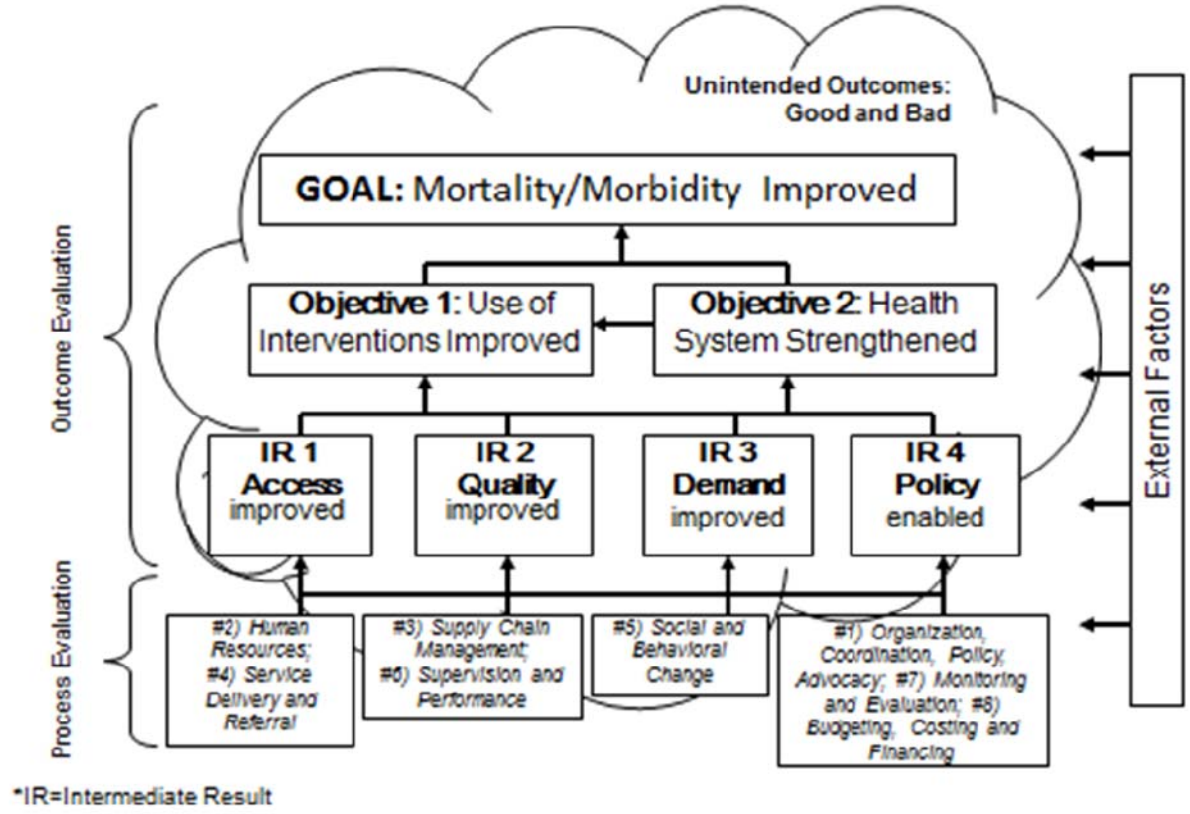

Figure 2: iCCM Evaluation Framework matched to papers in this supplement (bold line indicates nationally prioritized research question; orange indicates editorial)

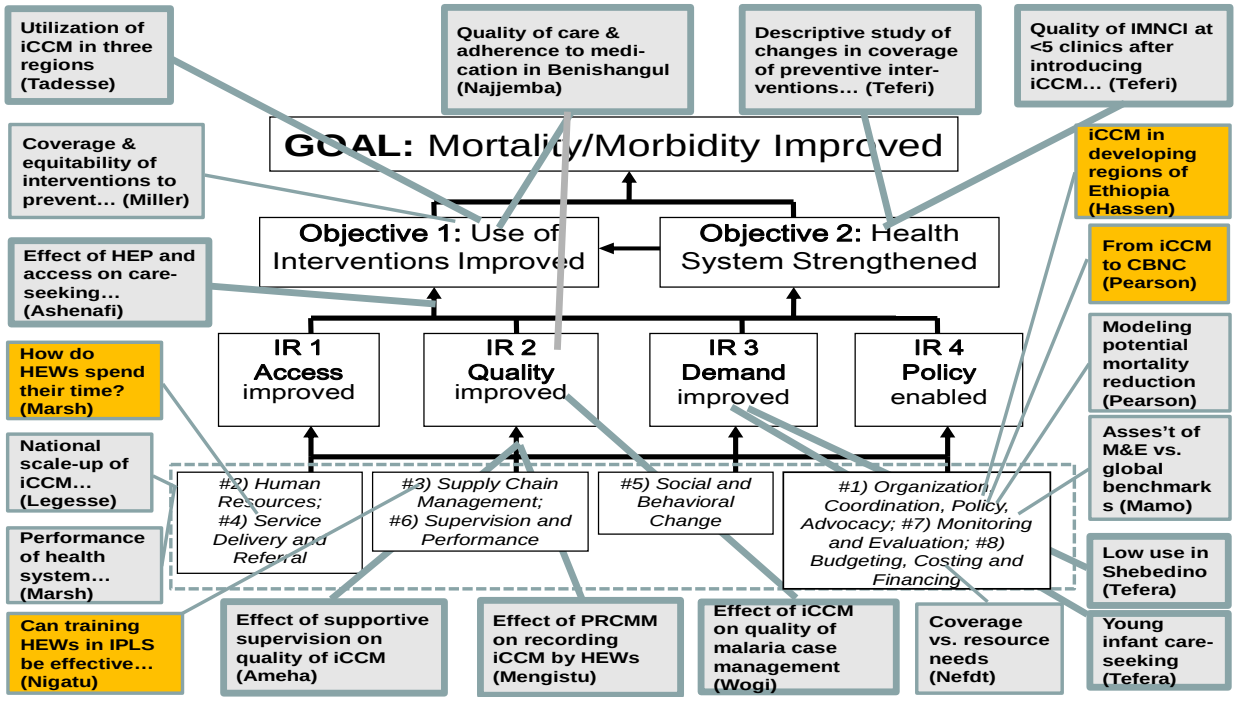

Table 2: Capacity-building approaches employed to produce this supplement

Approach	Strongly Agree This Helped
Conceptual framework (i.e., draft of Figure 2)	100% (11/11)
Training slide-show 1: "Winning the Argument"	100% (10/10)
Email exchanges	92% (11/12)
Suggested edits in track changes on manuscript	91% (10/11)
Training slide-show 4: "Scientific Writing" with cases	90% (9/10)
Marginal notes on manuscript	90% (9/10)
Presentation with plenary feedback	90% (9/10)
Face-to-face guidance at writing workshop	89% (8/9)
Training slide-show 2: "Manuscript Preparation"	80% (8/10)
Style Guide for Technical Writing	80% (8/10)
Submission check-list	80% (8/10)
Structured précis format	80% (8/10)
Informal support from the "CCM family"	77% (7/9)
Training slide-show 3: "Grammar"	70% (7/10)
1-pager with writing "Rules"	70% (7/10)

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EDITORIAL

INTEGRATED COMMUNITY CASE MANAGEMENT OF CHILDHOOD ILLNESSES: ADAPTATIONS FOR THE DEVELOPING REGIONS OF ETHIOPIA

Kebir Hassen, MD, MPH; Bukhari Shikh Aden; Dereje Belew, MD, MPH; Hailemariam Legesse, MD; Meseret Yetubie, MPH; Luwei Pearson, MD, MSc

Integrated Community Case Management (iCCM) of childhood illnesses started from areas with a stronger Health Extension Program in 2010, followed in 2011 by gradual expansion to the four developing regions of Benishangul, Gambella, Afar, and Somali. The developing regions present different challenges for iCCM than the areas with stronger Health Extension Programs. Adaptation is needed. For example, Health Extension Workers (HEWs) in developing regions have less formal education and thus receive a 6-month pre-service training compared to 12 months in developed regions. Due to unsatisfactory performance of HEWs in the developing regions in 2011,the government mapped HEWs, retained those performing well, and replaced those who were not. The new HEWs received a one year (9 months in Afar) pre-service training and, once sufficient numbers graduated, the regional health bureaus introduced the iCCM program in collaboration with development partners.

Although the four developing regions cover over 50% of the geographic area of Ethiopia, they have only 10% of the population, mostly pastoralists who are mobile or semi-mobile. Afar and Somali Regions adapted the national guidelines and translated the training materials into the local languages for their unique and challenging settings, and added iCCM training to the end of pre-service training for new HEWs. Unlike regions with more dense populations, health posts in the four developing regions have HEWs, frontline workers, and junior nurses providing basic curative care. Therefore, correct division of labor is critical to balance preventive and curative services, and different regions have different models. For example, in Afar Region, the frontline health workers and the nurses are the direct iCCM service providers, while the HEWs mainly facilitate demand creation and referral. Alternatively, Mobile Health and Nutrition Teams (MHNT) in Somali Region complement static services provided at the health posts and health centers. Since 2008, the Somali Region has over 40 MHNTs providing scheduled weekly outreach including free IMNCI service to villages in the emergency and conflict-affected areas.

As in other areas, weak demand for curative services by communities in the developing regions is a barrier to treatment of children. Chiefs, religious leaders, and traditional verbal communication channels, such as the *Dagu* system in Afar, can help mobilize communities to use services. This should be supported and linked with health education activities provided by health staff, including HEWs, and through outreach and MHNTs. The unit cost of the iCCM program is higher in developing regions mainly due to long distances, geographic dispersion, and greater time required to build capacity and strengthen implementation through training, supervision, and clinical mentoring. Resource mobilization is required to sustain, consolidate, and increase use of health care services in developing regions.

It is commendable that all four developing regions are implementing iCCM programs that are adapted to their local settings. Further operations research is needed to document lessons and experience of these unique iCCM strategies. The hope is that these iCCM programs will boost the Health Extension Program in developing regions and provide more equitable health services to these under-served communities.

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EDITORIAL

FROM INTEGRATED COMMUNITY CASE MANAGEMENT TO COMMUNITY-BASED NEWBORN CARE

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In Ethiopia, the under-five mortality rate (U5MR) was reduced by 28% between 2005 and 2011, but the neonatal mortality rate (NMR) remains unchanged and now accounts for 42% of all U5 deaths. This burden is even greater for the large rural population due to poor access to and utilization of maternal and newborn health services. To achieve Millennium Development Goal 4, neonatal mortality must be addressed, specifically the major direct causes – sepsis, birth asphyxia, and preterm delivery. Neonatal sepsis, the major newborn killer in Ethiopia, accounts for more than one third of neonatal deaths, 75% in first week of life when even modest delays in receiving effective care can be deadly.

The national scale-up of integrated Community Case Management (iCCM) in 2010-2012 provided a needed boost to the Health Extension Program (HEP) by introducing a package of high quality basic curative interventions meeting the demand of the communities. According to the national guidelines for iCCM, Health Extension Workers assess and classify newborn infections and then refer them to health centers and hospitals for treatment. When referral is not possible or delayed, they can provide pre-referral or even complete treatment with oral antibiotics. There is limited care seeking by caregivers for sick young infants under 2 months of age in the iCCM program.

The Federal Ministry of Health (FMOH) established a working group that presented a strategy paper, "Exploring the potential for community-based case management of neonatal sepsis in Ethiopia" in February 2012. The paper analyzed the potential benefits and challenges of introducing community-based sepsis management. Reducing neonatal mortality is increasingly important not only because the *proportion* of U5 deaths in the neonatal period is increasing, but also because the health interventions to address neonatal deaths generally differ from those to address other under-five deaths. High levels of home delivery (90%) and cultural beliefs of secluding the newborn challenge identifying and treating sick newborns. Active pregnancy and birth surveillance and postpartum home visits early in the first week are required to identify and manage sick neonates.

In September 2012, following the successful introduction and scale-up of iCCM, the FMOH agreed to introduce community-based newborn sepsis management through the HEP. To support the implementation, the FMOH and development partners conducted a joint learning trip to Nepal to study the experience of scaling up newborn care as a national program. An important lesson was to scale up an integrated package of maternal and newborn care interventions at the community and health facility.

The national guidelines for community-based newborn care developed under FMOH leadership were launched in March 2013. A strong HEP and iCCM program, coupled with community mobilization through the Health Development Army and other local mechanisms, are critical for successful community-based newborn care. Good practices from the iCCM program experience, such as clinical mentoring, supervision, and program review meetings for quality improvement; a balance between preventive and curative care; and resource mobilization and coordination will be applied to the national scale-up of community-based newborn care, a daunting but not impossible task. This is an important step towards ending all preventable death among Ethiopia's children.

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EDITORIAL

CAN TRAINING HEALTH EXTENSION WORKERS IN THE INTEGRATED PHARMACEUTICAL LOGISTICS SYSTEM (IPLS) BE EFFECTIVE, AFFORDABLE, AND OPPORTUNISTIC?

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Critical to the success of integrated Community Case Management (iCCM) is the availability of life-saving curative interventions at health posts (HP), which is dependent on Health Extension Workers (HEWs) trained on supply and logistics management. Results from our 2010 baseline assessment showed that the availability of key iCCM products at HPs was low on the day of inspection: ORS for diarrhea (56%), malaria rapid diagnostic tests (22%), Coartem 1X6 (10%), Coartem 2X6 (18%), cotrimoxazole 120mg for pneumonia (0%), and zinc 20mg for diarrhea (0%). Likewise, we observed a lack of basic supply chain knowledge and skills among HEWs and their health center (HC) supervisors, with only 11% and 8%, respectively, having received any training in SC management.

Training 34,000 HEWs to order, maintain, and store health products requires an effective, rapid, affordable, and efficient approach. Partnering with Ethiopia's Pharmaceutical Fund and Supply Agency (PFSA) and the USAID | DELIVER Project, we developed five one-hour modules that could be incorporated into existing opportunities where HC staff and HEWs meet, such as monthly Primary Health Care Unit meetings (suitable for group training) and resupply or salary collection interactions (suitable for on-the-job training [OJT]). The topics were: Introduction to IPLS for HEWs, Completing the Bin Card, Monthly Report and Request Form, Receiving and Conducting Physical Count, and Proper Storage of Pharmaceuticals. PFSA hub and Regional Health Bureau staff trained HC supervisors to conduct each module in an interactive, practical way. HC staff were also trained in problem-solving skills so they could help HEWs find local solutions and in communicating issues such as national stock shortages, which often drive stockouts at HC and community levels.

We surveyed 263 HEWs to assess training coverage and competency in basic SC tasks six months after training 987 HC staff. About half (54%) of HEWs had been trained, a five-fold increase over baseline. Coverage was higher (84%) in areas where the HEWs were trained as a group and when HC staff received higher level support to organize the trainings. HEW competency varied by task: higher for the simple task of starting a bin card (85%) and lower for the most complicated skill of completing the Health Post Monthly Report and Resupply form (49%). The latter modest performance score was, in fact, a dramatic improvement over baseline (0%), and would likely improve further over time with practice and targeted supportive supervision.

The evaluation has shaped the ongoing SC training approach implemented by PFSA and its partners. The most important finding is that using HC staff to train HEWs in basic SC knowledge and skills, by incorporating lessons into existing activities, can improve training levels in a short time. It is also affordable, since it does not require extra travel or allowances, and it improves competency. Reinforcing these skills through problem-solving sessions and OJT, especially for more difficult topics, such as the monthly report and resupply form, is essential if HEWs are to fully master the SC skills. Improving HEW skills in SC management is an essential first step to enhancing iCCM product availability at HPs and should be a priority for reducing child mortality. As efforts are made to improve national availability of iCCM products, this knowledge and these skills will ensure HEWs know how to access the products they need to save lives.

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EDITORIAL

HOW DO ETHIOPIA'S HEALTH EXTENSION WORKERS SPEND THEIR TIME?

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How much time do Health Extension Workers (HEWs) spend at the health post? In the community? Conducting non-health activities? How does clinic vs. community time allocation change if a health post is staffed by a pair of HEWS vs. a single HEW? How is the time apportioned between service and travel? How much time do volunteers spend promoting health?

We developed a rapid assessment to characterize how HEWs spend their time. We extensively probed HEWs to list all their activities over a year – then the frequency and average time duration for activity, preparation, and round-trip travel for each. We programmed Excel© (Windows 7, Microsoft Corporation, Washington, USA) to convert duration input to hours and frequency input to number per month, yielding prorated values as hours/month. We entered the values on a computer in the field and shared the results with the interviewees upon completing the interview, generating much interest.

In August 2012, we applied the technique in Shebedino District, Sidama Zone, Southern Nations, Nationalities and Peoples' Region, a year after Save the Children and partners trained HEWs in integrated community case management. We interviewed five HEWs and a volunteer Community Health Promoter for comparison. Two HEWs worked alone at their health post; one was a member of a pair; and two others comprised the same pair. We asked the latter three to describe their pair's activities and then divided by two to yield individual profiles. Each interview took about an hour.

HEWs reported working 193 hours/month with solo HEWs working more than their paired counterparts (217 vs. 170 hours/month, respectively). Solo HEWs reported wide variation in the proportion of time spent in the community (7 to 59% of total), while paired HEWs reported similar levels (42% of total, range 36-48%). Preparation time was low (mean: 3 hours/month), but travel accounted for up to 53% of community time. The two paired HEWs reported spending almost two thirds of their community time conducting home visits (63%), followed by meeting supervisors (9%), and group health talks (8%). They reported spending little community time on non-health activities (6%), such as community gatherings arranged by the *kebele*, cabinet meetings, visiting the Women and Child Affairs Office, and meeting with the development team. The volunteer contributed 44 hours/month in preparation (9%), travel (27%), and actual activity (64%). As demand for HEWs' curative services increases, the proportion of time at health posts might increase.

Our rapid method seems credible because the sum of reported activities approximated full-time work. This activity-by-activity approach seems less susceptible to over-reporting than global summary statements. Moreover, solo HEWs reported working more than their paired counterparts, which is sensible. HEWs have fixed working hours and watches and are well schooled, supporting the validity of their reports. Unpaid volunteers reported approximately a 0.23 full-time equivalent that may be difficult to sustain. We cannot generalize from a small sample, but this method, quicker and less costly than diaries or direct observation, may be worth repeating and/or adapting for other questions. If further experience confirms validation, the approach could have wide applicability.

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ORIGINAL ARTICLE

NATIONAL SCALE-UP OF INTEGRATED COMMUNITY CASE MANAGEMENT IN RURAL ETHIOPIA: IMPLEMENTATION AND EARLY LESSONS LEARNED

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ABSTRACT

Background. *Although under-five mortality in Ethiopia has decreased 67% in the past two decades, many children still die from preventable or treatable conditions, mainly pneumonia, newborn problems, diarrhea, malaria and malnutrition. Most of these deaths can be avoided with timely and appropriate care, but access to and use of treatment remains inadequate. Community health workers, appropriately trained, supervised, and supplied with essential equipment and medicines, can deliver case management or referral to most sick children. In 2010, Ethiopia added pneumonia to diarrhea, malaria and severe acute malnutrition, targeted for treatment in the integrated community case management (iCCM) strategy.*

Purpose. *This article describes the national scale-up of iCCM implementation and early lessons learned.*

Methods. *We reviewed data related to iCCM program inputs and processes from reports, minutes, and related documents from January 2010 through July 2013. We describe introduction and scale-up through eight health system components.*

Results. *The government and partners trained and supplied 27,116 of the total 32,000 Health Extension Workers and mentored 80% of them to deliver iCCM services to over one million children. The government led a strong iCCM partnership that attracted development partners in implementation, monitoring, evaluation, and research. Service utilization and weak supply chain remain major challenges.*

Conclusion: *Strong MOH leadership, policy support, and national partnerships helped successful national iCCM scale-up and should help settle remaining challenges.*

Key Words: *Ethiopia, child health, community health worker, community case management, health system, implementation*

INTRODUCTION

Ethiopia has the second highest population in Africa, an estimated 86 million, of which 13 million are children under five years of age (1). About 86% of the population lives in rural areas. Ethiopia has reduced under five mortality by 67% from 1990 to 2012 (204 to 68/1,000 live births) (2). However, common childhood illnesses still account for 33% of under-5 mortality (pneumonia 18%, diarrhea diseases 13%, and malaria 2%); newborn conditions account for another third; and half of under-5 mortality is associated with malnutrition (3).

The coverage and utilization of evidence-based, high impact interventions and services for children remain low due to factors of supply (e.g., inaccessibility, unavailability) and demand (e.g., illness recognition, cultural beliefs, opportunity, and actual cost) (4). For example, the 2011 Demographic and Health Survey DHS showed that caregivers sought care for less than a third (27%) of under-five children with symptoms of acute respiratory tract infection (ARI). Only a third (32%) of children with diarrhea was taken to a health facility or provider for care, and only 40% received oral rehydration therapy solution (ORS) (5,6).

Integrated community case management (iCCM) is a strategy to improve coverage by delivering curative interventions to sick children in communities that lack access to health centers (HC). Ethiopia has invested heavily in this strategy. The purpose of this paper is to present the implementation process and

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early lessons learnt from the national scale-up of an iCCM program in Ethiopia, which to our knowledge is the largest iCCM program in Africa both in terms of the number of service providers trained and the population covered.

The Health System in Ethiopia/Health Extension Program: The public health system provides most health care in Ethiopia. Access to private sector providers is mainly limited to peri-urban and urban settings. This health system is decentralized with regional and *woreda* (district) autonomy.

The government of Ethiopia launched a community-based health care delivery system, the Health Extension Program (HEP), during the second Health Sector Development Program (HSDP II) in 2003. The HEP relies on salaried civil servants, mostly female, to bring health services to the community. The HEP aims to create a healthy society by reducing maternal and child morbidity and mortality through the delivery of preventive and promotive services and selected high impact curative interventions at the community level (7).

Primary hospitals, HCs, and their health posts (HP) make up the primary health care unit (PHCU). Each HP is staffed by two female Health Extension Workers (HEW) from nearby villages, having completed at least the 10^{th} grade. The Federal Ministry of Health (MOH) has trained and deployed about 32,000 HEWs in almost 16,000 HPs in rural areas serving a total population of 70,000,000 (8).They receive a 12-month theoretical and practical training on 16 health service packages (Box 1) of health promotion and disease prevention in the areas of family health, environmental sanitation and hygiene, disease prevention and control, and health education and communication. The "Maternal and Child Health" package (#3a) includes antenatal (ANC), delivery, and postnatal care (PNC) for mothers and newborns; optimal infant and young infant feeding; and selected, non-algorithm-based curative interventions for children (e.g. two ORS sachets for any diarrhea syndrome, paracetamol or first-line antimalarial for fever). Rapid diagnostic tests (RDT) and Artemesin in-based combination therapy (ACT) were added in 2006 to the management of malaria and distributed to *kebeles* with either high or low malaria risk (9). RDTs and ACT are not distributed to HP in *kebeles* with zero malaria risk, where HEWs consider malaria only if there is history of travel to malarious area. In such cases, they refer the sick child for management to the HC where blood tests and antimalarials are available.

Ready-to-Use Therapeutic Feeding (RUTF) for selected high-risk *woredas* was added in 2008 (10). HEWs provide services at HPs, community outreach, and through home visits. They refer serious cases to HCs. HEWs promote key behaviors and practices using a standardized national communication tool, the Family Health Guide (FHG), which has 64 maternal, newborn, and child health action messages in picture and text, informed by formative research. The national Health Development Army (HDA) is a network of one female for every five in the neighborhood to enhance community engagement and adoption of healthy lifestyles, emphasizing use of maternal and newborn health services. HEWs use registers to record performance (e.g., immunization, family planning, ANC, and PNC). They regularly update a Family Folder for each household to record vital statistics and use of maternal and child health services. HEWs aggregate information from registers to provide a monthly activity report to the HC. The HC staff and the HEWs review performance every month.

The HEP has attracted health development partners' support for HEW training, supplies, and equipment. The government covers the HEW salary and cost of industrial materials for HP construction, and communities cover the cost of local construction materials and provide labor to construct HPs and HEW residences. The HEP is the platform on which iCCM was placed.

Box 1: The 16 essential health packages

1. Hygiene and environmental sanitation:
    a) Proper and safe excreta disposal and proper and safe solid and liquid waste management
    b) Water supply safety measures
    c) Food hygiene and safety measures
    d) Healthy home environment
    e) Arthropod and rodent control
    f) Personal hygiene
2. Disease prevention and control:
    a) HIV/AIDS prevention and control
    b) TB prevention and control
    c) Malaria prevention and control
    d) First aid
3. Family health services:
    a) Maternal and child health
    b) Family planning
    c) Immunization
    d) Adolescent reproductive health
    e) Nutrition
4. Health Education and Communication

Table 1: Key milestones and timeline

Butajira research (1987-1994)	**Liben pilot**: *Save the Children's child survival project in a pre-HEW setting in Liben District, Oromia* (1997-2006)		**Bolosore pilot**: *USAID/JSI ESHE child survival and system strengthening project, SNNPR*(2006-2008)	**Policy change** (2010)	**Scale up** (2010-2013)
Built health posts Trained community health agents to deliver cotrimox-azole for fast breathing, paracetamol for fever, and refer for immunization and severe illness Developed referral system from community to health centers	1997-2001: IMCI training for frontline health workers at facilities (junior nurses and health assistants) Health system strengthened through supervision, capacity building, and drug supply Community volunteers promoted illness recognition and care-seeking to facilities	2001-2006: Added CCM of fever, fast breathing and diarrhoea	HEWs trained and mentored on integrated case management of malaria, diarrhoea and pneumonia (with cotrimoxazole); and essential newborn care and classification and referral for newborn infection, dysentery, severe malnutrition, and HIV Strengthened immunization, infant and young child feeding promotion and other HEP packages	National implementation plan developed Implementing partners identified and PCA signed Training material developed, translated and printed Training kits packaged and distributed Monitoring plan and tools developed	National and regional launches National master trainers trained Regional training of trainers HEW and supervisor training Service provision Monitoring

Table 2: iCCM cases by syndrome and year

Syndromes Treated	**2011**	**2012**	**2013**	**Total**
Malaria	22,356	104,709	163,885	290,950
Suspected pneumonia	28,876	135,249	159,714	323,839
Diarrhea	33,534	157,064	371,446	562,044
Severe acute malnutrition	NA	41,174	47,153	88,327
Total	84,766	438,196	742,198	1,265,160
Number of health posts providing iCCM	4,510	8,990	13,500	

Table 3: Contents of iCCM supply starter or "replenishment" kits (non-malarious area kit excludes antimalarial drugs and RDTs)

Item	Quantity
Zinc 20 mg tablet (pack of 100)	50
ORS sachet (box of 1000)	1
20mg Trimethoprim + 120mg Sulphamethoxazole (pack of 100 tabs)	30
Artesunate rectal sup. 50mg (box of 6)	2
Artesunate rectal sup. 200mg (box of 6)	2
Artemether 20 mg + 120 mg Lumefantrine tablet,	
1X6 of 30 strip box	1
2X6 of 30 strip box	1
3X6 of 30 strip box	1
4X6 of 30 strip box	1
Chloroquine syrup	20
multi-species RDT	300 tests
Paracetamol 100mg tablet (box of 1000)	1
Albendazole 400mg (pack of 100 tabs)	2
1% Tetracycline eye ointment (box of 50)	1

Table 4: Supervision, Performance Review, and Mentoring Approaches

Parameter	Health Sector Command Post Weekly Form	Checklist for Integrated Supportive Supervision to Health Post	Form C: ICCM Supportive Supervision/ Follow-up Checklist	Performance Review and Clinical Mentoring Meeting Guide
Description	Amharic; 8 p	English, 8 p, including instructions	English, 11 p (3 p for 2 Sick Child Rec. Forms)	37 p including form C and case abstraction forms
Where	Health post	Health post	Health post	2-day review at *woreda* with all (~10) HEWs of a PHCU
When	Weekly	Quarterly	Quarterly	As resources permit, annually
Who	Health center staff	*Woreda* staff and health center and sometimes partners	Partners and sometimes health center and *woreda* staff	Partners and *woreda* and health center staff
Official	Yes	Yes	No	No
Purpose	Track HEW and community activities according to plan	Child and maternal health; malaria, TB, HIV/AIDS; sanitation; model HH; management; supervision; HMIS; supplies; HP condition	Categorize HP function as high, medium, low (by register completeness/ consistency) and plan support every 1, 2, or 4 weeks.	Enhance quality of care and service uptake by peer learning through register review and experience sharing; identification of barriers and solutions and mentoring through direct observation
iCCM variables	Malaria cases; RDT availability	8/98 total variables: CCM training, CCM provision, ORT corner, diarrhea treatment, weigh/plot, feeding counselling (#14-20); ORS (#91)	Register review of 2 cases of each classification for completeness, consistency, referral, follow up, outcome; vitamin A, immunization, and deworm; classification vs. HMIS; supplies; drugs; ORT corner; knowledge; ENC; summary	Case management practice and recording, barriers and solutions
Use	Local	Local	Local	Local
Forwarding	Woreda collects from health center	4 copies: health post and health center, woreda, zone, and partner	To partner	To partner
Aggregation	*Woreda* compilation	*Woreda* computerizes	Partners enter into national Form C database	Partners enter into national Form C database

Table 5: 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.

Parameter	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)	18/42c	- 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 in stock on the day of data collection[d]	71/103	69 (59-78)	2/46	4 (1-15)
All essential supplies and job aids for iCCM in stock on the day of data collection [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)	-	-
Child with severe illness correctly managed	13/38	34 (22-50)	-	-
Caretaker can correctly describe how to give all treatments	131/158	83 (75-89)	-	-
	Mean (95% CI)	**Range**	**Mean (95% CI)**	**Range**
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
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

[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.
[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

Integrated Community-Based Case Management

Timeline and Milestones: The evolution of iCCM in Ethiopia covers phases of partial introduction, policy debate, systematic demonstration, and rapid scale-up throughout regions across the country (Table 1) (11-13). Planners initially targeted the four agrarian regions (Amhara, Oromia, SNNP, and Tigray) comprising about 75% of Ethiopia's population because the population density was greater, the implementation of the HEP was uniform, and achievement of the 16 packages was good (14). In 2013, Ethiopia expanded iCCM implementation from four to seven regions (step-wise to Benishangul-Gumuz, Gambella, and Afar) with a total of 13,500 HPs in 600 *woredas*, reaching an estimated 10,230,450 under-5s. Since the program started, over one million children under five have received iCCM services (Table 2) (15). The following sections describe the iCCM program according to eight health system components. We restricted the term "quality" to refer to the technical quality of care or of supervision.

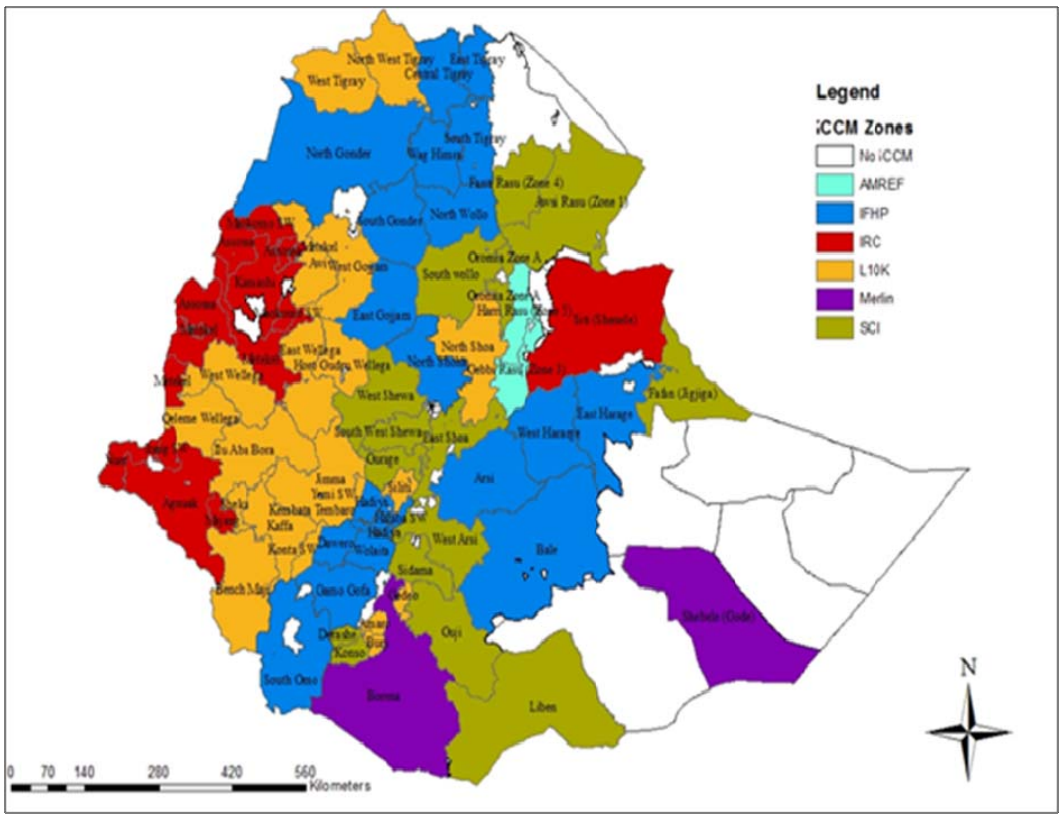

Figure 1: Partners working on iCCM implementation by zone and region as of 31 June, 2013

Inputs	Processes	Outputs	Outcomes and Effects		Impact
Funding Policies Plans focussed on major causes of death Procurement of commodities Partner coordination	Dissemination of guidelines Training, supervision, capacity building Supply and distribution of commodities IEC activities Community mobilization Program monitoring	Provision anduse of services Continuous availability of commodities District Plan and resources tied to major causes of death	Quality of service and supervision	Increased coverage for high impact interventions Behaviour change	Improved child (and maternal) survival Improved nutrition and reduction in stunting Cost- effectiveness
Equity and Costs					
Change in the program as a result of the independent evaluation					

Figure 2: Common results framework for the scale-up to MDG 4 &5 (based on the Operational Framework. Geneva: WHO; 2010)

1. Coordination and Policy: n January 2010, Ethiopia introduced treatment of pneumonia to the mandate of the HEW. Previously, Ethiopia endorsed all relevant global policy recommendations for iCCM including treatment of diarrhea with low osmolarity ORS and zinc, RDT assessment of fever and ACT treatment for malaria, and home visits for postnatal care to identify newborns with danger signs. With the addition of a pneumonia case management policy, the full iCCM package was at last in place.

The Health Promotion Disease Prevention Directorate was responsible for HEP and iCCM until August 2013, when responsibility shifted to the HEP and Primary Care Directorate. For iCCM, the MOH engaged in a partnership that brought together UNICEF, the Catalytic Initiative of the Canadian International Development Assistance (CI/CIDA), the United States Agency for International Development (USAID), the World Health Organization (WHO), the Bill & Melinda Gates Foundation (BMGF), and non-governmental implementing partners to support delivery of iCCM (Figure 1). Implementing partners worked hand-in-hand with the MOH and initially included Save the Children, John Snow Inc./Last Ten Kilometers Project, and USAID's Integrated Family Health Program (IFHP). The International Rescue Committee and MERLIN joined as scale-up progressed in 2011 and 2012. Each partner had a specific geographic area where it supported the MOH. Written agreements assured accountability for performance and results.

The MOH and the partners established Technical Working Groups (TWG) at national and regional levels to support and guide implementation. The TWG is a technical and stakeholder forum and a subgroup of the Child Survival Working Group. The MOH initially convened monthly, then quarterly, meetings including senior personnel from all participating agencies. TWGs prepared implementation plans, training materials, job aids, and monitoring and evaluation frameworks and tools. Between late 2008 and 2010, the MOH led and worked with partners to harmonize and standardize HEW in-service training that resulted in a single set of integrated refresher training (IRT) materials for each component of the HEP package, including iCCM. They were organized into six thematic areas, one of which was iCCM.

Community coordination and support for HEP and iCCM were also extensive through the Command Post structure and through local government. The Command Post strategy extends through region to *woreda* to *kebele* and coordinates all political and socio-economic multi-sectoral development through the Health Development Army (see below). In addition, one of the usually two HEWs represents health on the *kebele* council.

2. Human Resources. The TWG adapted and simplified the WHO/UNICEF Integrated Management of Newborn and Childhood Illness (IMNCI) curriculum and replaced reading modules with exercise booklets. Training materials include oral rehydration treatment (ORT) supplies, wrist watch, thermometer, infant weighing scale, training manikins, videos, charts, exercise and photo booklets for managing sick young infants (<2 months) and sick children (2-59 months), checklists and facilitator guides for performance review and clinical mentoring (PRCMM), and treatment registers in three local languages (Table1). Each row in the register (one row per case) is designed to recapitulate all the evidence-based case management steps in the IMNCI-iCCM Chart Booklet.

The training has defined learning objectives and tasks aligned with HEW roles and responsibilities, specifically: providing essential newborn and postnatal care for mothers and newborns; counselling caretakers; treating pneumonia, diarrhoea, malaria, and uncomplicated severe acute malnutrition; and referring severe illnesses and sick newborns promptly. The training cascade included national and regional training of trainers, who in turn trained the HEWs in a six-day, competency-based training of which 60% percent was practical. The trainers received a seven-day training that included the same six-day case management training and one day of supervision training in "Form C," the partner-supported supervision checklist for iCCM (see below). From 2010 to April 2013, the MOH and partners trained 900 facilitators, 7,000 supervisors (including facilitators, IMNCI supervisors and iCCM supervisors), and 27,116 HEWs. All HEWs received a certificate, and the training report specified those needing more support through post-training follow-up. In theory, since each HP had two HEWs, the stronger would coach the weaker.

A handbook describes task-sharing and working arrangements between HEWs and the HDA. HEWs train HDA members who, in turn, give health promotion messages, refer sick children to the HP, notify HEWs of births, and conduct postnatal visits mainly in partner-supported areas. The roles and responsibilities of HEWs and the HDA are generally clear to communities. HEWs use a national HDA implemen-

tation guide to provide community orientation and training. The HDA is explicitly a voluntary, non-paid, non-incentivized cadre (16).

3. Service Delivery and Referral. The HEW's iCCM service responsibilities include: (1) sensitizing the community and creating demand for iCCM; (2) providing essential newborn care; (3) assessing, classifying, treating, counselling, and following up children with pneumonia, diarrhea, malaria, and uncomplicated severe acute malnutrition; (4) checking and updating child immunization status; (5) checking, counselling, and referring for HIV testing; (6) referring sick young infants and children with general danger signs or severe illness; (7) maintaining registers; (8) reporting; (9) monitoring supply and requesting timely re-supply of drugs, job aids, and equipment; and (10) ensuring that iCCM issues are discussed in community conversations in the *kebele*.

Referral is facilitated by pre-referral treatment, referral slip, and occasional problem solving for transport or financial assistance. HEWs are trained on back-referral, but it is generally lacking. Work patterns were recently reviewed and revised. Initially HEWs were trained to spend 75% of their time in the community and 25% at the HP. As of Oct 2012, the policy states that one HEW should remain at the HP Monday-Friday, 35 hours/week to improve utilization of maternal and child health (iCCM) services delivered at the HP. In practice, both HEWs may sometimes be absent due to meetings, trainings given or received, campaigns, personal reasons, or inadvertently adhering to the former policy, among other reasons. According to an iCCM implementation strength and quality of care assessment by JHU-IIP in West Hararghe and Jima Zones in Oromia Region, HEWs self-reported that the HPs were open on average 20 hours per week (17).

Adherence to guidelines is facilitated by the evidence-based IMNCI Chart Booklet, by the registers that match the steps in the booklet, and by the many hand-made flipchart sheets taped to the HP walls that specify respiratory rate cut-offs, steps of case management, general danger signs, and more.

4. Supply Chain. The TWG developed a standardized list of iCCM supplies to guide procurement. All iCCM medicines are in the national Essential Medicines list. Distribution had three strategies: short-, intermediate-, and long-term. The short-term strategy distributed "training kits" to HEWs at the end of the training to allow immediate service delivery. UNICEF assembled and distributed 28,000 training kits, each with enough cotrimoxazole for 80 treatments (HEWs already had supplies of other medicines). The intermediate-term strategy developed "replenishment kits" for both malarious and non-malarious *kebeles* with 12 months of essential drugs and supplies (Table 3). The TWG with the Pharmaceutical Fund and Supply Agency (PFSA) quantified replenishment kits, assuming 50% care-seeking at HPs for the following estimated episodes/child/year: 0.27 (pneumonia), 0.10 (malaria in malarious *kebeles*), and 3.0 (diarrhea). HPs could obtain additional drugs if use exceeded forecast. The long-term strategy, not yet implemented, will involve local quantification and replenishment through an integrated (i.e., more than just iCCM) "pull" mechanism supported by a fully functional logistic management information system. Thus far, the iCCM supply system has been parallel to the national system.

As part of the TWG's Logistics Sub-Group, JSI's Supply Chain for CCM (SC4CCM) Project has conducted a baseline assessment (18), assisted national quantification, and piloted a "pull" system in two zones in SNNP and Amhara Regions.

5. Behavior and Social Change. Launch meetings at region, zone, and *woreda* helped introduce iCCM. After training, trained HEWs sensitized their *kebele's* administration, community and religious leaders, and HDAs on the availability of iCCM services.

Ethiopia's Family Health Guide (FHG) was developed in 2003-04 and informed by experience from Madagascar. The FHG has been revised several times to become a 64-message guide. It was last vetted in 2009 through a national review to inform the current Integrated Refresher Training module, "Communication Skills for Community Maternal, Newborn, and Child Health." Unsatisfactory progress in adopting health behaviors through the previous "model family" strategy led to the current HDA strategy of one female leader for five households. The leaders are locally influential, respected individuals who engage their neighbors through interpersonal and group communication at market places, community gatherings, coffee ceremonies, and other social occasions. HDA members meet weekly together and monthly with the HEWs to review progress.

6. Supervision, Performance Review, and Clinical Mentoring Meetings: Supervising, supporting, and mentoring HEWs is complex (Table 4). Five HPs are linked to one HC, and the HC staff provide weekly supervision and on the job mentoring. The HEWs collect needed supplies every month from the super-

vising HC. Occasionally, supervisors deliver supplies during regular visits. The health workers from HCs provide weekly supervision, and *woreda* health staff lead quarterly joint integrated supportive supervision with HC staff and partners. The checklists for these two official approaches devote minimal space to iCCM. Thus, partner-supported supervisors also use a standardized, unofficial, partner-supported checklist ("Form C") to assess performance through detailed register review and/or direct case observation. They check HEW knowledge and stock status and provide clinical mentoring. The HEW-supervisor problem-solving dialogue is standard, but of uneven quality. A *kebele* Command Post weekly review assesses HEP implementation, including HDA activities, and reports to the *woreda* Command Post.

According to the national iCCM database 2013 report, 75% of HEWs (20,330/27,120) were supervised at least once between February 2011 and April 2013 in Amhara, Tigray, SNNP, Oromia, and Beninshangul Gumuz Regions, and 80% (21,700/27,120) attended at least one two-day Performance Review and Clinical Mentoring Meeting (PRCMM) (15). The same report revealed that stock-outs were not unusual in the 10,000 HPs supervised. While most health facilities (90%) had ORS, cotrimoxazole, and ACT, only three quarters (75%) had RUTF and RDT, and only about half (54%) had zinc on the day of visit (15).

Supervisors receive a one-day training in Form C that includes practice administering it at a HP. Supervisors are not systematically supervised regarding their supervision (quality of supervision or actual vs. planned encounters), although a modified, partner-supported Form C is under development to measure what supervisors actually do at a sample of HPs.

7. Monitoring and Evaluation. The TWG adopted the John Hopkins Institute for International Programs (JHU-IIP) conceptual framework shown in Figure 2, and an adaptation of the global CCM Task Force's monitoring framework (17, 19). Ethiopia's partners adopted 27 indicators, informed by global consensus and national priority with supporting registers, checklists, and review meeting guides and tools. Measures of success for iCCM include indicators of scale, use, and quality.

The TWG established a national database consisting of data from training, supervision, and PRCMM. UNICEF and MOH manage the database, and implementing partners enter, analyse, and use data for monitoring and quality improvement. The new national health management information system has many documents at the HP level: registers, Family Folder for the HEP, tally sheets, and Monthly Service Delivery and Disease Report Forms, among others. Relevant to iCCM, the service report includes ORS and ACT availability and outpatient sick visits for under-fives by sex, while the disease report tallies malaria (falciparum and non-falciparum), diarrhea by syndrome, and pneumonia cases among under-fives. Moreover, these data are forwarded up through the system maintaining source of treatment – valuable to assess iCCM. However, few HEWs and health workers have been trained in the new system.

The national TWG reviewed global research priorities and identified the following national priorities (19). (a) What are the level and determinants of service utilization at PHCUs? (b) What is the best way to supervise iCCM? (c) What is the quality of iCCM? (d) What is the effect of iCCM on the preventive and promotive components of HEP?

The JHU-IIP was commissioned by CIDA and UNICEF to conduct an independent evaluation of the implementation of iCCM in Ethiopia. As part of the evaluation, JHU-IIP conducted an assessment of the strength of iCCM and quality of care in HPs through an "implementation snapshot" in West Hararge and Jima zones of the Oromia region. The assessment documented good program strength and quality of care at the HP (Table 5) (17).

8. Costing and Finance. The program has received substantial donor attention and support. The implementing partners have leveraged matching resources to a greater extent than before 2011. The government has covered the cost of salaries which is more than 30 million USD annually, capital costs, and most of the consumables.

Lessons Learned and Continued Challenges:

Coordination and Policy: Strong government commitment and leadership were essential to drive national iCCM scale-up. Likewise, strong coordination among development partners was vital to introduction and scale-up. Many partners engaged in planning, preparing, and implementing iCCM. Accountability mechanisms specified clear responsibilities and deliverables among the government, UNICEF, and implementing partners. The government-led national TWG reviewed and adapted previous local experience to harmonize and superintend a single national implementation plan that led to rapid, coherent national scale-up. The program has reached every *woreda* and *kebele* in the big agrarian regions and

Beninshangul Gumuz Region, aiming for universal coverage and equitable access to service in these areas. The introduction of a national policy for pneumonia treatment at the community level was a critical milestone.

Human Resources. The presence of the PHCU with salaried HEWs was a robust platform for iCCM implementation. The HC with its director and dedicated supervisors provides institutionalized support and monitoring of HEWs, including salary payment.

Service Delivery and Referral. The HEP was maturing during 2009 in the sense that preventive and promotive interventions were achieving good coverage and served as a foundation for iCCM. However, despite the increased use of iCCM with time, utilization remains low for both 0-2 and 2-59 month old children, especially for the former group. A quality of care and implementation strength survey conducted by the JHU-IIP showed an iCCM consultation of only 16 sick children per HP per month – or only about 0.26 episodes per child per year for a typical population of 730 children in a kebele (14.6% of a total population of 5000) (17).The same survey found that more than three times as many sick children were treated in iCCM implementing HPs than in non-iCCM implementing HPs. However, the service utilization still remained low compared to the expected number of sick children. A qualitative survey of care-seeking by JHU-IIP showed that the main barriers to care-seeking at HPs were sociocultural and religious factors, and lack of information on availability of treatment at the HP. In addition, some informants reported expecting costs from a visit to a HP, specifically that it would lead to a costly referral and the burden of carrying a child for more than an hour over difficult terrain (21).The skills-based training of HEWs (in iCCM), of supervisors (in iCCM supervision), and of HC staff and woreda focal persons (in IMNCI); the joint post-training follow up; and the joint performance review and mentoring are intended to improve quality of care, strengthen links between HPs and HCs, and increase service utilization. These findings indicate these efforts are insufficient to fully address the barriers to care-seeking.

