LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

COMMUNITY BASED NEWBORN CARE IN ETHIOPIA

Quality of CBNC programme assessment
Midline Evaluation Report **March 2017**

JaRco Consulting

IDEAS

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ACRONYMS

ACRONYM	DEFINITION
ANC	Antenatal care
CBNC	Community Based Newborn Care
HEW	Health Extension Worker
HMIS	Health management information system
iCCM	Integrated Community Case Management
IDEAS	Informed Decisions for Actions in Maternal and Newborn Health
IFHP	Integrated Family Health Program
IMNCI	Integrated management of newborn and childhood illness
IRT	Integrated refresher training
LSHTM	London School of Hygiene & Tropical Medicine
MNCH	Maternal, newborn and child health
MNH	Maternal and newborn health
MUAC	Mid-upper arm circumference
NGO	Non-governmental organisation
ORS	Oral rehydration solution
PDA	Personal digital assistant
PHCU	Primary Health Care Unit
PNC	Postnatal care
PRCM	Performance Review and Clinical Mentoring
SNNP	Southern Nations Nationalities and People
TTC	Tetracycline
TWG	Technical Working Group
VSD	Very severe disease
WDA	Women's Development Army

EXECUTIVE SUMMARY

This report presents results from a quality of care assessment of the Ethiopian Community Based Newborn Care (CBNC) programme conducted in late 2015. It focuses on the delivery of newborn care and illness management services within a community setting, primarily by health extension workers (HEWs). CBNC is a pioneer Ethiopian national programme, which precedes the World Health Organization's policy on antibiotic use by frontline workers for neonatal illness. The CBNC programme quality of care assessment presented in this report focuses on investigating facility readiness, system integration, health workforce potential and HEW competence to provide quality newborn care services.

BACKGROUND

The CBNC programme is a key milestone of the Ethiopian Health Extension Program. Building on lessons learned from integrated Community Case Management of childhood illness (iCCM), the implementation of CBNC used the following guiding principles to ensure rapid, high-quality implementation: 1) government leadership and ownership; 2) spanning the continuum of care; 3) balance between preventive and curative care at the community level; 4) quality service; 5) community participation; 6) strong health system support, and 7) phased implementation approach and partnership.

The goal of the CBNC programme is to reduce newborn mortality through strengthening the primary health care unit (PHCU)[1] approach and the Health Extension Program. This goal is achieved by improving linkages between health centres and health posts and the performance of Health Extension Workers (HEWs) and Women's Development Army (WDA), to improve antenatal, intrapartum, postnatal and newborn care through the "four Cs" (1) early prenatal and postnatal Contact with the mother and newborn; (2) Case-identification of newborns with signs of possible severe bacterial infection; (3) Care, or treatment that is appropriate and initiated as early as possible; and (4) Completion of a full seven-day course of appropriate antibiotics. CBNC implementation involves the scaling-up of community based maternal and newborn health (MNH) services in:

1. Early identification of pregnancy
2. Provision of focused antenatal care (ANC)
3. Promotion of institutional delivery
4. Safe and clean delivery
5. Provision of immediate newborn care, including

application of chlorhexidine on the cord
6. Recognition of asphyxia, initial stimulation and resuscitation of the newborn baby
7. Prevention and management of hypothermia
8. Management of pre-term and low birth weight neonates
9. Management of neonatal sepsis and very severe disease (VSD) at community level

COMMUNITY-BASED NEWBORN CARE IMPLEMENTATION

CBNC was launched in March 2013 by the Government of Ethiopia in collaboration with its implementing partners (UNICEF, Last 10Kilometres, Integrated Family Health Program-IFHP, and Save the Children). CBNC was implemented in two major phases. Phase I was implemented in March 2014 in all the woredas and PHCUs of seven selected zones from the agrarian regions namely: Amhara (East Gojam zone), Tigray (Eastern zone), Oromia (North and East Shewa zones) and Southern Nations Nationalities and Peoples' (SNNP) Region (Wolayita, Gurage and Sidama zones). These zones were selected due to the strength of their health system. In these seven zones a total population of over 11 million was expected to benefit from the CBNC interventions, with 2.6 million women of reproductive age and almost 400,000 expected deliveries per year. The CBNC programme in Ethiopia has the following objectives:

1. To further strengthen the PHCU approach and the Health Extension Program by improving linkages between health centres and health posts and the performance of the HEW, to scale up community based MNH services including introduction of newborn sepsis management;
2. To strengthen the capacity of health centres in providing quality maternal, newborn and child health services;
3. To further strengthen logistics and information systems within the PHCU context;
4. To improve maternal and newborn care practices and care seeking through the WDA and other existing effective community mobilization mechanisms; and
5. To draw experience and lessons from the initial phase to inform the scale-up phase.

The major activities for Phase I included preparation of training guides and supporting training materials for health workers, HEWs and the WDA leaders, cascaded training, regional and zonal level orientation, orientation of the WDA on CBNC, follow-up after training and regular supportive supervision, Performance Review and Clinical Mentoring (PRCM) meetings and procurement and distribution of essential supplies and drugs as well as operations research.

By August 2014 all HEWs in PHCUs in these zones had completed training. Based on learning from the Phase I zones Phase II of CBNC programme implementation was launched in January of 2015, with training in some zones taking place at a later date.