Current iCCM scale-up has not reached most pastoralist settings with scattered populations, limited resources, lower capacity, and weaker HEP implementation. iCCM should be expanded in these areas in a phased manner through prior strengthening the HEP preventive and promotive packages to which iCCM will be added. Afar and Somali regions have developed a specific iCCM implementation plan and started iCCM in a few selected *woredas* (22).

Supply Chain. The short-term iCCM supply distribution strategies that Ethiopia followed have helped to overcome the challenges of a weak supply chain. Training kits ensured start-up of service immediately after HEWs returned to their HP after training, a recognized best practice. The replenishment kits provided HPs enough supplies for at least one year. This approach is temporary, and the MOH/PFSA and partners should emphasize a long-term "pull" strategy through the LMIS.

Behavior and Social Change. Low health care seeking behavior among families is one of the contributors to low service utilization witnessed. In the first one to two years of iCCM implementation, more attention was given to building technical capacity of HEWs and supervisors and distribution of supplies. More focus should be given to improve care-seeking behavior through community mobilization and behavior change communication by the HDA network.

Supervision, Performance Review, and Clinical Mentoring Meetings. The PRCCM data and the JHU -IIP/UNICEF implementation strength and quality of care findings show that the HEWs may be providing better care than CHWs in other countries, which is likely due to solid standardized training, job aids and registers that detail case management steps, post-training follow-up, structured supportive supervision, and mentoring.

Monitoring and Evaluation. The health management information system is not fully established to capture the iCCM service data. Multiple competing priorities were also among the major challenges. In response, the child survival TWG has prioritized action research questions to be answered through operations research, many of the results of which are included in this supplement.

Costing and Finance. The introduction of a national policy for pneumonia treatment at the community level, a costed implementation plan, and inclusion of iCCM in HSDP4 and *woreda* core plans were keys to success (14, 23, 24). The main iCCM cost drivers were training, medicines, supervision, and PRCMM. The government mobilized sufficient resources for iCCM from UNICEF, USAID, CI/CIDA, and the BMGF for implementation at scale in three years. The successful implementation catalyzed other donor resources to address pastoralist areas (i.e., Micronutrient Initiative in the Afar region iCCM and The International Rescue Committee and Save the Children for the Somali region) and to expand services to include community-based newborn care (25, 26).

Sustainability. The iCCM program is now part of the HEP packages, which is at the core of the Ethiopian HSDP. The decentralized annual plans of the rural woreda have iCCM as their major intervention strategy (23,24). These all will provide good ground for sustainability.

In conclusion, Ethiopia's iCCM strategy has accomplished much and contributed to national and global learning. There is more to do to further consolidate and sustain it in the already covered regions while expanding it in the pastoralist communities of the Somali and Afar Regions. Nonetheless, the iCCM program is part of the HEP package, which is central to the Ethiopian HSDP. The decentralized annual plans of the rural *woredas* have iCCM as a major intervention strategy.

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ORIGINAL ARICLE

PERFORMANCE OF ETHIOPIA'S HEALTH SYSTEM IN DELIVERING INTEGRATED COMMUNITY-BASED CASE MANAGEMENT

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ABSTRACT

Background. *Analyzing complex health programs by their components and sub-components serves design, documentation, evaluation, research, and gap identification and prioritization. In 2012, we developed a rapid methodology to characterize integrated community case management (iCCM) programs by assessing benchmarks for eight health system components in three program phases.*

Objective. *To assess iCCM benchmarks in Ethiopia three years after scale-up commenced, and to compare the benchmarks across the geographical region.*

Methods. *Six national iCCM experts scored each of 70 benchmarks (no, partial, or yes) and then were facilitated to reach consensus.*

Results. *Overall, iCCM benchmark achievement in Ethiopia was high (87.3%), highest for pre-introduction (93.0%), followed by introduction (87.9%) and scale-up (78.1%) phases. Achievement by system component was highest for coordination and policy (94.2%) and lowest for costing and finance (70.3%). Six regional countries' benchmark assessments, including two from Ethiopia 14 months apart, were highly correlated with program duration at scale (correlation coefficient: +0.88).*

Conclusion. *Ethiopia has a mature, broad-based iCCM program. Despite limitations, the method described here rapidly, systematically, and validly characterized a complex program and highlighted areas for attention through government or partners.*

Key Words: *Ethiopia, child health, community health worker, community case management, health system, benchmarks*

INTRODUCTION

It is a challenge to rapidly, systematically, and validly assess the status of complex health programs. In 2010, the World Health Organization (WHO) identified six "key components of a well-functioning health system" – each with several sub-components (1). In 2012, Mc Gorman et al. proposed eight components to characterize a health system, as applied to integrated community case management (iCCM) programs: (1) organization, coordination, and policy setting; (2) budgeting, costing, and financing; (3) human resources; (4) supply chain management; (5) service delivery and referral; (6) behavior and social change, sensitization, and advocacy; (7) supervision and performance; and (8) monitoring, HMIS, evaluation, and research (2). The main differences compared to the WHO components are that McGorman et al. added "social and behavior change" and specified "supervision and performance" as a stand-alone component.

Analyzing health programs by component and subcomponent serves several purposes, including design, documentation, evaluation, and research. For example, WHO is preparing a program guide organized around the eight components defined by McGorman et al. to help countries introduce an integrated community-based strategy for newborns, sick children, and healthy children (3). Pelletier and colleagues

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prepared a program documentation guide for USAID's A2Z Project to promote micronutrient nutrition that used a one-day workshop to guide systematic program documentation (4). A companion guide informed a systematic assessment of a program's supply, demand, utilization, information, and social and political commitment to yield a strategic plan, an action plan, a monitoring and evaluation plan, and an applied research agenda (5). UNICEF used a health systems approach to assess integrated community case management (iCCM) programs in six sub-Saharan African countries: Ethiopia, Ghana, Malawi, Mali, Mozambique, and Niger (6). They examined community health worker deployment, supervision, motivation, and retention; supply chain; demand; monitoring and evaluation; and government policy and engagement. In short, implementers, policy makers and donors benefit from systematic analysis because program and policy gaps are prioritized.
A parallel development has been the applications of benchmarks to characterize a health system. Benchmarks can be thought of as industry standards of best practice, necessary but insufficient steps towards effective, sustained programming at scale. Moran and colleagues identified 27 benchmarks to measure nine countries' readiness to scale up newborn survival interventions (7).

McGorman et al., in addition to the eight health system components described above, proposed 68 benchmarks to characterize the components of iCCM programs, arrayed in three phases: advocacy and planning (28), pilot and early implementation (21), and expansion and scale-up (19) shown in Table 1 (3). Important differences between the two benchmark lists are that, unlike the iCCM list, the scale-up readiness list was the result of a prioritization exercise of 42 proposed benchmarks; considered only readiness, not implementation; and addressed both facility and community components. Also, the scale-up readiness benchmarks had criteria for responses (yes, partial, or no) and required document verification to substantiate a "yes." Each country assessment required a week of researcher time, spread over several weeks, plus a one-day stakeholder workshop.

Marsh et al. pilot-tested a streamlined approach to map benchmarks in iCCM programs – as well as the role of a non-governmental organization (NGO) partner –in Ethiopia, Malawi, Rwanda, and Sierra Leone (8). They requested a colleague from an NGO to assess each of the 68 benchmarks who then vetted the findings with the Ministry of Health or other impartial knowledgeable colleagues. Data collection and vetting took about two hours. Thereafter, Save the Children also mapped South Sudan and Mozambique, the latter with six informants (9). The entire exercise (data collection, analysis, and display) took about 12 hours in total. The purpose of this paper is to extend that work with a re-mapping of the national iCCM program in Ethiopia.

MATERIALS AND METHODS

Setting. Regarding iCCM, the Ethiopian Federal Ministry of Health supported pilot-tests (2001-06), entertained advocacy (2006-08), planned for (2009-10), introduced (February 2010), and commenced scale-up (July 2010).

Subjects. We purposively selected six national experts currently engaged in documenting Ethiopia's iCCM experience and an observer. Experts included two Health Specialists from UNICEF, two advisors from John Snow International's *Last 10 Kilometers* (L10K) *Project*, a Save the Children Senior Newborn Health Advisor seconded to the Federal Ministry of Health, and an advisor to the United States Agency for International Development's *Integrated Family Health Program*. The newly joined Child Health Team Leader of the Federal Ministry of Health was the observer. We permitted informants to skip any question for any reason.

Variables. The data collection form was an Excel table of 70 rows, one for each benchmark (two had been added to the original 68), and four columns to characterize benchmark achievement: no, partial, yes, or do not know, and an additional column for optional qualitative comments.

Process. Each informant replied independently. The next day, we facilitated four informants towards consensus and achieved further consensus with the remaining two informants during a following session the following day.

Analysis. We merged the six Excel files and analyzed each benchmark, scoring "no" as 0, "partial" as 0.5, and "yes" as 1.0. We omitted "don't know" values when computing averages. We averaged benchmark values within each of the three phases, within each of the eight components, and within phases for each component (24 in all). We used the following quintiles to visually display or "map" the status (<0.19 = low; 0.20-0.39= low partial, 0.40-0.59= partial, 0.60-0.79 = high partial, and ≥ 0.8 = high). We defined "agreement" among the informants as all

or all but one responding informants agreeing on the status of a given benchmark. We weighted benchmarks equally for calculating overall, phase-specific and component-specific scores. We weighted each of the 24 phase * component cells equally for the color-coded "map" using dark green for "high" (≥0.8), light green for "high partial" (0.6-0.79), yellow for partial (0.4-0.59), orange for low partial (0.2-0.39), and red for low (≤0.19). We used Excel (Windows 7, Microsoft Corporation) to measure correlation between program duration at scale and overall benchmark score and to derive a linear regression line.

RESULTS

These respondents were knowledgeable (total "don't know" responses: 6/420 [1.4%]) and rapidly completed the benchmark questionnaire (average time: 17.8 minutes, range 10-22 minutes).

Agreement. Respondents agreed on the status of most benchmarks (58/70 [82%]). They reached perfect consensus on 29 (41.2%) benchmarks, including 27 "yes" and two "partial" categories. They reached good consensus with a single outlier on an additional 29 (41.2%) benchmarks. The one outlier was a yes/no difference. The remaining 12 scores (17.1%) had two or more disagreements, only one of which involved a yes/no difference.

Scores. Overall, the iCCM program in Ethiopia scored "high" (87.3%). Benchmark achievement was highest for pre-introduction (93.0%), followed by introduction (87.9%) and scale-up (78.1%) phases (Figure 1). The health system components with the highest scores were coordination and policy (94.2%), communication and social mobilization (94.0%), human resources (90.8%), and supervision and performance quality assurance (90.7%; Figure 2).Supply chain management (79.8%) and costing and finance (70.3%) scored lowest.

The benchmark map summarizes benchmark achievement by component and phase by performance quintile (Table 2A). The pattern of pre-introduction surpassing introduction scores and introduction surpassing scale-up scores generally held for each component. The most notable exception was for service delivery and referral, largely because an effective referral and counter-referral system was still lacking.

Table 1. Benchmarks for Community Case Management by Health Systems Component and Program Phase

Component	Pre-Introduction	Introduction	Scale-up
1: Coordination and Policy Setting	a) Mapping CCM partners conducted b) Technical advisory group (TAG) established, including community leaders, CCM champion & CHW representation c) Needs assessment and situation analysis conducted d) Stakeholder meetings held to define roles and discuss policies e) National policies and guidelines reviewed *) CCM target areas defined (not an original benchmark)	f) MOH CCM leadership established g) Policy discussions (if necessary) completed	h) MOH leadership institutionalized i) Stakeholder meetings regularly held
2: Costing and Financing	a) CCM costing estimates made based on all service requirements b) Finances secured for CCM medicines, supplies, and all program costs	c) Financing gap analysis completed d) MOE funds invested in CCM	e) Long-term strategy developed for sustainability and financial viability f) MOH investment sustained in CCM
3: Human Resources	a) Roles defined for CHWs, communities and referral service providers b) Criteria defined for CHW recruitment c) Training plan developed for CHW training and refreshing (modules, training of trainers, monitoring and evaluation) d) CHW retention strategies (incentive/motivation) developed	e) Role and expectations of CHW made clear to community and referral service providers f) CHWs trained *) CHWs deployed post-training with medicines and supplies (not an original benchmark) g) CHW retention strategies (incentive/motivation) implemented	h) Process for update and discussion of role/expectations for CHW in place i) CHWs refreshed j) CHW retention strategies reviewed and revised k) Advancement, promotion, retirement offered
4: Supply Chain Management	a) Medicines and supplies (i.e., RDTs) included in essential drug list and consistent with national policies b) Quantifications completed for CCM medicines and supplies c) Procurement plan developed for medicines and supplies d) Inventory control and resupply logistic system developed	e) Medicines and supplies procured f) Systems implemented	g) Stocks of medicines & supplies monitored at all levels h) Systems adapted and effective
5: Service Delivery and Referral	a) Plan developed for rational use of medicines (and RDTs) b) Guidelines developed for case management and referral c) Referral and counter referral system developed	d) Good quality CCM delivered e) Guidelines reviewed and modified based on pilot f) Systems implemented	g) Timely receipt of CCM is the norm h) Guidelines reviewed and modified by experience i) Systems working
6: Communication and Social Mobilization	a) CSM strategies developed for policy makers, local leaders, health providers, CHWs, and communities b) CSM content for materials (training, job aids etc) developed c) Messages, materials and targets for CCM defined	d) CSM plans implemented e) Materials produced f) CHWs deliver messages	g) CSM plan and implementation reviewed and refined
7: Supervision & Performance Quality Assurance	a) Supervision checklists and other tools developed b) Supervision plan established c) Supervisors trained and equipped with supervision tools	d) Supervision every 1-3 months, with reviewing reports, monitoring of data e) Supervisor visits community, makes home visits, coaches f) CCM supervision is part of supervisor's performance review	g) CHWs routinely supervised for QA and performance h) Data from reports and community feed-back used for problem solving and coaching i) Yearly evaluation includes individual performance and coverage or monitoring data
8: M & E and Health Information Systems	a) Monitoring framework developed for all components with information sources b) Registers and report forms standardized c) Indicators and standards for HMIS and CCM surveys defined d) Research agenda for CCM documented and circulated	e) Monitoring framework tested & modified accordingly f) Registers and forms reviewed g) All levels trained to use framework,	h) Monitoring & evaluation on-going through HMIS data i) OR and external evaluations of CCM performed as necessary

Figure 1: Ethiopia's iCCM Program Status by Phase (overall score: 0.85)

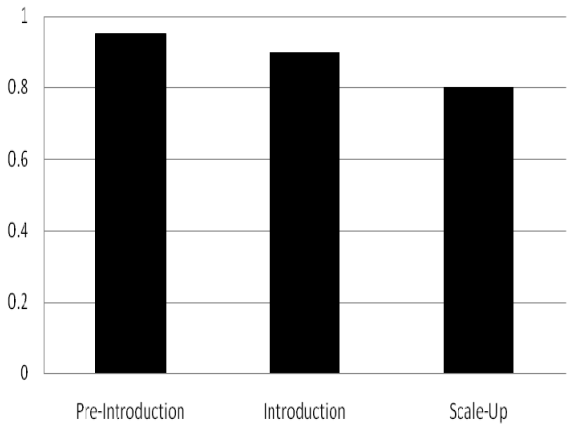

Figure 2: Ethiopia's iCCM Program by System Component (overall score: 0.85)

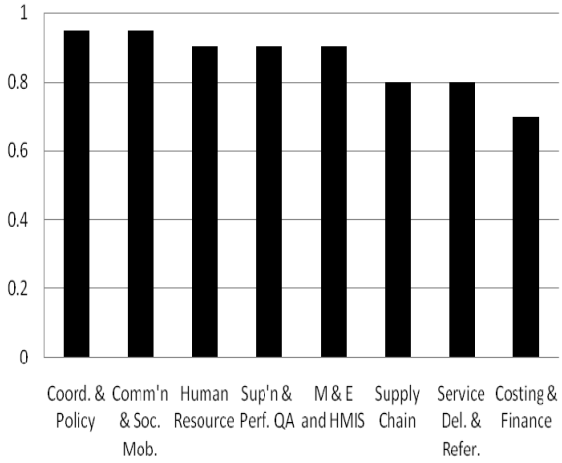

Table 2A. Status iCCM Program Benchmarks in Ethiopia by Component and Phase (6 informants, Aug 2013)

Health Systems Component	Program Phase		
	Pre-Introduction	Introduction	Scale-Up
Coordination & Policy	1.00	1.00	0.75
Costing & Finance	1.00	0.65	0.50
Human Resources	1.00	0.90	0.90
Supply Chain Management	1.00	0.75	0.65
Service Delivery & Referral	1.00	0.95	0.75
Comm'n & Social Mob'n.	1.00	0.90	1.00
Supervision & Performance	1.00	0.80	0.90
Monitoring & Evaluation	1.00	0.95	0.70

Key: <0.19 = low; 0.20-0.39 = low partial, 0.40-0.59 = partial, 0.60-0.79 = high partial, and >0.8 = high

Table 2B. Status iCCM Program Benchmarks in Ethiopia by Component and Phase (2 informants, June 2012)

Health Systems Component	Program Phase		
	Pre-Introduction	Introduction	Scale-Up
Coordination & Policy	0.80	1.00	1.00
Costing & Finance	0.75	0.75	1.00
Human Resources	1.00	1.00	0.75
Supply Chain Management	0.88	0.75	0.50
Service Delivery & Referral	1.00	0.67	0.50
Comm'n & Social Mob'n.	1.00	1.00	1.00
Supervision & Performance	1.00	0.34	0.50
Monitoring & Evaluation	1.00	0.84	1.00

Table 3. Status iCCM Program Benchmarks in Sierra Leone in 2012 by Component and Phase (2 informants, 70 Benchmarks)

Health Systems Component	Program Phase		
	Pre-Introduction	Introduction	Scale-Up
Coordination & Policy	0.50	0.25	0.25
Costing & Finance	0.50	0.25	0.00
Human Resources	0.63	0.34	0.50
Supply Chain Management	0.63	0.50	0.50
Service Delivery & Referral	0.50	0.50	0.00
Comm'n & Social Mob'n.	0.67	0.00	0.00
Supervision & Performance	1.00	0.50	0.34
Monitoring & Evaluation	0.38	0.34	0.75

Table 4. Status iCCM Program Benchmarks in Mozambique by Component and Phase (6 informants, 51 Benchmarks)

Health Systems Component	Program Phase		
	Pre-Introduction	Introduction	Scale-Up
Coordination & Policy	0.71	0.68	0.90
Costing & Finance	0.92	0.00	0.08
Human Resources	0.88	0.81	0.33
Supply Chain Management	0.69	0.83	0.50
Service Delivery & Referral	0.82	0.25	0.00
Comm'n & Social Mob'n.	0.67	0.67	0.17
Supervision & Performance	0.93	0.90	0.50
Monitoring & Evaluation	0.83	0.58	0.25

Key: <0.19 = low, 0.20-0.39 = low partial, 0.40-0.59 = partial, 0.60-0.79 = high partial, and >0.8 = high

DISCUSSION

Ethiopia has a mature national iCCM program – scoring 87.3% overall – with broad-based achievement across all health system components, four of which scored over 90%. This is an impressive achievement, given the complexity of iCCM and the size of Ethiopia. The agreement among the expert informants supports the validity of this conclusion. In addition, Ethiopia's Implementation Plan– a model for other settings – addressed all components (11); and partner coordination, which included implementation of the plan, was strong (94%).

The findings from Ethiopia were consistent with those of other countries described in 2012 including an earlier assessment in Ethiopia using a two-respondent method (Tables 2B and 3) and for Mozambique using a 6-informant method (Table 4) (8,12). Total benchmark achievement was highly and positively associated with duration of scale-up (correlation coefficient: +0.88) (Figure 3).

This benchmark method has both internal and external validity. Experts commonly gave the same or similar responses for a given benchmark. The higher scores for earlier compared to later program phases were sensible, as was the finding that costing and finance was the most challenging component. The further improvement in Ethiopia's achievement over the 14 months is reassuring and suggests that the method has good precision. The high positive correlation between benchmark score and duration at scale across countries suggests that the time required to introduce this new health system package is more or less predictable.

The method's color-coded display is consistent with other widely used "dashboards" that efficiently summarize program complexity for decision-makers, for example, the African Leaders' Malaria Alliance (ALMA) Scorecard for Accountability and Action (13), among others (14,15).

The method has limitations. First, the benchmarks do not assess program quality, so programs of different quality could have similar benchmark profiles. For example, Ethiopia's communication and social mobilization component scored highly; however, use of iCCM services remains low (16,17). Perhaps a single, uniform national demand generation strategy is not effective in some areas. Second, the middle "partial" group could theoretically be vast, including all gradations except those that were "no" or "yes." In fact, only 77 (18%) responses were partial. On the other hand, we scored all "partial" responses as 50%, which is likely an over-simplification. Qualitatively describing one or more intermediate steps might allow for more precise assessment, as in the scale-up readiness report (7).Third, supportive documentation would increase the validity, but at the expense of rapidity. Fourth, the weighting of the benchmarks changed depending on the indicator because the number of benchmarks per cell varied; however, requiring an equal number of benchmarks per cell is unrealistic. Fifth, personality, perspective, or organizational culture could result in some informants being more "negative" than others. We observed this phenomenon; however, the consensus-building step eliminated many, but not all, differences. Moreover, the informants were *the* national experts, and it is unlikely that a different panel would have improved validity, the modest disagreement notwithstanding.

In summary, this method has the potential to assess rapidly, systematically, and validly the status of complex programs by health systems component. It informs a rigorous description of a program's context through which results can be interpreted. It can likely highlight areas for increased attention through government or partners. Over time and with accruing experience it can describe different pathways to scale. Next steps could include adapting for a subnational application, validating benchmark achievement against program performance (i.e., implementation strength or results), and adapting to other programmatic areas.

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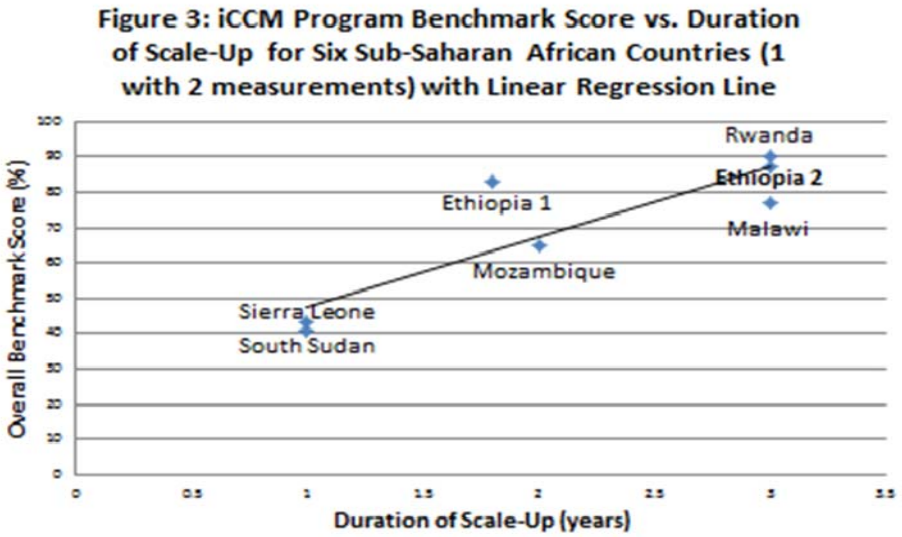

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ORIGINAL ARTICLE

COVERAGE AND EQUITABILITY OF INTERVENTIONS TO PREVENT CHILD MORTALITY IN RURAL JIMMA AND WEST HARARGHE ZONES, OROMIA REGION, ETHIOPIA

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ABSTRACT

Background: *Interventions to prevent childhood illnesses are important components of the Ethiopian Health Extension Program (HEP). Although the HEP was designed to reduce inequities in access to health care, there is little evidence on equitability of preventive interventions in Ethiopia.*

Purpose: *This article describes coverage of preventive interventions and how many interventions individual children received. We also examined which factors were associated with the number of preventive interventions received, and assessed the extent to which interventions were equitably distributed.*

Methods*: We conducted a cross-sectional survey in 3,200 randomly selected households in the rural Jimma and West Hararghe Zones of Ethiopia's Oromia Region. We calculated coverage of 10 preventive interventions and a composite of eight interventions (co-coverage) representing the number of interventions received by children. Multiple linear regressions were used to assess associations between co-coverage and explanatory variables. Finally, we assessed the equitability of preventive interventions by comparing coverage among children in the poorest and the least poor wealth quintiles.*

Results: *Coverage was less than 50% for six of the 10 interventions. Children received on average only three of the eight interventions included in the co-coverage calculation. Zone, gender, caretaker age, religion, and household wealth were all significantly associated with co-coverage, controlling for key covariates. Exclusive breastfeeding, vaccine uptake, and vitamin A supplementation were all relatively equitable. On the other hand, coverage of insecticide-treated nets or indoor residual spraying (ITN/IRS) and access to safe water were significantly higher among the least poor children compared to children in the poorest quintile.*

Conclusion: *Coverage of key interventions to prevent childhood illnesses is generally low in Jimma and West Hararghe. Although a number of interventions were equitably distributed, there were marked wealth-based inequities for interventions that are possessed at the household level, even among relatively homogeneous rural communities.*

Key words: *Ethiopia, Oromia, child health, disease prevention, coverage, equity*

INTRODUCTION

Mortality among Ethiopian children younger than five years of age has declined from 204 deaths per 1,000 live births in 1990 to 68 per 1,000 in 2012(1). Interventions to prevent common childhood illnesses such as exclusive breastfeeding, complementary feeding, access to safe water, improved sanitation, improved hygiene, vaccination, vitamin A and zinc supplementation, and insecticide-treated materials– are highly effective in reducing mortality from common childhood illnesses (2). Some of these preventive interventions are also among the most cost-effective interventions in terms of cost per child death averted (3).

The Ethiopian Federal Ministry of Health has prioritized increasing access to health services among children under five, especially among the rural poor. The primary vehicle for increasing coverage of key interventions is the Health Extension Program (HEP), which is based on the training and deployment of over 30,000female Health Extension Workers (HEWs) to provide preventive and curative services

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free of charge at the community level (4). Key preventive interventions in the HEP package include immunization; distribution of insecticide-treated bed nets; and promotion of improved water quality, sanitation, hygiene, and nutrition(5).

Uptake of interventions is often uneven among different segments of society, with inequities in coverage based on wealth, geography, and other factors(6). Although the HEP was designed to reduce inequities in access to health care, the extent to which preventive interventions, which may be delivered through HEWs or by other means, are equitably distributed is unclear.

In this study, we assessed population coverage of interventions to prevent childhood illnesses among children under five. We also assessed how many interventions children had received and which factors were associated with a child receiving more interventions. Finally, we compared coverage levels between the poorest and least poor households to assess whether interventions were being delivered equitably.

METHODS AND MATERIALS

We conducted a cross-sectional household survey in 3,200 households in rural woredas (districts) of Jimma and West Hararghe Zones, Oromia Region, Ethiopia. We employed a two-stage cluster sample design, stratified by *woreda*. The clusters were represented by enumeration areas (EAs) based on the 2007 population census. Four EAs were selected in each of 31 woredas, and 25-27 households were selected in each EA. Study participants were heads of households, women 15-49 years of age, and caretakers of children under the age of five residing in selected households. A questionnaire was completed for each household, each eligible woman and each eligible child in selected households. Structured questionnaires included questions on household, respondent, and child characteristics; child illnesses; treatments and other interventions received by children; and child mortality. Data collection was carried out from December 25, 2010 to February 24, 2011 using paper questionnaires and double data entry was completed using EpiInfo (7). Quality control measures included:

- Pre-testing and piloting of survey tools.
- Observation of selected interviews by supervisors
- Checks of randomly selected households to ensure that the interviewers have visited the correct households and interviewed all eligible women and children in these households.
- Field editing of each completed questionnaire for completeness and consistency.
- Spot checks and supervision of survey teams by study coordinators.
- Double data-entry and discrepancy reconciliation.

We obtained ethical clearance from the Institutional Review Boards of the Johns Hopkins University Bloomberg School of Public Health and the Ethiopian Public Health Association. Informed consent was obtained from all study participants.

We assessed coverage of 10 key preventive interventions. Because the recommended age groups vary for the different interventions, the coverage indicators are for varying age groups, which leads to variable sample sizes. The interventions and the age groups for which coverage was calculated are: 1) exclusive breastfeeding (0-5 months of age), 2) complementary feeding (6-9 months), 3) BCG vaccine (12-35 months), 4) oral polio vaccine (OPV, 12-35 months), 5) pentavalent vaccine (12-35 months), 6) measles vaccine (12-35 months), 7) vitamin A supplementation (6-59 months), 8) protection against malaria through insecticide-treated bed net or indoor residual spraying (ITN/IRS, 0-59 months), 9) access to safe water (0-59 months), and 10) access to improved sanitation (0-59 months).

A child was considered fully immunized for a given vaccine if he/she received at least one dose of BCG, one dose of measles, the third dose of OPV (OPV-3), and the third dose of pentavalent vaccine (penta-3). For vitamin A supplementation, a child should have received at least one dose of vitamin A in the six months prior to the interview. Complementary feeding was defined as solid, semi-solid, or soft food received at least once in the previous day, in addition to breastfeeding. A child was considered protected from malaria if he/she slept under an ITN the previous night or lived in a house that had received IRS in the previous six months.

The calculation of coverage of ITN/IRS was restricted to malarious areas only. We determined that a child had access to safe water if the household's main source of water was an improved source, according to the definition used by the 2011 Ethiopia Demographic and Health Survey(8) (piped water, public standpipe borehole, protected dug well, protected spring, rainwater collection, or bottled water). Improved sanitation was defined as flush or pour

flush system directly connected to a sewer system, septic tank, or pit latrine; ventilated improved pit latrine; pit latrine with slab; or composting toilet.

Following the example of Victora and colleagues(9), we used a composite of eight preventive interventions (co-coverage) to calculate the number of interventions received and to assess factors associated with receiving interventions. The calculation of co-coverage was limited to eight of the 10 interventions (BCG vaccine, OPV-3 vaccine, penta-3 vaccine, measles vaccine, vitamin A supplement, ITN or IRS, safe water, and improved sanitation) and to children 12-35 months of age because these are the interventions and age group for which we had a large sample size.

We used multiple linear regression to assess factors associated with co-coverage of interventions. A separate regression model was run for each predictor of interest. Additional covariates that were thought to be potential confounders of the relationships of interest were controlled for in the models. Equity analyses were conducted using a household wealth index based on possession of household assets to categorize households into five wealth quintiles(10). Each wealth quintile represents roughly 20% of the population in the survey sample, with the poorest households in quintile one (Q1) and the least poor households in quintile five (Q5).

To determine whether coverage of individual interventions was equitably distributed, we calculated the difference in coverage between children in Q5 and those in Q1 for each intervention. The comparisons of coverage of safe water and improved sanitation by wealth quintile were conducted using a wealth index that was calculated excluding household water source and type of toilet. Finally, we assessed the direction of the difference (i.e., was coverage of the intervention higher in the least poor quintile?) and tested whether the difference was statistically significantly different from zero using Stata 12 software (11).

RESULTS

Data were successfully collected from 3,150 of the 3,200 selected households and the sample included 2,753 children under five years of age. Table 1 presents the coverage levels for each of the 10 interventions in Jimma and West Hararghe. Measles vaccine and vitamin A supplementation were the interventions with the highest coverage, with just over two-thirds of children receiving each intervention. Over half (55.7%) of the children received BCG vaccine, and coverage of all other interventions was low. The intervention with the lowest coverage, at only 1.9%, was improved sanitation. Coverage of vaccines and vitamin A were higher in West Hararghe Zone, while coverage of ITN/IRS, safe water, and improved sanitation were over twice as high in Jimma as in West Hararghe.

Figure 1 shows the distribution of the number of interventions received by children 12-35 months of age. Children received on average only three of the eight interventions included in the calculation of co-coverage. Close to half of the children surveyed received either three (23.5%) or four (21.2%) interventions. Only 20.5% of children received more than half of the interventions. Almost no children received all eight interventions and only 1.2% received seven interventions, while 6.2% did not receive any of the eight interventions.

The results of multiple linear regressions to assess the relationships between child, caretaker, and household characteristics and co-coverage of the eight preventive interventions are presented in Table 2. Co-coverage was significantly associated with zone (higher in West Hararghe), child gender (higher for females), caretaker age (higher for older caretakers), religion (higher for Orthodox Christians), and household wealth (higher for wealthier households) controlling for key covariates. Caretaker education, household size, and female-headed household were not significantly associated with co-coverage

Table 1: Coverage of interventions to prevent childhood illnesses among children under five in rural Jimma and West Hararghe Zones, Oromia Region, Ethiopia, 2011.

Indicator (age range)	Total		Jimma		West Hararghe	
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Measles vaccine (12-35 months)	904	68.9 (63.83-73.55)	432	57.4 (49.06-65.26)	473	79.4 (74.2-83.85)
Vitamin A supplement (6-59 months)	2132	68.4 (64.03-72.47)	1109	59.8 (52.76-66.4)	1023	77.8 (73.66-81.37)
BCG vaccine (12-35 months)	902	55.7 (50.97-60.31)	432	47.9 (41.3-54.52)	471	62.9 (56.32-68.95)
Complementary feeding (6-9 months)	221	50.1 (41.19-59.09)	121	52.6 (38.26-66.43)	100	47.2 (36.79-57.9)
Safe water (0-59 months)	2753	39.2 (33.93-44.81)	1409	55.9 (50.64-61.04)	1344	21.8 (13.74-32.68)
Exclusive breastfeeding (0-6 months)	319	38.3 (31.62-45.34)	163	40.7 (31.38-50.64)	156	35.7 (26.46-46.2)
ITN or IRS (0-59 months)	2303	30.9 (24.02-38.65)	1033	44.1 (30.16-59.02)	1269	20.1 (14.87-26.56)
Penta-3 vaccine (12-35 months)	885	28.9 (24.44-33.78)	421	24.1 (18.88-30.13)	463	33.3 (26.32-41.04)
OPV-3 vaccine (12-35 months)	862	21.0 (17.84-24.57)	409	15.8 (12.08-20.38)	453	25.7 (20.89-31.22)
Improved sanitation (0-59 months)	2755	1.9 (1.22-3.0)	1409	2.8 (1.6-4.79)	1345	1.0 (0.48-2.13)

Figure 1: Distribution of the number of the eight interventions to prevent childhood illnesses received by children 12-35 months (n=805) in Jimma and West Hararghe Zones, Oromia Region, Ethiopia, 2011.

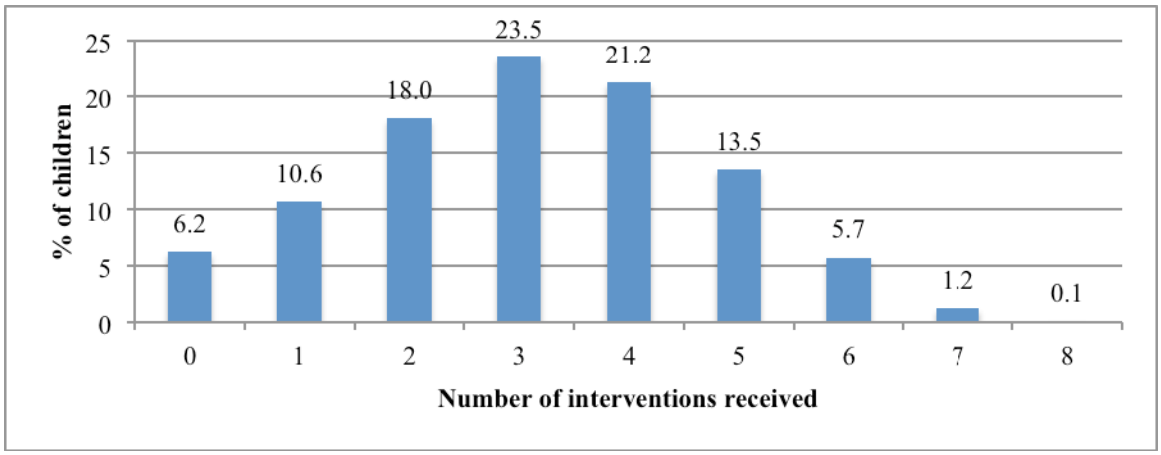

Table 2: Associations from multiple linear regressions of co-coverage of eight interventions to prevent childhood illnesses among children 12-35 months (n=805) and child, caretaker, and household characteristics in Jimma and West Hararghe Zones, Oromia Region, Ethiopia, 2011.

Dependent variable	Predictor of interest	Additional covariates	Coefficient	p-value	Comments
Co-coverage of eight preventive interventions	Zone	Household wealth	-0.78	0.004	West Hararghe higher
	Child gender	-	0.35	0.01	Female higher
	Caretaker age	Caretaker education, household wealth	0.2	0.03	Older caretaker age higher
	Caretaker education	Zone, caretaker age, number of children under five in household, female-headed household, religion, household wealth	-0.12	0.572	Caretaker attended school higher
	Number of children under five in HH	Zone, caretaker age, caretaker education, female-headed household, religion, household wealth	-0.05	0.536	Fewer children higher
	Female-headed household	Zone, caretaker age, caretaker education, number of children under five in household, religion, household wealth	-0.2	0.512	Non-female-headed household higher
	Religion	Zone, household wealth	-0.21	0.028	Orthodox higher, Muslim lower
	Household wealth	Zone, caretaker age, caretaker education, number of children under five in household, female-headed household, religion	0.25	<0.001	Higher for higher household wealth

Figure 2 shows the mean number of the eight preventive interventions received by children 12-35 months of age by household wealth quintile. Although the magnitude of the differences in the mean number of interventions received by children in different wealth quintiles was small, the number of interventions received generally increased with increasing household wealth. Children in the poorest quintile received the fewest interventions (2.9), while children in the least poor households received the most interventions (3.5). The difference in the number of interventions received between the least poor and the poorest children was borderline significant.

An examination of differences in coverage of individual interventions between the least poor and the poorest wealth quintiles (Table 3) reveals that coverage of most of the 10 interventions assessed was similar among the poorest and least poor children. There was no statistically significant difference in coverage between the poorest and least poor households for eight of the 10 interventions. Coverage of exclusive breastfeeding, vaccines, and vitamin A supplementation all appear to be relatively equitably distributed. Improved sanitation is rare in both wealth quintiles. On the other hand, children in the least poor quintile had significantly higher coverage of ITN/IRS and access to safe water than children in the poorest quintile. Complementary feeding was 11.8 percentage points higher among the least poor, but the difference was not significant, possibly due to small sample size.

Figure 2: Mean number of eight interventions to prevent childhood illnesses received by children 12-35 months (n=805) by household wealth quintile in Jimma and West Hararghe Zones, Oromia Region, Ethiopia, 2011.

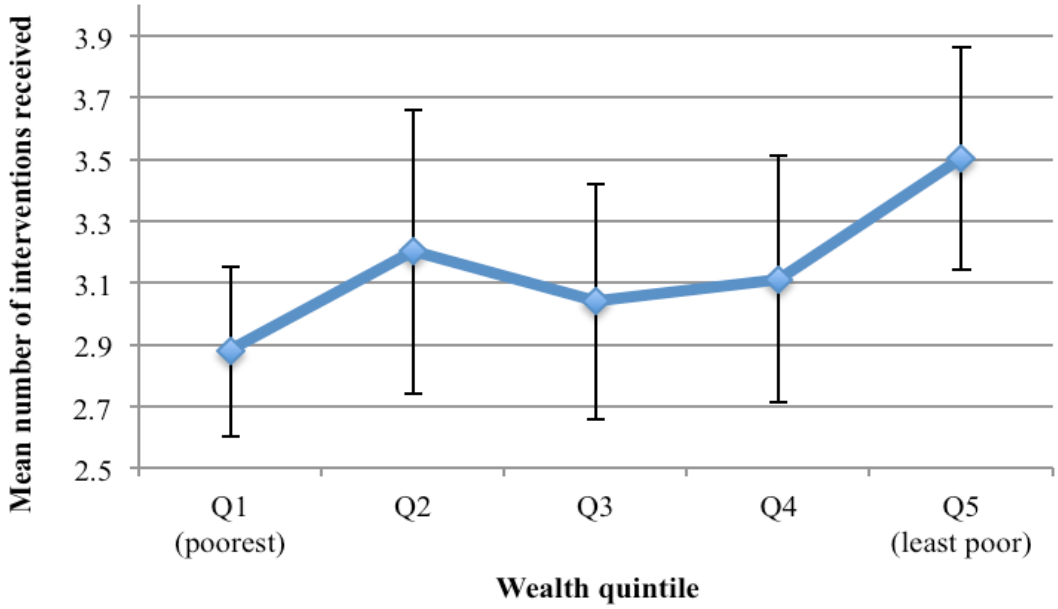

Table 3: Differences in coverage of 10 interventions to prevent childhood illnesses among children under five between the least poor and the poorest quintiles in Jimma and West Hararghe Zones, Oromia Region, Ethiopia, 2011.

Intervention	Overall coverage (%)	Q1 coverage (%)	Q5 coverage (%)	Difference (Q5-Q1, % points)	P-value (Q5-Q1=0)
Measles vaccine (12–35 months)	68.9 (63.83-73.55)	74.4 (68.39-79.61)	70.0 (60.75-77.93)	-4.4 (-13.45-4.73)	0.345
Vitamin A supplement (6-59 months)	68.4 (64.03-72.47)	69.5 (63.96-74.53)	69.5 (62.43-75.73)	0.0 (-6.25-6.21)	0.995
BCG vaccine (12-35 months)	55.7 (50.97-60.31)	61.9 (54.01-69.25)	58.1 (49.37-66.43)	-3.8 (-13.69-6.13)	0.454
Complementary feeding (6-9 months)	50.1 (41.19-59.09)	44.1 (30.7-58.48)	56.0 (37.98-72.49)	11.8 (-9.45-33.09)	0.279
Safe water (0-59 months)	39.2 (33.93-44.81)	16.4 (9.88-26.02)	59.5 (51.11-67.36)	43.1 (37.91-48.23)	<0.001
Exclusive breastfeeding (0-6 months)	38.3 (31.62-45.34)	31.4 (19.99-45.58)	34.4 (21.8-49.6)	3.0 (-13.86-19.84)	0.727
ITN or IRS (0-59 months)	30.9 (24.02-38.65)	18.3 (12.26-26.3)	40.2 (29.28-52.23)	21.9 (15.76-28.18)	<0.001
Penta-3 vaccine (12–35 months)	28.9 (24.44-33.78)	27.1 (19.44-36.38)	28.4 (21.38-36.59)	1.3 (-7.92-10.49)	0.783
OPV-3 vaccine (12-35 months)	21.0 (17.84-24.57)	20.4 (15.06-27.08)	22.0 (15.76-29.72)	1.5 (-6.96-10.02)	0.723
Improved sanitation (0-59 months)	1.9 (1.22-3.0)	1.2 (0.36-3.74)	2.3 (1.24-4.18)	1.1 (-0.42-2.68)	0.133

DISCUSSION

The results of the survey, representative for rural areas of Jimma and West Hararghe Zones, show that coverage for most of the interventions to prevent childhood illnesses was relatively low. Most children received half or fewer of the eight interventions in the co-coverage calculation, and very few children received seven or eight interventions. Only measles vaccine and vitamin A supplementation reached at least two-thirds of children. The high coverage of measles and vitamin A is likely due to a number of mass vaccination/supplementation campaigns carried out in the study areas prior to the survey. Dropout was common for vaccines with multiple doses, with less than one-third of children completing the series for polio or pentavalent vaccines. Interventions that were possessed at the household level also had low coverage. Improved sanitation in particular was extremely low in the rural areas surveyed.

Delivery of vaccinations appeared better in West Hararghe, while household-level interventions (ITN/IRS, clean water, improved sanitation) had higher

coverage in Jimma. Female children were more likely to receive preventive interventions, especially vaccines and vitamin A. Children of older caretakers and Orthodox Christians were more likely to have received preventive interventions, even when controlling for other factors such as wealth. Even among relatively homogeneous poor rural communities, household wealth was the most significant explanatory variable for how many preventive interventions a child received. The observed inequalities seem to be unfair and avoidable, and therefore represent inequities(12).

Previous research suggests that interventions delivered in health facilities tend to be less equitable than interventions delivered through campaigns at the community level(13). We found that scheduled interventions delivered at health facilities or through HEWs (vaccines) and those delivered in community campaigns (polio vaccine, vitamin A), with the exception of ITN/IRS, were relatively equitable. However, inequities may become more apparent as coverage of interventions increases. Coverage of ITN/IRS and safe water was significantly higher among the least poor children. The in equitability of ITN/IRS suggests that mass ITN distribution campaigns may not have reached the poorest households or communities, or that the poorest may have sold their ITNs to wealthier individuals. Likewise, the low coverage of safe water and improved sanitation suggest that efforts to promote safe water sources and latrines through the HEWs and community volunteers were insufficient. Promotion of safe water and improved sanitation by HEWs and community volunteers may not be effective for improving coverage if there is also a monetary expense associated with obtaining these interventions. Thus, poor households may have more difficulty obtaining these household-level interventions, even if knowledge of their benefits is widespread.

This analysis has several limitations. First, data were not available on all preventive interventions with proven impact on child mortality. Second, exclusive breastfeeding and complementary feeding were excluded from the analysis of co-coverage, as were children outside of the 12-35 month age range. Therefore, the results may not be representative of all children under five in the study area or reflect coverage levels of all relevant interventions. Third, the use of asset indices to determine household wealth may be affected by the assets included in the index, and some assets included in the index may be less relevant to rural settings (14, 15). However, the asset index is generally consistent with more complex measures of wealth (16, 17). Finally, this was a cross-sectional survey, so we were not able to assess trends and changes over time.

As treatment of common childhood illnesses by HEWs is scaled-up through the integrated community case management of childhood illness (iCCM) program, there are concerns that fewer resources will be committed to essential preventive interventions. Efforts to improve case management services by HEWs will require increased effort and time from HEWs. This could potentially be a distraction from disease prevention efforts. This survey shows that baseline levels of coverage of preventive interventions are low. Therefore, in addition to a focus on case management through HEWs, greater attention must also be placed on increasing coverage of preventive interventions. More optimistically, the iCCM program can be seen as an opportunity to improve disease prevention efforts through strengthening of the health system and increasing utilization of healthcare services. An ongoing independent evaluation of iCCM in Ethiopia carried out by Johns Hopkins University will provide insight into what effect, if any, the scale-up of iCCM has had on the coverage of key preventive interventions.