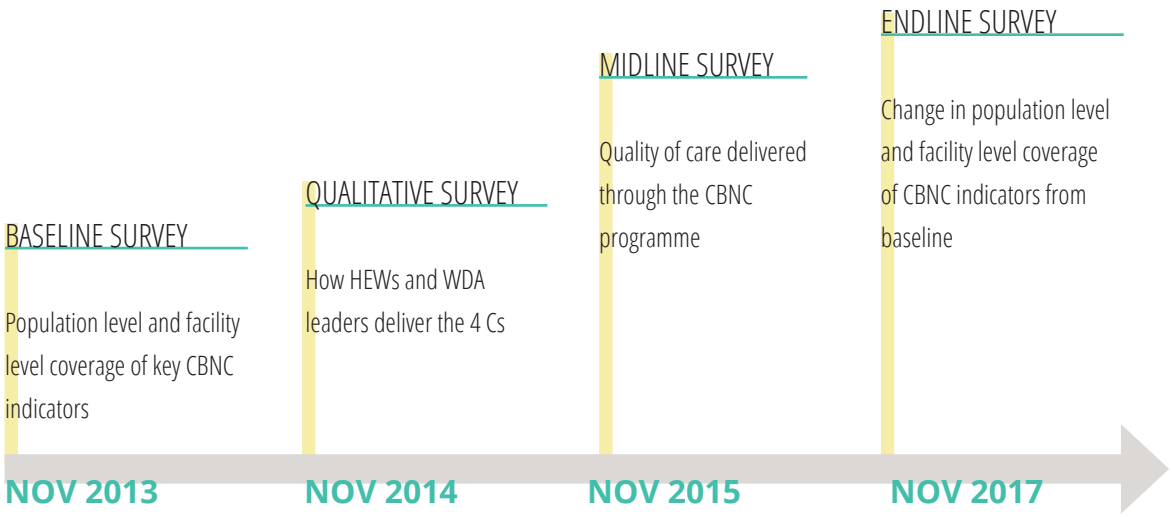
The London School of Hygiene & Tropical Medicine is collaborating with the Ethiopian Federal Ministry of Health to conduct an evaluation of Phase I, through the IDEAS (Informed Decisions for Actions in Maternal and Newborn Health) project. Funded by the Bill & Melinda Gates Foundation, IDEAS works with JaRco Consulting, an Ethiopian based research agency.

CBNC EVALUATION

The objective of the CBNC Phase I evaluation is to gather, analyse and synthesise evidence to determine whether and how community-based newborn care in the seven Phase I zones leads to increased coverage of critical interventions along the continuum of care, reflecting the CBNC programmatic components. The evaluation design includes before-and-after coverage surveys of key behaviours and interventions at household level and will compare Phase I (early implementers of CBNC) with Phase II (late implementers of CBNC)[2] areas. The evaluation also includes a qualitative study to assess how CBNC is being implemented (Figure i).

The CBNC baseline survey was conducted in the fourth quarter of 2013[3] and the endline is tentatively scheduled to take place in

Figure i. CBNC evaluation: components of CBNC Phase I evaluation



the fourth quarter of 2017, three-and-a-half years after the start of CBNC implementation. The CBNC evaluation also includes qualitative work to understand implementation processes, as well as a midline quality of care survey. This report details the methodology, results, discussion and recommendations that have resulted from the CBNC quality of care survey (midline evaluation) conducted in the fourth quarter of 2015.

CBNC MIDLINE SURVEY OBJECTIVES

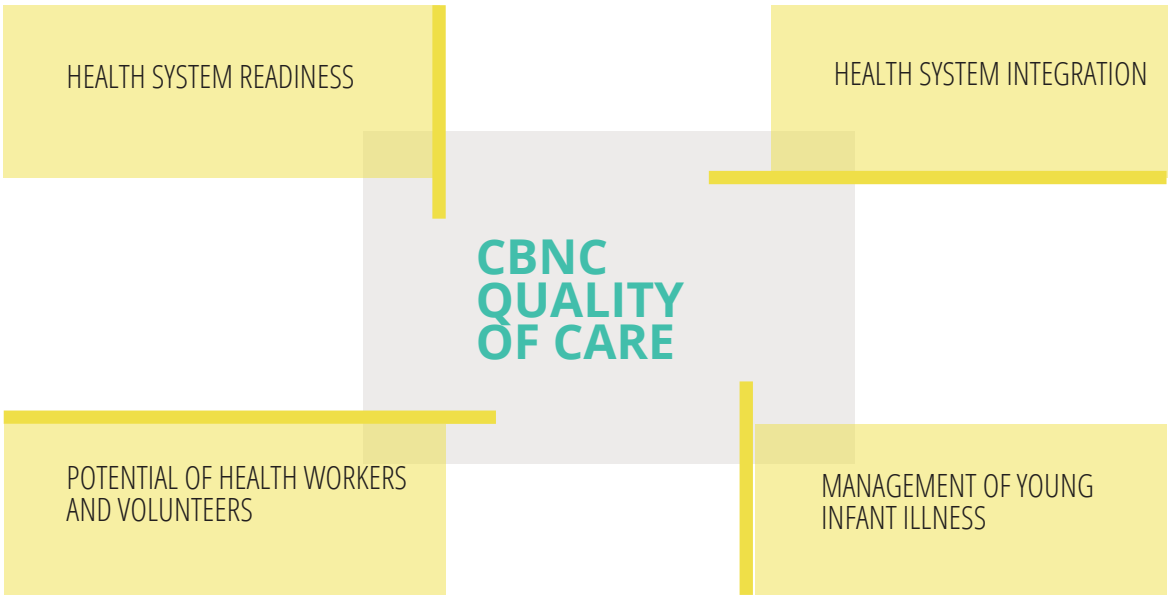
The CBNC midline quality of care evaluation has the following four main objectives:

1. To compare the health system readiness to provide quality CBNC services in CBNC early and late implementing areas.
2. To compare the health system integration within the PHCU for quality CBNC services in CBNC early and late implementing areas.
3. To compare the potential of health workers and volunteers to deliver CBNC services in CBNC early and late implementing areas.
4. To compare the quality of care provided by HEWs including sepsis management for infants less than two months of age, at the health post level in CBNC early and late implementing areas.