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ORIGINAL ARTICLE

UTILIZATION OF INTEGRATED COMMUNITY CASE MANAGEMENT SERVICES IN THREE REGIONS IN ETHIOPIA AFTER TWO YEARS OF IMPLEMENTATION

Yenealem Tadesse, MD, MPH[1]; Andargachew Eniyew, MPH[2]; Birkety Mengistu, MD, MPH[1]; Antenane Eniyew, MBA[2]; David R. Marsh, MD, MPH[3]

ABSTRACT

Background: *The integrated community case management (iCCM) strategy has brought fully integrated treatment for sick children to the community in Ethiopia since 2010.*
Objectives: *To describe patterns of use of iCCM services in 31 woredas (districts) in three regions of Ethiopia.*
Methods: *We analyzed all 60,452 encounters (58,341 [98.2%] for children 2-59 months of age and 2079 [1.8%] for children<2 months of age) recorded in iCCM registration books from December 24, 2012 to January 15, 2013 in 622 randomly sampled health posts.*
Results: *Children 2-23 months constituted more than half (58.9%) of the total children treated, and about half of the registered infants <2 months (1000/2079 [48.1%]) were not sick since some Health Extension Workers (HEWs) were recording well-infant visits. On average, sick children had 1.3 symptoms, more among children 2-59 months than among young infants (1.4 vs. 1.04, respectively). The main classifications for children 2-59 months were diarrhea with some or no dehydration (29.8%), pneumonia (20.7%), severe uncomplicated malnutrition (18.5%), malaria (11.2%), and other severe diseases (4.0%). More than half the sick children <2 months (52.7%) had very severe disease. Treatment rates (per 1000 children per year) were low for all classifications: 11.9 for malaria (in malarious kebeles only), 20.3 for malnutrition, 21.2 for pneumonia, and 29.2 for diarrhea with wide regional variations, except for pneumonia. Nearly two-thirds of health posts (64%) treated ≤5 cases/month, but one treated 40. Health Extension Workers saw 60% more sick children 2-59 months in the third quarter of 2012 than in the third quarter of 2011.*
Conclusion: *The use of iCCM services is low and increasing slowly, and the few busy health posts deserve further study. Recording healthy young infants in sick registers complicates tracking this vulnerable group.*
Key Words: *Ethiopia, child health, community health worker, community case management, service utilization, treatment rate.*

INTRODUCTION

In only six years, Ethiopia reduced under-five mortality by 28%, from 123 deaths per 1000 live births in 2005 to 68 deaths in 2012 (1,2). In 2012, pneumonia (17%), diarrhea (9%) and malaria (7%) were the leading causes of under-five mortality, with 44% of deaths occurring in neonatal period (2). Beginning in 2010, integrated Community Case Management (iCCM) has been bringing simple and effective interventions to treat these childhood illnesses closer to the community by training, supplying, and supervising Health Extension Workers (HEWs) to assess and treat diarrhea, malaria, malnutrition, and pneumonia in Ethiopia.

The national plan for iCCM describes one of the challenges as the low coverage and utilization of essential curative services with wide regional variations (3). An assessment of iCCM implementation strength and quality of care in Oromia showed that utilization of the services was low, especially for children less than two months (4), although better than in non-iCCM health posts. Evaluating the level of utilization of the services in the community is crucial, as it will affect health outcomes (5).

This paper describes the disease distribution of children seeking care and assesses service utilization patterns in 31 *woreda*s in three regions of Ethiopia after two years of iCCM implementation.

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MATERIALS AND METHODS

We conducted the study in 2012 in seven zones of Amhara, Oromia, and Southern Nationalities and Nations People's Region (SNNPR), where Save the Children supported iCCM implementation by training HEWs in 2010. This study is nested within a study in this supplement that examined the effect of the Performance Review and Clinical Mentoring Meetings on the quality of HEWs' register recording, a proxy for quality of care (6). As further detailed in Mengistu et al. (6), we selected 31 of the 83 *woreda*s in the seven zones by applying probability proportional to size (PPS), determined by the number of health posts (HP) per *woreda*. Then, we selected 657 of the HPs from these *woreda*s using random sampling.

We visited HPs and reviewed the two iCCM registration books (for children <2 and 2-59 months of age), noting age, sex, assessment, classification, treatment, referral, and follow up. We collected information between December 24, 2012 and January 15, 2013 on children that were registered during the 28-month period between September 11, 2010 (when iCCM commenced) and January 12, 2013.

Experienced, trained data entry clerks entered the data on each registered child directly into the designed data entry interface of CSPro (7). We checked the validity of the entered data daily and made corrections accordingly. The data were cleaned, checked for consistency, edited, and finally analyzed using SPSS software, version 17 (8). We used descriptive analysis to characterize the disease distribution by age, sex, and region and over time.

We distinguish between children and diseases where appropriate, i.e., each row in the register represents one child, who may have had one or more diseases, also known as "classifications." Upon realizing that many children in the young infant registers were, in fact, not sick, we restricted analysis to those receiving an illness classification. Regional Health Bureaus, Zone Health Departments, or *Woreda* Health Offices provided support letters. The study team maintained confidentiality for all registers reviewed and used codes to identify children's records to ensure anonymity.

RESULTS

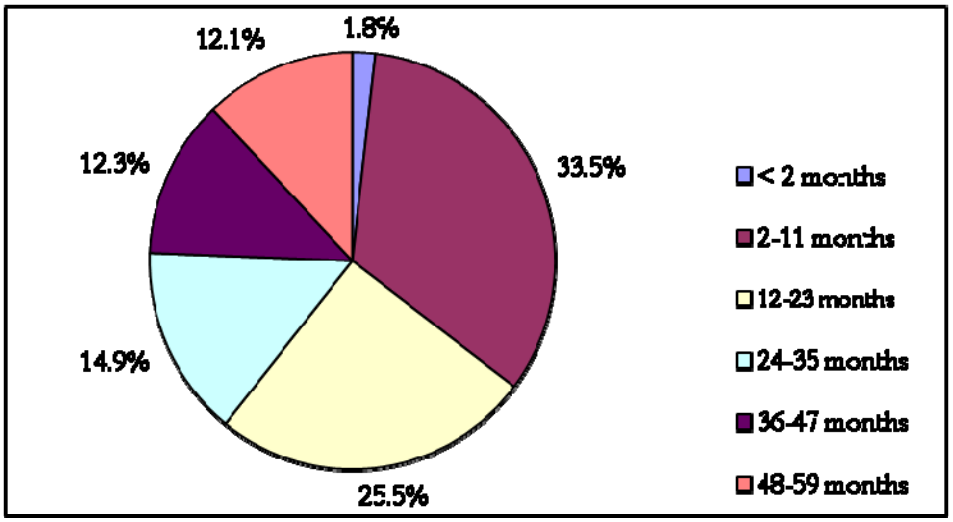
We assessed 622 of the 657 (95%) selected HPs, omitting those with extreme geographical inaccessibility or absence of HEWs at the time of the study. The surveyed HPs were spread among Amhara (155), Oromia (149), and SNNP (381) Regions. More than half of the HPs (63.5%) were in malarious *kebele*s. We collected information on 60,420 child encounters: 58,341 age 2-59 months and 2,079 <2 months, close to half of whom (1000/2079 [48.1%]) had no disease during the encounter since some HEWs had recorded information on well-infant visits.

Demographics. Children 2-59 months of age contributed to 98.2% of the sick cases reviewed, while1, 079 (1.8 %) were below two months of age (Figure 1). Children 2-23 months of age constituted more than half (58.9%) of the total children treated by HEWs. Contrariwise, young infants and children 36-59 months of age were under-represented. About half (51%) of children seen by the HEWs were males in both age groups.

Presenting Complaints. Older children (2-59 months) presented, on average, with 1.4 symptoms. Their most common presenting complaints were cough/difficult breathing (39.0%), fever (38.2%), and diarrhea (38.1%). Few (3.2%) presented with a general danger sign. Sick young infants (<2 months) presented with an average of 1.04 symptoms per case, most commonly diarrhea (55.6%) and feeding problem (32.0%).

Disease Classification. Overall, we tallied the following diagnoses: diarrhea with some or no dehydration (22,185 [29.8%]), pneumonia (15,353 [20.7%]), severe uncomplicated malnutrition (13,761 [18.5%]), malaria (8,342 [11.2%]), other severe diseases (3,010 [4.0%]), and others (11,694 [15.7%]; Table 1). Disease distribution varied little by sex among children 2-59 months of age (Figure 2) and among young infants (data not shown). On the other hand, disease distribution did vary by age (Figure 3).

Figure 1: Utilization of iCCM by age group in 622 health posts in 31 woredas in three Regions of Ethiopia from September 2010 and January 2013.



Malaria was evenly distributed (18-23% per year of life), but the other diseases were more likely to affect children 2-24 months of age. Thereafter, as age increased, the proportion of diarrhea continued to decrease, the proportion of pneumonia stayed about the same, and the proportion of malnutrition increased. More than half of sick children <2 months (569 [52.7%]) presented with very severe disease, followed by diarrhea with no dehydration (435 [40.3%]) and local bacterial infection (105 [9.7%]). There were regional differences. In Amhara, the most common disease classification for young infants was diarrhea (44.4%) while in Oromia and SNNPR it was very severe disease (45.6% and 43.8%, respectively). Local bacterial infection (25.7%)was classified more commonly in Oromia than in other regions.

Co-morbidity. HEWs classified 58,341 sick older children with 74,345 diseases (1.3 disease/child) and 1,079 sick young infants with 1,316 diseases (1.2 disease/child), for a total of 59,420 sick children <5 with 75,661 diseases overall (1.3 disease/child). About a quarter of the children (24%) presented with two or more disease classifications (Figure 4).

Treatment Outcome for Non-severe Classification. Most cases (8279 [87.3%]) among children aged 2-59 months classified by HEWs as having pneumonia, diarrhea, malaria, or severe uncomplicated malnutrition improved. Only two died. Outcome for the rest (1125 [11.9%]) is unknown. Twenty-one (2.1%) sick young infants died during the sampling period .

Treatment Rate and Case loads. Treatment rates (per 1000 children per year) were low for all diseases in Ethiopia fiscal year (EFY) 2004 (July 2011 to June 2102): 11.9 for malaria (in malarious *kebeles* only), 20.3 for severe acute malnutrition (SAM), 21.2 for pneumonia, and 29.2 for diarrhea, with wide regional variations, except for pneumonia (Table 1). For example, SSNP had five times the level of SAM treatment as Amhara, and Amhara had almost three times the level of diarrhea treatment as Oromia.

During the same time period, 64% of HP treated five cases or less, and 24% saw between 6-10 cases per month. Only 2% (12/622) of HPs saw more than 15 cases monthly, 11 of which were in SNNPR. The busiest HPs were one in Dara *Woreda* (Sidama Zone) and two in Konso *Woreda* (Segen Zone), treating an average of 27, 31, and 40 cases per month, respectively.

Utilization Trend. HEWs saw 60% more sick children 2-59 months of age in the first quarter of 2005 EFY as compared to same period in 2004 (3rd quarter 2012 and 2011, respectively (Figure 5). Similarly, HEWs saw 73% more sick young infants during the same period.

Table 1: Disease classification among 58,341children 2-59 months of age by sex and region (n [%])* in 622 health posts in 31 woredas in three regions of Ethiopia from September 2010 and January 2013

Disease classification	Amhara (n=14,128)			Oromia (n=9,835)			SNNP (n=34,378)			Total (58,341)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
Severe pneumonia or very severe disease	198 (2.5)	229 (3.1)	427 (2.8)	192 (3.3)	157 (2.8)	349 (3.1)	433 (1.8)	391 (1.7)	824 (1.7)	823 (2.2)	777 (2.1)	1600 (2.2)
Pneumonia	1454 (18.4)	1219 (16.3)	2673 (17.4)	1618 (27.9)	1498 (26.6)	3116 (27.3)	4991 (20.4)	4573 (19.7)	9564 (20.1)	8063 (21.2)	7290 (20.1)	15353 (20.7)
No pneumonia (cough or cold)	765 (9.7)	756 (10.1)	1521 (9.9)	658 (11.4)	662 (11.8)	1320 (11.6)	2560 (10.5)	2403 (10.4)	4963 (10.4)	3983 (10.5)	3821 (10.5)	7804 (10.5)
Severe dehydration	44 (0.6)	41 (0.5)	85 (0.6)	39 (0.7)	41 (0.7)	80 (0.7)	78 (0.3)	74 (0.3)	152 (0.3)	161 (0.4)	156 (0.4)	317 (0.4)
Some dehydration	598 (7.6)	524 (7.0)	1122 (7.3)	472 (8.1)	418 (7.4)	890 (7.8)	867 (3.6)	832 (3.6)	1699 (3.6)	1937 (5.1)	1774 (4.9)	3711 (5.0)
No dehydration	3467 (44.0)	3290 (44.1)	6757 (44.0)	884 (15.3)	859 (15.3)	1743 (15.3)	5111 (20.9)	4863 (21.0)	9974 (21.0)	9462 (24.8)	9012 (24.9)	18474 (24.8)
Severe persistent diarrhea	23 (0.3)	17 (0.2)	40 (0.3)	27 (0.5)	23 (0.4)	50 (0.4)	12 (0.05)	8 (0.03)	20 (0.04)	62 (0.2)	48 (0.1)	110 (0.1)
Persistent diarrhea	77 (1.0)	43 (0.6)	120 (0.8)	23 (0.4)	28 (0.5)	51 (0.4)	145 (0.6)	101 (0.4)	246 (0.5)	245 (0.6)	172 (0.5)	417 (0.6)
Dysentery	85 (1.1)	92 (1.2)	177 (1.2)	65 (1.1)	63 (1.1)	128 (1.1)	210 (0.9)	200 (0.9)	410 (0.9)	360 (0.9)	355 (1.0)	715 (1.0)
Very severe febrile diseases	18 (0.2)	11 (0.1)	29 (0.2)	29 (0.5)	28 (0.5)	57 (0.5)	21 (0.1)	24 (0.1)	45 (0.1)	68 (0.2)	63 (0.2)	131 (0.2)
Malaria	70 (0.9)	44 (0.6)	114 (0.7)	1062 (18.3)	1078 (19.2)	2140 (18.7)	3238 (13.3)	2850 (12.3)	6088 (12.8)	4370 (11.5)	3972 (11.0)	8342 (11.2)
Acute ear infection	66 (0.8)	55 (0.7)	121 (0.8)	64 (1.1)	54 (1.0)	118 (1.0)	98 (0.4)	97 (0.4)	195 (0.4)	228 (0.6)	206 (0.6)	434 (0.6)
Chronic ear infection	34 (0.4)	42 (0.6)	76 (0.5)	33 (0.6)	49 (0.9)	82 (0.7)	75 (0.3)	89 (0.4)	164 (0.3)	142 (0.4)	180 (0.5)	322 (0.4)
Severe complicated malnutrition	94 (1.2)	101 (1.4)	195 (1.3)	116 (2.0)	96 (1.7)	212 (1.9)	182 (0.7)	206 (0.9)	388 (0.8)	392 (1.0)	403 (1.1)	795 (1.1)
Severe uncomplicated malnutrition	502 (6.4)	571 (7.7)	1073 (7.0)	252 (4.4)	300 (5.3)	552 (4.8)	6050 (24.8)	6086 (26.3)	12136 (25.5)	6804 (17.9)	6957 (19.2)	13761 (18.5)
Moderate acute malnutrition	370 (4.7)	413 (5.5)	783 (5.1)	169 (2.9)	180 (3.2)	349 (3.1)	293 (1.2)	325 (1.4)	618 (1.3)	832 (2.2)	918 (2.5)	1750 (2.4)
Severe anemia	7 (0.1)	7 (0.1)	14 (0.1)	16 (0.3)	11 (0.2)	27 (0.2)	11 (0.05)	5 (0.02	16 (0.03)	34 (0.1)	23 (0.1)	57 (0.1)
Anemia	9 (0.1)	8 (0.1)	17 (0.1)	74 (1.3)	83 (1.5)	157 (1.4)	38 (0.2)	40 (0.2)	78 (0.2)	121 (0.3)	131 (0.4)	252 (0.3)
Total	**7881 (100)**	**7463 (100)**	**15344 (100)**	**5793 (100)**	**5628 (100)**	**11419 (100)**	**24413 (100)**	**23167 (100)**	**47580 (100)**	**38087 (100)**	**36258 (100)**	**74345 (100)**

Figure 2: Disease distribution by sex among children aged 2-59 months (n=65,654 diagnoses) in 622 health posts in 31 woredas in three regions of Ethiopia from September 2010 and January 2013

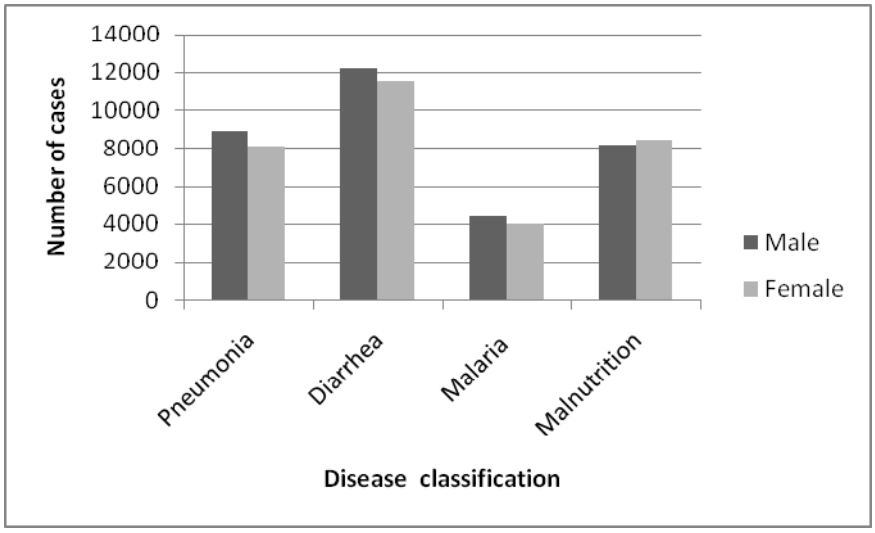


Figure 3: Morbidity (as % of total) by disease and age group in 622 health posts in 31 woredas in three regions of Ethiopia from September 2010 and January 2013

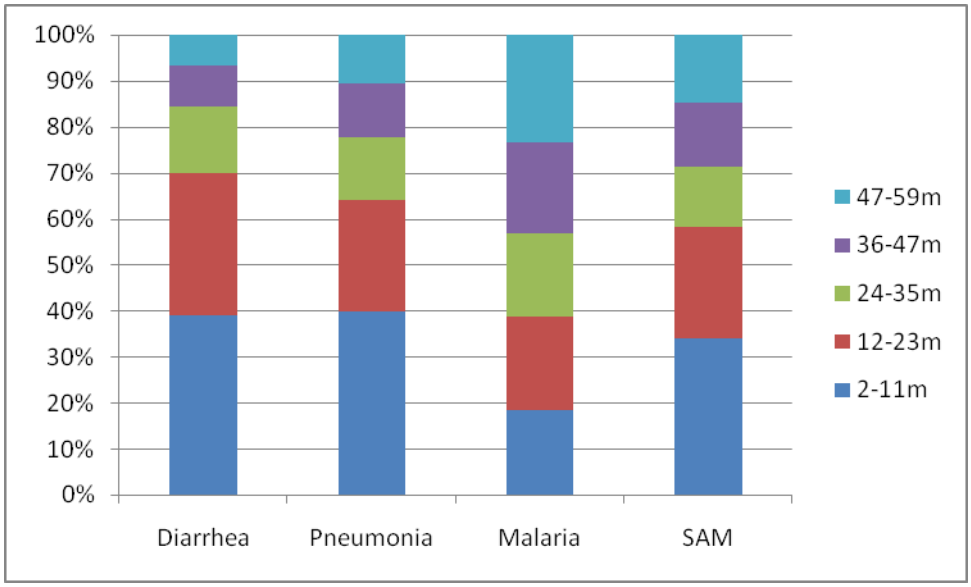
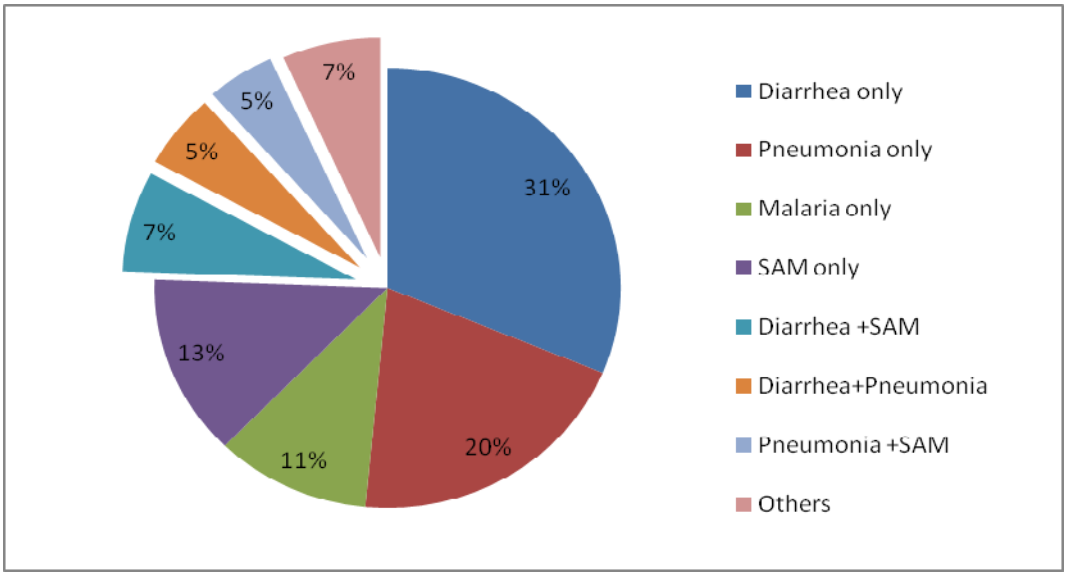


Figure 4: Major diagnostic combinations, single and multiple , among children 2-59 months of age (n = 49,480 Diagnoses)* in 622 health posts in 31 woredas in three regions of Ethiopia fromSeptember 2010 and January 2013



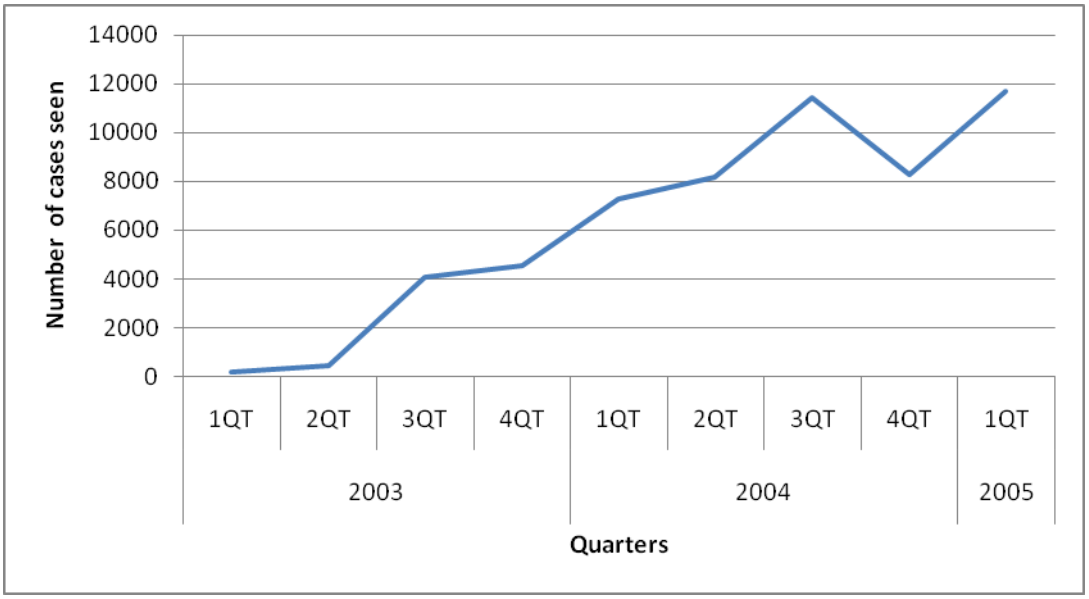
***** Others = other combinations of pneumonia, diarrhea, malaria and/or malnutrition

Table 2: Treatment rate (cases/1000 children/year) by disease and region for children aged 2-59 months for EFY 2004* in 622 health posts in 31 woredas in three regions of Ethiopia from September 2010 and January 2013.

Region	Pneumonia		Diarrhea		Malaria		Malnutrition	
	# Cases	Treatment rate	# Cases	Treatment rate	# Cases	Treatment rate	# Cases	Treatment rate
Amhara	1307	13.6	3797	39.6	66	0.7	616	6.4
Oromia	1819	16.8	1511	14.0	1321	12.2	380	3.5
SNNP	6331	26.3	7693	31.9	3929	16.3	8060	33.4
Total	9457	21.2	13001	29.2	5316	11.9	9056	20.3

*****Treatment rate for malaria restricted to malaria endemic *kebeles*; malnutrition includes severe uncomplicated malnutrition

Figure 5: iCCM utilization over time by 56,082 children 2-59 months of age from first quarter 2003 to first quarter 2005 Ethiopian Fiscal Year (3rd quarter 2010 to 3rd quarter 2012)



DISCUSSION

We examined sick child treatment registers to report the recorded experience of 622 HPs, each serving a total population of about 5000 people in three regions (i.e., a total of about three million people) during iCCM introduction and scale-up. Service statistics shed light on the utilization of iCCM services by cause, age, and sex over time. Children 2-23 months constituted more than half of the total children treated, but about half of the registered infants <2 months were not sick since some HEWs seemed to be recording well-infant visits. The main classifications (i.e., proportion of all diagnoses) for children 2-59 months were diarrhea with some or no dehydration (29.8%), pneumonia (20.7%), severe uncomplicated malnutrition (18.5%), malaria (11.2%), and other severe diseases (4.0%). More than half the *sick* children <2 months (52.7%) had very severe disease. Treatment rates were low for common classifications, i.e., malaria (in malarious *kebeles* only), malnutrition, pneumonia, and diarrhea. Nearly two-thirds of health posts (64%) treated ≤5 cases/month, but one treated 40. HEWs saw 60% more sick children 2 -59 months in the third quarter of 2012 than in the third quarter of 2011.

Diarrhea (36%) was the most common diagnosis among sick children, similar to a recent household survey result (39.2%) (9), followed by pneumonia (26%) and malnutrition (25%). These diseases are major contributors to under-five mortality. Ethiopia is among 15 countries that contribute to 53% and 65% of global episodes of diarrhea and pneumonia, respectively (10). Half of infants less than 2 months (52.7%) presented with very severe disease. This may indicate that mothers are reluctant to bring young infants to HPs unless they are very sick. More than a quarter of the children presented with two or more disease classifications. Co-morbidity with synergistic effects of multiple illnesses is an important contributor to mortality and part of the rationale for *integrated* CCM (9).

The sex distribution among the children in the sample is similar to the distribution in the population. HEWs were more likely to see children <24 months and particularly <12 months. Under-twos are over-represented in the study sample compared to their representation in the under-five population (36.3 % versus 16.4 %) which is not surprising given their increased vulnerability (11). For example, the burden of diarrhea is reported highest at 6-11 months, decreasing thereafter (12). Only 3.2% of the children presented with a general danger sign, much lower than reported in a study from Malawi (18%) (13). A qualitative study in Oromia reported that care givers said that HEWs shared less information on danger

signs than on other health topics, so the lower care-seeking could represent a lack of information (14).

The treatment rate for the four common conditions is lower than expected. A "treatment ratio" is the percentage of cases actually seen versus expected over a year. Expected levels of episodes per 1000 children per year are 3000 (diarrhea), 270 (pneumonia), 100 (malaria in endemic areas) and 20 (SAM) (15). Applying the actual findings in Table 1 yields treatment ratios of 1% (diarrhea), 8% (pneumonia), 12% (malaria), and 102% (SAM). The pneumonia and malaria treatment ratios are lower than in a study by Last Ten Kilometers Project; whereas, the ratio for diarrheal diseases is higher (16).

The higher ratio for malnutrition results from very high treatment in SNNPR. Part of the explanation for the low treatment ratio for diarrhea could be that for years health messages have advised mothers not to seek care at a health facility unless the diarrhea continued beyond three days or had blood and mucus. Ethiopian mothers commonly provided home care for sick children, including herbal treatment for diarrhea, traditional healers, and antibiotics from local shops (13). Another study in Shebedino Woreda, SNNPR, also described the low utilization of curative services for sick young infants (15).

Moreover, our observation that fully half of recorded young infant encounters were *not* for illness points out that crude tallies of young infant visits could markedly over-estimate utilization of curative services for this vulnerable group. This practice needs review. Overall, the low treatment ratios show the need for demand creation, along with careful reconsideration of the expected incidences, given the very wide gaps.

Most HPs saw few sick children, but some were busy and invite further review. A low-cost "positive deviance" inquiry could identify successful strategies used at these *kebeles* and HPs that could be adopted in other areas to improve utilization, perhaps through HEW-to-HEW peer education (17).

There was an increasing trend in utilization of iCCM services during the review period. Utilization was assessed by comparing similar time periods to avoid variation due to seasonal patterns. Other studies in Ethiopia have shown that iCCM services can increase utilization (4,9). Malaria was the only classification where the number of cases seen was lower in first quarter of 2005 compared to the same period in 2004. Further studies would be needed to assess if this is related to an actual reduction in cases as reported in National Malaria Guidelines (18).

Our analysis of services-based data reflects families who sought care and children who were then recorded. Clearly, this is no substitute for population-based coverage surveys. Our reported counts may somewhat underestimate actual treatments given (but not registered), as when HEWs see sick children during household visits without their bulky registers (19).There is also the possibility of self-referral with sick children taken directly to higher and /or private facilities. The study describes utilization, not determinants; however, these are discussed elsewhere (15,19). Diagnoses are based on HEW assessment. An earlier study showed that HEWs had a high rate of correct assessment for iCCM illnesses; however, they under-recognized danger signs (4). Perhaps more children presented with severe illness than were recorded in the registers we reviewed.

In summary, HP treatment rates were low, but slowly increasing, for diarrhea, pneumonia, SAM, and malaria. The few busy health posts deserve further study. Recording healthy young infants in sick registers complicates tracking this vulnerable group.

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ORIGINAL ARTICLE

EFFECT OF THE HEALTH EXTENSION PROGRAM AND OTHER ACCESSIBILITY FACTORS ON CARE-SEEKING BEHAVIORS FOR COMMON CHILDHOOD ILLNESSES IN RURAL ETHIOPIA

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ABSTRACT

Background*. In January 2011, Health Extension Workers (HEWs) of Ethiopia's Health Extension Program (HEP) began providing pneumonia case management for children less than five years of age through the integrated Community Case Management (iCCM) strategy.*

Objective*. To report the effect of HEP, following the introduction of iCCM, and other accessibility factors on care-seeking behaviors for common childhood illnesses (acute respiratory infection [ARI], diarrhea, and fever).*

Methods*. Three possible care-seeking outcomes for childhood illnesses were considered: not seeking appropriate care, seeking care from HEP sources, or seeking care from other appropriate sources. The baseline care-seeking outcomes from the Ethiopian Demographic and Health Survey, 2011, were compared with the care-seeking outcomes in a follow-up iCCM survey in December 2012. The effects of the HEP intensity and other factors on care-seeking outcomes were estimated using regression analyses.*

Results*. Appropriate care-seeking for children with acute respiratory infection, ARI, diarrhea, or fever increased two-fold, from 19% at baseline to 38% at follow-up, mainly due to an increase in seeking care for common childhood illnesses from HEWs. Higher intensity of the HEP and other accessibility factors were associated with higher care-seeking for childhood illnesses from HEP sources.*

Conclusion*. Incorporating iCCM within the HEP service package significantly improved the appropriate care-seeking behaviors for childhood illnesses in rural Ethiopia.*

Key words*: Ethiopia, child health, Health extension program, community case management, community health worker, program evaluation, care-seeking behavior*

INTRODUCTION

Despite achievements in reduction of child mortality in Ethiopia, about 180,000 children under five years of age (U5) still die each year, mainly from pneumonia, diarrhea, malaria, neonatal problems, and malnutrition (1). Many of these deaths could be prevented through integrated Community Case Management (iCCM) interventions, including treatment with oral antibiotics, anti-malaria drugs, oral rehydration therapy, and use of "ready to use food" for malnourished children (2–4). Health Extension Workers (HEWs), the frontline workers of Ethiopia's Health Extension Program (HEP), have managed diarrhea, malaria, and severe acute malnutrition components of iCCM; however, they were barred from treating uncomplicated childhood pneumonia. In 2010 the Ethiopian Federal Ministry of Health (FMOH) amended its policy to allow HEWs to treat child pneumonia cases at the community level to accelerate its child mortality reduction effort (5).

The Last Ten Kilometers Project (L10K) supported iCCM scale-up in 113 *woreda*s (districts) of the four most populous regions of the country: Amhara, Oromia, Southern Nations, Nationalities, and People's (SNNP) and Tigray, comprising about 12 million people. The project aimed to strengthen HEWs' management of common childhood illnesses and to build skills of health center staff and HEW supervisors to effectively supervise HEWs, support regular follow-up, review progress, conduct refresher trainings, and monitor and evaluate iCCM implementation. Details of the iCCM intervention including the Ethiopian health system is described by Legesse et al. (5), i.e., the first article of this supplement. High utilization of iCCM services is essential to have a significant impact on reducing child mortality (4,6,7). Use of health services is determined by availability, adequa-

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cy of supply, affordability, physical or geographical accessibility, and acceptability of services (8-10). Understanding and addressing these accessibility factors is vital for the HEP to improve the utilization of iCCM services.

Service statistics indicated that there has been an increase in the utilization of iCCM services provided by the HEWs following the implementation of iCCM in Ethiopia (11,12). This increase is associated with the iCCM program implementation strength (12). Nevertheless, the impact of the HEP on the population level estimates of appropriate care-seeking behaviors for common childhood illnesses and their determinants are yet to be reported. Accordingly, this study investigates the effects of the HEP following the introduction of iCCM, and other accessibility factors, on care-seeking behaviors for acute respiratory infection (ARI), diarrhea, and fever among U5 children.

MATERIALS AND METHODS

Design: The effectiveness of the HEP was analyzed by comparing baseline care-seeking behaviors for common childhood illnesses from the Ethiopian Demographic and Health Survey (EDHS), January–May 2011, with the follow-up estimates from the L10K iCCM survey, December 2012 (13).The effect of the HEP on care-seeking behavior for childhood illnesses was estimated by the amount of variation in the HEP intensity (i.e., number of HEWs/1,000 U5 population) across the 60 *kebele*s that was associated with the variation in the likelihood of seeking care for childhood illnesses from HEWs in those *kebele*s. We also measured the association between reported care-seeking and other access factors.

Setting: The iCCM survey domain included 90 rural *woredas* where L10K supported the HEP to implement iCCM: Amhara, SNNP and Tigray Regions. Oromia was excluded because it was a special study area, and 14 urban *woreda*s were excluded because the urban HEP has a different context and strategy compared to the rural HEP. The EDHS analysis represented the rural areas of the three intervention regions.

Subjects, Sample Size, and Sampling: The iCCM survey used a three-stage cluster sample to obtain reported care-seeking patterns for common childhood illnesses from mothers of children aged 0 to 59 months who had an episode of ARI (i.e., cough with or without other respiratory symptoms), fever, or diarrhea during the two weeks preceding the interview. Most survey questions were adapted from EDHS. The questionnaire was then translated into the two major local languages (Amharic and Tigrigna). In SNNP, with 11 more languages, the interviewers translated from Amharic while administering the questionnaires.

During the first stage, 30 *woreda*s were selected with the probability proportional to their population sizes (PPS). At the second stage, two *kebele*s from each of the selected *woreda*s were selected using PPS. Each health post was visited and a HEW from the health post was interviewed to measure HEP intensity and other accessibility characteristics of the *kebele*. At the third stage, 13 survey respondents from each *kebele* were selected using the 30 by 7 survey methodology recommended by the World Health Organization for estimating immunization coverage (14). In each *kebele,* the first household was randomly selected from its central location, followed by the next closest household further from the center. All consenting women with sick children were interviewed.

Field operation: The interviewers and supervisors were health professionals from regional health bureaus who received a two-day training. They did not interview in the areas under their supervision. Survey supervisors and regional coordinators were trained to monitor and supervise the survey and ensure data quality. Five survey teams, each consisting of four interviewers and one supervisor, conducted the field operation, which took about 21 days in December 2012.

Variables: We considered three possible care-seeking outcomes for each of the three syndromes (ARI, fever, or diarrhea): seeking no or inappropriate care, seeking care from a health post (i.e., HEW), or seeking care from another appropriate source (health centers, hospitals, private clinics, or doctors). Utilization (or coverage) of iCCM services was considered to be the proportion of sick children under five years of age seeking care from HEP sources (i.e., from the health post). For the analysis of the effects of the HEP and other accessibility factors on the utilization of iCCM services, the care-seeking out come for a child with ARI, fever, or diarrhea was considered.

The HEP intensity for a *kebele* was the number of HEWs per 1,000 U5 population-with the assumption that higher number of HEWs per U5 population would lead to better access to child health services in the *kebele*. Based on the ratio, the *kebele*s were cate-

gorized into three equal terciles, i.e., tercile 1, tercile 2, and tercile 3. The other *kebele* characteristics that were considered as accessibility factors were presence of a health center in the *kebele* and whether the *kebele* had road access for vehicles. The household-level accessibility factors considered were household wealth and distance from the household to the nearest health facility, measured as walking time.

The household wealth index was constructed for each household via a principal component analysis of household possessions and characteristics. The households were ranked according to the wealth score and then divided into five quintiles indicating poor, medium poor, medium, medium rich and rich households (15).

Analytic Approach and Statistical Methods: The differences in the respondents' background characteristics between the EDHS 2011 and iCCM 2012 were analyzed to assess their comparability. This was done by constructing 95% confidence intervals for the percentage distribution of respective sample characteristics, adjusted for respective survey design effects. A sample characteristic was considered statistically significant if their confidence intervals did not overlap. Similarly, statistically significant changes in the care-seeking behaviors for childhood illnesses between the two surveys were assessed.

Care-seeking behavior for a sick child was a multinomial variable with three possible outcomes. As such, a multinomial logit model, adjusted for survey design, was used to analyze the effect of HEP intensity and other accessibility factors on care-seeking behavior (16,17).The regression controlled for the sick child's age and gender, mother's age and education, and *woredas*. After assessing the goodness-of-fit of the model, adjusted care-seeking behaviors according to the accessibility factor categories with their 95% confidence intervals were obtained from the model. Statistically significant determinants of care-seeking behavior were determined by non-overlapping confidence intervals.

Ethical consideration: Ethical clearance was obtained from the regional health bureaus of the study regions. Verbal consent was sought and documented by the interviewers.

RESULTS

The iCCM survey and the EDHS samples included 780 and 1,190 mothers with sick children, respectively (Table 1). The sample distributions by the age and gender of the sick child, age and education of the mother, and administrative region were not statistically significantly ($p>0.05$) different between the two surveys. The iCCM survey found somewhat more children with cough and fewer children with diarrhea than the EDHS. The severity of ARI was similar between the two surveys.

The mean HEP intensity of a *kebele* was 2.5 HEWs/1,000 U5 population, which was similar to the nationally accepted norm of 2.2 HEWs/1,000 U5 populations. The median HEP intensity for tercile 1, tercile 2, and tercile 3 were 1.7, 2.5, and 4.1 HEWs/1,000 U5 population, respectively; while the ranges were from 1.14 to 2.15, from 2.16 to 3.00, and from 3.01 to 14.3 HEWs per 1,000 U5 population, respectively.

Changes in Coverage: Appropriate care-seeking behavior increased significantly for all three syndromes between baseline and follow-up surveys, mostly from increases in seeking care from health posts (Table 2). For ARI, utilization of iCCM services from health posts increased 12 percent-points (2% to 14%); for diarrhea, 16 percent-points (4% to 20%); and for fever, 13 percent-points (2% to 15%). There were no statistically significant changes in care-seeking behavior for childhood illnesses from other appropriate sources. The other appropriate sources were mainly health centers (70%, 80%, and to 76% for ARI, diarrhea, and fever, respectively) and private doctors (24%, 13%, and 21%, respectively).

Effect of HEP and Other Accessibility Factors: The adjusted analysis indicates that kebeles with higher density of HEWs were associated with higher utilization of iCCM services (Table 3). Other statistically significant accessibility factors associated with higher utilization of iCCM services included living closer to a health facility, not having a health center, and not having a road for vehicular access to the kebele. Women from the least poor quintile were significantly ($p<0.05$) more likely to seek care for childhood illnesses which was mainly from other appropriate providers compared to those from the poorest quintile, but care-seeking at health posts (i.e., utilization of iCCM services) was unaffected by wealth quintile.

Table 1: Characteristics of the sick children sample in the EDHS 2011 and iCCM 2012 surveys

Sample characteristics	EDHS 2011				iCCM survey 2012		
	n	%	(95% CI)		n	%	(95% CI)
Age of child (months)							
0 to 2	23	2.0	(1.28, 3.01)		29	3.7	(2.49, 5.52)
3 to 11	267	22.5	(20.16, 24.94)		131	16.8	(13.61, 20.55)
12 to 23	296	24.9	(22.29, 27.67)		183	23.5	(20.23, 27.03)
24 to 59	603	50.7	(47.47, 53.90)		437	56.0	(51.34, 60.6)
Sex of child							
Male	604	50.7	(47.38, 54.07)		417	53.5	(50.21, 56.68)
Female	586	49.3	(45.93, 52.62)		363	46.5	(43.32, 49.79)
Have ARI							
No	492	41.3	(37.62, 45.16)	*	230	29.5	(25.32, 34.03)
Yes	698	58.7	(54.84, 62.38)		550	70.5	(65.97, 74.68)
Only cough	243	20.4	(17.65, 23.49)		203	26.0	(21.21, 31.49)
Pneumonia	184	15.5	(12.91, 18.43)		150	19.2	(15.72, 23.31)
Sever pneumonia	271	22.8	(19.82, 26.03)		197	25.3	(20.35, 30.89)
Have diarrhea							
No	613	51.5	(47.33, 55.66)	*	472	60.8	(56.57, 64.92)
Yes	577	48.5	(44.34, 52.67)		304	39.2	(35.08, 43.43)
Have fever							
No	489	41.1	(37.57, 44.78)		300	38.6	(33.34, 44.16)
Yes	701	58.9	(55.22, 62.43)		477	61.4	(55.84, 66.66)
Mother's education							
None	899	75.5	(71.22, 79.39)		643	82.4	(77.78, 86.81)
Primary +	291	24.5	(20.61, 28.78)		134	17.2	(13.19, 22.22)
Mother's age (years)							
15 to 24	276	23.2	(19.98, 26.78)		164	21.0	(17.24, 25.39)
25 to 34	576	48.4	(44.37, 52.38)		430	55.1	(51.01, 59.18)
35 to 49	338	28.4	(25.26, 31.84)		186	23.9	(20.39, 27.69)
Region							
Tigray	178	14.9	(10.57, 20.63)		130	16.7	(9.04, 28.69)
Amhara	521	43.8	(34.73, 53.49)		390	50.0	(37.26, 62.74)
SNNP	490	41.2	(32.43, 50.55)		260	33.3	(22.34, 46.49)
Distance to health facility							
Within 30 minutes					614	78.7	(69.95, 85.46)
30 minutes or more					166	21.3	(14.54, 30.05)
Health center in *kebele*							
No					650	83.3	(71.31, 90.96)
Yes					130	16.7	(9.04, 28.69)
Road access to *kebele*							
No					468	60.0	(46.85, 71.85)
Yes					312	40.0	(28.15, 53.15)
Total	1,190	100.0			780	100.0	

*Non-overlapping confidence interval (statistically significant at $p<0.05$)

Table 2: Care-seeking behaviors for childhood illnesses according to EDHS 2011 and iCCM survey 2012

Symptoms	Care-seeking outcome	EDHS 2011			iCCM survey 2012		
		%	(95% CI)	n	%	(95% CI)	n
ARI	Inappropriate/none	81.1	(77.09, 84.62)	604	66.4	(60.45, 71.81)	365
	Appropriate	18.7	(15.37, 22.92)	140	33.6	(28.19, 39.55)	185
	Health post	1.9	(1.05, 3.38)	14	13.8	(10.41, 18.11)	76
	Other	17.0	(13.68, 20.85)	126	19.8	(15.57, 24.89)	109
	All	100.0		744	100.0		550
Diarrhea	Inappropriate/none	72.5	(67.34, 77.04)	401	49.3	(42.82, 55.89)	150
	Appropriate	27.5	(22.96, 32.67)	152	50.7	(44.11, 57.18)	154
	Health post	3.9	(2.13, 7.00)	21	19.7	(15.16, 25.29)	60
	Other	23.7	(19.59, 28.27)	131	30.9	(25.21, 37.28)	94
	All	100.0		553	100.0		304
Fever	Inappropriate/none	80.5	(76.58, 83.88)	573	60.0	(53.37, 66.2)	286
	Appropriate	19.5	(16.11, 23.42)	139	40.0	(33.8, 46.63)	191
	Health post	1.9	(0.97, 3.87)	14	15.1	(11.11, 20.18)	72
	Other	17.6	(14.35, 21.32)	125	24.9	(20.11, 30.51)	119
	All	100.0		712	100.0		477
Sick	Inappropriate/none	80.7	(77.27, 83.69)	911	62.0	(56.59, 67.08)	471
	Appropriate	19.3	(16.31, 22.73)	218	38.0	(32.92, 43.41)	289
	Health post	2.2	(1.23, 3.84)	25	14.9	(11.65, 18.79)	113
	Other	17.1	(14.41, 20.25)	193	23.2	(19.04, 27.86)	176
	All	100.0		1,129			760[μ]

[μ]Twenty observations were dropped when the reported care-seeking behavior for different symptoms did not match among children with multiple symptoms.

Table 3: Adjusted care-seeking behavior for children sick with ARI, diarrhea, or fever, stratified by accessibility factors (obtained from multinomial logistic regression model estimates).

Accessibility factors	Sources of seeking care (%)		
	Inappropriate % (95% CI)	Health post % (95% CI)	Other appropriate % (95% CI)
Wealth quintile			
Poorest	69.5 (61.4, 77.64)	15.1 (8.16, 22)	15.4 (8.87, 21.92)
Poorer	61.6 (54.08, 69.05)	18.5 (12.41, 24.68)	19.9 (14.03, 25.75)
Middle	60.9 (53.07, 68.66)	15.8 (10.59, 20.98)	23.4 (16.32, 30.38)
Less poor	59.1 (51.5, 66.79)	16.4 (11.42, 21.4)	24.4 (17.79, 31.1)
Least poor	58.1 (49.42, 66.7)	8.8 (4.07, 13.61)	33.1 (25.26, 40.93)
Distance to health facility			
<30 minutes	61.5 (58.52, 64.55)	16.6 (14.43, 18.73)	21.9 (19.14, 24.62)
≥ 30 minutes	64.0 (55.52, 72.56)	6.2 (1.78, 10.67)	29.7 (21.62, 37.84)
No. HEW/1,000 children			
Tercile 1	63.0 (56.73, 69.18)	10.9 (8.29, 13.49)	26.2 (20.19, 32.13)
Tercile 2	61.9 (55.4, 68.38)	13.0 (9.76, 16.26)	25.1 (18.36, 31.84)
Tercile 3	59.6 (53.07, 66.07)	21.1 (16.28, 25.99)	19.3 (13.93, 24.66)
Health center in *kebele*			
No	61.4 (58.23, 64.52)	16.5 (14.49, 18.47)	22.1 (19.35, 24.93)
Yes	65.2 (54.97, 75.46)	5.7 (1.61, 9.89)	29.0 (20.05, 38.01)
Road access to *kebele*			
No	62.1 (57.44, 66.78)	17.0 (14.78, 19.28)	20.9 (15.71, 26.01)
Yes	61.9 (55.24, 68.55)	11.6 (9.29, 13.94)	26.5 (19.18, 33.8)

Shaded areas indicate statistically significant variation of the outcome between the accessibility factor categories.

DISCUSSION

Our study demonstrates that adoption of iCCM within the HEP at scale substantially increased the care-seeking behaviors for children sick with ARI, diarrhea, and fever, and that relatively high intensity of HEP in a *kebele* was associated with relatively high care-seeking for iCCM services. Although HEWs provided management of diarrhea and fever before introduction of iCCM, the substantial increase in the utilization of these services from the health posts after the introduction of iCCM indicates that adoption of iCCM expanded care-seeking for treatment of childhood illnesses. The iCCM strategy increased the time HEWs spent at health posts, which could have increased the role of HEWs in curative care.

The population-level increase in the utilization of iCCM services was consistent with increases in case loads for iCCM services reported by others during the same period (11,18). Introduction of iCCM through HEWs in Ethiopia is consistent with that observed in Zambia, where an increased reliance on community health workers for management of common childhood illnesses was also observed following

the introduction of iCCM (19). Although there was inequity in the utilization of appropriate services for common childhood illnesses, it was encouraging to note that utilization of iCCM services was not associated with household wealth quintile. Nevertheless, household wealth was associated with seeking care for childhood illnesses from health centers and private doctors (i.e., other appropriate providers). Although MNCH services at the health centers are free, most (58%) of the caretakers interviewed for the study lived more than an hour's walking distance from a health center. Women from the poorest quintile probably had a higher opportunity cost to travel to the health center for child health services. Nevertheless, further research should be conducted to assess whether there are any hidden costs or other factors that discourage the poorest segment of the population to seek care from the health centers (20).

This study supports the importance of distance and socio-economic as factors affecting access to child health services as observed in other settings (8, 21,22). *Kebele*s without health centers or road access to vehicles were associated with higher utilization of iCCM services, thereby indicating that the iCCM strategy redresses inequitable access to case management.

There are a few limitations of the study. The comparison between the EDHS and the L10K iCCM survey could be partly biased due to the differences in survey methodologies. The 30 by 7 method may overestimate coverage because the interviewers may avoid hard-to-reach areas and non-responders are not revisited (14).

However, the care seeking behavior for sick children reported here was lower (38%) than that reported (50%) by Oliver et al. (23).There were no reasons to indicate that the internal validity of the effects of HEP and other accessibility factors were biased by the 30 x 7 survey methodology. However, The two surveys were not conducted in the same season, which could explain the slightly different morbidity patterns.

There is a possibility that unmeasured cofounders biased the effects of HEP intensity and other factors on utilization of iCCM services. Although the associations were cross-sectional, there was no reason to believe that there was temporal ambiguity between the independent and the dependent variables. The independent variables were constant factors, at least during the recent past, and they had an opportunity to influence the dependent variable, which occurred within the two weeks preceding the survey.

The HEP intensity measure for this study measured a single dimension of accessibility. However, there are other dimensions of program intensity-training of the HEWs, commodity availability, job aids, supervision, and program monitoring and evaluation-that were not included. Future studies should make an effort to measure these dimensions.

The equability factors to the access to iCCM services described by this study is not exhaustive. Future studies should attempt to measure whether children with greater needs had better access to iCCM services-which is another important dimension of assess equitability of health systems.

This study indicates that the introduction of iCCM within HEP was successful in improving the care-seeking behaviors for sick children in rural Ethiopia.

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ORIGINAL ARTICLE

EFFECTIVENESS OF SUPPORTIVE SUPERVISION ON THE CONSISTENCY OF INTEGRATED COMMUNITY CASES MANAGEMENT SKILLS OF THE HEALTH EXTENSION WORKERS IN 113 DISTRICTS OF ETHIOPIA

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ABSTRACT

Background. *Consistency in the adherence to integrated Community Case Management (iCCM) protocols for common childhood illnesses provided by Ethiopia's Health Extension Program (HEP) frontline workers. One approach is to provide regular clinical mentoring to the frontline health workers of the HEP at their health posts (HP) through supportive supervision (SS) following the initial training.*

Objective. *To Assess the effectiveness of visits to improve the consistency of iCCM skills (CoS) of the HEWs in 113 districts in Ethiopia.*

Methods. *We analyzed data from 3,909 supportive supervision visits between January 2011 and June 2013 in 113 districts in Ethiopia. From case assessment registers, a health post was classified as consistent in managing pneumonia, malaria, or diarrhea cases if the disease classification, treatment, and follow-up of the last two cases managed at the health posts were consistent with the protocol. We used regression models to assess the effects of SS on CoS.*

Results: *All HPs (2,368) received at least one supportive supervision visit, 41% received two, and 15% received more than two. During the observation period, HP management consistency in pneumonia, malaria, and diarrhea increased by 3.0, 2.7 and 4.4-fold, respectively. After controlling for secular trend and other factors, significant dose-response relationships were observed between number of SS visits and CoS indicators.*

Conclusions*: The SS visits following the initial training were effective in improving the CoS.*

Key words*: Ethiopia, child health, child survival, community case management, supportive supervision, community-based program, community health worker, health extension program.*

INTRODUCTION

High availability, quality, and use of the integrated Community Case Management (iCCM) of common childhood illnesses are essential for reducing mortality among children under five years of age. Community health workers (CHW), the nucleus of the iCCM strategy, require support to ensure the quality of iCCM services. Job aids, periodic refresher training, and clinical mentoring are proven approaches to maintain and enhance case management skills, especially for programs implemented at scale (1,2).

Training CHWs followed by supervision was associated with improved program outcomes and the accuracy of classification and treatment of common child hood illnesses in underserved rural areas of Côte d'Ivoire, Ethiopia, Rwanda, Sierra Leone, South Sudan, and Uganda (3). Support to mentor CHW skills in case management of child illnesses and ensuring availability of supplies are vital components of supervision to community-based programs (2,4-6).

The Ethiopian Federal Ministry of Health (FMOH) adopted the iCCM strategy within its Health Extension Program (HEP) platform in October 2010 (7). John Snow, Inc. through the Last Ten Kilometers project (L10K), has supported the HEP to implement iCCM in 113 *woredas* (administrative districts, each with about 100,000 people) in Amhara, Oromia, Southern Nations, Nationalities, and People's (SNNP) and Tigray Regions (8).

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Since supportive supervision (SS) is central to the Ethiopian National iCCM strategy, it is a key component of L10K's support for iCCM (9). L10K provided regular SS to about 5,000 frontline workers of the HEP, i.e., the Health Extension Workers (HEWs), from 2,368 of the 2,471 intervention *kebeles* (the smallest administrative unit with about 5,000 people). The SS provided through the national iCCM strategy included coaching to ensure proper case management by reviewing registers, use of job aids, problem-solving to encourage and motivate HEWs to improve their performance, and data collection for monitoring and evaluating the program.

Ethiopia's national iCCM strategy invests about one-third of its recurrent program costs in SS to ensure consistency of iCCM skills (CoS) of the HEWs. The frequency of L10K's SS varied across health posts and over time and provided an opportunity to examine the effect of SS on the management of three common childhood illness: pneumonia, diarrhea, and malaria. Thus, this paper examines: (a) the level of the CoS achieved by HEP in L10K project areas, (b) the trends of the CoS over the course of the project, and (c) the effect of SS on the CoS.

MATERIALS AND METHODS

Design. This study used longitudinal secondary analysis of program monitoring data collected during SS between January 2011 and June 2013.

Setting. The study area covered 2,368 out of 2,471 health posts in the 113 iCCM intervention *woredas* of the L10K project.

Intervention. All intervention HEWs (about 5,000) received the initial six-day iCCM training in 2011 and initiated iCCM services immediately thereafter. They recorded cases in two registers, one for young infants aged 0-2 months and one for children 2-59 months. The registers—a quality assurance tool—record the case management steps in the iCCM protocol: assessment, classification, treatment, and follow-up. L10K supported the HEWs with regular SS visits to their health posts and with Performance Review and Clinical Mentoring Meetings (PRCMM) at the *woreda* level. During SS the HEW supervisors and L10K staff reviewed at least last two case records from the registers for each of the three illnesses to assess the consistency of the classification, treatment, and follow-up within the cases against the protocol. The information was then used to coach the HEWs. During PRCMM the HEWs from all the *kebeles* in a *woreda* meet together with their registers. Supervisors, *woredas* health administration staff, and L10K staff reviewed iCCM performance based on register review and provided coaching to the HEWs (10).

Subjects, Sample Size, and Sampling. The unit of analysis was the SS events in all health posts. A total of 3,909 SS visits to the health posts were analyzed during the 30-month review period (January 2011 – June 2013).

Measurements. Case records from registers provided the CoS data. CoS was defined as consistency of the recorded classification, treatment, and follow-up for pneumonia, diarrhea, and malaria. A health post was considered to provide consistent case management for a particular illness if 100% of the cases assessed were consistently classified, treated, and followed-up within two days of initiating treatment.

Field Methods. The national Technical Working Group designed a standard checklist ("Form C") for SS for iCCM (10). Twenty-two clinical officers and four regional coordinators conducted the SS visits along with the HEW supervisors. All officers and coordinators held Bachelor's Degrees in nursing or public health and were also iCCM trainers.

Analytic Approach Including Data Handling. Data from Form C were computerized using Epi-Info software (version 3.5.4). First, we examined the distribution of the number of SS visits over quarterly observation periods. Then, we estimated CoS indicators over six monthly observation periods and by the number of SS visits, the differentials for which were assessed by non-overlapping of the 95% confidence intervals of the point estimates.

We used random effects multiple logistic regression models for longitudinal data, implemented by Stata version 13, to predict the probability that a health post consistently conducted case management of childhood pneumonia, diarrhea, and malaria (11). The *woredas* were considered as the random factors to account for possible within-*woreda* similarities of the health posts in terms of the CoS indicator (i.e., intra-class correlation) and the within-*woreda* similarities of the CoS across the observation quarters. The model held the observation quarters as fixed factors, there by controlling the effect of time and thus program maturity, including the secular trend. Essentially, the analysis estimated the association

between the numbers of SS visits provided to health posts and their CoS indicators for each observation quarter. The CoS indicators were weighted and averaged across observation quarters to estimate the unbiased association between numbers of SS visits and the CoS indicators. After assessing the goodness-of-fit of the regression models, the adjusted estimates for the CoS indicators with their 95% confidence intervals were reported according to the round number of SS visits. The analysis excluded the first three observation quarters due to lack of variability in the number of SS visits because at that time the health posts were receiving the first round of SS visits.

The timing of PRCMM for each of the *woredas* was obtained from program reports and inserted in the SS database to assess whether the effects of SS on CoS indicators were confounded by PRCMM. Lastly, the possible bias associated with selection of health posts for the second and subsequent SS visits were assessed by comparing the CoS indicators from the first SS visit between *kebeles* that were visited once and those visited more than once. The random effects models were also used for this purpose.

Ethical Aspects. The consultants who designed the national iCCM program monitoring data base were responsible for the appropriate ethical considerations. However, the names of the HEWs present during SS visits were left anonymous in the database.

RESULTS

Between January 2011 and June 2013 all the 2,368 L10K intervention health posts received at least one SS visit, 968 (41%) received two visits, 366 (15%) received three visits, and 207 (9%) received four visits. All health posts participated in two PRCMMs. As expected, the number of second, third and fourth SS visits increased over observation periods (Table 1 and Figure 1). The majority of the first round of SS visits (1,423 [60%]) occurred during October-December 2011, during which time the program hired consultants to accelerate the completion of the first SS visit following the initial training.

Table 1: Distribution of the supportive supervision visits over time and number of visits to a *kebele*

Year	Quarter	Number of SS visits								Total visits	
		1st		2nd		3rd		4th			
		%	n	%	n	%	n	%	n	%	N
2011	Jan-Mar	100.0	29	0.0	0	0.0	0	0.0	0	100.0	29
	Apr-June	98.3	290	1.7	5	0.0	0	0.0	0	100.0	295
	Jul-Sept	98.5	324	1.5	5	0.0	0	0.0	0	100.0	329
	Oct-Dec	87.7	1,423	12.3	200	0.0	0	0.0	0	100.0	1,623
2012	Jan-Mar	55.4	260	42.4	199	2.1	10	0.0	0	100.0	469
	Apr-June	9.2	31	66.3	224	24.6	83	0.0	0	100.0	338
	Jul-Sept	2.1	3	95.2	139	2.7	4	0.0	0	100.0	146
	Oct-Dec	0.9	2	0.9	2	66.0	153	32.3	75	100.0	232
2013	Jan-Mar	2.7	5	96.3	182	0.0	0	1.1	2	100.0	189
	Apr-June	0.4	1	4.6	12	44.8	116	50.2	130	100.0	259
Total		**60.6**	**2,368**	**24.8**	**968**	**9.4**	**366**	**5.3**	**207**	**100.0**	**3,909**

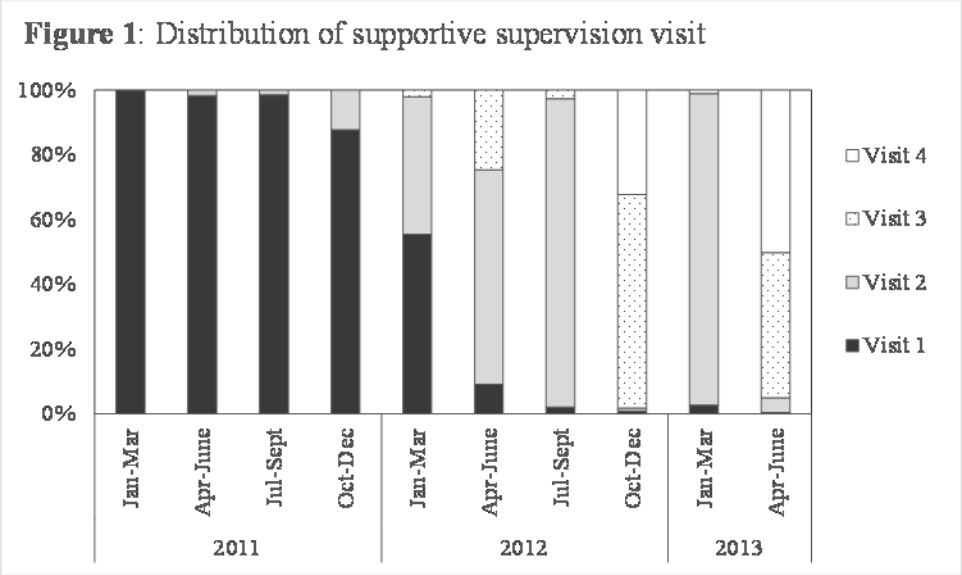

Table 2. Trend in consistency of case management

Illness		Jan-Jun 2011	Jul-Dec 2011	Jan-Jun 2012	Jul-Dec 2012	Jan-Jun 2013
Pneumonia	(No. of SS visits)	(226)	(1,492)	(700)	(339)	(431)
	%	23.0	38.5	60.0	69.0	70.1
	(95% CI)	(17.52, 28.50)	(36.06, 41.01)	(56.37, 63.63)	(64.10, 73.95)	(65.74, 74.39)
Malaria	(No. of SS visits)	(146)	(998)	(440)	(229)	(189)
	%	26.0	42.8	59.8	64.0	68.8
	(95% CI)	(18.90, 33.14)	(39.71, 45.86)	(55.19, 64.35)	(57.80, 70.26)	(62.17, 75.39)
Diarrhea	(No. of SS visits)	(239)	(1,669)	(747)	(366)	(442)
	%	13.8	24.3	47.5	60.1	60.8
	(95% CI)	(9.43, 18.18)	(22.26, 26.38)	(43.94, 51.10)	(55.09, 65.13)	(56.21, 65.33)

Consistent management of pneumonia, malaria, and diarrhea cases by the health posts in the L10K areas improved significantly ($p<0.05$) over the observation period (Table 2). During January-June 2011 the percentage of health posts with consistency of case management for pneumonia, malaria, and diarrhea was 23%, 26% and 14%, respectively, which improved to 70%, 69%, and 61% during January–June 2013, respectively.

Table 3 shows the consistency of case management of the three illnesses according to the SS visit number, unadjusted for the observation quarter. Since the variation in the number of SS visits was not observed or was meager during the first three observation quarters of 2011 (Table 1), the SS visits from those reporting periods were omitted from the analysis. The analysis suggests a dose-response relationship between the number of SS visits and the CoS indicators. For example, the consistency of pneumonia case management was 38% during the first SS visit following which it increased to 65% during the second SS visit and to 78% during the fourth SS visit. The incremental effect of SS was observed between first and second rounds of SS visits for all the three illnesses and between third and fourth rounds of SS visits for pneumonia and diarrhea. However, the incremental effect of SS was not observed between the second and third rounds of visits.

Table 3: Consistency of case management according to the supportive supervision (SS) visit round (unadjusted)

Indicators		1st SS visit	2nd SS visit	3rd SS visit	4th SS visit
Pneumonia	(No. of SS visits)	(1,395)	(848)	(338)	(201)
	%	38.4	65.1	67.2	77.6
	(95% CI)	(35.79, 40.90)	(61.8, 68.30)	(62.15, 72.17)	(71.84, 83.34)
Malaria	(No. of SS visits)	(871)	(533)	(232)	(69)
	%	42.7	64.7	61.6	79.7
	(95% CI)	(39.42, 45.99)	(60.59, 68.72)	(55.38, 97.90)	(70.22, 89.20)
Diarrhea	(No. of SS visits)	(1,551)	(912)	(363)	(200)
	%	25.7	51.7	57.9	70.0
	(95% CI)	(23.54, 27.90)	(48.45, 54.95)	(52.77, 62.93)	(63.64, 76.35)

The dose-response relationship does not distinguish between improvement associated with SS frequency or program maturation including the secular trend (Table 3). After adjusting for the program maturity effect (including secular trend), the dose-response relationships between consistency of case management and number of rounds of SS visits (Table 4).

The effect of PRCMM on the CoS indicators were statistically significant in the expected directions when the regression models did not control for observation quarters; however, the statistical significance of PRCMM effects disappeared after the models controlled for observation quarters. Similarly, the observation period effect on CoS models not including PRCMM diminished when PRCMM was added to the models.

This indicated that the variation in CoS due to PRCMM is also explained by the variation in CoS due to observation period effect. In other words, the effects of PRCMM on CoS indicators were totally confounded (collinear) by observation quarters (analysis not shown). Nevertheless, the models predicting the effects of SS visits on CoS indicators that controlled for observation quarters also controlled for the effect of PRCMM.

Assessment of the bias associated with selection of health posts for second and subsequent SS visits indicated that the CoS indicators measured at the first SS visit were not statistically significantly different between health posts that were visited once and those visited twice; however, the difference was statistically significant when compared between those visited once and those visited more than twice.

Table 4: Consistency of case management according to the supportive supervision (SS) visit round (adjusted)

Indicators		1st SS visit	2nd SS visit	3rd SS visit	4th SS visit
Pneumonia	(No. of SS visits)	(1,395)	(848)	(338)	(201)
	%	41.4	61.4	68.2	78.5
	(95% CI)	(36.53, 46.26)	(56.36, 66.40)	(58.88, 77.52)	(68.67, 88.26)
Malaria	(No. of SS visits)	(871)	(533)	(232)	(69)
	%	46.6	62.0	58.4	77.6
	(95% CI)	(40.45 , 52.66)	(55.71, 68.20)	(45.69, 71.17)	(62.65, 92.64)
Diarrhea	(No. of SS visits)	(1,551)	(912)	(363)	(200)
	%	30.7	43.5	51.7	65.6
	(95% CI)	(25.80 , 35.51)	(38.09, 48.83)	(41.35, 62.00)	(52.80, 78.31)

DISCUSSION

This study indicates that the CoS provided by the HEP in 113 *woredas* substantially improved with program maturation. During the latest observation the proportion of health posts that consistently managed pneumonia, malaria, and diarrhea cases were 78%, 80% and 70%, respectively. Analyses demonstrated dose-response relationships between number of SS visits received by the health posts and improvements in CoS; more SS visits were associated with better CoS. The levels of consistency in the case management for the three illnesses were similar to those observed in Jimma and West Harrarghe zones of Oromia region (12).

The findings of this study are consistent with Hadi (2003) and Laínez et al. (2012) that indicated training CHWs followed by supervision improved the accuracy of CHWs' classification and treatment of common childhood illnesses (3,4). The major components of the iCCM SS strategy in Ethiopia were to coach CHW skills in assessing and managing child illnesses and to ensure availability of supplies, which are viewed essential for community-based iCCM programs (2,4–6).

The study design was not adequate to detect the effect of PRCMM on CoS, mainly because the effects of PRCMM on CoS were collinear (totally confounded) with the observation quarters. Alternate study design or analytic technique will be required to assess the effect PRCMM on CoS.

All health posts received the first SS visit. Supervisors generally prioritized three or more visits to weaker performing HPs. Thus, the observed effects between second and subsequent SS visits are likely all the more noteworthy since these visits occurred within a sample biased towards lower performance.

The consistency in case management of childhood illnesses from iCCM registers in Malawi were reliable for managing fever and diarrhea, but not for pneumonia (13). Therefore, it is possible that the observed trend in improved CoS over the observation period could be also reflecting improved case recording, especially for the pneumonia cases.

Although iCCM included the management of acute malnutrition, we did not assess its CoS because the detail case management information was recorded in a separate register, data from which were not reviewed during SS. The iCCM project should consider reviewing the management of acute malnutrition case records in future.

The National iCCM investment in providing intensive SS to HEWs following the initial iCCM training is worthwhile. The high marginal improvements in CoS between the first and second SS rounds suggest the desirability of least one post-training SS visit. Sustaining the SS system will require training, supporting, and monitoring Primary Health Care Unit staff at health centers.

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ORIGINAL ARTICLE

EFFECT OF PERFORMANCE REVIEW AND CLINICAL MENTORING MEETINGS (PRCMM) ON RECORDING OF COMMUNITY CASE MANAGEMENT BY HEALTH EXTENSION WORKERS IN ETHIOPIA

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ABSTRACT

Background: *The Performance Review and Clinical Mentoring Meeting (PRCMM) is an approach to improve and sustain Health Extension Worker (HEW) skills and performance in integrated Community Case Management (iCCM).*

Objective: *To compare HEW performance in recording case management before and after they participated in PRCMM.*

Methods: *We conducted a historical cohort analysis of iCCM case records between September 2010 and December 2012 from 622 randomly selected health posts representing 31 intervention woredas (districts) of Amhara, Oromia and Southern Nations Nationalities and Peoples' Regions. We used longitudinal regression analysis comparing the trend in the consistency of the classification with the assessment, treatment and follow-up date as well as caseload in the periods before and after PRCMM, with 5511 and 7901 case records, respectively.*

Results: *Overall consistency improved after PRCMM for all common classifications as follows: pneumonia (54.1% [95% CI: 47.7%–60.5%] vs. 78.2% [73.9%–82.5%]), malaria (50.8% [42.9%–58.7%] vs. 78.9% [73.4%–84.4%]), and diarrhea (33.7% [27.9%–39.5%] vs. 70.0% [64.7%–75.3%]). This improvement was consistently observed comparing the six months before and the six months after PRCMM in all the common classifications except for malaria where the improvement observed during the first three post-PRCMM months disappeared during the fifth and sixth months. Caseload increased significantly after PRCMM (6.6 [95% CI: 5.9–7.3] vs. 9.2 [8.5–9.9] cases/health post/month).*

Conclusion: *PRCMM seemed to improve iCCM performance of HEWs and should be integrated within the PHC system and given about every six months, at least at first, to sustain improvement.*

Key Words: *Ethiopia, child health, community health worker, community case management, supervision, mentoring, quality of care*

INTRODUCTION

In 2010, Ethiopia implemented an integrated community case management (iCCM) strategy to bring the treatment of sick children closer to the community through assessment and treatment of childhood pneumonia, malaria, diarrhea and malnutrition by community-based Health Extension Workers (HEWs) (1). An effective, safe strategy requires that the delivery of case management adhere to evidence-based protocols. High quality iCCM should not only maintain treatment effectiveness, but also improve HEW motivation and increase demand and use for interventions (2). HEWs require support to maintain and enhance their skills in case management. A previous study in Oromia showed that the quality of care provided by HEWs was high compared to other settings; however, little was known about the factors that contributed to high performance (3).

The Ethiopian national implementation plan for iCCM specifies several approaches to assure HEW performance quality, including competency-based training; prompt post-training follow-up; supportive

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supervision; a continuous supply of drugs, job aids and equipment; and Performance Review Clinical Mentoring Meetings (PRCMM) (4). UNICEF and partners developed the PRCMM guide that Save the Children used (5). PRCMM is a two-day performance review meeting in which iCCM registers are examined on day one, and clinical mentoring occurs on day two. Health workers trained as trainers facilitate a PRCMM for 20-24 HEWs, which usually takes place in a meeting hall at a central town. Supervisors and peer-HEWs review the registers for consistency, completeness and observed vs. expected caseloads. Sharing experiences at the PRCMM instills a spirit of friendly competition among the HEWs as they review each other's registers. PRCMMs were initially planned as a quarterly event, but limited resources resulted in most health posts (HP) experiencing only one.

Save the Children supported iCCM scale-up in 130 *woredas* in three regions. The purpose of this paper is to examine the effect of PRCMM on the performance of HEWs delivering iCCM.

METHODS AND MATERIALS

***Design and Setting*:** In December 2012 and January 2013, Save the Children and Le Monde Health and Development Consultancy conducted a historical cohort analysis comparing the trend in the indicators of interest before and after PRCMM in the seven zones of Save the Children's first phase iCCM sites in Amhara, Oromia and Southern Nations Nationalities Peoples' (SNNP) Regions, examining experience from September 2010 to December 2012. The sampled HPs had had the first PRCMM between September 2011 and July 2012.

Sampling: The sampling unit was the HP as all HEWs in a HP share common registers, one for the sick child (2-59 months) and one for the sick young infant (less than two months). The unit of analysis was the case management record of a child from 2-59 months of age. The sample size was 657 HPs (of a total of 2,244 HPs in the 83 intervention *woredas*), assuming a frequency of outcome of 0.5, a design effect of 2, a response rate of 80%, and a two-tailed alpha error of 0.05. Using two-stage cluster sampling, we first selected 31 from the 83 *woredas* in the seven zones applying probability proportional to size (PPS) determined by the number of HPs in a *woreda*. Then the number of HPs to be selected was allocated proportional to the number of HPs in the *woredas*. Finally, the HPs in the *woredas* were selected using simple random sampling. In fact, we achieved a sample size of 622 (95% response rate) due to geographical inaccessibility and absence of some HEWs at the time of the study (Table 1).

Variables: We reviewed records in the register by checking the consistency between the classification and the assessment, treatment, and follow-up date. Consistent case management was defined as a dichotomous variable. It was coded '1' when the classification of a case agreed with assessment, treatment dose, treatment schedule, treatment duration, and follow-up date, and '0' otherwise. We also measured caseload as the number of children seen. The date of PRCMM was marked in the registration books, but we relied on HEWs' recall regarding timing of supervision, and other mentoring visits. Supervision referred to any visit by health worker(s) by staff from a health center, implementing partner or *woreda*. We defined mentoring visit as a visit that involved direct observation of case management.

Field Methods: We brought the iCCM registers from the HPs to *woreda* centers for data entry. Health workers who had experience in iCCM were trained for one day to assess the consistency and completeness through record review. Experienced data entry clerks, trained for one day on the questionnaire, entered the data in CSPro, version 5.0. The consultants from Le Monde Health Development checked the completeness, accuracy and consistency of the entered data daily. The data were cleaned and edited before analysis.

***Analysis*:** The 622 HPs contributed to a total of 8,966 HP-months of observations, which included 58,341 iCCM case management records for children 2 to 59 months of age, spanning 29 months from the beginning of the program. The analysis for the comparison of pre-/post-PRCMM caseload and trend was restricted to the 214 HPs for which four to six months of pre- and post-PRCMM iCCM case management records were available. There were 1,110 HP-months of observations for the pre-PRCMM period with 5,511 case records and 1,206 HP-months of observations for the post-PRCMM period with 7,901case records. We analyzed data using Stata, version 13, applying random effects logit regression for longitudinal data (6). The pre-/post-PRCMM differences in the trend in the mean monthly caseload per HP were analyzed using the random effects linear regression for longitudinal data. The regression models accounted for secular trend (program maturity) and repeated measures of HPs. In the logit analysis, the repeated

measures of HPs were present within and across observation months, and in the linear regression analysis, the repeated measures of HPs were across the observation months. The secular trend was accounted for by specifying monthly observation period as a linear variable in the models. After assessing goodness-of-fit of the models, the estimates of interest with their 95% confidence intervals were obtained.

Ethical aspects: We received support letters from Regional Health Bureaus, Zonal Health Departments or *Woreda* Health Offices. The study team maintained confidentiality for all the registers reviewed and used codes to identify children's records to assure anonymity thereafter.

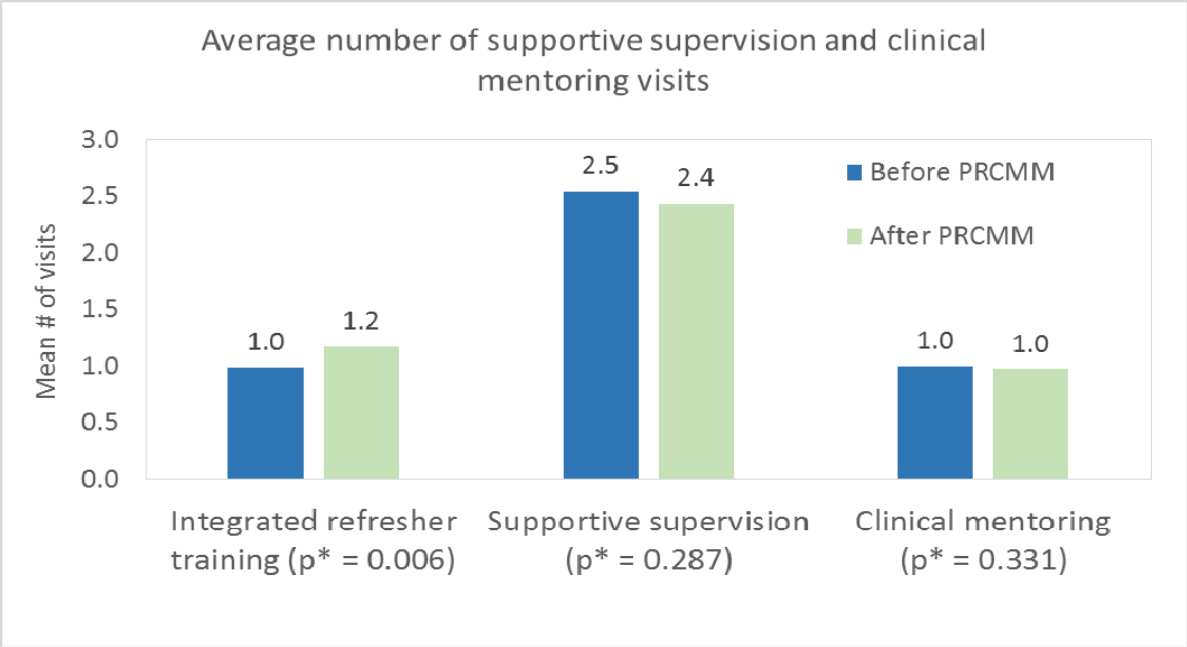
RESULTS

***Background Characteristics*:** The 622 HPs had 1,175 HEWs, an average of 1.9 HEWs per HP. All HEWs were females and young (mean age: 25.9 years). Nearly all were trained in iCCM (98%) and had participated in at least one PRCMM (97%). More than half of the selected HPs (63.5%) were in malarious areas (Table 2).

Table 1: Sampled district and number of HP

Region	Zone	Districts	Total HP	Sampled HP
Amhara	Oromia	Bati	18	13
	South Wollo	Albuko	14	11
		Borena	34	27
		Jamma	19	15
		Kelala	31	26
		Legehida	13	12
		Ajbar Saint	28	24
		Weghedi	31	27
Oromia	East Shoa	Adamitulu Jido Kombolcha	44	34
		Bora	17	14
		Dugda	36	29
		Lume	34	23
	West Arsi	Adaba	17	8
		Gedeb Hasasa	24	18
		Kore	18	6
		Nansebo	12	7
		Shashemene	38	9
SNNPR	Gurage	Cheha	34	21
		Enemor ena Ener	69	49
		Muhor Na Aklil	32	22
		Kebena	23	18
		Meskan	48	24
		Sodo	57	31
	Sidama	Aleta Wondo	27	20
		Aroresa	19	12
		Borecha	41	29
		Chire	16	9
		Dara	29	21
		Hulla	30	19
		Shebedino	30	21
	Segen	Konso	52	23
Total	7	31	935	622

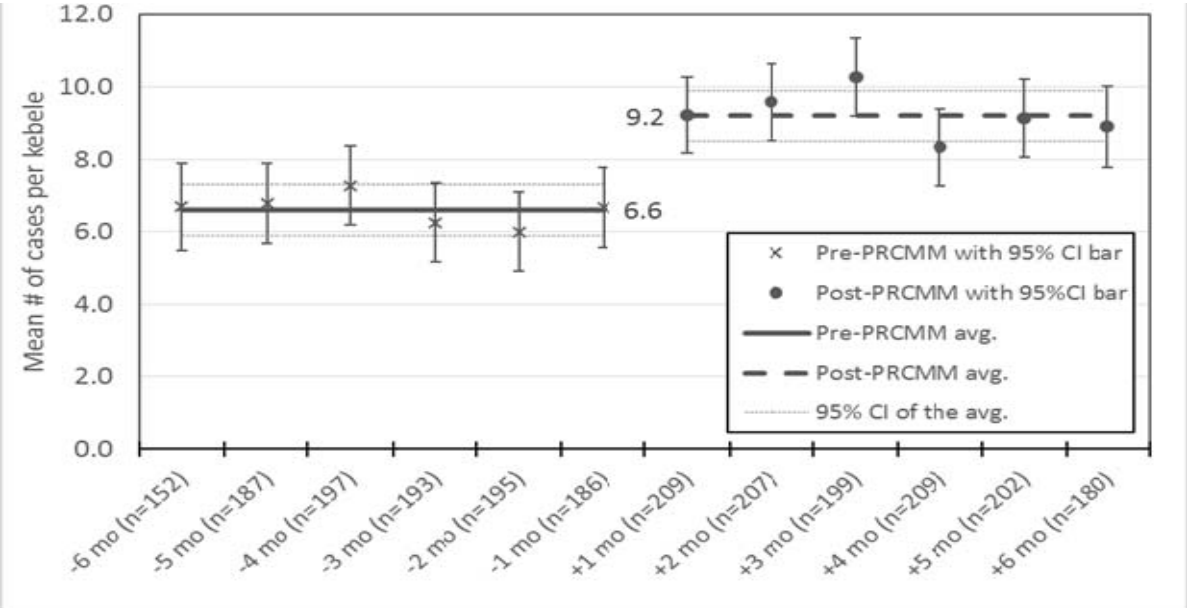
Figure 1: Average number of integrated refresher training, supportive supervision and clinical mentoring visits (n = 214 pairs)



***Supervision received*:** HEWs reported nearly identical levels of supportive supervision and mentoring visits before and after PRCMM (2.5 vs. 2.4, p=0.29; and 1.0 vs. 1.0, p=0.33, respectively) (Figure 1).

***Caseload per HP*:** The 214 HPs provided more iCCM for children after PRCMM than before (average cases per HP per month pre- vs. post-PRCMM: 6.6 (95% CI: 5.9–7.3) vs. 9.2 (8.5–9.9) (Figure 2).

Figure 2: Trend in the average monthly caseload per health post during the six months before and after PRCMM



Consistency in recording assessment, treatment and follow-up: The consistency for all the common classifications improved significantly following PRCMM**.** For example, the consistency in assessment, classification and treatment for pneumonia during the six months before PRCMM ranged between 47.1% (95% CI: 36.8-57.3%) and 61.3% (95% CI: 53.0-69.6%) (Figure 3).

The consistency improved abruptly to 78.6% (95% CI: 73.0%-84.1%) the month following participation in PRCMM. This improvement was sustained during the next five months. Similar increments were observed for malaria (50.8 vs. 78.9%) and diarrhea (33.7 vs. 70.0%) following PRCMM (Figures 4-5). For malaria, the improvement seen in the first three months was not sustained and started to decrease in the fifth month. Although Figure 5 depicts a decrement for diarrhea similar to that for malaria, it was not statistically significant. Diarrhea had the greatest improvement in consistency post-PRCMM (36.3 percentage points), while malaria and pneumonia had higher consistency at baseline.

Table 2: Background information on the study area and HEWs, by study sample

Characteristic		**Amhara**	**Oromia**	**SNNP**	**Total**
HPs included in the study, n (%)	Sampled	155 (24.9)	149 (24.0)	318 (51.1)	622 (100.0)
	Analyzed	51 (23.8)	35 (16.4)	128 (59.8)	214 (100.0)
Currently working HEWs, n (mean/HP)	Sampled	274 (1.8)	294 (2.0)	607 (1.9)	1,175 (1.9)
	Analyzed	92 (1.8)	70 (2.0)	248 (1.9)	410 (1.9)
Currently working HEWs trained on ICCM, n (mean/HP)	Sampled	274 (1.8)	277 (1.9)	602 (1.9)	1,153 (1.9)
	Analyzed	92 (1.8)	68 (1.9)	245 (1.9)	405 (1.9)
Currently working HEWs who participated in PRCMM, n (mean/HP)	Sampled	272 (1.8)	272 (1.8)	596 (1.9)	1,140 (1.8)
	Analyzed	92 (1.8)	66 (1.9)	242 (1.9)	400 (1.9)
Age of currently working HEWs, mean (SD)	Sampled	27.8 (4.2)	24.0 (2.2)	25.7 (3.5)	25.8 (3.7)
	Analyzed	27.5 (3.7)	24.1 (2.2)	26.0 (3.5)	26.0 (3.5)
Malarious *kebeles*, n (%)	Sampled	89 (57.4)	89 (59.7)	217 (68.2)	395 (63.5)
	Analyzed	30 (58.8)	21 (60.0)	91 (71.1)	142 (66.4)

Figure 3: Trend in the consistency of pneumonia case management during the six months before and after PRCMM

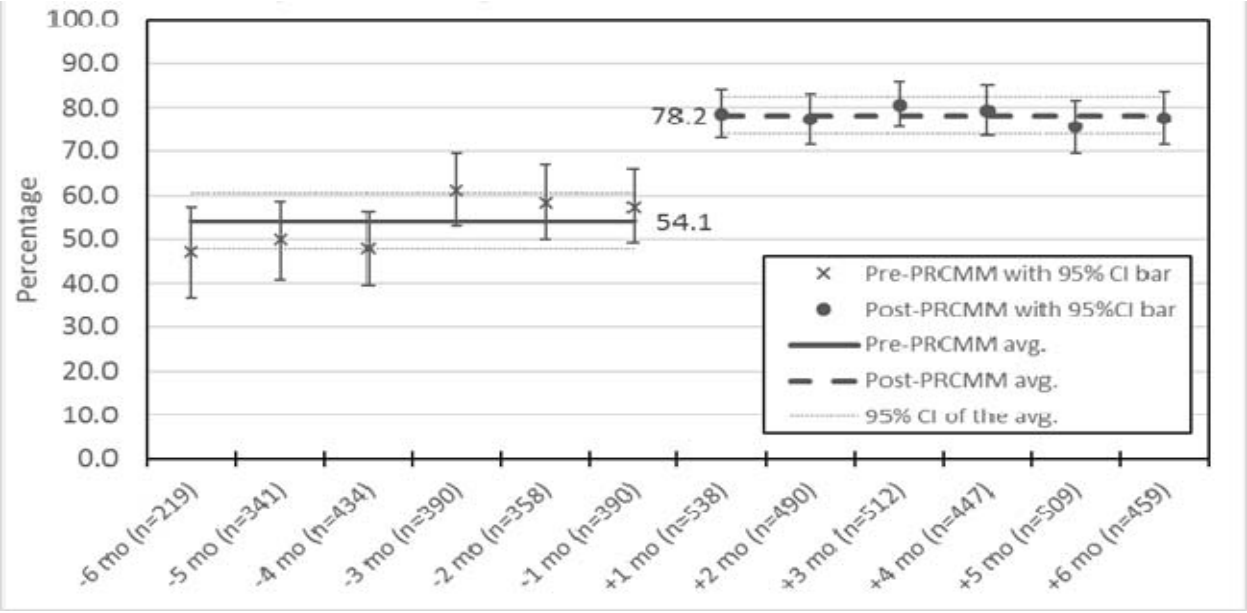


Figure 4: Trend in the consistency of malaria case management during the six months before and after PRCMM

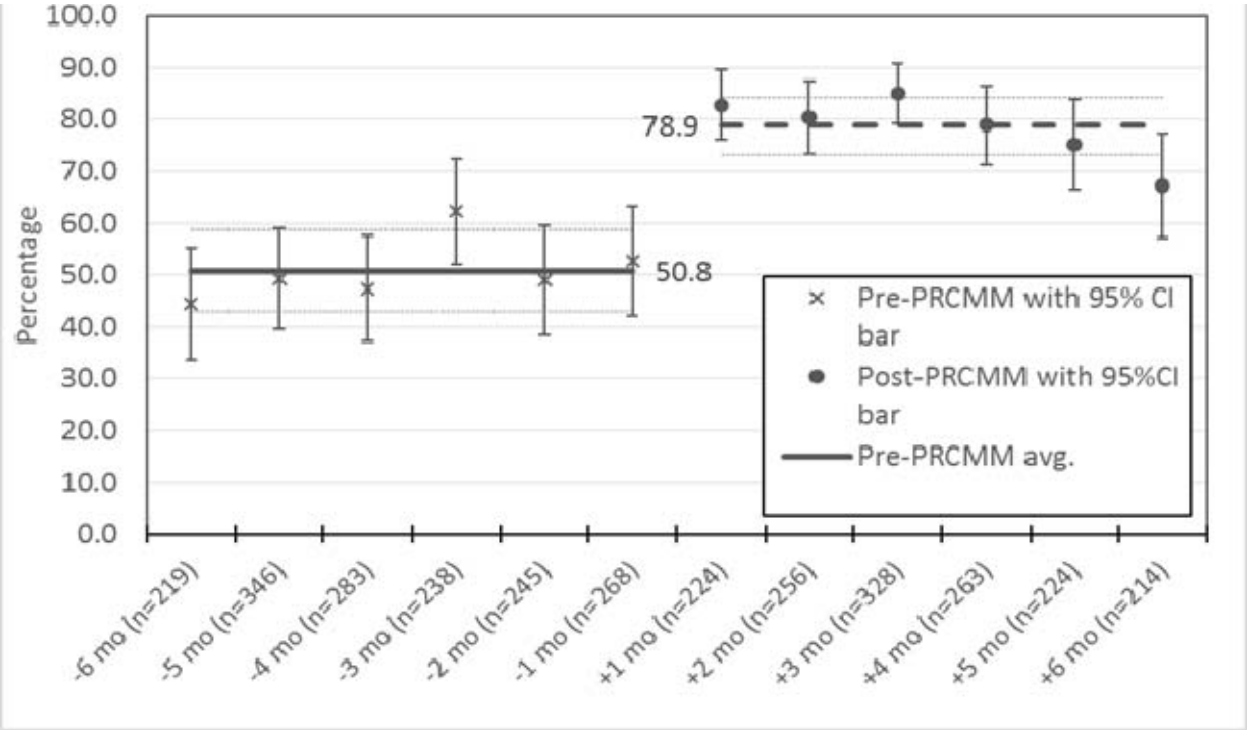
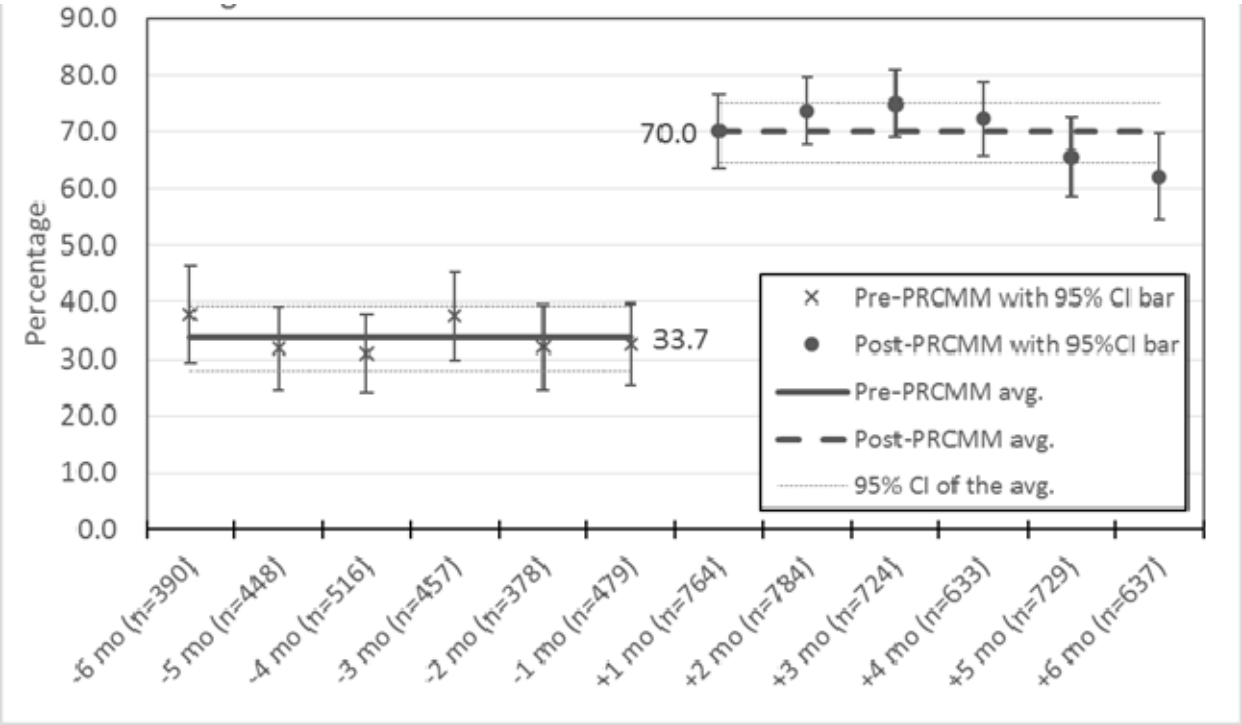


Figure 5: Trend in the consistency of diarrhea case management during the six months before and after PRCMM



DISCUSSION

The consistency of case recording in the register for the common iCCM classifications improved significantly following participation in PRCMM. The absence of sustained improvement in consistency mainly for malaria may suggest "performance fatigue." Caseload also increased after PRCMM, although utilization was still low. That is, 9.2 cases/HP/month for an average under five catchment population of 900 (i.e., 18% of a total population of about 5000) only represents treating 0.12 cases/child/year (i.e., [9.2 cases/month *12 months/year]/900 children). Correcting for co-morbidity (1.3 classifications/child, on average – data not shown), yields 0.16 episodes/child/year (0.12 * 1.3), still very low – a phenomenon observed by others (7-10).

Records in the registers are reasonable proxy measures of HEW performance in iCCM. The registers and the accompanying chart booklet guide the HEWs through the specific steps of case management. Thus, it is likely that the existing records that we examined reflect actual case management, although some registers may lack a few cases seen in the community or during busy periods (10).

The gold standard for measuring performance is direct observation (DO) with re-examination (RE), a rigorous but costly method. Cardemil and others compared the specificity and sensitivity of record review with that of DO with RE in Malawi (11). The record review estimates of fever and diarrhea closely approximated the DO with RE estimates (within 9 percentage points), but estimates for cough and fast breathing and severe illness differed markedly from the DO with RE estimates (12–51 percentage points). In Ethiopia, a forthcoming validation compared register review against DO with RE and found better sensitivity (accurately recording correct management) than specificity (accurately recording incorrect practice) (Miller N, personal communication, December 2012). As with the Cardemil study, register review provided better estimates for management of diarrhea than for fast breathing and severe illness.