CBNC MIDLINE SURVEY METHODS

Like the baseline survey, the CBNC midline survey took place in 12 zones across the four regions of Ethiopia - Amhara, Oromia, SNNP and Tigray. Data were collected over six-and–a-half weeks from October-December 2015. Overall, the sampling procedure for the survey resulted in a representative sample of PHCUs in the selected zones. The midline survey compared the CBNC quality of care between PHCUs in the seven CBNC early implementing zones and PHCUs in the five CBNC late implementing zones. The selection of zones for comparison was based on the Ministry of Health's recommendation, with the understanding that CBNC implementation in these zones was likely to take place after the endline survey had been conducted. However, Phase II of the CBNC programme started in 2015. As such the midline survey assesses CBNC programme maturity by making comparisons

Figure ii. The four domains used to conceptualise the quality of CBNC services



between areas that had a minimum of one year (average 19 months) of CBNC programme implementation and areas where implementation had just started (average of three months) prior to the midline survey.

The sample size calculation for the midline survey aimed to detect a minimum 15 percentage points change in correct classification of young infant health status (0-2 months old) based on CBNC guidelines between early and late implementing areas (primary outcome), with a minimum of 80% power, and a 5% level of significance. This required a sample size of 420 young infants in early and 300 in late implementing areas. This was achieved by sampling 140 health posts with three young infants per health post in the early implementing areas, and 100 health posts with three young infants per health post in late implementing areas. The 140 health posts in early implementing areas were distributed across 70 PHCUs and 100 health posts in late implementing areas were distributed across 50 PHCUs, proportionate to the population size of the PHUCs.

This study was conducted in 30 woredas (18 in early implementing areas and 12 in late implementing areas), 117 PHCUs (70 in early implementing and 47[4] in late implementing areas) and 240 health posts (140 in early implementing and 100 in late implementing areas). Health facility surveys were conducted in 117 health centres and 240 health posts to collect information on catchment population, infrastructure, as well as CBNC-related staff profile, supervision, equipment, medicine, job aids and register review. A total of 240 HEWs and 240 Women's Development Army (WDA) leaders each were also interviewed with respect to their CBNC-related knowledge, training, supervision, mentorship and service delivery. Lastly, the skills of all 240 HEWs to deliver

quality CBNC case management were assessed through clinical vignettes, antibiotic injection simulation and young infant clinical case classification. Clinical vignettes covered clinical scenarios for management of young infants with VSD, VSD follow up care and general counselling for healthy newborns. For the clinical case classification, a total of 893 sick young infants of less than two months old had an observed consultation with a HEW, followed by a re-examination by a health officer.

This report presents the findings from the midline study with results presented by early and late implementation areas, as well as totals for all the PHCUs visited. The report has seven chapters. Chapter 1 provides a brief background on the CBNC programme as well as an overview of the CBNC evaluation, with a focus on the midline survey. The methodology for the midline survey is provided in Chapter 2.

The quality of the CBNC programme has been conceptualised and assessed across four key domains and the results of midline survey are presented under these domains (Figure ii):

A. Health system readiness to provide quality CBNC services (Chapter 3): Health system readiness was assessed in terms of facility readiness (equipment, drugs and number of trained staff). The level of supervision, mentorship and CBNC-related service delivery was also investigated.
B. Health system integration within the PHCU for quality CBNC services (Chapter 4): Under this domain, we looked at the drug supply chain and the supply of key job aids relevant to CBNC, as well as at referrals of sick newborns from the health posts to health centres.
C. Potential of health workers and volunteers to deliver quality CBNC services (Chapter 5): Under this domain, the survey assessed the level of CBNC programme training, knowledge and practice among HEWs and WDA leaders. This survey implemented a novel technique of using images from the family health card (a maternal and child health behavioural change communication job aid) as flash cards to assess WDA leaders' knowledge.
D. Management of young infant illness (Chapter 6): Under this last domain the survey assessed HEWs' competence to deliver CBNC services. For this purpose, novel techniques were also employed. HEWs' case management skills were assessed through clinical vignettes following the CBNC protocol. HEWs' skills in appropriately providing gentamycin injections were assessed through an injection model. Lastly, HEWs' case classification skills were assessed although an observed consultation for a sick young infant between the ages of 0-2 months, followed by an independent re-examination of the newborn by a health officer. Although the WHO health facility assessment guide does not include case observation for 0-2 month infants, we adapted the tools used for 2-59 month old children in accordance with the iCCM chart booklet issued by the Ethiopian Ministry of Health.

"THE QUALITY OF THE CBNC PROGRAMME HAS BEEN CONCEPTUALISED AND ASSESSED ACROSS FOR KEY DOMAINS."

A discussion of the results and recommendations are detailed in Chapter 7. There is also an Appendix of tables that show coverage of other MNH-related indicators, some of which are not directly tied to the management of newborn illnesses.

SUMMARY OF KEY MIDLINE SURVEY FINDINGS AND DISCUSSION

Health system readiness to provide quality CBNC services

As detailed in Chapter 3, the assessment of health system readiness to provide quality CBNC services indicated that most facilities have the necessary equipment, supplies and job aids to provide CBNC services. However, poor supplies of water, soap and hand sanitizer at health posts and health centres, have major implications for hygiene, particularly when handling a newborn. There was a shortage of HEWs in late implementing areas, although despite this shortage, compared with early implementers, a greater proportion reported being available to provide services on weekends and holidays. On average health posts were open for five working days, with 15% reporting that they were operational for two to four days a week.