The consistency results in this study are higher than the assessment of iCCM implementation strength and quality of care in Oromia, Ethiopia that used DO with RE (3). The study showed that only 53% of

children were classified correctly and only 64% were managed correctly. This difference could be explained by regional variation in that we found that SNNP and Amhara somewhat outperformed Oromia (data not shown). In addition, our study period was six months after the Oromia study, thereby allowing for further program maturity. Finally, the assessment methods differed.

Limitations: The research question was posed after PRCMM introduction, which precluded a randomized controlled trial that could have better shown a cause and effect relation. However, the significant improvement in the indicators of interest just after PRCMM suggests that the effect was due to PRCMM. Our analysis did not control for other programmatic factors, such as supportive supervision that may have influenced the outcomes of interest. However, it is unlikely that supportive supervision would confound the observed effect of PRCMM mainly because there were no reasons to believe that the intensity of supportive supervision systematically increased following PRCMM. The assumption was supported by HEWs' experience that the frequency of supervision and clinical mentoring visits to the HP was similar before and after the PRCMM. In addition, the analysis controlled for secular trend, specifically program maturity and other historical events such as regular supportive supervision; hence, the observed significant improvement was likely attributable to PRCMM.

Recommendations: PRCMM seems to improve ICCM performance of HEWs and should be integrated within the PHC system. To ensure that improvements are sustained, PRCMM may need to happen every four to six months, especially at first, to reinforce skills. Demand creation needs attention since iCCM utilization is still low.

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ORIGINAL ARTICLE

INTEGRATED COMMUNITY CASE MANAGEMENT: QUALITY OF CARE AND ADHERENCE TO MEDICATION IN BENESHANGUL-GUMUZ REGION, ETHIOPIA

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ABSTRACT

Background: *The International Rescue Committee (IRC) supports implementation of integrated Community Case Management (iCCM) in all 20 woredas (districts) of Benishangul Gumuz Region (BSG) in Ethiopia.*
Objectives: *To identify the gaps in the provision of quality iCCM services provided by Health Extension Workers (HEWs) and to assess caregivers' adherence to prescribed medicines for children under five years of age.*
Methods: *We conducted a cross-sectional descriptive study with both quantitative and qualitative study methods. We interviewed 233 HEWs and 384 caregivers, reviewed HEW records of 1,082 cases, and organized eight focus groups.*
Results: *Most cases (98%) seen by HEWs were children 2-59 months old, and 85% of the HEWs did not see any sick young infant. The HEWs' knowledge on assessments and classification and need for referral of cases was above 80%. However, some reported challenges, especially in carrying out assessment correctly and not checking for danger signs. Over 90% of caretakers reported compliance with HEWs' prescription.*
Conclusion: *Partners have successfully deployed trained HEWs who can deliver iCCM according to protocol; however, additional support is needed to assure a supply of medicines and to mobilize demand for services, especially for young infants.*
Key words: *Ethiopia, child health, Health Extension worker, community case management, Malaria, Pneumonia, Caretakers adherence, Child treatment, Child Survival, Health Extension Program.*

INTRODUCTION

One in every 17 Ethiopian children dies before his or her first birthday, and one in every 11 children dies before his or her fifth birthday (1,2). The majority of these deaths are from preventable or treatable conditions: neonatal problems (25%), pneumonia (15%), diarrhea (23%) and malaria (7%) with malnutrition as an underlying cause in 57% (1,2). A key challenge to reduce childhood mortality is providing access to high quality health care in remote areas. The Federal Ministry of Health (FMOH) revised the Health Extension Program (HEP) policy mandating Health extension workers (HEWs) to treat non-severe childhood pneumonia in addition to provide essential newborn care and manage malaria, diarrhea and severe acute malnutrition (3). The International Rescue Committee (IRC) is an implementing agency supporting the government to roll out the Integrated Community Case Management (iCCM) strategy in all 20 *woredas* (districts) of the Benishangul Gumuz Region. From October 2011 to April 2012, IRC supported the training of 671 HEWs. The purpose of this study is to identify gaps in the quality of iCCM services provided by HEWs in BSG and to assess caregivers' adherence to medicines prescribed for children under five. The information generated by the study will be used by IRC and other partners to develop strategies to address gaps identified.

METHODS AND MATERIALS

We conducted a descriptive cross-sectional study in Assosa, Kamashi, and Metekel Zones and in Maoko-

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mo Special *Woreda* of Benishangul-Gumuz Region, from 31 July to 15 August 2012.

HEW Survey: We surveyed 233 HEWs trained in iCCM between October 2011 and March 2012 in all 20 *woredas* with IRC support. We interviewed 384 caregivers of children who were sick in the previous two weeks seen by the HEWs. We used a modified Kish and Leslie formula with a 95% confidence level, a precision estimate of ± 5%, and a p-value of 5% to calculate the sample size (4). We randomly selected the 233 HEWs from the 571 who were trained with probability proportionate to the number trained in each *woreda*. If the sampled HEW was absent, we replaced the second HEW at the health post (HP) if she was also trained during the same time period; otherwise, we randomly selected an HEW from another HP within the same *woreda*.

Quality of Case Management: We assessed HEWs' case management knowledge two ways. First, we used one case scenario for each age group (0-1 months – i.e., Sick Young Infant [SYI] – and 2-59 months). The SYI case scenario was a 7-week-old child with a weight of 4 kg, axillary temperature of 36.5^{o}C and 3 days' history of bloody diarrhoea but with no danger sign; and the 2-59 months old case scenario was a 30-month-old child with history of cough for two days, trouble breathing and fever for 1 day, and axillary temperature of 38.5^{o}C. The HEWs used their chart booklet and recording forms to assess the case scenarios. We assessed identification, assessment, classification, and treatment through the scenarios. In addition, we interviewed HEWs before the case scenario about their experience and perceived gaps in knowledge and skills.

Register Review: We reviewed the case of previous month's cases by age group and classification. Then, we reviewed the five most recent cases (a total of 1082) to establish completeness and consistency of classification or treatment vs. assessment through register review method.

Inventory: We directly observed the availability of iCCM drugs and supplies using the "Form C" checklist, a nationally developed iCCM program supportive supervision tool that looks at iCCM inputs, especially essential iCCM drugs, supplies, and equipment.

Caregiver Survey: We randomly selected from the registers one case of malaria/fever and one of cough/difficulty breathing seen in the previous two weeks at each HP to assess caregivers' adherence to HEWs' prescriptions. If the selected case was absent during the first attempted visit, we made an appointment for one revisit before marking the caregiver absent. We administered a structured questionnaire to assess adherence to prescribed medications and explored reasons for non-adherence.

Focus Group Discussions We conducted eight focus group discussions (FGDs) with non-surveyed caregivers of children under five, each group with 8-12 participants. We selected the participants who were accessible and had free time for group discussion during data collection. The question guide explored awareness of the iCCM program, household decision-making for care seeking, and health-seeking behavior for sick children.

Data analysis: Data were single-entered and analyzed using Epi Info, version 3.5 software (5). The data entry program included limits and protected cells to minimize data entry error. We defined HEW knowledge and skills as "good" if they correctly met 80% of the parameters (identification, assessment, classification and treatment) per the national protocol; we defined drug availability as "good" if all specified drugs (100%) were observed (6). Bivariate analysis was conducted to assess association between variables. We considered a p-value $\leq$0.05 statistically significant when assessing a possible association between variables. Data from the FGDs were transcribed and translated into English and triangulated with the quantitative findings.

Ethical considerations: Benishangul-Gumuz Regional Health Bureau provided ethical clearance for the study. Interviewers obtained oral informed consent from all study participants. Participants were informed that they could withdraw from the study at any time. In addition, measures were taken to ensure confidentiality such as holding interviews in a private setting and storing all data under lock and key.

RESULTS

We assessed 217 (93%) of the intended sample of 233 HEWs. ***Case Scenarios:*** Most HEWs correctly recorded the parameters to identify young infants (>98%) (Table 1). Performance in assessment and classification was also good (>82% and >80%, respectively); however, performance was lower for treatment and follow-up. For example, only 12.6% mentioned following-up at a later date. A similar pattern was observed for older children. Many HEWs had lower performance in identifying danger signs and associated disease, such as malnutrition and HIV status for both the mother and baby (Table 2).

Table 1: HEW Knowledge of assessment, classification and treatment of a case scenario of a sick young infant

Variables	Frequency (n=217)	Percentage	95% Confidence interval
Identify			
Child's name	217	100	
Child's *kebele*	215	99.1	96.7-99.9
Child's sex	216	99.5	97.5- 100
Child's age	216	99.5	97.5-100
Child's weight	217	100	
Child's temperature	214	98.6	96.0-99.7
Assess			
Diarrhoea as the child's problem	210	96.8	93.5-98.7
Number of days for the diarrhea	214	98.6	96.0-99.7
Presence of blood in the stool	204	94.0	90.0-96.8
Skin pinch as assessment of dehydration	178	82.0	76.3-86.9
Number of breaths per minute	209	96.3	92.9-98.4
Child's immuniza-tion status not yet started	208	95.9	92.3-98.1
Classify			
Dysentery	179/216	82.9	77.2-87.6
Mother's HIV status unlikely	175/217	80.6	74.8-85.7
Treat (n=215)*			
Refers the case	194	90.2	85.5-93.9
Gives ORS	146	67.9	61.2-74.1
Mother advised on breast feeding	160	74.4	68.0-80.1
Gave follow-up date	27	12.6	8.4-17.7

*Two HEWs did not record management and so were excluded from the analysis

Table 2: HEW knowledge of assessment, classification and treatment of a case scenario of a sick child.

Variables	Frequency (n=217)	Percentage	95% Confidence interval
Identify			
Child's name	215	100	
Kebele	215	100	
Child's sex	214	99.5	97.4-100
Child's age	214	99.5	97.4-100
Child's weight	215	100	
Child's temperature (38.5^{o}C)	211	98.6	96.0-99.7
Assess			
Unable to feed as danger sign	172	80.8	74.8-85.8
Lethargy as danger sign	143	66.5	59.8-72.8
Cough as child's problem	207	96.3	92.8-98.4
Cough duration (days)	198	92.5	88.1-95.7
Fever as a problem	210	98.1	95.3-99.5
The number of days for fever	192	89.3	84.4-93.1
Difficult breathing as child's problem	203	94.4	90.5-97.1
Harsh noise/stridor	180	83.7	78.1-88.4
Chest in-drawing	184	86.0	80.6-90.3
The number of breaths (60) of the child	211	98.1	95.3-99.5
Fast breathing	175	81.4	75.5-86.4
Child had received vitamin A	208	96.7	93.4-98.7
Classify			
Severe pneumonia/very severe febrile disease	195	89.9	85.1-93.5
No acute malnutrition	157	72.4	65.9-78.2
Mother HIV status positive	154	71.0	64.4-76.9
Childs has HIV or possible HIV infection	156	71.9	65.4-77.8
Treat (n=216)*			
Refer case	200	92.6	88.2-95.7
Give paracetamol as pre- referral treatment	51	23.6	18.1-29.8
Give cotrimoxazole as pre- referral treatment	167	77.3	71.1-82.7
Give follow-up date	23	10.6	6.9-15.5

Case Management Knowledge: About 91% of HEWs knew the age-specific, respiratory rate cut-offs. About (64%) knew the lower temperature cut-off danger sign for a hypothermic SYI. No statistically significant (data not shown) difference was observed among HEWs trained with six months vs. more than six months prior to study.

Register Review On average, HPs treated 13 cases in the previous month with a wide range for both sick children (1-95) and sick young infants (0-13). The vast majority of cases (98%) were 2-59 month olds. About 85%of HEWs did not attend to any SYI in the previous month (Table 3).

Table 3: Presenting complaints of the cases seen by the HEWs in the month prior to the study

Variable (Symptoms)	Total	Percentage
2 months – 5 years (N=3501)		
Fever	1590	45.4
Diarrhea	**1237**	**35.3**
Difficult/Fast breathing	659	18.8
Malnutrition	15	0.4
0-2 months (N=32)		
Diarrhea	17	53.1
Difficult breathing	8	25.0
Bacterial infection	4	12.5
Severe malnutrition	3	9.4

*HEWs merged related complaints and wrote classification terms instead of presenting complaints. Thus, "difficult/fast breathing" refers to cough, grunting, and difficult breathing; "bacterial infection" refers to skin infection and red or draining pus from the cord; "malnutrition" refers to perceived underweight or poor growth; and "severe malnutrition" refers to visible wasting, bilateral swelling of both legs, or complaint of malnutrition. Even with this merging, multiple symptoms are possible.

Almost all cases reviewed in the registers about 96% had all the required background information and case classification, and nearly all of the classifications (92%) were consistent with assessment and according to national guidelines (7). The correct recommended frequency and duration of treatment with Coartem, cotrimoxazole, zinc and chloroquine were generally high (94%, 93%, 95% and 68%, respectively). However, the correct recommended dosage for age was slightly lower, for each of the above (78%, 77%, 95% and 53% respectively).

Drug Availability: Over 80% of the HPs were observed to have essential drugs (Coartem, cotrimoxazole, ORS and zinc) for the sick children on the day of assessment. About 13% of HPS did not have plumpy Nut Sachets. All of the HPs had chart booklets and registration books. RDTs and timers were available in 85% of the HPs. Disposable gloves and Ambu bags were not available in most HPs (Table 5).

Caregivers' Adherence: The response rate for caregivers was 99%. The mean age for the caregivers was 30.9 years (range: 14-85); most (81.1%) were biological mothers. Most caregivers (93-100%) reported that they followed the HEW's instructions regarding dose and frequency for Coartem, cotrimoxazole and zinc; however, fewer admitted to adhering to the full duration (67-89%) (Table4).

The recommended treatment duration was associated with the caregivers' likelihood of completing the prescribed medicine. Children prescribed 10 days of zinc were five times less likely to complete the course than those receiving three days of Coartem, while those receiving five days of cotrimoxazole were 1.5 times less likely to complete their course than counterparts receiving three days of Coartem. Children who received one drug were three times more likely to complete treatment than those who received either two or three drugs. Other stated reasons for non-adherence were that the child improved, or that caregivers wanted to save the drugs for future use, had difficulty administering the medicine, or preferred an injection.

Table 4: Caregivers' reported compliance with HEW instructions regarding drug administration*

Medicine	Amount to be taken each time [n, (%)]	No. of times per day [n, (%)]	Total days to give the medicine [n, (%)]
Coartem (N= 242)	232 (95.9)	233 (96.3)	215 (88.8)
Cotrimoxazole (N= 151)	142 (94.0)	148 (98)	126 (83.4)
Zinc (N= 57)	57 (100)	50 (93)	38 (66.7)

***** Coartem: 2 times a day for three days; Cotrimoxazole: 2 times a day for five days; zinc: once daily for 10 days

HEW Work Experience and Perceived Gaps Most HEWs felt motivated to do their work. Only 14% indicated that the iCCM activities were affecting their other HEW responsibilities. They also indicated that the community regarded them as "doctors" because they could treat their children.

Major challenges mentioned were non-adherence to prescribed medicine (16%), no means of transport for referred cases (65%), lack of support of caregivers' husbands (22%), limited supportive supervision (24.4%) and shortage of skill of assessing SYI (18%).

Table 5: Availability of supplies and equipment and drugs

Item	**% of HPs (N=217)**
Registration for sick young infant	100
Registration for sick child	100
Chart booklets	100
MUAC	97.7
Health education materials	91.7
RDTs	86.6
Timing device	84.8
Weighing scale for children	55.8
Referral forms	45.6
Drug	
Cotrimoxazole pediatric tablets	96.3
ORS sachets	94.0
Coartem (Blue) blister packs	90.8
Zinc tablets	87.6
Chloroquine tablets	54.8
Coartem (Yellow) blister packs	21.7
Plumpy'Nut sachets	12.9
Chloroquine syrup	1.4

DISCUSSION

HEWs are primarily treating children 2-59 m of age and 85% of the HEWs had not seen a SYI. Recording lethargy as a general danger sign was low (67%), but knowledge of assessment, classification and indications for referral was good. Case classification for the primary presenting complaint of the child was over 80% for both case scenarios, but classification for associated conditions (such as HIV status) for both the mother and the child was lower (70%). The relatively low level of knowledge in classifying a hypothermic SYI (64%) as severe disease may be due to limited experience due to a low SYI case load.

Over 90% of prescriptions were correct for the recommended frequency and duration according to the register review. The good prescribing is comparable to a study in Zambia (8). On the other hand, their recommended dosage for age was not as good, except for zinc. This finding calls for continuous supportive supervision to curb this practice that can result in under-dosing, treatment failure, and drug resistance.

Availability of essential drugs is fundamental to good quality health care and patient satisfaction (i.e., “no product, no program”) (9,10). In this study, the availability of drugs for the sick child was over 80% of the HPs, but drugs for the SYI were only available in about 5% of the HPs.

Caregivers’ high reported compliance with treatment instructions could reflect trust in the HEWs’ counseling and the prepackaging of medicines. Studies have established higher adherence with pre-packaged compared to loosely packaged medicines (11). The caregivers’ reported lower compliance for completing the duration of treatment can be explained by their tendency to stop if they noted improvement in the child’s condition as found in similar studies (12). Another reason for non-adherence established by the study was multiple prescriptions. Several studies have shown that there is an inverse association between low compliance and the number of medications given (13,14).

One limitation of this study is that direct observations of HEWs managing sick children could not be undertaken due to limited resources; thus, we used register review as an alternative. Caregivers were asked to recall adherence after two weeks, and we relied on report rather than observation to assess adherence. Limited information was available on SYI, so few conclusions could be drawn. We cannot explain any of the differences in performance noted by case scenario vs. by record review of a month's experience, but differences are not surprising given the different methods.

Conclusion: The quality of service provided by the HEWs and the caregivers’ compliance to prescribed medicines were good, but some areas need improvement, specifically treatment follow-up, provision of recommended dosage for age, identifying danger signs and associated diseases, and lower temperature cut-off points for SYI. Most caregivers adhered to HEWs’ instructions regarding dose and frequency; however, fewer adhered to full treatment duration depending on the treatment duration requirements of certain drugs or on the number of drugs prescribed. Partners have successfully deployed trained HEWs who can deliver iCCM according to protocol; however, additional support is needed to assure a supply of medicines and to mobilize demand for services, especially for young infants.

Recommendations: Clinical mentoring of HEWs by their supervisors should be strengthened to improve their assessment skills, including treatment follow-up, provision of recommended dosage for age, danger signs, and cut-off points in an integrated, comprehensive manner. HEWs need to improve counseling of caregivers to improve adherence to the full duration of treatment, perhaps through follow-up visits. FMOH and other concerned bodies must ensure an uninterrupted medicine supply.

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ORIGINAL ARTICLE

QUALITY AND USE OF IMNCI SERVICES AT HEALTH CENTER UNDER-FIVE CLINICS AFTER INTRODUCTION OF INTEGRATED COMMUNITY-BASED CASE MANAGEMENT (ICCM) IN THREE REGIONS OF ETHIOPIA

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ABSTRACT

Background. *The Integrated Management of New born and Childhood Illness (IMNCI) and the related Integrated Community Case Management (iCCM) are evidence-based strategies to reduce childhood mortality in Ethiopia at health centres and community health posts, respectively. The effect of introducing iCCM on IMNCI is not known.*
Objective. *To assess the caseload and quality of IMNCI service in under-five clinics in health centres after iCCM implementation.*
Methods. *This cross-sectional study used register review to assess the IMNCI service use (before and after iCCM, in 2010 and 2012, respectively) and quality throughout the period in randomly selected health centers in three regions of the Integrated Family Health Program (Oromia, SNNPR [Southern Nations and Nationalities and Peoples Region] and Tigray).*
Results. *Caseload of sick children at 28 health centers increased by 16% after iCCM implementation (21,443 vs. 24,882 children in 2010 and 2012, respectively. The consistency of IMNCI treatment with classification for pneumonia, diarrhea and malaria was low (78, 45, and 67%, respectively) compared to iCCM treatment (86, 80, and 91%, respectively).*
Conclusion. *Health center case load increased modestly after iCCM was introduced, but was lower than expected, even when combined with health post use from other studies. The demand strategy for sick children needs review. The quality of IMNCI needs improving even to bring it to the quality of iCCM at health posts, as measured by the same methods. Successful quality assurance approaches from iCCM, e.g., the Performance Review and Clinical Mentoring Meeting, could be adapted for IMNCI.* ***Key words****; IMNCI, ICCM, case load ,Oromia ,SNNP, Tigray*

INTRODUCTION

Mortality among children under five years of age fell globally by 41% between 1990 and 2011 (1,2). Demographic Health Survey (DHS) data from Ethiopia showed 47% reduction in under-five mortality from the year 2000 to 2011 (3). The main causes of under-five deaths are pneumonia (27%), diarrhea (20%), and malaria (2.4%) with malnutrition thought to underlie 57% of all under-five deaths (2,4). Despite the mortality reduction, Ethiopia remains among countries with high child mortality.

The Integrated Management of Newborn and Childhood Illness (IMNCI) has been a key strategy to reduce deaths from these diseases in low-and middle-income countries since 1990. Ethiopia's Federal Ministry of Health (FMOH) adapted the IMNCI training package to build health worker skills at health centres (HC) to provide evidence-based sick childcare (4). Also, numerous studies have shown that the strategy—when services are accessible and used—lowers new born and child mortality (5-7).

National IMNCI case management guidelines, adapted from WHO guidelines, address all major causes of morbidity and mortality, including cough, diarrhea, fever, acute ear infection, malnutrition, anemia, and HIV/AIDS for sick children age 2-59 months. Additionally, the guidelines address essential newborn care, neonatal resuscitation, low birth weight, possible bacterial infection, and feeding problems in sick young infants less than age two months. The guidelines also include checking immunization, vitamin A supplementation, and deworming.

Integrated Community Case Management (iCCM) was adapted from IMNCI and introduced in Ethiopia

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in 2010 (10). Health Extension Workers (HEW) can treat many child illnesses at community health posts (HP) and refer severe or unusual cases. Health workers at HCs supervise and support the HEWs at the five (typically) HPs in their catchment area.

Health planners need to anticipate the effect of iCCM on HC caseloads. If most sick children were seen by HEWs, then caseloads at HCs would decrease resulting in possible staff/workload mismatches. On the other hand, the system strengthening required to implement iCCM could result in the same or more cases overall. In Nicaragua, introducing iCCM initially shifted care from the facility to the community, but a year later, utilization at both settings increased (7). In Sierra Leone, adding iCCM for pneumonia quadrupled the total number of cases seen while gradually reducing by half the level seen at facilities (8). In contrast, the effect of iCCM on the quality of IMNCI services is unknown. In Ethiopia, no study has described the use of IMNCI services at HCs before and after introducing iCCM, which is the purpose of this report. We also report the quality of IMNCI services throughout 2010-12.

MATERIALS AND METHODS

Study design and setting. In 2013, we conducted a cross-sectional study in three of Integrated Family Health Program (IFHP) target regions (Oromia, SNNP, and Tigray) where IFHP was supporting the implementation of both IMNCI and iCCM. The total population of the three regions, projected from 2007 census report, is 22,400,000, with 678 HCs and 3903 HPs providing IMNCI and iCCM services, respectively.

Sampling frame, sample size and sampling. The sampling frame consisted of all public HCs within three regions that provided IMNCI service and had satellite HPs that provided iCCM service. Six hundred seventy eight HCs fulfilled the criteria. We randomly selected 28 HCs applying probability proportional to size, 15 from Oromia, 8 from SNNPR, and 5 from Tigray, applying the following assumptions: levels of health facility level indicators (50%), 2-sided alpha error (5%), precision (±20%), and non-response rate (20%) using the normal approximation to the hyper-geometric distribution statistical formula. We planned to review registers to identify two cases at each HC for each classification, i.e., pneumonia, diarrhea, malaria, and severe acute malnutrition for 2-59 months; and possible serious bacterial infection, preterm, low birth weight, and feeding problem/underweight for <2 months). These data yield a total sample size of 224 classifications for sick children 2-59 months and168 classifications for young infants <2 months of age.

Variables. We measured the number of health workers trained in IMNCI and iCCM starting time. We reviewed registers to tally the total number of cases and targeted classifications for 2010, 2011, and 2012.IMNCI registers were used to assess the quality of recording (as a proxy for IMNCI quality) by comparing the consistency of the classification with assessment, treatment, and follow-up date. Treatment had three components: dose, schedule, and duration. To assess quality, data collectors used a module adopted from the iCCM Form C developed by UNICEF(1). The overall checklist captured basic information (region, zone, woreda, health facility, catchment population, under 5 population, number of IMNCI trained providers, iCCM started time), tallies of caseload, and quality of services.

Field methods. The survey team spent 1.5 days at each HC. They interviewed health workers for basic information and then examined two IMNCI registers (i.e., for sick children 2-59 and <2 months of age, respectively). The data collectors counted all and targeted classifications over the last three years. They restricted quality assessment to children with a single classification. They used simple random sampling over the whole three-year period to select common classifications, but used any encountered case for rare classifications. Team supervisors reviewed all forms before departing.

Data quality control, processing and analysis. The principal investigator and supervisors monitored data collection. Completed forms were submitted to the IFHP country office where skilled data entry clerks performed the double data entry on a random sample of 10% of the forms. The country office monitoring and evaluation team coded, entered, and processed the data, which were analyzed with SPSS, version 16.0 (SPSS Inc., Chicago, USA).

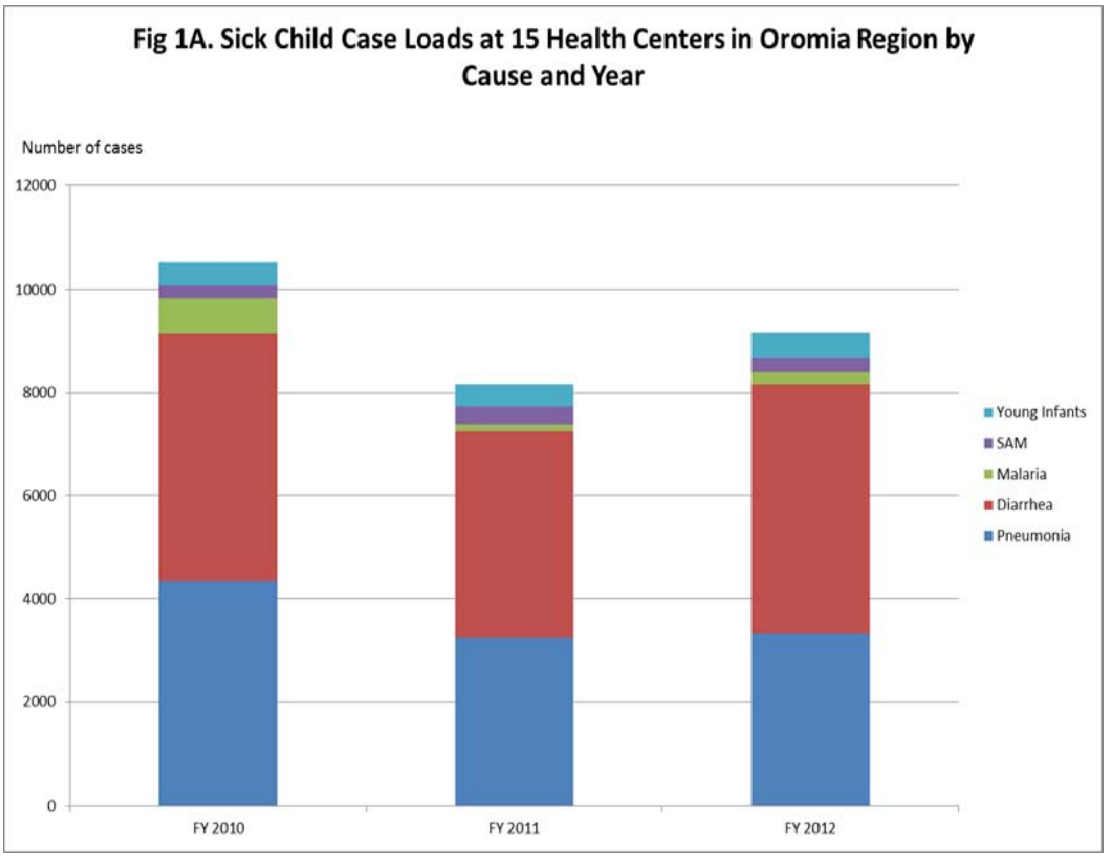
Ethical aspects. Study objective was explained, and verbal consent was obtained from the regional health bureaus, zonal heath offices, woreda health offices, and health workers.

RESULTS

Characteristics of health centers (HC). Eight (29%) HCs had a single IMNCI-trained health worker, and 20 (71%) had two or more. iCCM service started in 2010, 2011 and 2012 in the catchment areas of 5, 15 and 8HCs, respectively.

Trend of caseloads. The sick child caseload at the surveyed HCs totaled 67,207 over the three years. Specifically, the 28 HCs saw 21,443 sick children in 2010, 20,882 in 2011, and 24,882 in 2012 .

Trend of classifications. Overall, the proportionate morbidity was pneumonia (32%), diarrhea (41%), malaria (19%), Severe Acute Malnutrition (SAM) (4%), and sick young infant (4%).These proportions were stable before and after iCCM introduction (Figure 2). The patterns varied slightly by region (Figures 1A-1C). For example, malaria was the leading diagnosis in SNNPR, followed by pneumonia and diarrhea, where as pneumonia and diarrhea were the leading diagnoses in Tigray and Oromia. Classifications for SAM or sick young infants were uncommon in all three regions.



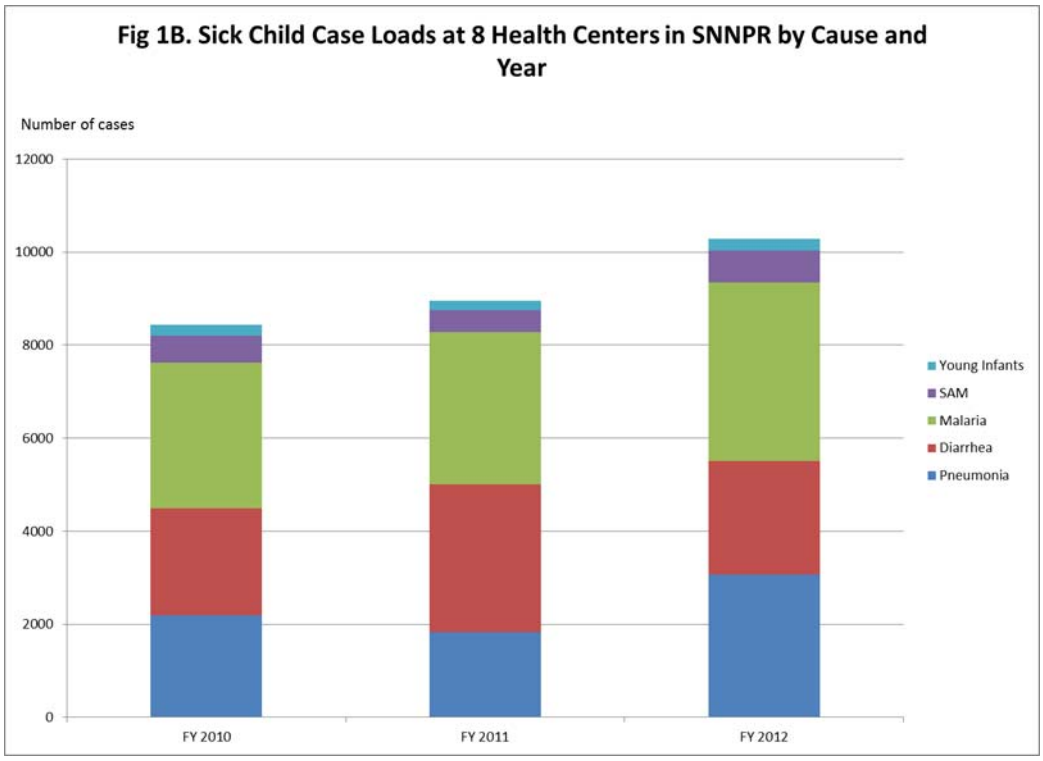


Fig 1B. Sick Child Case Loads at 8 Health Centers in SNNPR by Cause and Year
Number of cases
12000
10000
8000
6000
4000
2000
0
FY 2010
FY 2011
FY 2012
Young Infants
SAM
Malaria
Diarrhea
Pneumonia

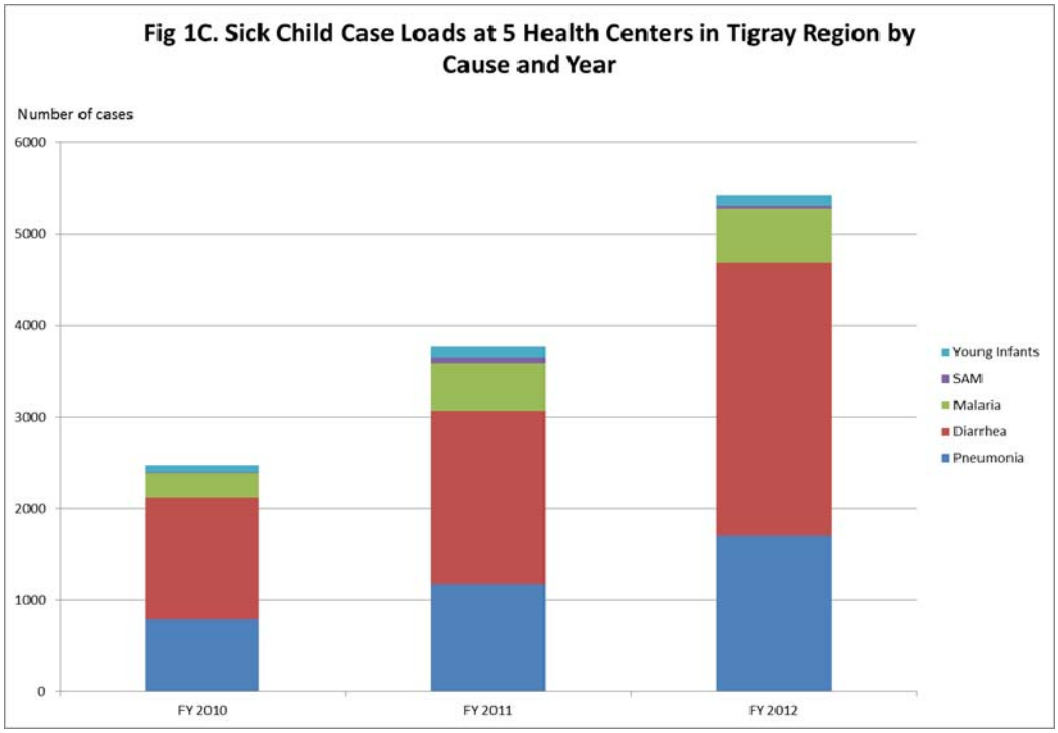
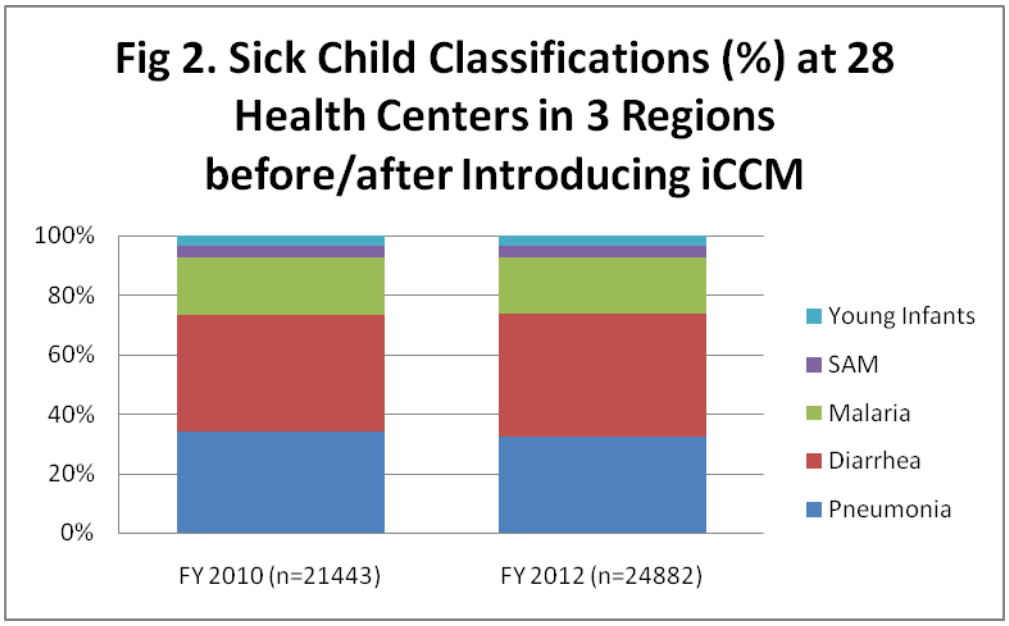


Fig 1C. Sick Child Case Loads at 5 Health Centers in Tigray Region by Cause and Year
Number of cases
6000
5000
4000
3000
2000
1000
0
FY 2010
FY 2011
FY 2012
Young Infants
SAM
Malaria
Diarrhea
Pneumonia



Quality of service. We were able to identify and assess two thirds of the planned sample of cases (268/392, [68%]) by register review, on average 9.5 per HC (Table 1). Some classifications (feeding problem/underweight and low birth weight/preterm) were difficult to find. Three quarters of the sample (75.2% [200/266]) consisted of children 2-59 months of age. Regarding the steps of case management, health workers' performance was best for assessment, followed by counseling, and weakest for treatment or follow-up. This pattern applied to both young infants and older children. Regarding the latter, health workers' recorded management for diarrhea/dehydration, and especially for SAM, was weaker than for pneumonia and diarrhea. Regarding young infants, health workers performed a bit better for feeding problems or underweight than for the other two syndromes.

The quality of care at these 28 HCs was not as good as what we observed by the same methods at 554 HPs in 2012 (Table 2). However, eight of the HCs only had a single IMNCI-trained provider, and all providers used the same registers. With the exception of consistency between classification and assessment for pneumonia (97 vs. 88% for HC vs. HP, respectively), all other indicators favored the HP, especially of consistency between classification and treatment for diarrhea and malaria.

Table 1. Consistency between Classification and Other Case Management Steps at Health Centers through Register Review (n=266)

Age Group (months)	Classification (n)	Classification consistent with (%)			
		Assessment	Treat-ment	Counseling	Follow-up
2-59	Pneumonia (58)	97	78	78	83
	Malaria (36)	86	67	81	69
	Diarrhea/Dehydration (58)	76	45	74	50
	Severe Acute Malnutrition (48)	56	56	60	44
	Weighted average (200)	79	62	73	62
<2	Possible Serious Bacterial Infection (40)	75	43	53	38
	Low Birth Weight and/or Preterm (7)	43	71	71	29
	Feeding Problem or Underweight (19)	95	74	84	74
	Weighted average (66)	77	55	64	47

Table 2. Consistency of Case Recording at Health Centers vs. Health Posts (2012)

Study	Classification consistent with assessment (%)			Classification consistent with treatment %		
	Pneumonia	Diarrhea	Malaria	Pneumonia	Diar-rhea	Malaria
IMNCI (28 health centers, 2013)	97	76	86	78	45	67
iCCM (554 health posts, 2012)	88	92	93	86	80	91

DISCUSSION

The number of sick children seen at HCs increased modestly (16%) from 21,443 in 2010 to 24,882 in 2012, before and after iCCM implementation The morbidity profile did not change. Health workers' performance in recording case management was uneven, ranging from near perfect (for assessment of pneumonia [97%] and young infant feeding problems or underweight (95%]) to disappointing (for following up low birth weight or preterm [29%] or SAM [44%]).

HCs saw an average of 64, 62, and 74 children/HC/month in 2010 ,2011 and 2012, respectively. Assuming a catchment population of about 25,000 per HC (of which about 14.6% [3650] are under five years), this yields annual sick child treatment rates of 0.21, 0.20, and 0.24 episodes/child/year for 2010, 2011 and 2012, respectively (17).

The increase in HC case load was similar to that reported in Nicaragua (11) and Sierra Leone (12), but differed from the decrease observed in Borana Zone (13). The decrease in the latter probably resulted from families opting for iCCM care closer to home (for those who *could* access HCs) and from fewer severe cases requiring referral due to the earlier treatment afforded by iCCM.

The experience was from a single remote *woreda* (district) where geographic access to HCs was extremely challenging, so an increase in HC use would have been unexpected. Even though, the HC use increased from 0.21 to 0.24 episodes/child/year, it is still far below the total expected morbidity (estimated episodes/child/year) of 3.37 proposed by of Pharmaceutical Fund and Supply Agency to quantify medicine needs for iCCM: 0.27 (pneumonia), 0.10 (malaria in malarious kebeles), and 3.0 (diarrhea) (15). Of course, the calculation of treatment ratios should include HP services, which might comprise the bulk of encounters.

The quality of care at HCs improved compared to findings from a 2008 survey, except for treatment of dehydration. The HC-HP difference is all the more remarkable because the HP assessment was before the Performance. Review and Clinical Mentoring Meetings (PRCMM) that others have shown to significantly improve recording performance (15,18). Reasons for this differential performance could include the likelihood that the HP Health Extension Workers (a) received more support than health workers, (b) were more recently trained in iCCM than health workers were in IMNCI, or (c) had more job aids than health workers, e.g., HP walls covered with flip-chart reminders.

Our study has limitations. We do not have levels of service use at the HPs in the HCs' catchment areas during the same period, which would allow more complete characterization of use. Similarly, we lack information about use of non-government sources of case management; however, these are usually low in rural Ethiopia (16).This research does not attempt to show a causal association between iCCM and IMNCI; however, a stratified analysis of HC phenomena by duration of iCCM (and year for quality) may have been informative. Register review is, at best, a proxy for actual quality (16). Some of the rare cases we reviewed may have antedated introduction of iCCM. We used internal personnel to collect data (IMNCI health workers, iCCM facilitators and supervisors or IFHP staff), which may overestimate some indicators. A few selected HCs were either remote or not implementing IMNCI, which required substituting other HCs from the same district, but this should not bias the findings.

In summary, we observed that use of IMNCI services at HCs did not drop with the introduction of iCCM and that quality of IMNCI needs improving. Since HCs treat cases referred from HPs and also supervise them, HC staff must have better knowledge and skill. They need training, supervision, and support from woreda and zonal health offices. Lessons learned from iCCM, e.g., PRCMM, can be adapted for HC use to strengthen quality.

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ORIGINAL ARTICLE

EFFECT OF INTEGRATED COMMUNITY CASE MANAGEMENT OF COMMON CHILDHOOD ILLNESSES ON THE QUALITY OF MALARIA CASE MANAGEMENT PROVIDED BY HEALTH EXTENSION WORKERS AT HEALTH POSTS

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ABSTRACT

Introduction*: The Integrated Family Health Program supported the government of Ethiopia to implement the Integrated Community Case Management (iCCM) strategy to control childhood illness of which malaria is a major cause.*
Objective*: To assess the effect of iCCM training on quality of malaria case management at health posts.*
Methods*: A comparative cross-sectional study was conducted among 170 Health Extension Workers (HEW) providing either integrated or vertical malaria case management for children less than five years of age in 14 woredas (districts) of West Hararghe Zone using a multi-stage sampling procedure. HEWs in seven intervention woredas were trained in malaria case management and rapid diagnostic test (RDT) procedures through iCCM, and HEWs in comparison woredas were trained vertically through the national malaria control program. Performance was assessed using interview, review of registers, and observation of RDT procedure.*
Results*: Intervention HEWs performed better than their counterparts in correct drug prescription (90.8 vs. 81.0%, p=0.03), treatment duration (97.7 vs. 89.9%, p=0.001), and treatment schedule (95.4 vs. 75.9%, p=0.000). Intervention HEWs recorded case management with more consistency than their counterparts (≥ 80% consistency between: classification and assessment [23.0 vs. 3.8%; p=0.000], classification and treatment [24.1 vs. 7.6%; p=0.003], and classification and follow up [24.1% vs. 0.0%; p=0.000]); however, there is room for improvement.*
Conclusion*: ICCM training has a positive effect on the quality of malaria case management at the community level.*

INTRODUCTION

Globally, an estimated 3.3 billion people were at risk of malaria in 2011, with populations living in sub-Saharan Africa having the highest risk of acquiring malaria. Approximately 80% of cases and 90% of deaths are estimated to occur in the WHO African Region, with children under five years of age most severely affected (1).

Ethiopia's national Malaria Indicator Survey (MIS) of 2011 showed that malaria parasite prevalence in areas below 2,000 meters was 1.3% by microscopy blood-slide examination for all ages, with 1% of these *Plasmodium (P.) falciparum* and 0.3% *P. vivax* (2). According to the Federal Ministry of Health (FMOH), in 2009-10 malaria accounted for up to 12% of outpatient consultations and 10% of health facility admissions and was among the ten leading causes of inpatient death among children under five in Ethiopia (3).

The Health Extension Program (HEP) aims at achieving universal coverage of primary health care to make sure that all Ethiopians have equal access to health services. The program seeks to improve the health status of families by creating access to high impact preventive and curative health services in the households or at the health post (HP). Each *kebele* (the smallest administrative of 5000 people) has one health post, staffed with usually two female Health Extension Workers (HEWs). The HEW is a paid female

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community health worker with one year training, who provides 16 packages of essential preventive and promotive health services targeting households in the community plus some basic curative health services, including integrated community case management (iCCM), in the health post (4).

Access to prompt and effective treatment is a cornerstone of the current malaria control strategy, and the treatment policy recommends artemesinin combination therapy (ACT) as the first line drug to treat uncomplicated falciparum malaria and chloroquine to treat vivax malaria (5,6). Before introducing iCCM, the country moved quickly to scale up diagnostic testing for malaria at all levels of the public system, including the community, with the goal of achieving universal diagnostic testing for all cases of suspected malaria (6). However, studies revealed that a substantial portion of the population in rural areas practiced self-treatment and were at greater risk of inadequate diagnosis and treatment of malaria (6,7).

With the introduction of iCCM nationally in 2011, the country shifted from a vertical to an integrated training and case management strategy using iCCM algorithms that addressed the three main killer diseases of children: malaria, pneumonia and diarrhea (8). This equipped HEWs to assess, classify and treat children with pneumonia, uncomplicated malaria, and diarrhea and to identify and refer children with severe illness. Many studies in Africa showed the advantage of integrated vs. single disease training in increasing treatment coverage (9-15), but few showed contrary findings on the quality of care achieved through integrated vs. single disease training approaches (16-18). We know of no report from Ethiopia comparing the effect of iCCM vs. vertical community case management on quality of service provided at community level. The purpose of this report is to assess the effect of iCCM on the quality of malaria case management at health posts (HP) through HEWs and to provide a basis for future program improvement in the country.

METHODS AND MATERIALS

Design: This was a comparative cross-sectional health facility survey**.**

Setting: We conducted the survey from August 1-30, 2012 in West Hararghe Zone after 18 months of iCCM implementation. West Hararghe is in eastern Oromia and its capital, Chiro, is 326 km from Addis Ababa. The total population of the zone as projected from 2007 census report is 2,104,447 in 16 *woredas* (districts) of which 14 are rural. About 90% of the zone is either malarious or potentially malarious, and all the population in these areas is at risk of infection.

***Intervention*:** The Integrated Family Health Program (IFHP) had trained nearly all HEWs (391/400 [98%]) in intervention *woredas* with the standard 6-day iCCM course to treat cough, diarrhea, fever (malaria), and malnutrition with the algorithm and supportive materials adapted in 2011 from the facility-based strategy of Integrated Management of Neonatal and Childhood Illness (IMNCI) strategy. At the end of training, each HEW received essential commodities, including those for malaria case management. On site supportive supervision and *woreda* performance review meetings were also conducted to ensure the availability of necessary supplies, reinforce skills, and collect information. IFHP and government had also trained most HEWs (446/483 [92%]) in non–intervention *woredas* in vertical malaria case management and RDT procedures using national guidelines for three days, and the malaria activities at HPs were supervised and reviewed by staff from *woreda* health offices or health centers integrated with other activities.

***Subjects, sample size and sampl*ing:** Fourteen rural *woredas* of the zone were divided into intervention and comparison *woredas* based on the existence and non-existence of iCCM**.** Further, the *kebeles* were stratified into malarious vs. non-malarious. The sampling frame included 306 functional HPs in malarious *kebeles*. The sample size was calculated using a Fleiss JL statistical formula used to determine sample size needed to detect a difference between two proportions (28). We assumed 43% and 65.7% adherence to correct treatment of confirmed malaria cases in the comparison and intervention sample, respectively, based on MIS 2007 survey report for levels of correct treatment of confirmed malaria cases in Ethiopia (19).

This study was powered to test 10-20% differences in levels of indicators for quality of malaria case management between two areas based on MIS 2007 study finding (19). The assumptions (alpha 0.05, power 0.8, and margin of error 10%) yielded a sample size for intervention and comparison *woredas* of 90 and 80 HEWs from an equal number of HPs, respectively. We selected by lottery one of the two HEWs at each HP – if two were present. We aimed to randomly select at least five malaria classifications per HP from the under-five treatment register to as-

sess the consistency of malaria case management.

***Variables*:** The dependent variables were: RDT procedure according to standard for selected indicators; correct administration (drug, schedule and duration) of anti-malaria drugs for identified malaria cases; and consistency of recording of sick children among assessment, classification, treatment and follow up. We also measured HEW demographic characteristics, availability of essential supplies and logistics, links with community, and monitoring. We measured RDT performance through direct observation (volunteers or actual cases), treatment through HEW interview, and consistency through register review—all recommended approaches for assessing the quality of provider performance in developing countries (20).

***Field methods*:** To maximize availability, HEWs were informed of the date of visit; sometimes an appointment for a second visit was required. We used structured, pre-tested questionnaires. We adapted a checklist for register review from iCCM supervision Form C developed by UNICEF and WHO. We reviewed 91 registers (43 intervention and 48 comparison), which yielded 348 malaria classifications and compared against the gold standard iCCM algorithm. The remaining 75 registers (46 interventions and 31 comparisons) were not reviewed either due to incomplete information or no malaria cases registered within the last 12 months. We interviewed 166 HEWs (87 interventions and 79 comparisons) to assess knowledge. During the interview HEWs were allowed to use supportive documents. The survey team also interviewed HEWs and inspected HPs for availability of essential supplies and drugs. The surveyors followed the observation checklist adopted from national RDT procedure guideline for 20 critical steps. Observers noted whether the HEW performed each step correctly, incorrectly, or not at all. Team supervisors reviewed all forms before departing. Any errors were discussed and if possible, interviewers would re-ask the identified question(s) to correct errors.

***Analytic approach and biostatistics analysis, including data handling*:** Data were double-entered into a Microsoft Access database, checked for discordance and then exported to SPSS, version 20, for cleaning and analysis. Descriptive statistics for frequency and a Pearson chi square test (X^2) for two sided p-value at the 0.05 level was used to determine statistical significance. Our general approach was to compare performance of intervention vs. comparison HEWs/ HPs; however, we also restricted analysis for consistency of recording to those HEWs who only re-

***Ethical aspects*:** The study received ethical approval from Oromia Regional Health Bureau Committee and verbal consent was obtained from study participants.

RESULTS

Characteristics of HEWs: We assessed 166 HEWs from 166 HPs, 87 (52.4%) from the intervention and 78 (47.6%) from the comparison *woredas* with a 98% response rate (Table 1). Apart from training, HEWs in both groups were similar. HEWs' age averaged 23 years in both areas, ranging from 20 to 30 years in intervention and from 19 to 28 in comparison *woredas*. Most respondents (84.9%) were from the Oromo ethnic group, and about half (53.0%) were Orthodox Christians. Most HEWs attained 10 years of formal schooling (94.3 vs. 86.0% in intervention vs. comparison *woredas*, respectively), and all had graduated from the Technical and Vocational Education Training (TVET) on average four years prior to the survey (Table 1).

The *kebeles* in each group had similar total population (4561 vs. 4611 in intervention vs. comparison *kebeles*, respectively). HEWs reported on average that they were supported by 15 volunteer CHWs, ranging from two to 42. Far more intervention than comparison HEWs reported receiving iCCM training (95.4 vs. 4.6%). On the other hand, more comparison than intervention HEWs reported receiving vertical malaria case management training (94.9 vs. 64.4%). On other hand, 57/166 (34.3 %) of HEWs of the whole sample had received both kind of the training.

Table 1: Background characteristics of HEWs, West Hararghe Zone, August 2012

Characteristics	Intervention *woredas*	Comparison *woredas*	Total	2-sided p-value
Age in years				
≤ 24	67 (77.0%)	57 (73.4%)	124 (74.7%)	0.59
> 24	20 (23.0%)	21 (26.6%)	40 (24.1%)	
Marital status				
Union	56 (64.4%)	49 (62.0%)	105 (63.3%)	
Not in union	31 (33.3%)	30 (36.7%)	61 (34.9%)	0.44
Educational status (Grade)				
10+1	83 (95.4%)	74 (93.7%)	157 (90.4%)	
10+2	2 (2.3%)	0 (0.0%)	2 (1.2%)	
10+3	2 (2.3%)	5 (6.3%)	**7** (4.2%)	
Ethnicity				
Oromo	75 (86.2%)	66 (83.5%)	141 (84.9%)	0.40
Others*	12 (13.8%)	13 (16.5%)	25 (15.1%)	
Religion				
Orthodox Christian	47 (54.0%)	41 (51.9%)	88 (53.0%)	
Muslim	36 (41.4%)	35 (44.1%)	71 (42.8%)	0.91
Others**	4 (4.6%)	3 (3.8%)	7 (4.2%)	
Have house for residence in place of work				
Yes	58 (66.7%)	52 (65.8%)	110 (66.3%)	
iCCM training				
Yes	83 (95.4%)	4 (5.1%)	87 (52.7%)	0.000
No	4 (4.6%)	74 (94.9%)	78 (47.3%)	
Any other malaria training, for example training on RDT				
Yes	56 (64.4%)	74 (94.9%)	130 (78.8%)	0.000
No	31 (35.6%)	4 (5.1%)	34 (21.2%)	
Total	87 (52.7%)	78 (47.3%)	165 (100%)	

*Amhara and Gurage, **Protestant and Catholic

***System Support*:** Overall, key commodities for malaria case management were commonly unavailable (Table 2). Only a quarter of HPs had malaria guidelines (24.1 vs. 26.8% in intervention and comparison HPs, respectively). As expected, iCCM service delivery standards and registers were available only in intervention *woredas*; 90.7% of iCCM *woredas* had an iCCM chart booklet (vs. 3.8% in comparison), and 98.9% had an iCCM register for sick children 2-59 months of age (vs. 0 in comparison). Intervention HPs were more likely than comparison HPs to have RDT (93.1 vs. 85.9%), and especially chloroquine (69.0 vs. 6.5%) and Coartem (83.9 vs. 44.9%). Comparison HPs were more likely than intervention HPs to have received supervision from the health center (HC) (53.2 vs. 40.2%) and from *Woreda* Health Office (70.1 vs. 49.4%) per quarter for the last one year. Both groups had high levels of performance review of malaria activities (90.8 vs. 87.3% for intervention and comparison HPs, respectively).

Table 2: Availability of essential commodities and system support activities at Health Posts , West Hararghe Zone, August 2012.

Characteristics	Intervention *woredas*	Comparison *woredas*	Total	2-sided p-value
Malaria related activities performance review meeting				
Yes	79 (90.8%)	69 (87.3%)	148 (89.2%)	0.618
Total	87 (52.4%)	79 (47.6%)	166 (100%)	
Availability of Malaria guidelines				
Yes	21 (24.1%)	20 (26.8%)	41 (25.0%)	0.463
Availability of iCCM chart booklet				
Yes	78 (90.7%)	3 (3.8 %)	81 (49.4%)	0.000
Total	87 (53.0%)	77 (47%)	164 (100%)	
Availability of iCCM register for children 2mon to 5 Years				
Yes	86 (98.9%)	0 (0.0%)	86 (58.9%)	0.000
Total	87 (59.6%)	59 (40.4%)	146 (100.0%)	
Availability of other registers for malaria cases for U5 years				
Yes	14 (16.5%)	69 (89.6%)	83 (51.2%)	0.000
Total	85 (52.5%)	77 (47.5%)	162 (100.0%)	
Availability of RDT				
Yes	81 (93.1%)	67 (85.9%)	148 (89.7%)	0.103
Availability of Coartem				
Yes	73 (83.9%)	35 (44.9%)	108 (65.5%)	0.000
Total	87 (52.7%)	78 (47.3%)	165 (100.0%)	
Availability of Chloroquine				
Yes	60 (69.0%)	5 (6.5%)	65 (39.6%)	0.000
Total	87 (53.0%)	77 (47.0%)	164 (100.0%)	
Supportive supervision from HC to HPs				
Yes	35 (40.2%)	42 (53.2%)	77 (46.4%)	0.005
Supportive supervision from WorHO to HPs				
Yes	43 (49.4%)	54 (70.1%)	97 (59.1%)	0.065
Total	87 (53.0%)	77 (47.0%)	164 (100%)	

***Quality of malaria case management*:** Four HEWs in each group (8/163) performed all 20 RDT steps correctly; however, intervention HEWs overall outperformed their counterparts (≥80% correct RDT procedures: 39.1 [34/ 87] vs. 21.0% [16/76], respectively, p = 0.006), especially in the important steps of writing the patient's name on the test, allowing the alcohol to dry before pricking the finger, recording time, and reading the RDT results (data not shown). Intervention HEWs prescribed the correct anti-malaria drug (Coartem) for RDT-confirmed PF malaria more commonly than comparison HEWs (90.8 vs. 81.0%, respectively, p=0.05) (Table 3). Likewise, Table 4 shows that intervention HEWs were more likely than their counterparts to recommend the correct Coartem treatment duration (97.7 vs. 89.9%, p= 0.03) and daily schedule (95.4 vs. 75.9%, p=0.001) and the correct chloroquine treatment duration (86.2 vs. 65.4%, p=0.005) and daily schedule (51.7 vs. 24.1 %, p=0.000).

Table 3: Health Extension Workers' anti-malarial prescription **,** West Hararghe Zone, August 2012.

Variables	Intervention *woredas*	Comparison *woredas*	Total	2-sided p-value
Drug of choice to treat PF malaria				
Coartem	79 (90.8%)	64 (81.0%)	143 (86.1%)	
Other antimalarial drugs*	8 (9.2%)	15 (19.0%)	23 (13.9%)	0.05
Total	87 (52.4%)	79 (47.6%)	166 (100%)	
Drug of choice to treat PV malaria				
Other antimalarial drugs**	39 (44.8%)	46 (59.7%)	85 (51.8%)	0.04
Chloroquine	48 (55.2%)	31 (40.3%)	79 (48.2%)	
Drug of choice to treat malaria due to mixed infections				
Coartem	52 (59.8%)	42 (54.5%)	94 (57.3%)	0.303
Other antimalarial drugs*	35 (40.2%)	35 (45.5%)	70 (42.7%)	
Total	87 (53.0%)	77 (47%)	164 (100%)	

*Chloroquine and both Coartem and chloroquine (combined treatment)
**Coartem and both chloroquine and Coartem (combined treatment)

Table 4: Health Extension Workers' knowledge of anti-malaria drugs administration, West Hararghe Zone, August 2012.

Variables	Intervention *woredas*	Comparison *woredas*	Total	2-sided p-value
Coartem				
Treatment duration (days)				
1	1 (1.1%)	0 (0.0%)	1 (0.6%)	
2	0 (0.0%)	2 (2.5%)	2 (1.2%)	
3	85 (97.7%)	71 (89.9%)	156 (94.0%)	0.029
4 or more	1 (1.1%)	6 (7.6%)	7 (4.2%)	
Daily schedule				
1	2 (2.3%)	5 (6.3%)	7 (4.2%)	
2	83 (95.4%)	60 (75.9%)	143 (86.1%)	0.001
3 or more	2 (2. 3%)	14 (17.7%)	16 (9.6%)	
Chloroquine				
Treatment duration (days)				
1	2 (2.3%)	0 (0.0%)	2 (1.2%)	
2	1 (1.1%)	1 (1.3%)	2 (1.2%)	0.005
3	75 (86.2%)	54 (65.4%)	129 (77.7%)	
4 or more	9 (10.3%)	24 (30.4%)	33 (19.9%)	
Daily schedule				
1	45 (51.7%)	19 (24.1%)	64 (38.6%)	
2	31 (35.6%)	28 (35.4%)	59 (35.5%)	0.000
3 or more	11 (12.6%)	32 (40.5%)	43 (25.9%)	
Total	87 (52.4%)	79 (47.6%)	166 (100%)	

Examination of the registers showed that intervention HEWs recorded with greater consistency than their counterparts (≥ 80% consistency between: classification and assessment [23.0 vs. 3.8%; p=0.000], classification and treatment [24.1 vs. 7.6%; p=0.003], and classification and follow up [24.1% vs. 0.0%; p=0.000]; however, none of the levels were satisfactory (Table 5).

Moreover, HEWs who had had *only* iCCM training recorded three times more consistently then HEWs who had had *only* vertical malaria management and RDT training for: assess vs. classify (34.8 vs.13.0%) and classify vs. stated follow-up date (38.1 vs. 9.5%) (Table 6).

Table 5: Health Extension Workers' consistency of malaria case management by study group, West Hararghe Zone, August 2012.

≥ 80% consistency between classify and…	**Intervention HEWs (n=87), %**	**Comparison HEWs (n=79), %**	**Difference, %**	**2 sided p- value**
Assessment	23.0	3.8	19.2	0.000
Treatment	24.1	7.6	16.5	0.003
Follow-up date	24.1	0.0	24.1	0.000

Table 6: Health Extension Workers' consistency of malaria case management by types of training, West Hararghe Zone, August 2012.

≥ 80% consistency between classify and…	**HEWs trained in iCCM only (n=30), %**	**HEWs trained in malaria only (n=74), %**	**Difference, %**	**2-sided p-value**
Assessment	34.8	13.0	21.8	0.04
Treatment	18.5	29.6	-11.1	0.566
Stated follow-up date	38.1	9.5	28.6	0.03

DISCUSSION

Intervention HEWs and HPs outperformed their counterparts in correct prescription and administration of anti-malaria drugs. They achieved this even though HEWs and HPs in comparison *woredas* had similar or even greater levels of supervision, performance review, and mentoring. Intervention HEWs and HPs were more likely to have antimalarial drugs and job aids.

Intervention HEWs' better performance is not surprising because iCCM training builds the capacity of HEWs to systematically assess, classify and treat multiple diseases, including uncomplicated malaria during both classroom and practical sessions. Moreover, hands-on practical sessions at the health facility also reinforce HEWs' case management knowledge and skills. Studies in Africa indicate that CHWs can provide good quality service when trained to systematically assess, classify, treat and refer severe cases of major causes of mortality among under-fives (13,14,21,22).

Similar studies also emphasized the importance of job aids to guide CHWs to correctly administer antimalaria drugs (21-24). In this study the availability of job aids (iCCM algorithms and registers) probably had a role in increasing the malaria case management performance of intervention HEWs. Moreover, the simplicity and comprehensiveness of the algorithm and registers guide HEWs, step by step, to adhere to standards. Our findings are also consistent with studies that showed that CHWs could provide good quality service for sick children when they used an integrated algorithm or other decision-making tools (27, 28).

Studies from Tanzania, Senegal, and Kenya indicated that CHWs who were systematically trained to manage multiple diseases with overlapping signs provided higher quality service than CHWs trained to manage only a single disease (16, 18, 25-27). Restricting analysis to HEWs who only received one type of training suggested that performance was better after iCCM than vertical training, but the numbers were small. This may be attributed to differences in classroom and practical training, and availability of algorithm and comprehensive register.

Intervention HPs were more likely to have essential supplies, including medicines, probably because intervention HEWs received commodities at the end of iCCM training with regular re-supply through iCCM logistics. Moreover, an association between greater availability of essential supplies and quality of care would not be surprising since supplied HEWs would be more likely to actually deliver case management, use the algorithm, and record in the register—all of which reinforce skills.

The study has limitations. Some registration books were incomplete. Data collectors were health professionals from the study zone, which may have influenced responses but probably not differentially between intervention and control HPs. Moreover, we attempted to assign data collectors to other than their home *woredas*. Informing the HEWs of the day of visit may have exaggerated performance, but again probably not differentially. Finally, HEWs' training experience in both groups, especially the intervention group, was often contaminated by more than one type of training. However, our restricted analysis, though the numbers were small, supports the overall conclusions.

In summary, this report provides evidence for the benefit of integrated training, available drugs, and job aids and registers that recapitulate the steps of case management on the quality of case management of malaria.

To obtain more result and achieve more success, the government`s direction of training all HEWs on iCCM through implementation iCCM program in all woredas is an important measure. In addition, the study team recommends the availability of simplified and comprehensive job aids (iCCM algorithms) and registers to reinforce and guide HEWs, step by step to adhere to the standards.

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ORIGINAL ARTICLE

FACTORS INFLUENCING THE LOW UTILIZATION OF CURATIVE CHILD HEALTH SERVICES IN SHEBEDINO DISTRICT, SIDAMA ZONE, ETHIOPIA

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ABSTRACT

Background: *Use and coverage of curative interventions for childhood pneumonia, diarrhea, and malaria were low in Ethiopia before integrated community-based case management (iCCM).*
Objectives: *To examine factors accounting for low use of iCCM in Shebedino District applying a "Pathway to Survival" approach to assess illness recognition; home care; labeling and decision-making; patterns of care-seeking; access, availability and quality of care; and referral.*
Methods: *Shortly after introduction of iCCM, we conducted five studies in Shebedino District in May 2011: a population-based household survey; focus group discussions of mothers of recently ill children; key informant interviews, including knowledge assessment, with Health Extension Workers at health posts and with health workers at health centers; and an inventory of drugs, supplies, and job aids at health posts and health centers.*
Results: *The many barriers to use of evidence-based treatment included: (1) home remedies of uncertain effect and safety that delay care-seeking; (2) absent decision-maker; (3) fear of stigma; (4) expectation of non-availability of service or medicine; (5) geographic and financial barriers; (6) perception of (or actual) poor quality of care; and (7) accessible, available, affordable, reliable, non-standard, alternative sources of care.*
Conclusion: *Only a system-strengthening approach can overcome such manifold barriers to use of curative care that has not increased much after iCCM introduction.*
Key Words*: Ethiopia, child health, community health worker, community case management, care seeking, access*

INTRODUCTION

Even with the availability of life-saving interventions, patients must first utilize those interventions in order for those programs to achieve impact. Population-based surveys and service statistics reveal low utilization of curative services for children in Ethiopia, both before and after introduction of integrated community-based case management (iCCM) (1). These data are especially puzzling given the large investment in iCCM through the Health Extension Program, and given that the formal private sector is not a major alternative source of care in rural settings, which is typical for much of Africa (2). The 2011 Ethiopia Demographic and Health Survey, reflecting pre-iCCM conditions, reported low levels of appropriate care-seeking for cough and fast or difficult breathing (27%), fever (24.2%) and diarrhea (31.8%) (3). Service statistics tell a similar story. A 2010 pre-iCCM review of the annual experience of 293 health posts (HP) showed low utilization, with 39% treating no diarrhea cases and 60% referring no ARI cases (4).

The United States Agency for International Development Child Survival and Health Grant Program supported Save the Children (SC), who partnered with government health services (October 2007-September 2012) to control childhood pneumonia, malaria, and diarrhea and neonatal infection in Shebedino and Lanfero Districts in Ethiopia's Southern Nations, Nationalities and Peoples' Region (SNNPR). The main implementation strategy was the same in each district: case management through Integrated Management of Newborn and Childhood Illness at health centers (HCs) and iCCM at HPs—plus health systems support and demand creation. SC tracked service statistics throughout the project (Table 1). At baseline (2008), pre-iCCM, use of curative services was far lower in Shebedino than in Lanfero District (46 vs. 319 episodes/1000 children/year). By mid-term (2010), also pre-iCCM, utiliza-

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tion increased, but Shebedino's all-cause encounter rate was still one eighth of that in Lanfero (168 vs. 1399 episodes per 1000 children per year, respectively). SC trained Shebedino's Health Extension Workers (HEW) in iCCM in December 2010 and facilitated two Performance Review and Clinical Mentoring Meetings in December 2011 and Feb 2012. During the project final evaluation (2012), a register review of four HPs and three HCs in Shebedino yielded an all-cause sick child encounter rate of only 190/1000 children, a modest increase over the 2010 value.

In developing countries, health seeking behavior and health care services utilization are associated with physical, socio-economic, cultural, and political factors, as well as child age and gender, women's autonomy, urban or rural residence, economic status, severity of illness, availability of physical infrastructure, type and cadre of provider. Low levels of appropriate use of health services for sick children were recently documented by Miller et al. in Ethiopia and by Hodgins in a review of national household surveys of 42 low income countries (5,6).

The evaluation team recommended an in-depth analysis to identify the cause(s) for such under-utilization in Shebedino District by examining: household illness recognition; home care; labeling and decision-making for care outside the home; care-seeking; and service accessibility, availability, and quality. The purpose of this report is to present these findings.

MATERIALS AND METHODS

We conducted five studies in May 2011 (after iCCM training, but before mentoring) in each of Shebedino District's six supervision areas (SA): a population-based household survey, focus group discussion of mothers of recently ill children, key informant interviews with Health Extension Workers (HEWs) at Health Posts (HPs) and health workers (HW) at Health Centers (HCs), and a health facility inventory. Shebedino District (estimated total population 268,700, projected from 2007 census) is in Sidama Zone in eastern SNNPR.

Household Survey We used the Lot Quality Assurance Sampling (LQAS) method and randomly selected 19 households from each of the district's six supervision areas (SAs). We interviewed 114 mothers with children <12 months of age (19 randomly selected in each of six SAs) about demographics, illness recognition, home treatment, care-seeking, referral, cultural beliefs, and access. Six experienced, trained data collection teams of two interviewed 9-10 households daily with an Amharic questionnaire and pre-agreed Sidaminya terms and triple-checked forms in the field. Data were double-entered into SPSS (SPSS for Windows, Version 16.0, 2006, Chicago, USA). We calculated point values of summary indicators.

Focus Group Discussions We randomly selected *kebeles* from SAs – three near to Leku (3-8 km), the main district town, and three far from Leku (10-18 km) using a random number table. To select far *kebeles*, we used the list of *kebeles* obtained from District Health Office (DHO). To select the near *kebeles*, we listed all *kebeles* near Leku, the main district town. We restricted the sample to *kebeles* with well-performing HEWs (regular reporting and good relations with the district health team and HC); thus, as necessary we randomly re-sampled until we achieved the required number meeting these criteria. We facilitated discussions among 60 mothers who had sick children in the past three months (10 mothers in each of six groups from six *kebeles*, one in each SA). We inquired about illness recognition, home care, labeling and decision-making, and care-seeking for children 2-11 m and <2 m, reported elsewhere (5). Three teams of a facilitator and note-taker debriefed with the study manager nightly. Responses were entered in Excel and analyzed by topic and subtopic.

Key Informant Interview: We interviewed six HEWs, one at each HP in the six *kebeles*; and we interviewed six HWs who led or worked in the under-5 clinic at each of the district's six HCs, inquiring about service access; availability and use; registration completeness; technical knowledge; and referral.

Ethical Consent: Mothers were told of the purpose of the survey/interview and assured of the confidentiality of their responses. They had the right to refuse to participate, but none did. They were interviewed in private to assure frank discussion.

Inventory After interviewing the providers, we inspected their iCCM registers for recording consistency and inspected the availability of 12 medicines, seven functional case management equipment items, and six case management job aids. We entered qualitative responses in Excel (Windows 7, Microsoft Corporation, Washington, USA) and analyzed by topic, and quantitative responses were analyzed to inform summary indicators. A sick child record was *consistent* if the assessment, classification, and treatment were in agreement.

RESULTS

Reported Morbidity The household survey sample (n=114) consisted of slightly more boys than girls (53.5% vs. 46.5%) with the expected age distribution (3%<2 months, 48% 2-5.9 months, 49% 6-11.9 months). Just over half the mothers (51.8% [59/114]) reported having attended school.

Surveyed mothers reported that, in the prior fortnight, more than a third of their children a had fever, for 30% of whom they sought care outside the home, with half going to a traditional healer (Table 2). One child initially brought to a traditional healer failed to improve and was taken to HP, after which he recovered. The five who received treatment at the HP reported satisfactory care, i.e., available, friendly, quick, clean, private, and in mother's language. Mothers reported fewer children with cough and difficult or rapid breathing, for only a quarter of whom indicated they sought outside care. When five children did not improve, their mothers returned to the HP, and three were successfully referred to a HC. In all cases, treatment (reportedly an antibiotic) was likewise satisfactory.

Mothers reported a similar number of children with diarrhea, 41% of whom sought care outside the home, mainly to a HP or private pharmacy. One mother who brought her child to the HP was unsatisfied due to an insufficient examination.

Illness Recognition: Most mothers (69.3% [79/114]) knew two or more illness signs requiring care outside the home. In the focus groups, they reported: diarrhea, fever, malaria, cough, difficult breathing, malnutrition, swollen body, and vomiting.

Table 1: Use of Curative Services (episodes/1000 children/year) by Project Phase and District

Syndrome	Pre-iCCM				Post-iCCM
	Project Baseline Oct-Dec 2008*		Project Mid-Term Jul 2009-Jun 2010*		Project End line Aug 2011-Jul 2012
	Lanfero District	Shebedino District	Lanfero District	Shebedino District	Shebedino District**
Pneumonia	76	19	465	46	
Diarrhea	106	20	287	49	
Malaria	137	10	647	73	
Total	319	49	1399	168	190

*From joint monitoring of health posts and health centers by Save the Children and health facility staff. **From register review of four health posts and three health centers by evaluation team

Table 2: Care-Seeking by Syndrome in Past 2 Weeks Prior to the Survey (n=114 caregivers)

Syndrome	Prevalence, n (%)	Care Outside Home, n (%)	First Source of Care, n			
			Health Post	Health Center	Pharmacy	Traditional Healer
Diarrhea	32 (28.0)	13 (40.6)	5	1	4	3
Cough	34 (29.8)	9 (26.5)	3	1		5
Fever	40 (35.1)	12 (30.0)	5	1		6

Home Care: Mothers' reported home care varied across illnesses and *kebele*. Examples of home care included (a) for fever: *michchete tagichcho* leaf tea; (b) for stomach cramp: boiled *sinkurita* (Amharic: *tena adam*) leaf tea; (c) for diarrhea: boiled, pounded eucalyptus tea and boiled *dengetenya* root tea; (d) for diarrhea with vomiting: milk; (e) for inability to breastfeed: throat scratching; (f) for *botota* (swelling of body or part): massage; (g) for measles*:* hot fluid; (h) for unknown illness (*dengetenya*): garlic, boiled medicine wood and any available tablet; and (i) for *fancho* (body rash, sunken fontanel, visible blood vessels on face, head and sometimes abdomen, irritability, wasting, diarrhea and vomiting): *amessa*, a medicinal tree, the leaf, bark, or root of which is boiled and administered orally. Mothers also reported giving additional food, milk, gruel, boiled sugar, and breastmilk to sick children, and hot fluids for colds. Members of one of the six focus group discussion (FGD) abandoned traditional medicine, except for massage for swelling.

"Labeling" and Decision Making Mothers from all FGD listed similar conditions requiring care outside the home: inability to breastfeed; fever; cough, difficult breathing, or grunting; diarrhea – especially with blood, stomach cramps, vomiting; sunken eyes, inability to walk; eye infection; swollen body; malnutrition; unconsciousness; malaria; sore throat; milk teeth needing extraction; and unknown disease. The decision-maker for outside care was the husband. Consultation with neighbors could suffice were he unavailable. However, two groups insisted that only the husband could decide if payment for care was required.

Access: The distances from the HCs to the furthest *kebeles* in their catchment area varied (5-20 km, mean: 9.5 km) with a walking time ranging from 50 minutes to four hours. Barriers to care varied by the health system level (Table 3). Cost was a concern, even when there was no financial cost for HP services. Five of the six HEWs had recommended a referral to a family that could not afford it, and most families did not comply. HEWs occasionally contributed money if a case was critical. One respondent petitioned the district administration for a letter for free HC treatment. Another respondent tried to mobilize a local committee (*Idir*) and religious institutions for money to save the life of the sick child. Non-economic, non-geographic barriers included concerns about availability of treatment, quality of care, and neighbors' criticism.

Table 3: Barriers to Accessing Health Facilities for Sick Child Care

To Health Post	Referral from Health Post to Health Center	To Health Center	Referral from Health Center to Hospital
Distance, lack of transport	Financial cost	Distance	Financial cost
Seasonal harvest rain, river flooding		Financial cost	Hospitals are where people die
Financial cost		Lack awareness of benefit of modern treatment	
Non-availability of drugs		Long waiting time for service and treatment	
Reluctant husbands		Tablets instead of injections	
Likelihood of a self-cure		Concerns about health worker competence	
Weakness of sick child			
Fear of being seen and risking "evil eye"			
Mothers of malnourished children reluctant because people could say the family was poor or the mother was unable to care for her children.			

Care-Seeking: Nearly three-quarters of surveyed mothers (72.8%) reported having sought religious leaders, mainly for prayers, for continuously crying, irritable children; for evil eye; and for unknown illnesses, as well as commonly recognized syndromes (Table 4). Mothers preferred prayers when they had little money. Fewer (43.9%) reported having sought traditional healers. Mothers in FGD reported, "Traditional healers are well experienced and their hand is in medicine," but "their equipment is not clean and transmits disease." Many mothers (38.6%) reported having used private providers for largely the same reasons. Mothers in FGD noted that families also took sick children to private providers for diseases needing urgent treatment, and for swollen lymph nodes. Private providers had high prices, but reliably available and varied drugs, fast service, and injections, with guaranteed availability compared to HPs that closed on weekends. Similarly, many mothers (40.4%) reported using drug sellers, especially for diarrhea and stomach cramp, and cough.

Service Availability: Hours of operation at the six HPs were generally Monday-Friday 0900-1700 excluding an hour for lunch, with some variation due to scheduled field activities.

In the month prior to the research, four of the six HPs were closed for more than four days (mean: 8.3 days) for personal reasons and for participating in *Health Services Expansion Program* activities. The off-hours approach to a sick child varied: some HEWs said that families had to wait until regular hours; others were willing to see after-hours children, assuming the HEW resided in the community. Five of the six HEWs had identified sick children during household visits in the prior month. They noted the difficulty of providing iCCM at the household because they lacked the chart booklet, register, and drugs; thus, they advised families to bring the child to HP. But two HEWs said that they could manage a sick child since they had memorized the case management protocol, carried drugs in their bag, took notes, and transferred the information to the registers upon returning to their HP. Availability of essential medicines was worse on the day of assessment (64%; range 50-75%) than for the prior month (74% without stockout). The availability of job aids at HPs was good (86%; range: 67-100%) as was the availability of equipment (84%; range 71-86%), the gap mainly due to lack of newborn Ambu bags (Table 5).

Table 4: Patterns of Care-Seeking by Syndrome and Health Care Provider

	Syndrome					
Provider (% informants ever using)	Fever/ Malaria	Cough and difficult or fast breathing	Diarrhea	Irritability, inconsolable crying, "evil eye"	Other	Note
Religious leader (72.8)	Yes	Yes	Yes	Yes	Injury, unknown illness (*fancho*), unconsciousness, epilepsy, headache, developmental delay	Treatment is prayer; often 1st option (free)
Traditional healer (43.9)	Yes	Yes	Yes	Yes	Not breastfeeding, stomach cramp, rash, unknown frequent illness, milk teeth extraction, swelling, inability to breathe	Treatment is often massage, including for chest indrawing, inability to breathe, swollen body and stomach cramps
Private provider (38.6)	Yes	Yes	Yes		Unable to walk, rash, stomach cramp, headache; anything needing urgent treatment; swollen lymph nodes	High prices, available, varied drugs, fast service, injections,
Drug seller (40.4)	Yes	Yes	Yes		Stomach cramps	Treatment, not case management

Service availability at HCs was similar to HP, except that HWs were on duty for emergency services after hours. In the prior month, two of the six HWs were away for more than five days, but there was no interruption of service. Availability of medicines was about the same on the day of assessment (74%; range 50-100%) as for the prior month (71% without stockout; Table 5). The availability of case management equipment was worse than at HPs (70%; range 50-100%), the gap mainly due to lack of timers to count seconds. The job aids (83%; range: 80-100%) were generally available, except for Outpatient Therapeutic Feeding Program (OTP) Cards and Family Health Cards.

Service Quality Consistent case recording in the six HP registers was low (55% [33/60]; range: 0-100%; Table 5). On the other hand, HEW knowledge was generally good across a range of technical areas. Registers did not capture all sick children. For example, HEWs recorded malnourished children in the OTP register, not the iCCM register. Reports should compile all cases, but multiple registers challenged completeness. One HEW treated childhood diarrhea without recording. Another failed to record when the workload was hectic or when a seriously ill child presented. In the month prior to the survey, two HEWs specified not registering 14 patients.

Consistent case recording for the last 10 cases in the six HC registers was also low (35% [21/60]; range: 0 -60%; Table 5). However, HW IMCNI knowledge was nearly perfect across many topics. As at HPs, HWs did not enter all sick children in the register, especially after hours when they entered cases in the Emergency Register or when an untrained HW was covering under-5 clinic.

Table 6: Facilitators and Barriers to Evidence-Based Curative Care by "Pathway to Survival" Step

Step	Facilitators	Barriers
Illness recognition	Mothers collectively reported a lengthy list of illness signs, and 69% knew >2 signs	Individuals' knowledge is incomplete.
Home care	Additional fluids and feeding for illness	Varied and complex array of possibly delaying home care of uncertain effectiveness and safety
Labeling and decision-making	Good list of indications. Husband makes the decision, but neighbors can advise in his absence.	Husband *must* make decision about expenditure which is challenging if he is not present
Access to and availability of care in community	90% live within 5 km of health post and usually two HEWs. Almost always religious leaders (free), traditional healers and less commonly private providers (injections) and drug sellers.	Occasional seasonal barriers and perceived financial barriers to HP. Non-availability of drugs, HEW.
Quality of care in community	No information that quality of non-HEW providers' care is unacceptable, but the technical quality of care by religious leaders, traditional healers and drug sellers is suspect.	Uncertain perceived quality of HEW; technical quality in iCCM not strong.
Access to and availability of referral care to health center	Continuously available	Seasonal barriers; cost for transport and treatment;
Quality of care at health center	Better availability of curative drugs than recording in register	Long waiting time for evaluation and then treatment; tablets (not injections); "poor approach"; technical quality in iCCM not strong (perhaps worse than at HP)
Referral	Definitive care	Cost. Hospitals are where people die.

Table 7: A Health System Approach to Increase Use of Curative Interventions

Health System Component	Achievement	Possible Next Steps
Coordination and Policy Setting	Health Extension Program; iCCM (including pneumonia) at HP level	Define and test approaches to deliver iCCM to hard-to-reach *kebeles*; review roles of non-governmental providers (informal and formal) in case management
Costing and Financing	HC gives free treatment to poorest of poor if family has letter from *kebele* administration, in which case district administration reimburses HC for cost of treatment	Define and test approaches to subsidize further the cost of care and transport and opportunity cost for the poorest of the poor.
Human Resources	HEWs and HWs trained in evidence-based case management (IMCI)	Identify and train selected private providers and drug sellers in iCCM; sensitize religious leaders and traditional healers in iCCM
Supply chain management	Prioritized as an urgent need because "no drugs = no program"	Innovate urgently. Community mobilization to demand drugs
Service Delivery and Referral	Primary Health Care Unit	Mobilize *kebele* administration (Health Sector Command Post) to assure uninterrupted availability of service.
Communication and Social Mobilization	Health Development Army, Family Folder	Identify and engage "satisfied customers" of HP or HC services to promote their appropriate use
Supervision & Performance Quality Assurance	Integrated Supportive Supervision; partners' iCCM supervision	Sustain and strengthen the already good supervision. Public recognition for HEWs who perform iCCM well
M & E and Health Information Systems	National HMIS tracks treatments and includes a iCCM indicator (% HP with iCCM)	Quantify the under-reporting of case management. Simplify reporting. Test mobile phone applications.

DISCUSSION

This *Pathway to Survival* study illustrates many barriers (Table 6) that prevent families from achieving good care for their sick children (7). These include a familiar list of (a) home remedies of uncertain effect and safety that may delay definitive care-seeking; (b) inability to seek care with real or imagined financial implications outside the home due to an absent decision-maker; (c) reluctance to seek care because of stigma, or concern about non-availability of the service, or medicine at supposed sources of evidence-based care, e.g., at HP or HC; (d) inability to seek care due to geographic or financial barriers; (e) legitimate concerns about the perceived or technical quality of HP or HC care; and (f) accessible, available, affordable, acceptable sources of alternative care, each of which seemed able to handle most major childhood syndromes. These findings are all the more notable because the *kebele* selection criteria presumed above average HP-HC-district links.

Positively, mothers did report knowing illness signs and reported giving increased feeding and fluids during illness. Moreover, the actual under-utilization of curative services is likely to be less than service statistics suggest because of non-documentation of some, but perhaps many, cases. The quality of HC and HP care has likely improved since this rapid study because iCCM seems to improve the quality of HC care (8). Furthermore, mentoring and supportive supervision, which had yet to occur, has been shown to increase the quality of iCCM (9,10).

The findings from our SNNPR study are consistent with those from a more recent (2012-13) and larger (16 focus groups and 78 in-depth interviews) study from Oromia that examined care-seeking for sick children, barriers, and local solutions (11). The authors reported greater levels of maternal decision-making compared to our study. Barriers were financial, geographic, informational, socio-culturo-religious, and facility deterrents. Recommended local solutions included multi-channel messages about child illness and treatment, and assuring availability of HEW and medicines.

Our findings are also consistent with post-iCCM service statistics (Table 1). SC also supported iCCM scale up in Oromia, Amhara and other districts in SNNPR. An examination of all 36,830 cases in 2012 from 622 health posts in 31 supported districts showed persistently low treatment rates (per 1000 children per year) for malaria (11.9), severe uncomplicated malnutrition (20.3), pneumonia (21.2), and diarrhea (29.2), yielding 82 episodes per 1000 children per year (12). How can the certainly low utilization of curative services for sick children be increased? Unfortunately, these findings do not point to a single approach. McGorman *et al*. proposed an 8-component health systems approach to iCCM (Table 7) (13). Illustrative approaches informed by this framework range from supply to demand to policy.

Our report has limitations. We evaluated low utilization before iCCM was introduced and/or mature. However, HEWs had been able to treat some childhood illness before iCCM. Moreover, Tadesse *et al*. showed generalized low use of curative services at 622 health posts after introduction of iCCM (83 encounters/1000 children/year, ranging from 47 in Oromia to 108 in SNNP) (12). Resource limitations precluded study in both Shebedino and contiguous Lanfero District. Perhaps we studied the wrong district in that Lanfaro's "normal" use seems to have been the exception. Other limitations arose largely from resource constraints. For instance, our small sample size limited confidence in the precision and representativeness of the findings. We did not seek local solutions as Shaw *et al.* did. We did not conduct in-depth interviews with mothers, which may have encouraged reporting less conformist views. We did not explore political dimensions of the Health Extension Program, which could theoretically influence the availability of and/or the demand for HEW services.

Nonetheless, we provide a theory-based, systematic assessment of low utilization in Shebedino District. A manifold challenge is presented. We recommend strengthening promotional activities through DHO, HWs, HEWs and Health Development Army (HDA) to improve appropriate health care seeking by mothers and caregivers. In addition, DHO and health facilities should ensure the regular supply of essential drugs and medical equipment, the completeness and consistency of registers and reports, and a strengthened referral system.

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ORIGINAL ARTICLE

ASSESSMENT OF THE MONITORING AND EVALUATION SYSTEM FOR INTEGRATED COMMUNITY CASE MANAGEMENT (ICCM) IN ETHIOPIA: A COMPARISON AGAINST GLOBAL BENCHMARK INDICATORS

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ABSTRACT

Background. *Program managers require feasible, timely, reliable, and valid measures of iCCM implementation to identify problems and assess progress. The global iCCM Task Force developed benchmark indicators to guide implementers to develop or improve monitoring and evaluation (M&E) systems.*

Objective. *To assesses Ethiopia's iCCM M&E system by determining the availability and feasibility of the iCCM benchmark indicators.*

Methods. *We conducted a desk review of iCCM policy documents, monitoring tools, survey reports, and other relevant documents; and key informant interviews with government and implementing partners involved in iCCM scale -up and M&E.*

Results. *Currently, Ethiopia collects data to inform most (70% [33/47]) iCCM benchmark indicators, and modest extra effort could boost this to 83% (39/47). Eight (17%) are not available given the current system. Most benchmark indicators that track coordination and policy, human resources, service delivery and referral, supervision, and quality assurance are available through the routine monitoring systems or periodic surveys. Indicators for supply chain management are less available due to limited consumption data and a weak link with treatment data. Little information is available on iCCM costs.*

Conclusion. *Benchmark indicators can detail the status of iCCM implementation; however, some indicators may not fit country priorities, and others may be difficult to collect. The government of Ethiopia and partners should review and prioritize the benchmark indicators to determine which should be included in the routine M&E system, especially since iCCM data are being reviewed for addition to the HMIS. Moreover, the Health Extension Worker's reporting burden can be minimized by an integrated reporting approach.*

INTRODUCTION

In 2011, 60 of the Countdown to 2015 priority countries were implementing integrated community case management of childhood illness (iCCM) programs (1). Among many implementation challenges, country programs struggle to monitor and measure implementation and overall progress in iCCM. Program managers require feasible, timely, reliable, and valid measures of iCCM implementation to identify problems and assess progress. Additionally, good quality data are needed as a basis for reports to stakeholders, including donors, at national and international levels. Evaluators and researchers require better indicators of iCCM implementation to help explain evaluation and research results.

To meet this demand, the Maternal and Child Health Integrated Program (MCHIP), with support from the United States Agency for International Development (USAID), convened a Global iCCM Task Force to provide resources for program implementers. In 2010, USAID and partners developed the iCCM

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Benchmark Framework, a program planning tool that outlined 70 steps spanning eight components to assist program managers to design, introduce and scale up iCCM (2). The eight components of the iCCM Benchmark Framework are: 1) coordination and policy setting; 2) costing and financing; 3) human resources; 4) supply chain management; 5) service delivery and referral; 6) communication and social mobilization; 7) supervision and performance quality assurance; and 8) M&E and health management information systems (HMIS) (3). In 2012, the Task Force finalized a set of 47 iCCM benchmark indicators to guide implementers when developing or improving monitoring and evaluation (M&E) systems. The 47 indicators, the focus of this paper, complement the 70 benchmarks by defining standard metrics to measure strength of implementation and progress towards results.

Ethiopia has implemented iCCM of common childhood illnesses since 2010 (5). Health Extension Workers (HEWs) provide preventive, promotive, and basic curative services to under-five children in rural areas treating diarrhea, pneumonia, severe acute malnutrition, and malaria through health posts. The Federal Ministry of Health (FMOH) is still refining and rolling out the M&E system, and will soon integrate iCCM data into the national HMIS. The aim of this report is to assess Ethiopia's iCCM M&E system against global benchmark indicators.

This study was funded by the United States Agency for International Development under the Translating Research into Action Cooperative Agreement No. GHS-A-00-09-00015-00.

MATERIALS AND METHODS

Design, setting and subjects: The TRAction iCCM-IDIP (Improving Data to Improve Programs) group developed standard methods and benchmark indicator assessment tools, which were adapted for the Ethiopia context (6). We conducted a desk review of iCCM national policy documents, implementation strategy and guideline documents, M&E plans, monitoring tools and reports, survey reports, and the national health information system (HIS) implementation and reporting documents. We also conducted key informant interviews with Ministry of Health representatives supporting the national iCCM program, lead technical officers from implementing partners, and technical experts who support the national HIS and contribute to the global child survival strategy in Ethiopia. A consultant collected data during the fourth quarter of 2013 supported by Save the Children with technical assistance and oversight from the IIP-JHU.

Variables and analysis We categorized indicators by data source (Box).

Benchmark indicator categories

Type 1: Indicators measured through routine sources and expected to be available over time at the facility, district, and regional levels, in most cases. These indicators are primarily for use by program managers.

Type 2: Indicators measured through household surveys or other special studies that are collected periodically for use by both program managers and national stakeholders. Some indicators can be measured both routinely and periodically (considered as both Type 1 and Type 2 indicators).

Type 3: National milestone indicators assessed through document reviews and key informant interviews. These are not collected regularly and are closer to program milestones than to traditional indicators.

From the desk review and interviews, we detailed the routine M&E system components and summarized how partners engage in routine iCCM monitoring. We assessed the availability and feasibility of data collection for the iCCM Task Force benchmark indicators. We assessed which iCCM indicators were currently collected in Ethiopia and which indicators *could* be collected, given the available data, tools and partner plans. For each indicator we recorded the source of indicator data whether existing or planned; and for those indicators currently not being collected, we investigated challenges to collecting them. The indicators were then color-coded: green indicates that the data for the indicator are currently available; yellow indicates data for the indicator are potentially available either through planned data collection or with modification to existing system; and red indicates the data for the indicator are not available and there is no clear plan to collect.

Ethics This activity was submitted to the Johns Hopkins University Institutional Review Board (IRB) and considered non-human subject research and exempt from IRB review. A written letter of support from Save the Children International, Ethiopia Office was submitted to the partner organizations and verbal consent was obtained from each respondent.

RESULTS

We conducted 18 key informant interviews, including nearly all partners (10/11) supporting implementation of iCCM or the M&E system; and we reviewed 32 documents.

M&E system overview: The Maternal and Child Health Directorate of the MOH, supported by implementing partners, developed, introduced (in 2010), and scaled up a routine system for reporting iCCM program data from the health posts to the central level.

Indicators: The FMOH, with input from UNICEF and other technical working groups, proposed 27 national indicators to measure iCCM implementation. The current HMIS lacks some key iCCM indicators for children under five, such as the proportion with diarrhea treated with ORT or treated with zinc, the proportion with pneumonia treated with antibiotics, the proportion with fever tested for malaria and the proportion of those with positive tests treated with an anti-malarial, and the proportion whose weight is monitored. The FMOH is in the process of developing guidelines to incorporate these.

Data flow and management: Table 1 shows the main forms used at health posts, their purpose, and how the information is reported. There are several reporting paths: through NGOs to the FMOH and through the *woreda* (district) health office, zonal health departments, and regional health bureaus to specific departments of the FMOH, such as the Pharmaceuticals Fund Supply Agency (PFSA). The MOH indicators are collected through the routine reporting systems on a monthly or quarterly basis.

Each health post is meant to receive a quarterly Performance Review and Clinical Mentoring Meeting (PRCMM), which provides data on quality of care, service utilization, drug/supply stocks, and other information that is compiled and submitted to PRCMM iCCM database (supported by implementing partners) and reported to the FMOH (7).