The frequency of Performance Review and Clinical Mentoring meetings was promising with 67% of HEWs reporting that they had attended a meeting in the last six months. Fifty-eight percent of HEWs (69% in early and 43% in late implementing areas, $p<0.001$) reported receiving a CBNC/iCCM programme specific supervision in the last six months. However, the most notable gap in health system readiness was infrequent integrated supportive supervisory visits, with 52% of HEWs (53% in early and 50% in late implementing areas) reporting that they had not received a visit in the last month. Furthermore, visits did not adequately cover aspects of sick newborn care management. Among those receiving a visit in the last six months, 53% of visits were conducted by health centre staff, 18% by woreda health office, 13% by an implementing partner and 15% of visits were joint (between health centre, woreda health office and/or an implementing partner).

On the day of the survey, 97% of health posts had amoxicillin and 91% had gentamycin. A quarter of health posts had expired oral rehydration solution and half had expired zinc. The level of supervision from health centre to health post has to be strengthened to ensure that HEWs are providing services according to the CBNC protocol and also to ensure that the necessary drugs for the management of newborn illnesses are available.

With respect to the function of health facilities in providing CBNC services, there were good linkages between health posts, WDA leaders and communities, with two-thirds of HEWs organising monthly pregnant women's conferences that were widely attended by expectant mothers. Service utilisation records showed that ANC and facility deliveries are on the rise. However, postnatal care (PNC), particularly at health posts, was very low.

A record review of health post and health centre registers indicated possible misclassification of data because of the way that PNC 1 is defined by different health centres (PNC within the first 24 hours of delivery prior to discharge vs after discharge). Similar problems were also evident with respect to how both the four ANC and four PNC visits are recorded by health workers (timing of visit vs number of visits). This indicates a conceptual problem, highlighting a lack of clarity in the definitions of these indicators and what they are capturing. The problem can be addressed through training and supervision. It is important to ensure that health centres and health posts record PNC and ANC in a standardised manner so that accurate tracking of these indicators can inform decisions to improve service uptake.

Health system integration within the PHCU for quality CBNC services

Chapter 4 assessed the level of system integration that exits at the PHCU level to provide quality CBNC services. The availability of CBNC-related drugs at health centres, for supplying health posts, was also examined to assess the level of system integration. Overall, 80% of health centres had some form of amoxicillin (125 mg/250 mg dispersible tablet and/or 125mg/5ml syrup) with no reported stock-out in the last three months. Only 2% of health centres had amoxicillin stock-outs lasting three months or more. In contrast, 75% of health centres had experienced stock-out of gentamycin 20mg/2ml at some point in the previous

three months, with 43% having stock-out lasting three months or more. The reason for this high level of stock-out could be because health centres are encouraged to pass this drug to health posts rather than retain it at their facility.

Among health centres that had received amoxicillin (125 mg and 250 mg dispersible tablets, as well as 125mg/5ml syrup) and gentamycin (20 mg/2ml) deliveries in the last three months, over half were provided by the woreda health office, with this proportion being lower in early implementing areas, where implementing partners played a greater role in providing these drugs.

The review of the Integrated Management of Newborn and Childhood Illness (IMNCI) register showed that 825 (378 in early and 447 in late implementing areas) infants 0-2 months were seen across 104 health centres in the three months preceding the survey. The remaining 13 health centres (five in early and eight in late implementing areas) had not recorded any cases for the above mentioned period. Similarly, the iCCM 0-2 month registers at health posts had recorded 428 (289 in early and 139 in late implementing areas) cases in the three months preceding the survey. The remaining 46 health posts (13 in early and 33 in late implementing areas) had not recorded any cases of infants 0-2 months for the preceding three months. At health post level, among those classified as having VSD, 46% were referred to health centres. Among the 54% that received treatment at the health post, 80% were recorded as having completed their gentamycin injection.

"THE MOST NOTABLE GAP IN HEALTH SYSTEM READINESS WAS INFREQUENT INTEGRATED SUPPORTIVE SUPERVISORY VISITS."

Further review of registers to assess referral linkages showed a minimal level of follow-up, with only 7% of young infants recorded as referred in the iCCM registers at health posts being cross-linked to IMNCI registers at the referral health centre.

The assessment of government owned vehicles for the most recent obstetric referral showed that 63% had used woreda health office or health centre owned ambulances.

Potential of health workers and volunteers to deliver quality CBNC services

The assessment of health workforce potential showed that the majority of health centres (95%) had one or more staff members trained in IMNCI and 68% had CBNC trained staff. The high availability of IMNCI trained staff at health centres is promising. Improving the availability of staff trained both in CBNC and IMNCI will further ensure the quality of CBNC supportive supervision and mentorship that can be provided to HEWs.

CBNC training had been scaled up in Ethiopia. In this study, 98% of HEWs (100% in early and 96% in late implementing areas) had received CBNC training. However, a quarter of HEWs had not attended annual Integrated Refresher Training. The assessment of HEWs' unprompted knowledge (without the use of the chart booklet) showed that they had very good knowledge on nutritional counselling and assessment. Though there were gaps in their knowledge across newborn care and signs for sick newborns, HEWs had good knowledge of management and treatment for newborns with a given disease classification. Caution should be taken when interpreting the results in the HEW knowledge section of this report. As per government guidelines, HEWs are not expected to memorise all danger signs. Rather they are instructed to refer to the iCCM chart booklet.

The majority of WDA leaders reported having received an orientation in newborn care in the last 12 months. Yet, like HEWs, assessment of their knowledge showed that there were major gaps in their unprompted knowledge on newborn danger signs. Their comprehension of the family health card (a maternal and child health behavioural change communication job aid), assessed through flash cards of images depicting key messages, showed a lack of understanding among the majority of WDA leaders. As the family health card serves as the key job aid for WDA leaders to conduct their work, it is important to ensure that their orientation covers explanations of the messages it contains.