Table 1: Routine monitoring tools, purpose and reporting

iCCM Program Tools	Purpose	Reporting
iCCM Monthly Report (*Forms A1,A2 and A3*)	Tracks iCCM training and clinical mentoring for HEWs, supervisors and facility staff.	Databases kept by UNICEF and partners and reported to the FMOH.
iCCM Activity Register	Job Aid for the HEW.	Kept at HP; monitoring forms extract information.
Supportive Supervision Report/ *Form C*	Information on cases treated, quality of care through register review, drug/supply stocks and other information.	Collected during the PRCCM meetings.
iCCM Supervision Checklist	Used by the *woreda* health office to track training, iCCM provision and other indicators at the HP.	Entered in a database at the *woreda* level.
Health Post Monthly Report and Re-supply Form (consumption)	HP reports on drug and supply stocks.	Submitted to the *woreda*/ health facility. Aggregated reports are sent to PFSA and entered into LMIS for replenishment.

Monitoring human resources: UNICEF and the FMOH developed and maintained a database that includes the HEW iCCM trainings, clinical mentoring by PRCMM, and lists and maps of iCCM implementing partners. *Form A1* details HEW training, *Form A2* details iCCM training of HEW supervisors, and *Form A3* details IMNCI training of health facility workers. The purpose of the database is to track process indicators (inputs, activities, outputs) for these trainings. The database includes individual level identifiers, such as name, cell phone number, date of iCCM training, date of clinical mentoring visits, competency acquisition, and other information. Implementing partners produce a quarterly activity report that is reported to the FMOH.

Sick child registers: Each health post uses two iCCM registers to record their curative and promotive activities during sick child encounters, one for young infants <2 months and one for children 2-59 months. The registers record the classification, treatment, outcome, follow-up, referral, and immunization status. Information from the registers is primarily reported through the PRCMM quarterly meetings and supportive supervision report.

Supervision: The FMOH and partners developed a standard supervision training package for the iCCM program that includes training manual and supporting materials. The iCCM Supervision Checklist (F*orm C*) includes: key issues from the previous visit, availability of drugs and supplies, appropriate storage of drugs and supplies, consistency of data in register against reports, classification-treatment consistency as a proxy of service quality, appropriateness of referral, knowledge of HEW, main positive findings, weaknesses, and summary of feedback. The checklist is completed quarterly; however, coverage gaps occur. Partners enter data into a *woreda* database for use at national, regional, zonal and district levels. All partners implementing iCCM are now expected to use a standard form, after early inconsistency.

Supply chain management: At the end of the iCCM training, HEWs receive a training kit until the PFSA provides the starter kit. *Form C*—completed by the supervisor—reports the HEW consumption of iCCM medicines and supplies. In addition, the HEW counts each drug and supply at the end of each month, fills the section on the *Health Post Monthly Report and Re-supply Form* (HPMRR), and submits it to the catchment health center or *woreda*.

The aggregated consumption reports from districts are sent to PFSA regional hubs and entered to the Logistic Management Information System (LMIS) and/or to the regional health bureaus. Replenishment is based on demand. However, the supply-chain management system is not yet strong. UNICEF, working with FMOH, has developed an interim "push" strategy to distribute essential iCCM supplies while developing a long-term "pull" system.

Availability and feasibility of collecting benchmark indicators: Table 2 summarizes iCCM benchmark indicator availability by component and whether they are feasible to collect regularly. Currently, Ethiopia collects data to inform most (70% [33/47]) iCCM benchmark indicators, and modest extra effort could boost this to 83% (39/47). Eight (17%) are not available given the current system. Most indicators that track coordination and policy, human resources, service delivery and referral, supply chain management, supervision, and quality assurance are available through the routine monitoring systems, either through the partner or FMOH monitoring systems or periodic surveys. Data on human resources are collected through HMIS or available in government administrative databases. Most of the information on service delivery and referral, supply chain management, supervision, and quality assurance is available through partner-supported monitoring exercises, such as the PRCMM. Most of the supply chain management information comes from the *Form C* and other parallel partner databases.
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Table 2: iCCM Indicator Availability and Feasibility in Ethiopia (NM = National Milestone; SS = Special Study; RM = Routine Monitoring)

Component	Indicator (data source)	Data Availability	Feasible to collect
Component 1: Coordination and Policy Setting	iCCM policy (NM)	Yes, described in 2010 national implementation plan iCCM.	Yes, but unlikely to change once 'Yes' value achieved.
	iCCM coordination (NM)	Yes, described in 2010 national implementation plan iCCM.	Yes, should be reviewed every year as required.
	iCCM partner map (NM)	Yes (map available).	Yes, list of partners implementing iCCM program maintained by UNICEF and updated every year.
	iCCM target areas defined (NM)	Yes (areas defined by MOH).	Yes, outlined in iCCM implementation plan document and iCCM M&E plan.
Component 2: Costing and Financing	Annual iCCM costed operational plan (NM)	Yes (costed plan for three years developed in 2010).	Yes, MOH-led amendment of such plans annually is incorporated in to the comprehensive plan of FMOH.
	iCCM national financial contribution (SS)	No.	Resource dependent – but could be estimated from annual FMOH report as it relates to HSDP-IV target and by interviewing partners.
	Expenditure (1): iCCM proportion of disease program (SS)	No.	Resource-dependent but could be indirectly found on the annual Health and health related indicator* bulletin. National Health Account (NHA) could bring data on expenditure related to under five morbidity. NHA 2013 is under finalization.
	Expenditure (2): Average iCCM expenditure per capita (child) by disease program (SS)	No.	Resource dependent, but estimated per capita by disease in the national iCCM implementation plan. The 2013 NHA could bring in this data.
	Expenditure (3): Average per iCCM contact (SS)	No.	Resource dependent and challenging to obtain but estimated cost is set in the national iCCM implementation plan

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Component 3: Human Resources	Training strategy (NM)	Yes, 2010 national implementation plan of iCCM and iCCM training manuals and materials.	Yes, should be reviewed every 3 years until achieved.
	iCCM Health Extension worker Density (HEW) density[§] (RM)	Yes, through MOH and partner databases.	Yes, the HMIS collects ratio of (trained and untrained) HEW to population. Catchment area population will be available when the Family Folder system is fully implemented. Data also available through partner databases (*Form A*).
	Targeted HEWs providing iCCM[§] (RM)	Yes, district health office and partners.	Yes, able to track annually through the MOH administrative data and partners *Form A* and iCCM database.
	Annual iCCM HEW retention (RM/SS)	Yes, through MOH and partner databases. No special studies planning to collect.	Yes, annual retention is tracked by HMIS. Partners also track how many of their trained HEWs are still active by *Form A* and iCCM database.
Component 4: Supply Chain Management	Medicine and diagnostic registration (NM)	Yes (all iCCM medicines and diagnostics registered except Amoxicillin).	Yes, medicine and diagnostics registration documents are captured at Pharmaceutical Fund and Supply Agency (PFSA) for replenishment kits and UNICEF.
	Medicine and diagnostic availability (RM/SS)	Partial, for HPs receiving supervision with *Form C*; also available through partner stock management reports and periodic surveys.	Yes, but supervision needs to be 100% and standardization of reporting is required across each partner. Training kit supply managed by UNICEF and implementing partners. Replenishment kit supply managed by PFSA and reported accordingly.
	Medicine and diagnostic continuous stock (RM/SS)	Partial, for HPs receiving supervision with *Form C*; also available through partner stock management reports and periodic surveys.	Yes, but supervision needs to be 100% and standardization of reporting is required across each partner. Data captured through partners and UNICEF stock management report and supportive supervision report.
	Medicine and diagnostic storage (RM/SS)	Partial, for HPs receiving supervision with *Form C*. Not collected through special studies.	Yes, but supervision needs to be 100% and standardization of reporting is required across each partner.
	Medicine and diagnostic validity (RM/SS)	Partial, for HPs receiving supervision with *Form C*. Not collected through special studies.	Yes, but supervision needs to be 100% and standardization of reporting is required across each partner.

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Component 5: Service Delivery and Referral	iCCM treatment rate[§] (RM)	Yes, iCCM Treatment register (*Form C*) and Health Post Monthly Disease Report Form reports on monthly consumption data.	Yes, the HEWs set annual target for iCCM treatment coverage against which the treatment rate is measured and reported. The revised registers and reporting forms will ensure that iCCM treatments are disaggregated by age and sex. Catchment area population available through Family Folder system.
	Case load by HEW(RM)	No, only aggregated numbers of treated cases are reported. Not by HEW.	Yes, possible to collection through special studies.
	Referral rate (RM)	Yes, through periodic surveys and routine reporting.	Yes, periodically through HF surveys but also through *Form C* Supportive supervision report.
	Treatment coverage (SS)	Yes, regional and zonal through periodic surveys.	Yes, through regional surveys and partner surveys for pneumonia, diarrhea, malaria and SAM cases.
	iCCM treatment coverage by HEWs (SS)	Yes, captured through national and partner surveys.	Yes, captured through national and partner surveys.
	First source of care (SS)	Yes, captured through national and partner surveys.	Yes, captured through national and partner surveys.
	Follow up rate (SS)	Yes, through periodic surveys and routine reporting.	Yes, periodically through HF surveys but also through *Form C* Supportive supervision report extracted from the iCCM register
	Successful referral (SS)	No.	Not feasible with current system. Incomplete and incorrect recording at health centers is a barrier.
Component 6: Communication and Social Mobilization	Communication strategy (NM)	Yes, FMOH has a communication strategy as part of the HDA program. Partners such as UNICEF and IRC have also developed communication strategies for all health programs including iCCM.	Yes, should be reviewed every 1-2 years.
	Caregiver knowledge of HEWs (SS)	Yes, quality of services surveys by partner.	Yes, but only periodically through special surveys
	Caregiver knowledge of illness signs (SS)	Yes, quality of services surveys by partner.	Yes, but only periodically through special surveys.

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Component 7: Supervision and Performance Quality Assurance	Supervision strategy (NM)	Yes, 2010 national implementation plan of iCCM and supervision guidelines.	Yes, should be reviewed every 1-2 years.
	iCCM supervisor training (RM)	Yes, through MOH and partner training records.	Yes, data on number of HEWs and supervisors are captured through HMIS and *Form A2* (partner training report).
	HEWs to supervisor ratio (RM)	Partial, could be tracked by MOH and partner training records	Yes, could be calculated from HEWs' and supervisors' administrative and training records
	Routine supervision coverage (RM/SS)	Yes, regional through partner surveys; included in *Form C.*	Yes, reported through *Form C* and would be feasible for MOH to collect and report quarterly.
	Clinical supervision coverage (RM/SS)	Yes, regional through partner surveys and PRCCM database.	Yes, collected through special partner studies and routinely through PRCMM report.
	Correct case management (knowledge) (RM/SS)	Yes, regional through PRCCM.	Yes, collected through PRCCM.
	Correct count of respiratory rate (RM/SS)	Yes, through periodic surveys, but not routinely.	Yes, collected through partner surveys; may not appropriate to include in RM.
	Complete and consistent registration (RM/SS)	Yes, through periodic surveys and *Form C.*	Yes, this is collected through partner surveys and through *Form C.*
	Correct case management (observed) (SS)	Yes, quality of services surveys by partner.	Yes, but only periodically through special surveys.
	Appropriate RDT use (SS)	Yes, quality of services and caretaker adherence surveys.	Yes, but only periodically through special surveys.
	Appropriate prescribing practice for positive RDTs (SS)	Yes, quality of services and caretaker adherence surveys.	Yes, but only periodically through special surveys.
	Appropriate prescribing practice for negative RDTs (SS)	Yes, quality of services and caretaker adherence surveys.	Yes, but only periodically through special surveys.
	First dose (SS)	Yes, quality of service surveys by partner.	Yes, but only periodically through special surveys.
	Counseling quality (SS)	No.	Resource dependent.
	Correct referral (SS)	Yes, quality of service surveys by partner.	Yes, but only periodically through special surveys.

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Component 8: Monitoring & Evaluation and Health Information Systems	National monitoring and evaluation plan for iCCM (NM)	Yes, iCCM M&E plan includes indicators, tools, etc.	Yes, should be reviewed every 3 years until achieved.
	iCCM utilization indicators included in HMIS (NM)	Partial, HMIS does not currently include iCCM, but is under revision and will include community data.	Yes, should be reviewed every 3 years until achieved.
	District reporting (RM)	Yes, number of districts reporting completely and on-time is available.	Quarterly performance review meeting show this information.

*This is an annually produced bulletin, which publishes information on basic health indicators, health related MDG indicators, demographic and vital statistics, maternal and child health disease prevention and control (disaggregated by age and sex), assets, and proportion of health sector budget compared to the total budget for the country, among other information.

DISCUSSION

Ethiopia's iCCM M&E system collects much information through several channels. Many benchmark indicators are available or feasible to collect through routine monitoring or periodic surveys; however, the M&E system is fragmented, and the reporting burden is heavy. Information on costing indicators is scant, especially compared to training, supervision, and M&E. The supply chain management is not yet strong, and the plans for a *pull* system with tools and indicators are welcome.

Compared to findings from similar M&E system desk reviews conducted in Malawi, Mozambique, and Mali by the iCCM-IDIP, Ethiopia has more benchmark indicators available through the routine monitoring system and surveys (8-10). We also found more national documentation on the policies and strategies of iCCM and M&E implementation. The iCCM-IDIP found that parallel, non-standard partner M&E systems are not unique to Ethiopia. Other countries are working to integrate parallel systems into the national HMIS. Gaps in indicator data for supply chain management are another cross-country finding. Many indicators for service delivery, referral, supervision, and quality are available through the Ethiopian DHS or other smaller-scale partner surveys. National documentation of iCCM policy, coordination, and strategy is complete. However, little information is available on iCCM costing.
Our report has limitations. First, the benchmark indicators aim to provide a full picture on the status of iCCM implementation; however, they are guidelines for, not a definitive list of, required data for a successful M&E system. Some indicators may not align with country priorities, and others may be difficult to collect. The framework is limited for demand indicators, which is critical for Ethiopia where HP utilization is low (11). Second, we focused only on the indicator availability; however, assessing quality and use of data is essential. Finally, although we attempted to contact all implementing partners and review all relevant documents, we may have missed some relevant information.

Two opportunities lie ahead in Ethiopia. First, the FMOH has recognized the need to standardize and integrate tools and indicators among the many implementing partners (12). This will provide an opportunity to prioritize what data are needed to make decisions at each level and to reduce the reporting burden. Second, Ethiopia is integrating iCCM data into the HMIS. This also will require reviewing and prioritizing feasible benchmark and other indicators.

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For more information on TRAction's work, please visit http://www.tractionproject.org/.The findings of this study are the sole responsibility of the Institute for International Programs at Johns Hopkins University, and do not necessarily reflect the views of USAID or the United States Government

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ORIGINAL ARTICLE

MODELING POTENTIAL REDUCTION OF CHILD MORTALITY AFTER NATIONAL SCALE-UP OF COMMUNITY-BASED TREATMENT OF CHILDHOOD ILLNESSES IN ETHIOPIA

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ABSTRACT

Background. *Since 2010, 28,000 female health extension workers (HEWs) received training and support to provide integrated community based case management (iCCM) of childhood pneumonia, diarrhea, malaria, and severe malnutrition in Ethiopia.*
Objective. *We conducted a modeling exercise using two scenarios to project the potential reduction of the under five mortality rate due to the iCCM program in the four agrarian regions of Ethiopia.*
Methods. *We created three projections: (1) baseline projection without iCCM; (2) a "moderate" projection using 2012 coverage data scaled up to 30% by 2015 and (3) a "best case" scenario scaled up to 80% with 50% of newborns with sepsis receiving effective treatment by 2015.*
Results. *If the 2012 coverage gains (moderate projection) were applied to the four agrarian regions, we project that the iCCM program could have saved over 10,000 additional lives per year among children age 1-59 months. If iCCM coverage reaches the "best case" scenario, nearly 80,000 additional lives among children 1-59 months of age would be saved between 2012 and 2015.*
Conclusion. *High quality iCCM, delivered and used at scale, is an important contributor to the reduction of under five mortality in rural Ethiopia. Continued investments in iCCM are critical to sustaining and improving recent declines in child mortality.*
Key Words: *Ethiopia, child health, community health worker, and community case management, Lives Saved Tool*

INTRODUCTION

The national scale-up of integrated community based case management (iCCM) of common childhood illnesses began in 2010. The Government of Ethiopia and development partners trained and supported 28,000 female health extension workers (HEWs) to provide iCCM of pneumonia, diarrhea, malaria, and severe malnutrition by the end of 2012 (1).The primary objective of the initiative is to further accelerate the reduction of the under five mortality rate (U5MR) to reach or surpass Millennium Development Goal (MDG) 4 by 2015. The iCCM program began in the four agrarian regions (Oromia, SNNP, Amhara, and Tigray) in 2010, representing 85% of the total population, followed by the pastoralist regions (Benishangul, Gambella, Somali, and Afar).

The Lives Saved Tool (*LiST*) uses demographic projections and intervention efficacy measurements from the literature to model mortality changes based on baseline data and program targets (2,3). Several validation studies have found *LiST* to yield accurate projections of the expected mortality reduction due to maternal, newborn, and child health (MNCH) program scale-up (4). *LiST* projections have helped implementers identify high-impact interventions for stronger programs in Burkina Faso, Ghana, and Malawi (5). Recently, Onarhein and colleagues conducted a modeling exercise using *LiST* to explore the potential impact of MNCH intervention packages on U5MR in Ethiopia (6). The model predicted that scaling up 15 effective MNCH interventions to 90% could avert over 200,000 under five deaths every year in Ethiopia.

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This paper describes a *LiST* (ver 4.69) modeling exercise to project U5MR decline for two scenarios (a moderate and best-case scenario) of iCCM scale-up in the agrarian regions of Ethiopia to stimulate discussions with policy makers concerning iCCM program coverage, quality, and potential impact. With these two scenarios, we estimate the number of deaths among children under five, 1-59 months, and less than one month of age that could be averted per year by scaling-up community-based treatment of pneumonia, diarrhea, severe acute malnutrition (SAM), and malaria. Data were used from the 2007 and 2011 Malaria Indicator Survey (MIS), a 2011 baseline iCCM survey, the 2005 and 2011 Ethiopia Demographic and Health Surveys (EDHS), and 2012 household surveys carried out by the iCCM implementation partners.

METHODS AND MATERALS

Population Projection. The analysis is restricted to the agrarian regions since the iCCM program is still evolving in the urban and pastoralist regions. National, annual population trend data were obtained from the *UN World Population Prospects* for Ethiopia, which was based on the 2007 Ethiopian Population and Housing Census data (7). The national demographic and cause of death data were adjusted to reflect the rural population (8). The 2011 EDHS estimates the HIV prevalence among adults at 1.5%, so we did not consider it necessary to include the HIV module of *LiST*, which adjusts the mortality impact from program scale-up by projected HIV-related deaths (9). The 2011 baseline under five mortality estimates used in the analysis came from the UN Inter-agency Group for Child Mortality Estimation (IGME); these were last updated in 2013 (10). We used a cause of death model for under-fives adjusted for the rural population of Ethiopia similar to methods used in a similar study (8).

Baseline Data. Table 1 presents the baseline coverage data used in the *LiST* models. We entered rural mortality or health coverage data from the EDHS 2005 and 2011(9,11).Baseline coverage data related to malaria were obtained from the MIS 2007and 2011 (12,13). Vaccination data were entered from EPI Cluster surveys in 2006 and 2011 and the iCCM endline survey in 2013 (14-16). The baseline data were used as comparison in both iCCM projections.

"Moderate" Projection Data. In the iCCM "moderate" scale-up scenario, we aimed to project a more conservative model using recent iCCM household survey data. The iCCM utilization survey conducted by the L10K Project in the last quarter of 2012 covered 30 of 113 iCCM *woredas* (districts) in Tigray, Amhara, and SNNP Regions. Although this survey only covers a small portion of the iCCM regions, we aimed to calculate the projected U5MR if these coverage gains could be achieved in all pastoralist areas. The coverage of the iCCM program increased over baseline by the following percentages: Oral Rehydration Salts (ORS) 62.5%; zinc 4.2%; antibiotics for pneumonia and dysentery 14.8% and 18.4%, respectively; and malaria treatment 49% confirmed cases based on rapid diagnosis (17). The survey did not estimate SAM, so we used recent UNICEF program data to input an estimated coverage of 50% (personal communication, Tewoldeberhan Daniel, 2013, UNICEF Ethiopia). We then scaled-up this iCCM intervention coverage linearly to achieve at least 30% coverage by 2015. For interventions with coverage already higher than the target, the coverage was kept as is and not scaled down.

"Best Case" Projection Data. In the "best case" iCCM scale-up scenario, we projected the mortality reduction if 80% of children receive effective case management for pneumonia, diarrhea, malaria, and SAM, and 50% of newborns with sepsis receive effective treatment by 2015. Baseline coverage was increased linearly to their respective targets in 2015—targets set by the forthcoming Ethiopian government's roadmap for ending preventable maternal, newborn, and child deaths in a generation.

To estimate the mortality reduction due solely to the iCCM program, we present the projected U5MR reduction and number of lives saved adjusted by the reduction we would expect naturally over time based on other health programs outside of iCCM. The baseline projection was subtracted from the two iCCM scenarios to show the difference, or the lives saved due to the iCCM program only.

RESULTS

"Moderate" iCCM Scale-Up. In 2015, we would expect an U5MR of 84/1000 live births or a 6.6% reduction in the agrarian regions compared to no iCCM (U5MR: 90; Figure 1). By the end of 2015, if we assume that the gains measured by L10K were applied to the entire agrarian region of Ethiopia, the iCCM program would save an estimated 21,633 additional lives from pneumonia, diarrhea, malaria, and malnutrition among children aged 1-59 months, compared to the baseline before the national iCCM program (Table 2).

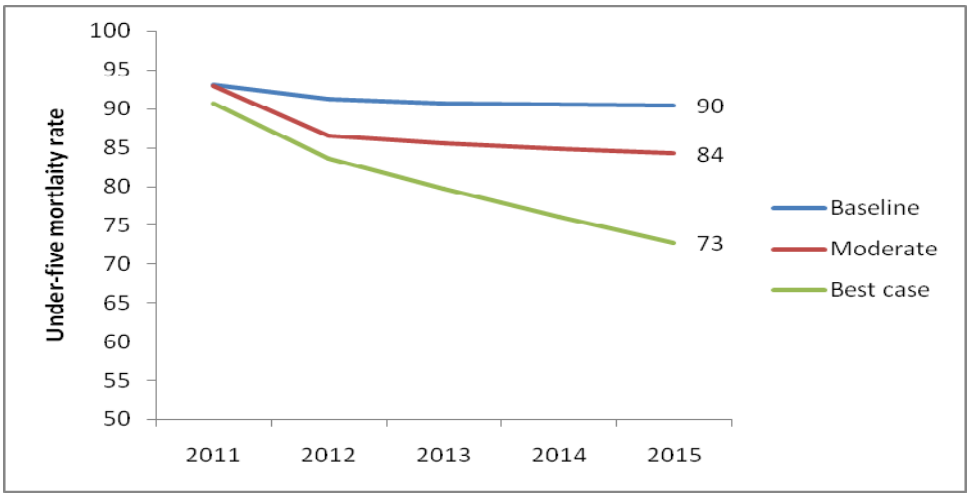

Figure 1: Projected trend of U5MR comparing a baseline scenario (no iCCM) with two intervention scenarios of iCCM scale-up.

"Best Case" iCCM Scale-Up. By the end of 2015, if the iCCM coverage reaches 80% and if the coverage of treatment for newborn sepsis reaches 50%, we would expect an U5MR of 73, an 18.9% reduction compared to without the iCCM program (U5MR: 90; Figure 1). An estimated total of 37,490 deaths could be averted among children aged 1-59 months of age between 2012 and 2015 if these gains were achieved in the four agrarian regions.

If we add all the deaths averted between 2012 and 2015 attributable to the iCCM program, the "best case" scenario can save nearly an additional 100,000 deaths among children 0-59 months, compared to just over 70,000 lives saved by the "moderate" or current iCCM program scale-up (Table 2). Since the best scenario projected 50% coverage rate of new-born sepsis, newborn deaths averted account for 18% of the total deaths averted, compared to only 4% of the moderate scenario (data not shown).

Table 1. Baseline indicators of selected MNCH interventions in the agrarian regions

Indicator	2011-2013	Source	2005/2006	Source
Pregnancy/childbirth				
ANC 4 or more visits	14.4	EDHS 2011	8.1	EDHS 2005
TT (Protected at Birth)[a]	65.0	EPI cluster survey 2012	63.0	EPI cluster 2006
Iron folate supplementation of pregnant women	11.8	EDHS 2011	10.3	EDHS 2005
Skilled attendant at delivery	4.0	EDHS 2011	4.8	EDHS 2005
Facility Delivery	4.1	EDHS 2011	4.3	EDHS 2005
Breastfeeding (BF)				
Infants less than 1 month of age				
Exclusive BF	70.3	EDHS 2011	67.3	EDHS 2005
Predominant BF	26.0	EDHS 2011	25.5	EDHS 2005
Partial BF	2.7	EDHS 2011	5.6	EDHS 2005
Infants aged 1-5 months of age				
Exclusive BF	43.6	EDHS 2011	40.5	EDHS 2005
Predominant BF	41.1	EDHS 2011	25.5	EDHS 2005
Partial BF	13.6	EDHS 2011	17.2	EDHS 2005
Stunting/wasting				
Moderate stunting (% below -2 standard deviations)				
<6 months	10.0	EDHS 2011	8.1	EDHS 2005
6-11 months	23.2	EDHS 2011	29.0	EDHS 2005
12-23 months	45.0	EDHS 2011	54.0	EDHS 2005
24-59 months	53.0	EDHS 2011	53.0	EDHS 2005
Moderate wasting (% below -2 standard deviations)				
<6 months	13.5	EDHS 2011	6.4	EDHS 2005
6-12 months	16.0	EDHS 2011	12.0	EDHS 2005
12-23 months	13.5	EDHS 2011	18.0	EDHS 2005
24-59 months	7.0	EDHS 2011	8.5	EDHS 2005

a. Protected at birth defined as mothers with two injections during the pregnancy of her last birth, or two or more injections (the last within 3 years of the last live birth), or three or more injections (the last within 5 years of the last birth), or four or more injections (the last within 10 years of the last live birth), or five or more injections at any time prior to the last birth
b. Piped or protected water source
c. Flush/pour latrine, ventilated improved latrine, pit latrine with slab, or composting latrine
d. The 2005 EDHS was not used because the figure was high and we were concerned about data quality issues

Table 1. Baseline indicators of selected MNCH interventions in the agrarian regions (continued)

Indicator	2011-2013	Source	2005/2006	Source
Preventive/Vaccines				
Postnatal visit in 48 hours	2.7	EDHS 2011	3.7	EDHS 2005
Vitamin A supplementation of under-five children	52.8	EDHS 2011	45.8	EDHS 2005
% households with improved water source	41.6	EDHS 2011	41.6	EDHS 2011 [d]
% households with water connections at home	0.1	EDHS 2011	0.0	EDHS 2005
% households with improved [c] sanitation	6.6	EDHS 2011	4.9	EDHS 2005
ITNs/IRS	43.7	MIS 2011	3.1	EDHS 2005
Immunization against diphtheria, pertussis and tetanus (at least three doses)	56.3	EPI cluster survey 2012	66.0	EPI cluster survey 2006
Immunization against haemophilus influenza type B (at least three doses) (same as DTP3)	56.3	EPI cluster survey 2012	0.0	N/A
Measles	65.9	EPI cluster survey 2012	54.3	EPI cluster survey 2006
Immunization against pneumococcal	18.7	iCCM end line survey 2013	0.0	N/A
Curative				
Oral rehydration therapy (ORS) treatment of diarrhea	26.6	EDHS 2011	18.6	EDHS 2005
Antibiotics for dysentery	12.4	EDHS 2011	10.4	EDHS 2005
Zinc treatment of diarrhea	0.2	EDHS 2011	0.2	EDHS 2005
Oral antibiotics for pneumonia	6.8	EDHS 2011	4.9	EDHS 2005
Vitamin A for measles (same as supplementation)	52.5	EDHS 2011	45.8	EDHS 2005
Artemesinin compounds for treatment of malaria	37	MIS 2011	0.6	EDHS 2005
Therapeutic feeding for SAM	0.0	N/A	0.0	N/A
Baseline mortality				
U5MR	N/A		109.8	IGME 2005
NMR	N/A		38.9	IGME 2005
IMR	N/A		70.0	IGME 2005

Table 2: Estimated additional deaths averted by age group by the two scenarios

	2012	2013	2014	2015	Total
"Moderate" scenario					
0-59 months	15,352	18,204	20,203	22,194	75,953
<1 months	532	539	554	561	2,186
1-59 months	14,820	17,664	19,650	21,633	73,767
"Best case" scenario					
0-59 months	17,012	26,879	35,909	44,824	124,624
<1 months	2,142	3,832	5,599	7,334	18,907
1-59 months	14,870	23,047	30,310	37,490	105,717

DISCUSSION

The iCCM program is saving thousands of lives annually. By 2015, the best-case scenario would achieve an 18.9% reduction beyond what was projected without an iCCM program while the moderate -case scenario would still achieve a 6.6% reduction.

Publications in this supplement and a survey on iCCM implementation strength show that iCCM program inputs, specifically training, initial supplies, and supervision, are adequate, although utilization continues to be a challenge (18-20). Improving utilization and quality of iCCM service is critical for reducing child mortality . A recent study in Ethiopia identified care-seeking and barriers to iCCM services, and suggested potential solutions (21).

The best scenario (iCCM coverage 80%) is likely in the four regions if the performance of HEWs continues to improve and if community mobilization through the Health Development Army (HDA) and other effective media including innovative ways to increase utilization at the health posts are effective. Furthermore, given the same startup cost of the iCCM program, the "best case" scenario is far more cost-effective than the 'moderate' scaling up.

The number of lives saved may be an underestimate since the effect of iCCM could go beyond curative care. A recent case study described by the Integrated Family Health Program (IFHP) shows evidence of increases in preventive and promotive intervention coverage associated with the iCCM program (22).

The iCCM program is an important contributor to reducing under-five mortality in rural Ethiopia. Although Ethiopia met the requirement for Millennium Development Goal 4 in 2012, government and partner investments to sustain and improve the iCCM program can maintain and perhaps even surpass these gains. An investment in iCCM is critical for continuing the U5MR decline and consolidating the Health Extension Programme in Ethiopia.

Limitations. The main limitation of this study is that *LiST* is a model. The quality of the inputted data will greatly affect the model outputs. We used data from the census, the DHS/MICS, and other large-scale surveys with a history of producing high quality data. Recent research shows that two-week incidence of pneumonia from household surveys is over-estimated; only 22% of children with reported pneumonia actually have the illness (23). The iCCM programme is designed to have high sensitivity and lower specificity in order to treat all the actual pneumonia cases for children 1-59 months of age. If we assume that all the actual pneumonia cases are being treated through iCCM and pneumonia incidence is over-estimated, it is likely that the pneumonia treatment coverage is under-estimating the actual coverage and the impact on pneumonia deaths is higher than modeled here. The estimates produced by *LiST* assume that interventions will be delivered and used at levels of quality sufficient to produce effects on mortality equivalent to those assumed in the model.

It is important to note that utilization of iCCM services varies considerably throughout the country, and coverage of different interventions varies. Although coverage of ORS has increased, it is not the case for zinc treatment of diarrhea due to delayed zinc sup-

plies. The treatment rate of 'fever,' e.g. 'malaria treatment rate,' may actually decrease because of the iCCM program due to diagnosis-based treatment using rapid diagnostic tests (24, 25). Estimating treatment rates of SAM is difficult as the period for treatment and care can take many weeks. It is important to derive a reliable way to estimate SAM treatment coverage through surveys.

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ORIGINAL ARTICLE

COSTING COMMODITY AND HUMAN RESOURCE NEEDS FOR INTEGRATED COMMUNITY CASE MANAGEMENT IN THE DIFFERING COMMUNITY HEALTH STRATEGIES OF ETHIOPIA, KENYA AND ZAMBIA

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ABSTRACT

Background: *To ensure correct and appropriate funding is available, there is a need to estimate resource needs for improved planning and implementation of integrated Community Case Management (iCCM).*
Objective: *To compare and estimate costs for commodity and human resource needs for iCCM, based on treatment coverage rates, bottlenecks and national targets in Ethiopia, Kenya and Zambia from 2014 to 2016.*
Methods: *Resource needs were estimated using Ministry of Health (MoH) targets from 2014 to 2016 for implementation of case management of pneumonia, diarrhea and malaria through iCCM based on epidemiological, demographic, economic, intervention coverage and other health system parameters. Bottleneck analysis adjusted cost estimates against system barriers. Ethiopia, Kenya and Zambia were chosen to compare differences in iCCM costs in different programmatic implementation landscapes.*
Results: *Coverage treatment rates through iCCM are lowest in Ethiopia, followed by Kenya and Zambia, but Ethiopia had the greatest increases between 2009 and 2012. Deployment of health extension workers (HEWs) in Ethiopia is more advanced compared to Kenya and Zambia, which have fewer equivalent cadres (called community health workers (CHWs)) covering a smaller proportion of the population. Between 2014 and 2016, the proportion of treatments through iCCM compared to health centres are set to increase from 30% to 81% in Ethiopia, 1% to18% in Kenya and 3% to 22% in Zambia. The total estimated cost of iCCM for these three years are USD 75,531,376 for Ethiopia, USD 19,839,780 for Kenya and USD 33,667,742 for Zambia. Projected per capita expenditure for 2016 is USD 0.28 for Ethiopia, USD 0.20 in Kenya and USD 0.98 in Zambia. Commodity costs for pneumonia and diarrhea were a small fraction of the total iCCM budget for all three countries (less than 3%), while around 80% of the costs related to human resources.*
Conclusion: *Analysis of coverage, demography and epidemiology data improves estimates of funding requirements for iCCM. Bottleneck analysis adjusts cost estimates by including system barriers, thus reflecting a more accurate estimate of potential resource utilization. Adding pneumonia and diarrhea interventions to existing large scale community-based malaria case management programs is likely to require relatively small and nationally affordable investments. iCCM can be implemented for USD 0.09 to 0.98 per capita per annum, depending on the stage of scale-up and targets set by the MoH.*
Key Words: *Ethiopia, Zambia, Kenya, treatment, community case management, costing*

INTRODUCTION

Malaria, diarrhea and pneumonia remain the largest contributors to mortality in under-fives in sub-Saharan Africa (1). Despite investments over the last two decades, treatment coverage rates have remained below 50%, but disease burden can be significantly reduced by expanding access to high impact and cheap treatment interventions (2,3). Research in Ethiopia (4), Kenya (5) and Zambia (6,7) provided evidence supporting the introduction of integrated community care management (iCCM) in several countries in Eastern and Southern Africa. Each of these countries has plans to further scale-up iCCM and has begun estimating resource needs to reach country coverage targets.

Ethiopia began scale-up of iCCM in 2010 through their Health Extension Program (HEP), where 31,150 government employed, salaried (average salary: USD600/HEW/year), and 12-month trained Health

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Extension Workers (HEWs) provide iCCM services in over 80% of the estimated 14,000 rural villages (8).

Zambia also initiated their iCCM program in 2010, through compared to Ethiopia this is through approximately 2,500 volunteer Community Health Workers (CHWs) in about 50% of the districts (9). These CHWs are estimated to earn average incentives valued at USD380/year and receive six-weeks training, with five days focused on iCCM rather than the 12 months training in Ethiopia. In both countries, these community-based cadres diagnose and treat malaria, pneumonia and diarrhea as an integrated package.

Kenya has over 30,000 CHWs who have only recently begun to treat malaria and diarrhea. CHWs in Kenya were authorized to diagnose and treat malaria and diarrhea from 2012 according to the Kenyan iCCM 2012-2017 plan of action (10). Full iCCM, including pneumonia treatment with amoxicillin, has begun as a trial in Homa Bay County with approximately 1,000 trained CHWs, each earning incentives valued at around USD289/year.

This study estimates costs of components of iCCM for Ethiopia, Kenya and Zambia, with the aim of inclusion into existing malaria control gap analyses to support additional fund-raising efforts and improve planning, monitoring and implementation of malaria control and iCCM services (11). It can provide estimates for budgets included in Global Fund concept notes and other funding proposals. We address the following questions: i) what is the current situation in terms of current coverage, unmet needs and major bottlenecks and ii) how to translate programmatic gaps into resource needs? We used data on demographics, epidemiology and coverage for malaria, diarrhea and pneumonia.

We investigate how different implementation strategies, epidemiological profiles, treatment coverage rates and national program targets affect levels and optimal allocation of resources. We then use the results to estimate commodity and health system component costs for iCCM in Ethiopia, Kenya and Zambia from 2014 to 2016. These countries were chosen from the small group of countries that are implementing iCCM, and because they have varying community health systems and iCCM implementation strategies and different overall target coverage rates.

MATERIALS AND METHODS

This study used nationally representative survey and program data from Demographic Health Surveys (DHS), Malaria Indicator Surveys (MIS), State of the World's Children (SOWC), Health Management Information Systems (HMIS) and administrative records. Information was compiled systematically by MOH staff using a Microsoft Excel template with formulas for estimating resource needs for selected iCCM deliverables. All outputs focus on results for children under five years of age.

Total funding requirements were estimated based on estimates from MoH records of selected iCCM components. Fixed costs were derived from previous expenditures using MoH records and included HEW/CHW incentives/salary per year; cost per training, per supervision, per micro-planning; and annual total costs of monitoring and evaluation, coordination, and research and evaluation.

Total cost for rapid diagnostic tests (RDT) was calculated based on the number of expected cases of fever in malaria areas, the average number of fever episodes in children under five per year, an adjustment factor to include other cases for other age groups (for malaria, people older than five years), and the cost per RDT in each country. Adjustment factors were also used to modify inputs through triangulation with HMIS, administrative data and other health information, and included inflation.

Cost estimates were adjusted according to bottleneck analysis within a tool we developed in 2012, based on the Tanahashi and Soucat model (12,13), but adapted to include costing, where barriers are taken into account. The tool estimates unmet needs, and uses current demographic, coverage and economic parameters to estimate these unmet needs, which include total quantities of commodities, and funding required to scale up iCCM in line with national targets. The tool uses selected indicators for six determinants. The first three determinants (commodities, human resources and access) are supply side determinants, while the last three relate to demand side and quality (utilization, continuity and effective coverage) based on estimates for bottleneck indicators summarized in Table 1.

Three tracers (ORS/zinc, malaria treatment and antibiotics for pneumonia) were analyzed to identify major constraints for iCCM programs. Each country set a bottleneck reduction target of every determinant to define the expected coverage per annum, and this proportion was used to estimate the number of target population. For example, in Kenya, diarrhea treatment coverage was expected to increase from 39% to 62% between 2012 and 2016. In 2014, MoH planned to be at 47% and wished to reduce their effective coverage bottleneck by 13% in 2014, by 25% in 2015 (coverage target at 54%) and by 38% in 2016 (coverage target at 62%). Treatment need was therefore calculated as a function of the prevalence, number of episodes, coverage target and the adjustment factor to include all targeted groups and inflation.

RESULTS

Estimation of the costs of iCCM is essential for future planning and fundraising efforts, and comparisons between three countries with differing iCCM implementation plans provides a range of resource needs. A comparison of the baseline estimates for 2009 with 2012 for the main indicators used in our analysis is shown in Table 2. Although Ethiopia had lower coverage rates then Kenya and Zambia, it had the greatest gains in coverage rates from 2009 to 2012, with malaria coverage doubling from 10% to 20%, compared to limited changes in Kenya and Zambia.

System barriers reduce treatment rates and hinder resource utilization for iCCM. These bottlenecks are shown in Figure 1 which compares 2012 baselines with 2016 targets for each country and determinant. For malaria, Ethiopia had high levels of service delivery (Figure 1a), with 90% of HEWs with zero absolute stock-outs of more than one week in the last 3 months, 70% of HEWs trained on case management of malaria and 47% of villages with trained HEWs (see Table 1 for determinants). However, utilization rates of malaria services in Ethiopia remain low, with indicators varying from 12% to 37% for diagnosis and correct treatment. The plan therefore is to increase utilization, the proportion tested with RDTs from 20% to 40% by 2016 in Ethiopia (i.e., reduce the bottleneck by 25%), from 12% to 80% in Kenya (bottleneck reduction of 77%) and from 32% to 100% in Zambia (bottleneck reduction of 100%).

Similarly, bottleneck analysis for treatment of diarrhea (Figure 1b) and pneumonia (Figure 1c) in Ethiopia suggests low utilization of services. Although 65% of villages have access to iCCM services, only 40% of children under five with diarrhea received oral rehydration salts (ORS). The plan expects to reduce this initial utilization bottleneck by 25% and set coverage target at 55%. Similarly, effective coverage for diarrhea is expected to increase to 43% by 2016 and to about 30% for pneumonia treatment.

Table 1: Determinants and indicators used for bottleneck analysis for case management of diarrhea, pneumonia and malaria

Tracer/ Determinant	Tracer/Indicator
Diarrhea	**ORS and zinc**
Commodities	Proportion of CHWs with zero absolute stock-outs of ORS and zinc supplements lasting more than 1 week during the past 3 months
Human Resources	Proportion of CHWs trained in diarrhea case management
Geographic access	Proportion of villages with access to CHWs trained in diarrhea case management
Utilization	Among children 0-59 months who had diarrhea, the proportion given ORS
Continuity	Among children under age 5 who had diarrhea, the proportion given ORS packets or prepackaged liquid AND zinc supplements
Effective coverage	Among children under age 5 who had diarrhea, the proportion given ORS packets or prepackaged liquid AND zinc supplements AND continued feeding and increased fluids
Malaria	**ACTs and RDTs**
Commodities	Proportion of CHWs with zero absolute stock-outs of ACT lasting more than 1 week at any time during the past 3 months
Human Resources	Proportion of CHWs trained in malaria case management
Geographic access	Proportion of villages with access to CHWs trained in malaria case management
Utilization	Among children under age 5 with fever, proportion for whom fever was tested for confirmation of malaria diagnosis
Continuity	Among children ages 0-59 months with confirmation of malaria diagnosis, proportion who received treatment with any anti-malaria drugs
Effective coverage	Among children ages 0-59 months with confirmation of malaria diagnosis, proportion who received treatment with ACT
Pneumonia	**Antibiotics for pneumonia**
Commodities	Proportion of CHWs with zero absolute stock-outs of antibiotics lasting more than 1 week during the past 3 months
Human Resources	Proportion of CHWs trained in pneumonia case management
Geographic access	Proportion of villages with access to CHWs trained in pneumonia case management
Utilization	Among children ages 0-59 months with symptoms of ARI, proportion for whom treatment was sought from a trained provider in a health facility
Continuity	Among children ages 0-59 months with symptoms of ARI, proportion for whom treatment was sought from a trained provider in a health facility and who received antibiotics
Effective coverage	Among children ages 0-59 months with symptoms of ARI, proportion for whom treatment was sought from a trained provider in a health facility and who received antibiotics and took them for the required period

Table 2: Country profiles: baselines (2009 and 2012) RDT-use and treatment coverage rates for pneumonia, diarrhea and malaria for Ethiopia, Kenya and Zambia

Country	Selected indicator	Baseline		Source for 2012 baseline
		2009	2012	
Ethiopia				
	Total population	82,825,000	83,870,477	CSA 2007 extrapolation 2.7%
	Proportion of population targeted for iCCM	65%	68%	Previous Application (2010)
	Proportion of population living in malaria areas		68%	Ethiopia National malaria control SP 2011-2015
	Malaria prevalence (under-fives)	19%	17%	Proxy; DHS 2011, Table 10.6 (Fever prevalence)
	Malaria Testing through RDTs (u5 children)		20%	MIS 2011, Table 19
	Malaria treatment (u5 children)	10%	26%	MIS 2011, Table 19
	Diarrhea prevalence (under-five children)	18%	13%	DHS 2011, Table 10.7
	Diarrhea treatment (u5 children)	15%	26%	Proxy; DHS 2011, Table 10.8 (ORS Packet)
	Pneumonia prevalence (under-five children)	13%	7%	DHS 2011, Table 10.5
	Pneumonia treatment (u5 children)	5%	7%	DHS 2011, Table 10.5
Kenya				
	Total population	39,802,000	3,167,510	WPP 2012 revision
	Proportion of population targeted for iCCM program	82%	40%	Acta Tropica 91 (2004) 239–251
	Proportion of population living in malaria areas		70%	MIS 2010
	Malaria prevalence (under-five children)	41%	12%	MIS 2010 (RDT for 3-59m), Table 6.1
	Malaria Testing through RDTs (u5 children)		12%	MIS 2010, Table 5.1
	Malaria treatment (u5 children)	27%	18%	MIS 2010, Table 5.1
	Diarrhea prevalence (under-five children)	16%	17%	DHS 2008/2009, Table 10.6
	Diarrhea treatment (u5 children)	33%	39%	DHS 2008/2009, Table 10.7 (ORS)
	Pneumonia prevalence (under-five children)	18%	8%	DHS 2008/2009, Table 10.4
	Pneumonia treatment (u5 children)	45%	50%	DHS 2008-09, Table 10.4
Zambia				
	Total population	12,935,000	13,806,539	CSO projection
	Proportion of population targeted for iCCM program	76%	61%	Zambia preliminary Census report 2011
	Proportion of population living in malarious areas		100%	ZDHS 2007
	Malaria prevalence (under-five children)	18%	15%	MIS 2012
	Malaria Testing through RDTs (u5 children)		32%	MIS 2012
	Malaria treatment (u5 children)	43%	32%	MIS 2012
	Diarrhea prevalence (under-five children)	16%	16%	ZDHS 2007
	Diarrhea treatment (u5 children)	56%	56%	ZDHS 2007
	Pneumonia prevalence (under-five children)	5%	5%	ZDHS 2007
	Pneumonia treatment (u5 children)	47%	50%	Expert opinion

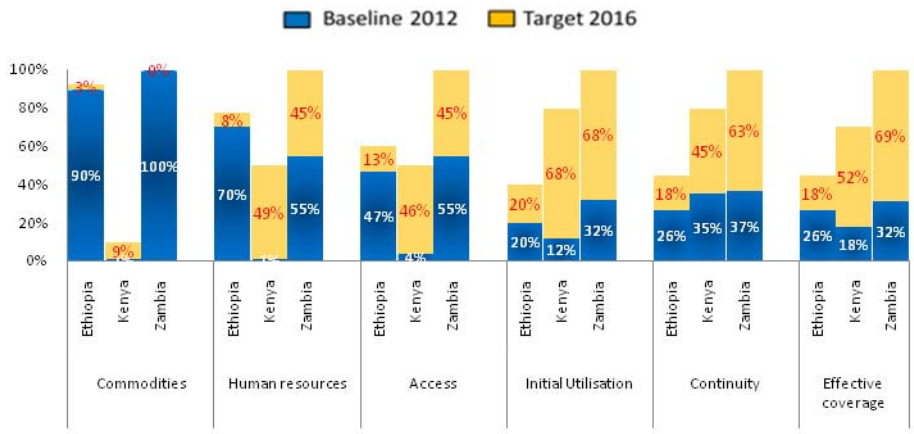

Figure 1a: Bottleneck analysis for malaria treatment for Ethiopia, Kenya and Zambia

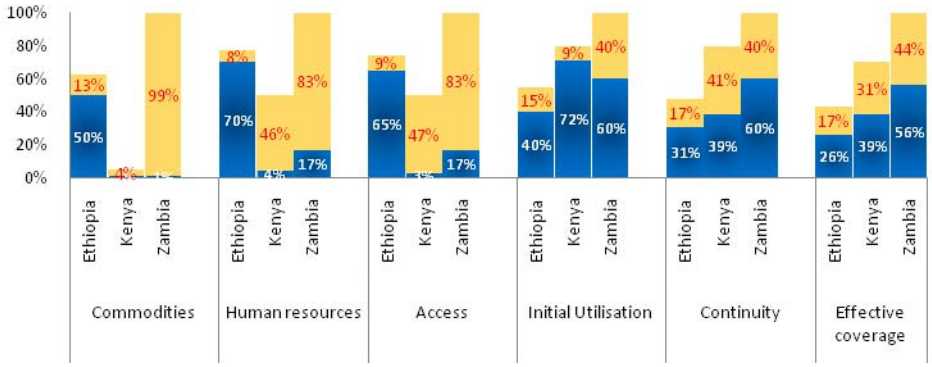

Figure 1b: Bottleneck analysis for diarrhea treatment for Ethiopia, Kenya and Zambia

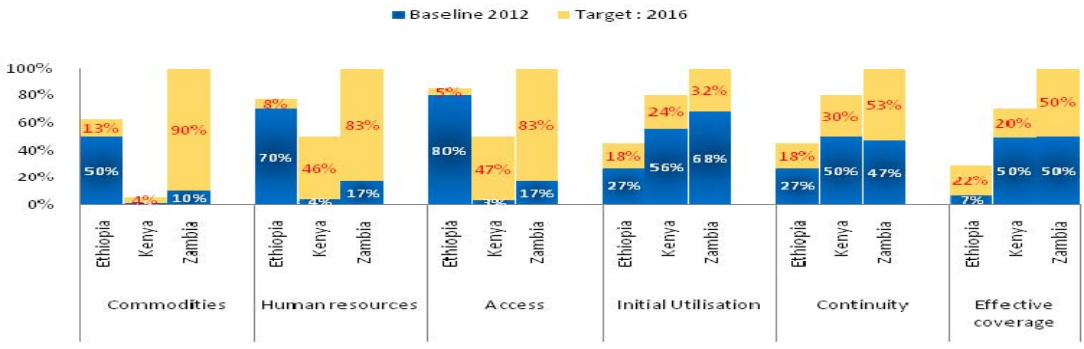

Figure 1c: Bottleneck analysis for case management of pneumonia for Ethiopia, Kenya and Zambia

In contrast, bottleneck analysis for Kenya and Zambia showed the reverse pattern, with comparatively low service delivery determinants for all three diseases, due to limited availability of iCCM trained CHWs. Where CHWs were implementing case management, utilization of iCCM services was relatively high compared to Ethiopia. Both Ethiopia and Zambia plan for universal treatment (effective coverage determinant) for all three diseases by 2016, whereas Kenyan targets are lower, with an effective coverage of 70% for the three diseases in 2016.