"ALTHOUGH THERE WERE GAPS IN THEIR KNOWLEDGE ACROSS NEWBORN CARE AND SIGNS FOR SICK NEWBORNS, HEALTH EXTENSION WORKERS HAD GOOD KNOWLEDGE OF MANAGEMENT AND TREATMENT FOR NEWBORNS WITH A GIVEN DISEASE CLASSIFICATION."

Management of young infant illness

HEW skills for the management of CBNC related young infant illness were evaluated through clinical vignettes, antibiotic injection simulation and direct observation of care management including clinical case classification.

Clinical vignettes for VSD case management, VSD follow-up care and general counselling for a healthy newborn showed that overall HEWs had good patient identification skills, although there were some minor gaps. This was similar to the findings from the 0-2 iCCM register review, which showed near complete data on newborns' background information. Overall, HEWs in both early and late implementing areas were similar with respect to their clinical skills to provide counselling for a healthy newborn. With respect to management of VSD cases, HEWs from early implementing areas had better clinical reasoning and management skills than those from late implementing areas. The most striking gap was the limited skills of studied HEWs in identifying the signs to correctly diagnose a sick newborn. However, if HEWs were verbally informed about specific signs of a young infant's illness, over three-quarters were able to provide the appropriate diagnosis and treatment for VSD. The gap in HEW's ability to recognise signs and symptoms for a specific young infant's illness highlights an area for focused training and clinical mentorship, which can bridge the observed gap.

Assessment of HEWs' skill in providing an intramuscular injection of gentamycin to newborns showed that their overall skill is low, which was surprising given their experience in providing vaccinations. However, HEWs from early implementing areas demonstrated better injection skills than those in late implementing areas.

This study also conducted case classification for 893 young infants aged 0-2 months that were considered sick by their caregivers. The major challenge faced was the absence of caregivers spontaneously bringing their sick young infants for treatment at the health post. As a result, we mobilised caregivers in the community to bringing their 'sick' babies, to the health post. All young infants 0-2 months old considered sick by their caregivers were included in this study.

Health system readiness to provide quality CBNC services needs:

- a functional infrastructure at health post level
- CBNC essential drug supply
- supportive supervision of health post staff
- streamlined data management processes at PHCU level, especially standardisation of the indicator definitions across the health system

Health system integration within the PHCU for quality CBNC services needs:

- an intact and responsive supply chain for CBNC antibiotics
- improved record keeping of CBNC services
- an effective referral process between health posts and health centres including transport and necessary documentations

Potential of health workers and volunteers to deliver quality CBNC services needs:

- regular needs assessment
- periodic refresher trainings
- optimisation of the potential of WDA leaders to create demand for CBNC services

Effective management of young infant illness needs:

- periodic examination of HEWs' diagnostic and management skills
- addressing observed gaps with supervision and mentoring

Comparison of the health officers' diagnoses to those made by HEWs showed that HEWs were able to correctly identify young infants that did not have a particular illness, as not having an illness. This is a promising finding as it suggests there is little misuse of antibiotics for young infant illness by HEWs. However, HEWs from both early and late implementing areas showed similar gaps with respect to correctly identifying babies that presented with an illness. The clinical vignettes and illness case classifications highlighted the areas of challenge in their theoretical and practical understanding of young infant management. HEWs misclassified 70% of VSD and 72% of feeding problem cases as not having these conditions. HEWs were able to correctly identify 55% of young infants that had local bacterial infection. Overall, two out of five sick young infants were correctly classified by HEWs. This indicates that some sick young infants were not receiving the appropriate life-saving drugs at the health post level.

Data collectors spent time with HEWs the day before the sick young infant assessment to explain the purpose and process of the study, ensuring that they were comfortable and able to provide services as per their routine. However, it is likely that HEWs performance might have been different in the absence of the observer.

It is important to note that there are several factors affecting HEWs' ability to correctly diagnose a sick young infant, including opportunities to practice clinical skills, supportive supervision and clinical mentoring. This was not assessed for in this report. Such nuanced analysis will be part of future work.

The experience of the caregivers at health posts was very positive. Exit-interviews showed that they were satisfied with the care that was provided to them by the HEWs, which potentially reinforces positive health seeking behaviours and sustains the demand for community newborn care services.

RECOMMENDATIONS

This survey provides an overview of the quality of CBNC services provided in early and late CBNC implementation areas. Overall, the health system readiness to provide quality CBNC services showed that there were good linkages within PHCUs and health facilities were well equipped with job aids, equipment and supplies. However, in some facilities there was an observed lack of water and soap. Furthermore, there were stock-outs of CBNC-related drugs at both health centres and health posts. Most notably, there was a major gap in supervision, which heavily limits a facility's readiness to provide quality CBNC services. With respect to system integration, the most notable gap was the lack of follow-up on referrals from health posts to health centres.

Assessment of HEWs' unprompted knowledge showed gaps in their ability to cite newborn danger signs. Although HEWs are not expected to memorise dangers signs, they need to know the signs that should prompt them to refer to the chart booklet. This was further highlighted by the clinical observations where HEWs were unable to recognise young infants that presented with danger signs. In clinical vignettes, once HEWs were informed of the exact danger signs, they were able to diagnose young infants and provide appropriate treatment. An assessment of intramuscular injection of gentamycin by HEWs indicated that early implementing area HEWs performed better than late implementing area HEWs, though both groups require further training. Despite these shortcomings, HEWs were providing services to caregivers that left them satisfied by the experience, which could potentially endorse positive health seeking behaviour by the community for neonatal illness and create community demand for CBNC services. WDA leaders also had limited understanding of images included in the family health card, with the gap being wider among late implementing area WDA leaders.

Results from this survey can enable CBNC programme implementers to understand the quality of services and identify strengths and gaps, so as to direct their implementation efforts accordingly. It is strongly recommended that the results presented in chapters 3-6 be thoroughly reviewed to identify overall gaps in quality, as well as gaps specific to early and late implementation areas. Based on the findings from this midline survey, we present key recommendations below for improvement across the four domains used to conceptualise quality CBNC service delivery:

Health system readiness to provide quality CBNC services

1. Incorporate supportive supervision activities specific to CBNC and iCCM into routine supervision visits
2. Make provision of MNCH/CBNC-related integrated supportive supervision for HEWs a key responsibility of health centre staff, by including it as an indicator during their performance review
3. Increase the frequency of supervision from health centres to health posts, ensuring that visits cover an assessment of HEWs' VSD service provision as well as monitoring drugs supply
4. Improve the infrastructure, especially the water supply
5. Develop and implement a well-defined matrix for measurement of ANC and PNC through HMIS
6. Explore the possibility of integrating post-natal care services with CBNC practices, as they are targeting the same timeframe and closely linking them will benefit both services

Health system integration within the PHCU for quality CBNC services

1. Improve the supply chain system for CBNC related drugs, ensuring that the drugs are fully incorporated into the Pharmaceuticals Fund and Supply Agency and the Integrated Pharmaceutical Logistics System
2. To ensure follow-up on referrals from the health post, increase access to woreda ambulances for transport of sick young infants to health centres
3. Ensure the availability of official referral forms at health posts and train HEWs to use them when referring sick newborns

4. Provide each sick young infant with a unique identifier for easy follow-up within the PHCU to ensure provision and completion of treatment

Potential of health workforce to deliver quality CBNC service

1. Explore the possibility of including CBNC as part of pre-service training to be supported by systematic on the job mentoring
2. Ensure periodic and structured coaching by HEWs to enhance WDA leaders' understanding of maternal, newborn and child health (MNCH) promotion messages spanning all CBNC components
3. Strengthen WDA leaders' capacity for demand creation to increase uptake of newborn services, focusing on their ability to recognise danger signs for young child illness and effective use of the family health card.
4. HEWs and WDA leaders' training should incorporate their satisfaction and engagement to inform the content and design of future trainings

Management of young infant illness

1. Create innovative, skills based trainings and mentoring activities for HEWs focusing on the recognition of danger signs in young infants
2. Provide periodic refresher training to HEWs on intramuscular injections for young infants using innovative technologies and methods
3. To overcome limited case load of sick young infants at the health post level, invite HEWs periodically to health centres to observe case management skills practiced by health officers
4. Revitalise the skills labs, especially for HEWs' CBNC refresher trainings

1. The primary health care unit consists of a health centre together with the surrounding satellite health posts.
2. Areas for comparison were selected from zones where CBNC roll-out was planned to be as late as possible, due to the need to further strengthen the iCCM programme, PHCU linkages and the Women's Development Army (community volunteers) prior to implementing CBNC.
3. Berhanu, D. Bilal, B.A. (2014) Community Based Newborn Care: Baseline report summary, Ethiopia October 2014. London: IDEAS London School of Hygiene & Tropical Medicine.
4. Three PHCUs in North Gondar zone (late implementing zone) were not visited due to civil unrest. More health posts in other PHUCs of the same zone were visited to ensure the desired sample size.

1. INTRODUCTION

This chapter provides background information on the Community Based Newborn Care (CBNC) programme and on the programme evaluation.

CHAPTER SECTIONS

BACKGROUND TO CBNC

CBNC is a means of bringing life-saving care to mothers and newborns at the community level within the Ethiopian health system. Through CBNC, the government aims to strengthen the primary health care unit (PHCU) and the Health Extension Program, a platform for community-based primary care delivery. By enhancing linkages between health centres and health posts within the PHCU and augmenting the performance of health extension workers (HEWs) and the voluntary Women's Development Army (WDA) leaders, CBNC aims to improve antenatal, intrapartum, postnatal and newborn care. The key components of the CBNC programme are shown in Figure 1.

It is important to highlight that the last component is achieved through four key steps, labeled as 4Cs: (1) early prenatal and postnatal **Contact** with the mother and newborn; (2) **Case-identification** of newborns with signs of possible severe bacterial infection; (3) **Care**, or treatment that is appropriate and initiated as early as possible; and (4) **Completion** of a full seven-day course of appropriate antibiotics (Figure 2).

CBNC was launched in March 2013 by the Government of Ethiopia in collaboration with its implementing partners (UNICEF, Last 10 Kilometres, Integrated Family Health Program -IFHP, and Save the Children). CBNC has been implemented in two major phases. Phase I began in March 2014 in seven zones across four regions of Ethiopia: Amhara (East Gojam Zone), Oromia (North and East Shewa zones), Southern Nations and Nationalities and Peoples' Region (SNNP) (Wolayita, Gurage and Sidama zones) and Tigray (Eastern zone) (Figure 3). Zones for CBNC Phase I were selected for having a strong PHCU, health extension program, integrated community case management platform and WDA network. As part of a second phase of implementation, CBNC was then rolled to other zones in the four regions in January 2015.

SCOPE AND AIM OF THE CBNC QUALITY OF CARE EVALUATION

Evaluation of CBNC programme Phase I includes a baseline (October 2013), a midline (October 2015) and an endline survey (tentatively scheduled for October 2017). It is also supported by qualitative research. The baseline and endline surveys assess the change in coverage across nine components of CBNC after two-and-a-half years of full implementation.

The rest of this report focuses on the midline evaluation, which concentrated on quality of care in relation to the management of neonatal sepsis or VSD at the community level through the 4Cs, described in Figure 2 above. The survey made the comparison between those areas that had a minimum of one year (average 19 months) of CBNC programme implementation and those where implementation had just started (average of three months) prior to the midline survey (Figure 3). As such, the midline assesses CBNC programme maturity by comparing areas where CBNC had been fully implemented for a year or more (early implementers) to areas where the programme had just started prior to the survey (late implementers).