Figure 2 illustrates the activity distribution (percentage of RDT tests and treatments for each disease) through iCCM versus health facilities at baseline in 2012 (Figure 2a) compared with 2016 expectations (Figure 2b). Around half the treatments were provided through iCCM in Ethiopia in 2012, and are estimated to reach 81% by 2016 based on the MoH targets. In contrast, in Kenya and Zambia nearly all treatments are currently provided through health facilities, with 1% through iCCM in Kenya and 3% in Zambia. Based on the MoH plans in our analysis, by 2016 Kenya will deliver 16% and Zambia 22% of treatments via iCCM.

The total quantities of commodity and implementation related needs for community treatment of pneumonia, diarrhea and malaria for the three countries from 2014 to 2016 are shown in Table 3. This includes increases in number of CHWs, which require significant financial investments. Table 4 provides the estimated iCCM financial investments for these resources, with Ethiopia requiring USD75,531,376, Kenya USD19,839,780 and Zambia USD33,667,742. This translates into average *per capita* costs in Ethiopia of USD0.28 for each year from 2014 to 2016, whereas costs rise when scale-up is still in progress, with Kenya increasing from USD0.09 in 2014 to USD0.20 in 2016 and Zambia from USD0.55 to USD0.98.

A breakdown of unit costs for commodities and human resource components is summarized in Table 5. Unit costs for malaria commodities are substantially higher than diarrhea and pneumonia, and trainings are most expensive in Zambia, reflecting differences in unit costs between countries. Unit costs, including those for commodities varied among countries and were based on prices included in the analysis from MoH administrative records.

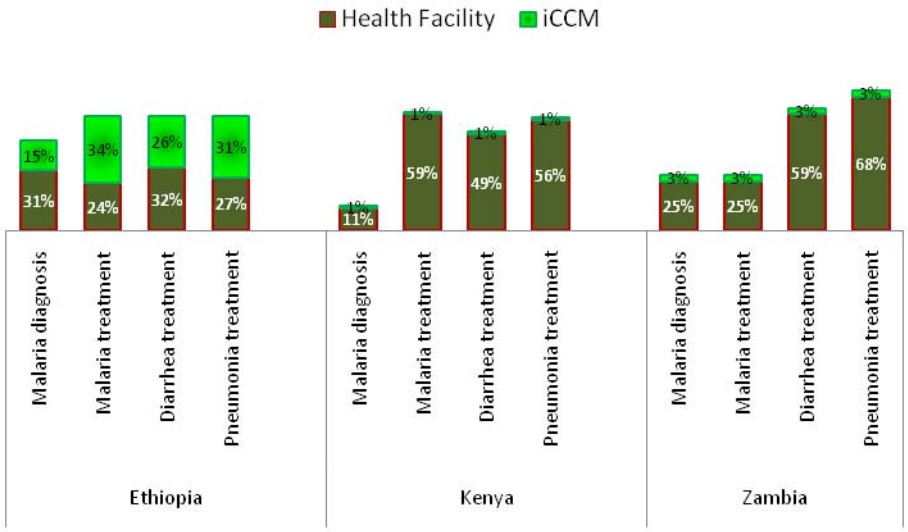

Figure 2a: Activity distribution for the three iCCM diseases through Health facilities versus iCCM in 2012

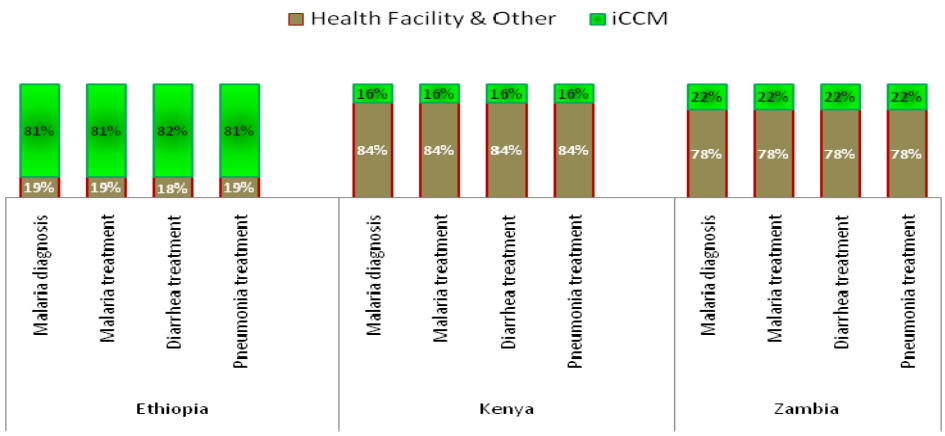

Figure 2b: Estimated activity distribution for the three iCCM diseases through Health facilities versus iCCM in 2016

Table 3: Key diagnosis and treatment commodity and human resource requirements for iCCM to reach national targets (x 1000)

Item	Unit	Ethiopia			Kenya			Zambia		
		2014	2015	2016	2014	2015	2016	2014	2015	2016
Commodities, drugs										
Antimalarial drug	Rx	661	631	605	79	145	205	281	487	668
RDTs	Rx	2566	2710	3170	194	484	841	1226	2430	3959
Antibiotics	Rx	607	792	912	117	233	363	171	267	472
ORS	Sachet	549	592	644	88	187	316	407	3362	3024
Zinc	Pack	330	355	387	53	112	190	102	1121	1008
Timers	Unit	11.4	13.7	16.3	1.39	4.16	8.40	1.54	3.54	6.33
MUAC	Unit	1.05	1.14	1.23						
Human resources										
CHWs for Malaria	CHW	32.8	34.4	36.0	9.3	16.2	23.1	10.5	18.1	25.7
CHWs for Diarrhea	CHW	31.4	31.6	31.8	9.3	16.2	23.1	3.6	4.3	5.1
CHWs for Pneumonia	CHW	32.8	34.4	36.0	6.3	10.2	14.2	7.5	12.1	16.8
Planned trainings	Training	0.055	0.055	0.055	0.232	0.232	0.232	0.255	0.255	0.255
Planned supervisions	Supervision	0.028	0.028	0.028	0.116	0.116	0.116	0.128	0.128	0.128

Table 4: Estimates of total funding requirements (in USD) for iCCM in Ethiopia, Kenya and Zambia from 2014 to 2016 (all but bottom row as: x 1000)

	Ethiopia			Kenya			Zambia		
	2014	2015	2016	2014	2015	2016	2014	2015	2016
Commodities, drugs & supplies	2819	3034	3427	534	1204	1990	572	1050	1577
Antimalarial drug	476	454	436	160	291	413	169	293	402
RDT	1719	1816	2124	317	790	1372	283	560	912
Antibiotic	382	499	574	16.2	32.2	50.2	28.6	44.8	79.2
ORS	98.9	107	116	31.1	65.9	112	63.5	103	120
Zinc	98.9	107	116	8.6	18.3	31.0	23.5	38.1	44.3
Timers	39.7	48.0	56.9	2.0	5.9	11.9	4.7	10.8	19.4
MUAC	3,817	4,131	4,452						
Human resources	19,989	20,962	21,942	3257	5264	7272	7195	10,098	13,001
Salary	19,659	20,636	21,614	2673	4682	6690	3973	6876	9779
Training	275	275	275	464	464	464	3048	3048	3048
Supervision	8400	8400	8400	58	58	58	115	115	115
Other HR costs	47	42	45	62	60	60	59	59	59
Other operation-al costs	1119	1119	1119	155	81	81	58	58	58
Grand total	23,928	25,115	26,488	3947	6549	9344	7825	11,206	14,636
Per capita	***0.28***	***0.28***	***0.29***	***0.09***	***0.14***	***0.20***	***0.55***	***0.77***	***0.98***

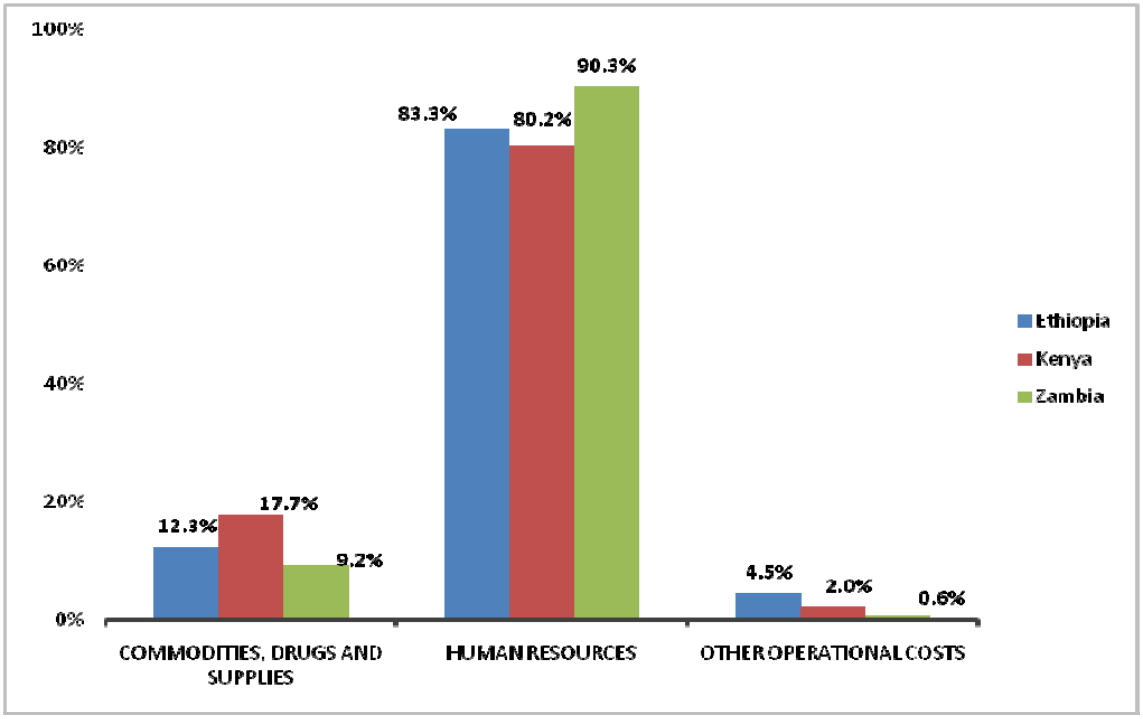

Figure 3: Estimated average costs for three main iCCM categories of commodities, human resources and operational costs

Table 5: Unit costs (USD) for commodities and human resource components in Ethiopia, Kenya and Zambia (average for 2014 to 2016)

Item	Unit	Ethiopia	Kenya	Zambia	Average
Commodities, Drugs and supplies					
Antimalarial drug	Rx	0.72	2.01	0.60	1.11
RDTs	Rx	0.67	1.63	0.23	0.84
Antibiotics	Rx	0.63	0.14	0.17	0.31
Timers	Unit	3.50	1.42	4.27	3.06
ORS	Rx	0.18	0.35	0.16	0.23
Zinc	Rx	0.30	0.16	0.23	0.23
MUAC	Unit	3.63	1.58	26.38	10.53
Human resources					
Salary for CHW	CHW/year	600	129	297	342
Training cost	One Training	5,000	8,436	13,136	8,857
Supervision cost	One Supervision	300	2,071	993	1,121

Our analysis shows that in all three countries the bulk of investments for iCCM are in human resources. As a percentages of total iCCM, human resource costs are similar, with Ethiopia at an average per year of 83%, Kenya at 80%and Zambia at 90% (Figure 3).Total commodity costs represent less than a quarter of total iCCM implementation costs, with Kenya having the lowest at 10%.

Table 6 provides a further breakdown in costs across the three diseases and shows that commodity costs for pneumonia and diarrhea are small fraction of the total iCCM budget, with Ethiopia at 3%, Kenya 2%, and Zambia at 2%.

Table 6: Breakdown of costs for malaria (ACTs and RDTs) vs. non-malaria case management (ORS, zinc, Amoxicillin, timers and MUAC) as percentages of total commodity and total iCCM implementation costs.

	Value of commodities (USD)	**% of commodities**	**% of total budget**
Ethiopia			
ACT and RDT	7,024,989	76%	9%
Pneumonia and diarrhea commodities	2,255,857	24%	3%
% of total commodities for iCCM budget			12%
Kenya			
ACT and RDT	3,343,459	90%	17%
Pneumonia and diarrhea commodities	385,275	10%	2%
% of total commodities for iCCM budget			19%
Zambia			
ACT and RDT	2,618,581	81%	8%
Pneumonia and diarrhea commodities	608,988	19%	2%
% of total commodities for iCCM budget			10%

DISCUSSION

We linked treatment coverage rates for pneumonia, diarrhea and malaria with resource needs for implementation of iCCM in Ethiopia, Kenya and Zambia. This is a new way of estimating resource needs, as it links coverage rates with resource needs, but also controls for health system absorptive capacity. Bottleneck analysis highlighted particular program needs and related this to the national target coverage rates and adjusted the estimated funding requirements. Our analysis estimates that Ethiopia will have to invest around USD 76 million in total over the three years from 2014 to 2016 to reach its 2016 iCCM targets. Zambia and Kenya are still scaling up their iCCM and are estimated to require USD34 and USD20 million, respectively. We found that the bulk of costs are related to human resource and operational implementation at 83% for Ethiopia, similar to another study in Ethiopia that estimated "fixed costs", mainly related to human resources, at 86% (14).

Per capita requirement is less than one USD in all three countries. By 2016, Zambia will have the highest requirement at USD0.98, mainly due to their high targets and training costs. Kenya would have the lowest at USD0.20 due to lower targets of reaching 70% of total the population by 2016. Ethiopia has already scaled up its HEP program to 80% of the population and needs to maintain and consolidate this by 2016, which will require an investment of USD0.29 per capita per year.

Bottleneck analysis showed that utilization of iCCM interventions in Ethiopia is low compared to availability and geographic access of commodities and HEWs. Low utilization will result in high costs per service; therefore, it is important that future investments aim to create demand within communities to increase the uptake of iCCM treatment services for better health and to reduce program costs. Although Kenya and Zambia also need to create demand, the more immediate bottleneck is the low number of trained CHWs and geographic coverage of iCCM.

This analysis has some limitations. Firstly, there are a number of parameters and variables that require accurate data, which is often not available. This is especially the case for the bottleneck analysis, where data for determinants may be absent or only representative of a small area. Where data are missing, we used information from proxy indicators. An additional limitation pertains to triangulation of other data and information to quantify the adjustment factors, which also vary for each component of the analysis. Finally, the analysis is based mainly on national estimates, which average estimates across what is often a highly variable landscape at a national level. There is therefore a need to conduct further analyses at a sub-national level, which will provide more accurate estimates closer to regional, provincial, and district levels.

An additional draw back includes use of data from different dates, necessitated by availability of national data from population-based surveys. Although baseline dates differ, it is the best information available and provides a reasonable basis for estimating future resource needs. Linking coverage rates with future resource estimates has the advantage of basing investments on actual use of health services.

Proportionately more iCCM services are delivered through HEWs in Ethiopia compared to Kenya and Zambia, where currently less than 3% of treatments are provided by CHWs. Our analysis shows that per capita cost ranged between USD0.09 to USD0.98 depending on national targets, and on the overall magnitude of scale-up still needed, with Zambia and Kenya's investments rising over the three years.

This study shows that commodity costs of adding pneumonia and diarrhea to existing large scale malaria case management programs is potentially relatively low. Relative to ACTs and RDTs, they constitute a small proportion of total commodity investments and are likely to be affordable, especially in Ethiopia where HEWs have already been deployed at scale. In Zambia and Kenya, the bulk of investment will be for the expansion of iCCM through the recruitment, training and deployment of new CHWs and related management systems, together with demand creation to ensure treatment services are utilized.

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BRIEF COMMUNICATION

A DESCRIPTIVE STUDY OF THE CHANGES IN COVERAGE OF PREVENTIVE AND PROMOTIVE INTERVENTIONS BEFORE AND AFTER THE INTRODUCTION OF INTEGRATED COMMUNITY CASE MANAGEMENT (ICCM) IN ETHIOPIA

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Ismael Ali, MPH[1]; Dedefo Teno, MPH[1]

ABSTRACT

Background: *The effect of integrated community case management (iCCM) of common childhood illness on use of vital preventive services is not known.*
Objective: *To measure the coverage of maternal and child health preventive and promotive interventions before and after scaling up iCCM.*
Methods: *In 2011 and 2013, we conducted cross-sectional, population-based, household coverage surveys in four Integrated Family Health Program target regions: Amhara, Oromia, SNNP, and Tigray.*
Results: *Coverage increased for 10 of 15 indicators, mainly for maternal, immunization, and nutrition services. In some cases, we observed dramatic increases, i.e., for ≥4 antenatal care visits, antenatal iron and folate, and exclusive breastfeeding. Some increase occurred even when 2011 levels were already high, i.e., for immunization. Three indicators remained high and unchanged (bednet ownership, children sleeping under bednets, and any latrine). Two indicators decreased (tetanus toxoid and households with ≥2 bednets).*
Conclusion: *Scale-up of iCCM was consistent with increased coverage of most preventative and promotive interventions, which may contribute to the life-saving effect of iCCM.*
Key Words*: Ethiopia, child health, community health worker, community case management, preventive interventions*

INTRODUCTION

An estimated 194,000 children under five die each year in Ethiopia despite more than a 40% reduction in child mortality in the past two decades (1). Many of these deaths are preventable at the community level by preventive, promotive, and/or curative interventions delivered by Health Extension Workers (HEW). In 2010, the Federal Ministry of Health (FMOH) introduced integrated community case management (iCCM), which included training of more than 28,000 HEWs to manage common childhood conditions (pneumonia, diarrhea, malaria, and malnutrition) and to provide newborn care.

The Integrated Family Health Program (IFHP) is a five-year, USAID-funded program implemented by Pathfinder International and John Snow, Inc. IFHP supports iCCM in 264 focus *woredas* (districts) through initial and follow-up training, performance review, clinical mentoring meetings (PRCMM) with the Ministry of Health (MOH), and distributing UNICEF-supplied kits and drugs. IFHP supported (a) the training of 12,000 HEWs from 5500 health posts and 1400 supervisors who commenced supportive supervision two months after training and (b) PRCMMs after three months to reinforce skills.

At the inception of iCCM, planners and policy makers were concerned that introducing curative services could negatively affect the delivery and use of preventive and promotive interventions. Indeed, "What is the effect of iCCM on the preventive and promotive components of the Health Extension Program?" is a prioritized operations research question (2). The purpose of this study is to describe the coverage of preventive and promotive interventions before and after iCCM.

[1]Integrated Family Health Program, Addis Ababa, Ethiopia

MATERIALS AND METHODS

From 2011 to 2013, we conducted annual (January-March) household coverage surveys in the four IFHP target regions: Amhara, Oromia, SNNP and Tigray. IFHP helped to expand iCCM from 6.3% to 90.5% of *woredas* between 2011 and 2013.

***Sample Size and Selection*:** We determined that 2,560 households (640 in Amhara, 960 in Oromia, 480 in Tigray, and 480 in SNNP) would allow for detection of a 12% change in coverage, assuming an initial prevalence of 50%, a design effect of 1.5, and a non-response rate of 10%.

IFHP had 16 implementation clusters or zones (groups of *woredas*): four in Amhara, six in Oromia, three in Tigray, and three in SNNP. Zonal cluster offices prepared sampling frames, from which we randomly selected *woreda* health offices, health centers (HC), health posts (HP) or *kebele*, hamlet, and households (HH), applying the following ratios in the field: five HH/HP, two HP/HC, and two HC/*woreda* health office. Interviewers selected HHs using a random walk technique, determining direction from the center of the selected hamlet by bottle spin and choosing every fifth house along that ray (3). Each cluster provided 160 households (2560 total households/16 total clusters). Thus, the two surveys used different, randomly selected samples.

***Data collection, quality, and analysis*:** The survey subjects were caregivers of children under age five years. Data collectors were IFHP cluster office and regional programme office staff members who used the same questionnaires for both surveys with standard questions to calculate indicators. All attended two-day training on checklist completion, household selection, and other data collection procedures.

RESULTS

Table 1 shows the samples and the denominators for the 15 preventive and promotive interventions measured in the two surveys. Table 2 shows significant increases in intervention coverage for mothers (>4 ANC visits, vitamin A, iron/folate, and family planning) and for children (fully vaccinated, vitamin A, exclusively breastfed, and timely initiation of complementary feeding). Levels of child immunization increased even though 2011 levels were already high. Three other indicators remained high and unchanged (bednet ownership, children sleeping under bednets, and any latrine). Two indicators decreased (tetanus toxoid and HH with ≥ 2 bednets).

Table 1: Survey yield (subjects by age-group and households) by survey year

Parameter	Number by survey year	
	2011	2013
Children 0-5 months	437	476
Children 0-59 months	1983	1987
Children 6-23 months	987	1001
Children 6-59 months	1536	1511
Children 12-23 months	484	502
Mothers with children 0-11 months	961	975
Households in malarious areas	1239	1391
Women aged 15-49 years (eligible for family planning)	1999	2144
Households with or without children	2560	2503

Table 2: Intervention coverage by survey year (% [n])*

Topic	Indicators	2011	2013	Change in per-cent-age points	p-value
Maternal	Mothers of children 0-11 m with ≥ 4 antenatal care	16.6 (163)	41.3 (403)	+24.7	0.000
	Mothers of children 0-11 m who received ≥ 2 antenatal tetanus toxoid	77.4 (740)	69.7 (683)	-7.7	0.000
	Women 15-49 y currently using any family planning	44.0 (880)	53.9 (1158)	+9.9	0.000
Immunization	Children 12-23 m fully vaccinated**	77.0 (373)	86.4 (432)	+9.4	0.000
	Children 6-59 m receiving vitamin A in last 6 m	86.5 (1336)	89.8 (1360)	+3.3	0.005
Nutrition	Women with children 0-11 m who received vitamin A within 45 d postpartum	31.4 (298)	43.8 (429)	+12.4	0.000
	Women with children 0-11 m who received antenatal iron plus folic acid	39.1 (375)	71.7 (702)	+32.6	0.000
	Infants 0-5 m who breastfed within 1 h of birth	70.4 (306)	78.6 (376)	+8.2	0.004
	Infants 0-5 m who were exclusively breastfed	57.7 (254)	79.2 (376)	+21.5	0.000
	Children 6-23 m who started complementary feeding at 6 m	60.8 (602)	75.4 (751)	+14.6	0.000
Malaria	Household in malarious areas with bednet	80.9 (1004)	81.6 (1141)	+0.7	NS
	Children 0-59 m who slept under bednet last night from household in malarious areas with bednets	72.9 (892)	71.4 (988)	-1.5	NS
	Household in malarious area with ≥ 2 bednets	64.0 (793)	55.1 (765)	-8.9	0.000
Sanitation	Household with any type of latrine	71.6 (1843)	70.0 (1752)	-1.6	NS
	Household with appropriate (sheltered, clean with water and soap/ash, and cover) latrine	25.3 (640)	31.1 (776)	+5.8	0.000

*for denominators, see Table 1
**fully immunized: 3 doses of Pentavalent [diphtheria, pertussis, tetanus, Haemophilus influenza and hepatitis B] and polio vaccine and one dose of BCG and measles

DISCUSSION

HEWs delivered not only the new iCCM strategy, but also other high-impact interventions prioritized by the Health Extension Program. The increase in, or sustained high levels of, coverage observed in this study for most preventive and promotive interventions after iCCM expansion is encouraging for the government of Ethiopia and other program implementers.

The marked increase in nutrition coverage may be due to improved HEW counseling, which is reinforced during the iCCM PRCMMs and includes an additional day devoted to promoting optimal breastfeeding, complementary feeding, feeding during pregnancy, and iron supplementation. Likewise, the increase in antenatal care coverage may be influenced by iCCM training, which emphasizes conducting home visits to identify sick young infants, and is a good opportunity to mobilize antenatal care, when appropriate. The initial community mobilization for iCCM was an opportunity to promote increased latrine coverage, but iCCM had no influence over bednets. There were no bednet campaigns during the study interval. Finally, others have noted that community health workers who begin to deliver curative interventions gain standing in the community, which may enhance the uptake of non-curative interventions (4).

Our report has limitations. We did not measure other health system factors that might have influenced coverage of preventive and promotive interventions, such as the presence of other health programs in these regions. Our report does not include data on whether the HEWs provided these services at levels adequate to affect the increase in coverage measured. We did not stratify the sample into *woredas* with or without iCCM.

A side-by-side, before-after design would have been preferable, but comparison sample sizes in 2011 and 2013, respectively, would have been small because few *woredas* had iCCM in 2011, and few did not have it by 2013. Finally, this study utilizes program monitoring data collected and analyzed by the implementing agency, IFHP. Although it is preferable to have an independent evaluation of program effectiveness, IHFP took every precaution to maintain the validity and accuracy of the data and analysis.

Due to these limitations, we are unable to attribute the increased/sustained coverage of preventive and promotive intervention to the iCCM strategy. However, even if the coverage of these interventions increased in non-iCCM *woredas*, we can still conclude that coverage also improved in iCCM *woredas*, notwithstanding the increased workload required to deliver iCCM. The levels of iCCM service use have generally been lower than expected (2,5,6). Whether high levels of coverage for preventive and promotive interventions can be sustained in the presence of high levels of iCCM utilization remains to be seen.

In summary, these preliminary findings suggest that iCCM is compatible with not only sustaining, but also with increasing coverage of preventive and promotive interventions. Indeed, the life-saving potential of iCCM may be underestimated by modeling restricted to changes in curative interventions alone. More rigorous research is needed to isolate the effect of iCCM on preventive and promotive intervention coverage.

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BRIEF COMMUNICATION

ILLNESS RECOGNITION, HOME CARE, AND CARE-SEEKING FOR SICK INFANTS LESS THAN TWO MONTHS OF AGE IN SHEBEDINO DISTRICT, SIDAMA ZONE, ETHIOPIA

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ABSTRACT

Background: *The incidence of newborn and young infant health danger signs is unknown in Ethiopia. Nevertheless, experience shows that care-seeking is far lower than conservative morbidity estimates would project.*
Objectives: *To examine illness recognition, home care, decision-making, and care-seeking for sick infants less than two months of age in Shebedino District, Southern Nations, Nationalities and Peoples Region in 2011.*
Methods: *Focus group interviews of mothers (n=60) of recently ill children.*
Results: *Mothers reported recognizing many, but not all, evidence-based newborn danger signs. Home care ranged from probably harmless to harmful and delayed definitive care-seeking. Decision-making was widespread, but patterns of care-seeking rarely led to prompt, evidence-based care. Mothers reported 10 barriers to care-seeking at health posts: lack of knowledge about availability of curative services, fear of evil eye, social stigma, perceived financial barrier, perceived young infant fragility, an elder's contrary advice, distance, husband's refusal, fear of injection, and belief in recovery without medicine.*
Conclusion: *Young infants are more vulnerable to illness than their older counterparts, yet they are less likely to receive the care they need without a targeted, contextualized communication strategy to generate demand for case management services that are accessible, available, and of good quality.*
Key Words: *Ethiopia, child health, community health worker, community case management, care seeking, young infant, newborn*

INTRODUCTION

The incidence of newborn health danger signs is unknown in Africa. Population-based experience from Asia yields 150-200 newborn danger signs per 1000 live births, but the incidence of provider-diagnosed, possible severe bacterial infection among infants <2 months of age is slightly less at 125/1000 live births, (personal communication: Anita Zaidi, January 2013). A study in Nepal identified 13.3% episodes of PSBI in their study population (1). The COMBINE Study is currently evaluating the effect of community -based management of newborn sepsis in Oromia and SNNP Regions of Ethiopia. Government and technical partners posited an incidence of newborn danger signs in this setting of 100 episodes per 1000 live births, or 10%. After extensive communication and community mobilization, intervention health posts and health centers are identifying about half (0.51, range 0.36-0.76) of the expected 10% (personal communication: Berekt Mathewos, September 30, 2013). An integrated community-based case management (iCCM) implementation strength and quality of care assessment in Oromia found that nearly all sick children seen at health posts in the previous month were 2-59 months of age with almost no young infants (2).

In August 2012, we reviewed sick child registers at four health posts and three health centers in Shebedino *Woreda* (District), Sidamo Zone, SNNPR, tallying the most recently completed 12 months of sick young infants (155) and sick children 2-59 months (3841). On one hand, the ratio of 0-1 month to 0-59 month cases (3.9%) generally reflected the age group's contribution to the population (3.3%), neglecting mortality effects. On the other hand, the catchment area population of 150,000 should have yielded about

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4500 births/year (crude birth rate: 30/1000) that, in turn, could have experienced as many as 450-900 episodes of danger signs (incidence: 100-200 per 1000 live births). The treatment ratio for sick young infants was low, probably 17-34% (155 observed per 900 to 450 expected). Understanding low utilization of curative services for sick young infants is important since neonatal mortality accounts for 42% of under-five death in Ethiopia. The purpose of this paper is to examine illness recognition, home care, and care-seeking for young infants in Shebedino *Woreda*.

MATERIALS AND METHODS

In 2011, we examined reasons for low use of curative services in Shebedino. The methods are described elsewhere in this supplement (3). Here, our report relies on focus group discussions. We facilitated discussions among 60 mothers with sick children in the past three months (10 mothers in each of six groups from six *kebeles*, one in each supervision area). We selected three *kebeles near* Leku (3-8 km), the main district town, and three *far* from Leku (10-18 km). Additional *kebele* selection criteria were: well-performing HEWs with regular reporting and good relations with the district health team and HC.

We inquired about illness recognition, home care, labeling and decision-making, and care-seeking for children <2 m and for 2-11 m, reported elsewhere (3). Three teams, each consisting of a facilitator and note-taker, debriefed with the study manager nightly. Responses were entered in Excel (in Windows 7, Microsoft Corporation, Washington, USA) and analyzed by topic and sub-topic.

RESULTS

Mothers in focus group discussions (FGD) reported broad ***illness recognition***, including several evidence -based young infant danger signs (Table 1). The mothers also identified: rash; sunken fontanel; visible blood vessels on face, head and sometimes abdomen (*fancho*); irritability, inability to sleep, continuous crying; vomiting, diarrhea; wasting; inability to breastfeed; fast breathing, chest in-drawing; feels hot; inability to breathe through the nose; convulsion, lethargy; and red, painful gums (a sign of milk teeth).

Home care for sick young infants ranged from amulets, massage, and body painting to herbal teas, fumigation, and cold bathing (Table 2).

Table 1: Young Infant Illnesses Reported by Mothers vs. Evidence-Based Danger Signs

Evidence-Based Danger Signs*	Reported by Mothers
Convulsed since birth	Convulsion
Movement only on stimulation or no movement even on stimulation	Lethargy
Not able to feed or stopped feeding well	Inability to breastfeed
Fast breathing: 60 breaths or more in one minute	Fast breathing
Chest in-drawing	Chest in-drawing
High temperature 37.5ºC or more	Feels hot
Very low temperature 35.4ºC or less	
Signs of local infection: umbilicus red or draining pus, skin boils and eyes draining pus.	Cord infection
Yellow soles	

*UNICEF and WHO, Counseling Cards for Caring for the Newborn at Home – A Training Course for Community Health Workers (2012), p 17

Table 2: Mothers' Reported Young Infant Home Care vs. Indication

Indication	Home Care
Rash, irritability, not feeding well, not alert, fever or unusual sickness	Massage and body painting with (or chewed and spit on the infant by traditional healer) *michchete tagichcho* (Amharic: *yemich medhanit*)
Fancho, i.e., any unusual illness	*Amessa* (a medicinal tree, the boiled root, bark or leaf of which yields an oral concoction
Clean the stomach	*Tena zyit* (castor oil) from a private clinic or boiled *tafan-cho* (dry wood) shavings if castor oil not affordable
Protect from the "evil eye" (*kurama*)	Tie amulet around the neck and drink *dengetenya* (boiled traditional medicine)
Stomach cramp	Abdominal butter massage
Continuous crying and irritability	Wash with cold water
Common cold.	Fumigation with bursa bark

Reported ***decision-making*** about care for young infants was widespread and included parents, any literate or educated person in the household, neighbors, and grandmothers. If the mother was alone, she could decide to seek care outside the home after consulting elders because "[she] has no power to see when her child is dying" and because "[she] cannot keep quiet while our children are dying."

Mothers' reported patterns of ***care-seeking*** varied according to the illness (Table 3). Barriers to seeking health post care were: (a) lack of knowledge that curative services were available for young infants; (b) fear of evil eye; (c) social stigma ("People will say, 'She gave birth yesterday and her infant is sick today!'"); (d) perceived financial barrier; (e) fear of a young infant's fragility; (f) an elder's contrary advice ("Did we grow up getting treatment? Why bring infants to the health facility?"); (g) distance; (h) husband's refusal; (i) fear of injection that could be fatal in the presence of *fancho*; and (j) belief that the child would recover without medicine ("The disease itself is the child").

Table 3: Mothers' Reported Patterns of Care-seeking vs. Indication

Provider	Indication
Bone-setter	Chest in-drawing (*luticho*)
Traditional healers	Stomach cramps and evil eye
Religious leaders pray for	Serious illness, fever, crying, irritability and inability to breastfeed, a disabled child (thinness of feet) and shivering.
Health facility staff	Seriously ill young infants and those with fever, vomiting, cough, inability to feed, stomach cramp, grunting, tonsillitis, inability to sleep, fast breathing, vomiting, and chest in-drawing.

DISCUSSION

Mothers in this study collectively volunteered many evidence-based health danger signs, but their reported home care and care-seeking patterns often did not lead to evidence-based case management because of many barriers along the *Pathway to Survival*, including unhelpful or harmful home care and delayed and inappropriate care-seeking outside the home (4).

These findings are similar to those seen in other studies, mainly from South Asia that identified the challenges for care-seeking for sick young infants as poor illness recognition by caregivers (5-8), delay in decision-making (7,9), cost (10-12), cultural factors (6,8,10), and distance or transport (6-7,9). Caregivers may also seek care from sources that do not provide evidence-based care, such as traditional healers (6,11,13), or they may question the quality of care provided at health facilities (7,9-10). Only two papers were from Africa—a 2010 report examining delays to newborn care in eastern Uganda and a 2013 report from Ethiopia showing the effect of the Health Extension Program to strengthen use of postnatal care, a welcome and necessary, but insufficient, step to care for sick young infants (7,14).

Young infants are more vulnerable to illness than their older counterparts, yet they are less likely to receive the care they need without a targeted, contextualized communication strategy to generate demand for case management services that need to be accessible, available, and of good quality.

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CONCLUSIONS: DELIVERING INTEGRATED COMMUNITY CASE MANAGEMENT (ICCM) TO TREAT CHILDHOOD ILLNESS AT SCALE IN ETHIOPIA

Rory Nefdt, PhD; David R. Marsh, MD, MPH; Elizabeth Hazel, MHS

This special supplement presents experience and evidence implementing integrated community case management (iCCM) in Ethiopia during scale-up from 2010-2012. Ethiopia's iCCM program is the largest in Africa, and this collection represents the largest iCCM "case study" of published reports from a single country of which we are aware.

We used the "Stockholm Framework" for evaluating iCCM to organize the findings (1). Figure 1 shows the framework with abbreviated messages from each of the supplement's papers. ***Mortality*** No paper measured mortality, given the cost, limited time, and on-going work by others; however, a mortality effect was modeled (see below). ***Use*** Several papers reported changes in use, measured as coverage by household survey or as utilization by service statistics. Miller et al. reported inequitable use of *preventive* interventions at baseline, consistent with the need for both a better demand strategy for these interventions, and for iCCM (2). Teferi et al. showed that introducing iCCM was consistent with maintaining or even increasing coverage of preventive interventions (). Utilization of iCCM was generally low (3).Utilization was particularly low for infants less than age two months, given their special vulnerability and the observation that many of the recorded visits were actually for healthy check-ups (4,5). Use increased a bit over time and was associated with the density of Health Extension Worker (HEW) deployment, among other factors (4,6). Despite low use, some health posts were busy, which deserves study to identify replicable factors that explain their uncommon success (4). Najjemba et al. provided evidence from Beneshangul-Gumuz Region that use was "effective," in that caregivers' reported high compliance with iCCM treatments, except for a 10-day course of zinc (5).

Health system strengthening The possible salutary effect of iCCM on the levels of preventive and promotive interventions warrants emphasis. Anecdotal reports of enhanced community health worker confidence and credibility to deliver other messages after adding curative interventions to their armamentarium deserve further study. Whether high coverage of preventive and promotive interventions can be sustained after use of iCCM services increases – perhaps five- to ten-fold – remains to be seen. In a second paper, Teferi et al. also reported modestly increased – but still low – sick child caseloads at health *centers* after introducing iCCM at health *posts*, a possible indicator of a stronger health system (7). Follow-on work should also tally encounters for *severe* disease by level since level-specific care-seeking for disease severity is an indicator of a rationalized health system.

Access Ethiopia achieved rapid access to iCCM in the vast agrarian regions, as described by Legesse et al. (8). This is a critical determinant of use (5). Marsh et al. proposed in an editorial a rapid time study to characterize HEW availability, a potentially useful inquiry for assessing feasibility as service use and/or scope increases (9). ***Quality*** Reports in this supplement usually used register reviews or case scenarios as proxies for the quality of case management. Ameha et al. and Mengistu et al. showed that supportive supervision and Performance Review and Clinical Mentoring Meetings, respectively, increased the quality of recording in treatment registers (10,11). The relative role of each remains to be determined, but this may be possible to assess with datasets in hand (personal communication: Ali Mehryar Karim, September 2013). Najjemba et al. reported that case scenarios revealed that the quality of assessment and classification was better than the quality of treatment and follow-up (5). Wogi et al. provided evidence—in part obtained through direct observation—suggesting that iCCM training resulted in better malaria case management than vertical malaria training; however, other factors, such as drug supply may have played a role (12). Nigatu et al. reported in an editorial that HEWs could master essential drug logistics skills through opportunistic training, a necessary but insufficient step to assure drug availability (13). ***Demand*** Tefera et al. contributed two papers from Shebedino District in SNNPR that described many demand-side barriers to using iCCM for young infants and for older children, respectively, and recommended a systems-approach to increase use (14,15).

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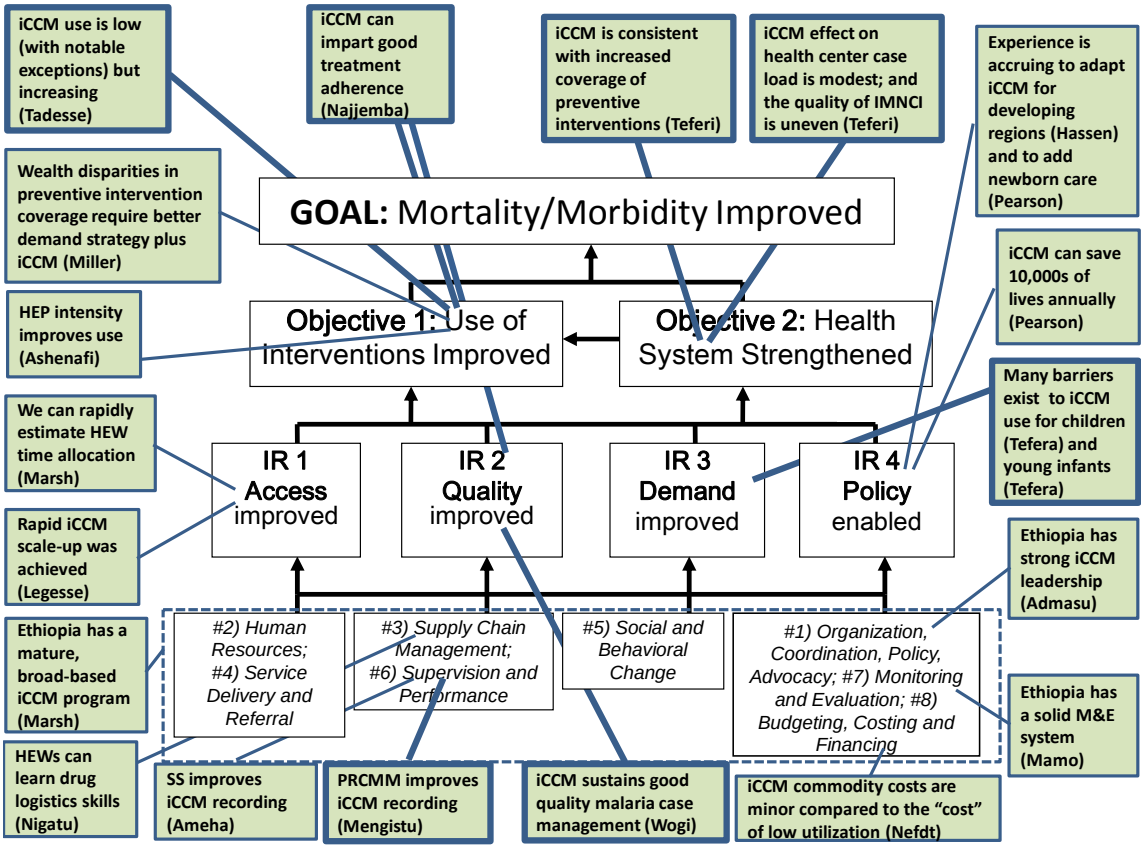
Policy Pearson et al. modeled iCCM scenarios using the Lives Saved Tool to project that even a moderate increase in coverage could save 50,000 lives per year by 2015 (16). Nefdt et al., applying bottleneck-based costing, projected the 2014-16 cost for iCCM in Ethiopia at USD 76 million, noting a lower cost per treatment as utilization increases (17). In two editorials, Hassen et al. and Pearson et al. advocated for the on-going adaptation of the agrarian iCCM package for developing regions and for community-based newborn care, respectively (18,19). ***Implementation*** Marsh et al., assessed input and activity benchmarks for eight iCCM health system components and reported that Ethiopia compared well with regional experience (20). Finally, Mamo et al., examining a single component in -depth, monitoring and evaluation, reported that Ethiopia already can measure most internationally recommended indicators and has near-term opportunities to prioritize, standardize and institutionalize iCCM monitoring (21).

Policy-makers, planners, and implementers agreed on a focused operations research agenda when Ethiopia commenced scaling up iCCM (1). This supplement helps to "answer" three of those four questions, regarding the level and determinants of service utilization from the primary health care unit (health post and health center), the best way to supervise iCCM, and the effect of iCCM on coverage of other preventive and promotive components of the Health Extension Program.

This supplement, like each of its papers, has limitations (Table 1). Many reports relied on routine service statistics (3,4,7,10-12,). Most employed random sampling within their sampling frames, but few evaluations were independent. None of the before/after surveys had comparison groups. None, except the initial program description, included measures of implementation strength to contextualize conclusions (8). Finally, only one quality paper employed direct observation (12). Three others relied on proxy measures of case management quality (5,10,11) in lieu of the gold standard of direct observation with re-examination. In response, the editors defend these papers as contributing to national program learning that informs practical program questions at an affordable cost within a reasonable time-frame. Indeed, the use of iCCM service statistics (T Diaz, personal communication, 5 March 2014) to inform local implementation research questions (D Rodriquez, personal communication, 4 March 2014) aligns well with guidance from the 2014 iCCM Evidence Review Symposium in Accra, Ghana.

Figure 1: Main messages from papers in the supplement*



*Bold boxes and lines represent conclusions informing national priority research questions. HEP=Health Extension Program, HEW=Health Extension Worker, IR = Intermediate Result, M&E=monitoring and evaluation, PRCMM=Performance Review and Clinical Mentoring Meeting, SS=supportive supervision

Table 1: Selected study design parameters from original research papers in this supplement*

Study	Design	Random Sample	External Evaluation
Miller et al. (2)	HHS (n=3200 households)	Yes	Yes
Teferi et al. (3)	Before/after HHS (n=2560/2503 households)	Yes	No
Tadesse et al. (4)	Register review (n=60,452 encounters from 622 health posts)	Yes	No
Najjemba et al. (5)	Health services assessment (n=233 HEWs, 384 caregivers of treated children)	Yes	No
Ashenafi et al. (6)	Before (EDHS, n=1190) /after (L10K, n=780) HHS	Yes	Yes
Teferi et al. (7)	Cross-sectional register review (n=28 health centers)	Yes	No
Ameha et al. (10)	Longitudinal *Form C* monitoring data (n=3909 supervision visits)	Near census	No
Mengistu et al. (11)	Historical cohort of registers (n=58,341 records from 622 health posts)	Yes	No
Wogi et al. (12)	Cross-sectional register review, interview, observation (n=166 HEWs with iCCM vs. Malaria Control Programme training)	Yes	No
Tefera et al. (14)	Purposive FGD (n=60 mothers)	No	No
Tefera et al. (15)	HHS (n=116); health services assessment; purposive FGD (n=60 mothers)	Yes (HHS); no for other	No
Pearson et al. (16)	Modeling	Not applicable	No
Nefdt et al. (17)	Modeling	Not applicable	No
Marsh et al. (20)	Survey of 6 experts	No	No
Mamo et al. (21)	Desk review	Not applicable	No

*EDHS=Ethiopia Demographic and Health Survey, FGD=focus group discussion, HHS=household survey, HEW=Health Extension Worker, L10K=Last Ten Kilometers Project

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