The evaluation of CBNC is being carried out by Informed Decisions for Actions in Maternal and Newborn Health (IDEAS), London School of Hygiene and Tropical Medicine (LSHTM), UK (Dr Bilal Avan and Dr Della Berhanu) in collaboration with JaRco Consulting, Ethiopia (Tsegahun Tessema, Dr Yirgalem Mekonnen and Nolawi Taddesse).

The success of the CBNC initiative on the quality of services rests on: the continued availability of drugs and supplies, and

Figure 1. The CBNC programme components

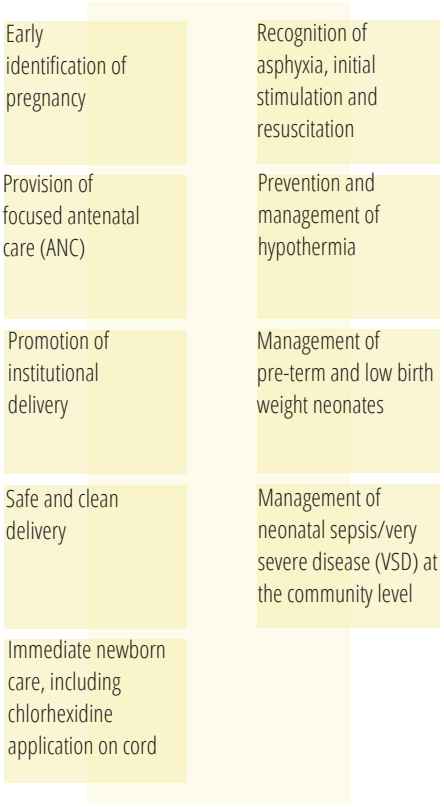
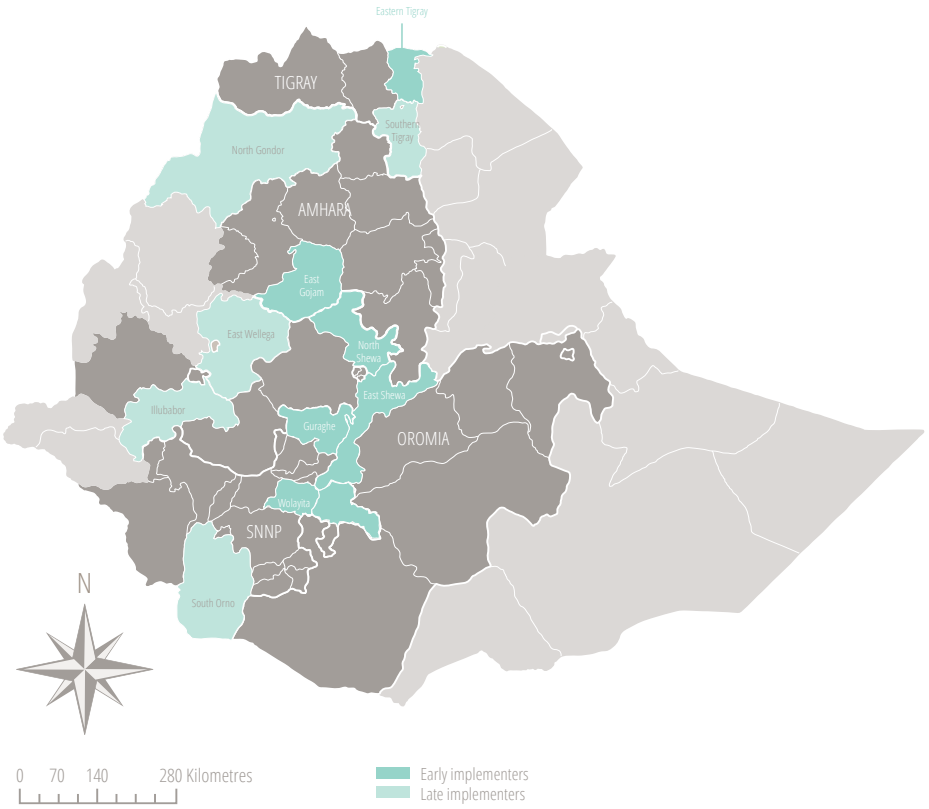


Figure 2: CBNC health care seeking framework: the 4Cs

Figure 3: CBNC programme evaluation areas: early implementing areas (March 2014) are in dark turquoise and late implementing areas (January 2015) are in light turquoise.



supportive supervision by the woreda and at the health-centre level; the availability of skilled HEWs at health posts; and early contact and related demand-generating activities by WDA leaders at the community level.

The rationale for a quality-of-care-focussed midline evaluation, one-and-a-half years after the initiation of the CBNC programme, is to identify areas for improvement and ensure vital adjustment and course correction in the delivery of CBNC services.

For the survey, 'quality of care' operationally refers to whether HEWs correctly assess, classify, treat and refer neonatal VSD illnesses, and provide necessary counselling to caregivers based on CBNC and integrated Community Case Management(iCCM) guidelines endorsed by the Ethiopian Ministry of Health.

The quality of care was assessed at both the health worker performance level and at the level of health system readiness and support. The assessment used the IPO (Infrastructure–Process–Outcome) framework, i.e.

A. Infrastructure and commodities: adequacy of physical infrastructure of facilities and drug supplies necessary for CBNC delivery;
B. Service delivery processes: adequacy of trainings, supportive supervision, referral system and HEW performance;
C. Service delivery outcome: completion of neonatal VSD treatment and functional referral system.

For this assessment, range of data collection methodologies, including questionnaire-based interviews, direct observation of clinical skills, health facility observations and records reviews. A comparative assessment was carried out in the CBNC early

implementation and CBNC late implementation areas across 12 zones in the four regions, i.e. Amhara, Oromia, SNNP and Tigray.

OBJECTIVES OF THE QUALITY OF CARE EVALUATION

The evaluation had the following specific objectives:

1. To compare the health system readiness to provide quality CBNC services in CBNC early and late implementing areas.

The survey assessed the availability of essentials needed for the delivery of quality services to the newborn with neonatal sepsis or VSD. This was assessed through interviews, direct observation of stock-outs and a review of records at the health facilities. Supportive supervision of HEWs (health post level) for the care of infants less than two months of age in CBNC was also assessed. Technical and administrative supervision is imperative for the delivery of quality newborn care services by health post staff. The nature and extent of the supportive supervision was assessed through interviews with HEWs and the health centre staff.

2. To compare the health system integration within the PHCU for quality CBNC services in CBNC early and late implementing areas.

This survey used interviews and direct observation to assess drug supply chain and supply of key job aids relevant to CBNC. Furthermore, through review of facility records for the last quarter, the survey assessed the level of appropriate and timely referral to a pre-designated health facility, which is one of the key aspects of managing VSD.

3. To compare the potential of health workers and volunteers to deliver CBNC services in CBNC early and late implementing areas.

The survey assessed the level of CBNC programme training, knowledge and practice among HEWs and WDA leaders through interviews and a review of records at health posts.

"WE EMPLOYED A WIDE RANGE OF STANDARD AND INNOVATIVE DATA COLLECTION METHODOLOGIES"

4. To compare the quality of care provided by HEWs including sepsis management for infants less than two months of age, at the health post level in CBNC early and late implementing areas.

The survey assessed the skills and practices needed for quality delivery services to infants 0-2 months of age, including correct classification of the physical health of the young infant, compliance with the standard CBNC/iCCM management and referral protocol, and facilitative interactions with caregivers (including health education and counselling for the mother). This objective was achieved by conducting questionnaire-based interviews with HEWs, including the use of clinical vignettes, observations of HEW consultations and independent re-examination of infants 0-2 months of age.

ORGANISATION OF THE CBNC QUALITY OF CARE REPORT

This report presents the data collected in October 2015. The following chapter (Chapter 2), provides an overview the CBNC midline evaluation methodology. Results are presented in Chapters 3-6: Chapter 3 provides results on facility readiness to provide quality CBNC services; Chapter 4 presents the level of health system integration within in the PHCU to deliver quality CBNC services; Chapter 5, the potential of the health worker and volunteers to deliver quality CBNC services; and Chapter 6, the management of newborn illnesses by HEWs. In the final chapter (Chapter 7) we present a discussion of the study findings. Additional results not included in the body of the report are included as appendices.

2. METHODS

This chapter presents the methods followed for the CBNC midline evaluation.

CHAPTER SECTIONS

STUDY AREA

The CBNC early and late implementing zones were from Amhara, Tigray, SNNP and Oromia, as shown in Table 1.

STUDY PARTICIPANTS

There were two types of participants in the study:
Health system

- HEWs performing examination and sepsis management of infants under two months of age;
- WDA leaders from the catchment areas of health posts;
- Health centre staff.

Community

- Caregivers with infants under two months of age who they presented at a health posts for a consultation.

Inclusion criteria

A. *Functional health post* - defined as a primary care facility, which has a physical structure for provision of health services and with at last one appointed HEW.
B. *HEW* - at least one HEW who has been at the health post for the last three months. Additionally, for the health posts in CBNC early implementation areas, one HEW who has received CBNC training at least one year before the time of this midline survey assessment.
C. *Infant* under the age of two months:
   - Considered 'sick' by their caregivers;
   - Being seen for the first time at the health post or by either of the HEWs (including in the home/ community) for the current illness episode.

   Recruitment of infants will be by:
   - Infant being presented spontaneously at the health post on the day of the survey;
   - Infant actively identified by the WDA leaders for consultation in the survey.

D. *WDA (1-30 network) leaders* serving in their catchment areas, who had referred a sick infant between the ages of 0-2 months in the three months or most recently preceding the evaluation.

SAMPLING

The CBNC midline survey focused on assessing the CBNC performance overall, and the quality of CBNC services provided to sick young infants by HEWs at the PHCU level.

Sample size

We conducted a series of sample size calculations with varying assumptions to find the most efficient but feasible sample for the study. Our sample distribution of clusters was proportionate to the population distribution in early and late implementing zones (7:5). Table 2 summarises the best possible option considered for the survey. In order to detect a 15 percentage point difference between early and late implementing areas and using a design effect 2.00 and intra-class correlation of 0.5 - we found that sample size of 240 clusters (health posts) with a target of three children (0-2 months old) selected from each health post, was the most efficient and feasible sample size. The test statistic used is the two-sided score test (Farrington & Manning)[5]. Varying the cluster number and cluster size could have made the survey less feasible due to a) a relatively low number of health posts with the challenge of finding more eligible young infants per health post, or b) a relatively high number of health posts requiring less young infants per health post, but posing an enormous challenge of extensive travelling and an extended data collection period of more than six months. A summary of sample size estimations is given below while more details are given in Appendix I.

Sampling strategy

The CBNC midline evaluation was carried out in all seven early implementation zones and five late implementation zones simultaneously across the four regions. Among the total study population, about 60% resided in the early implementation zones and 40% in the late implementation zones. A population-proportionate multistage cluster sampling was employed at the zonal and woreda levels.

Selection of woredas

There are 96 woredas in the seven CBNC early implementation zones, and 77 woredas in five late implementation zones. A total of 30 woredas (18 in early and 12 in late implementation areas) were randomly selected proportionate to the zonal population size.

Selection of PHCUs and health posts

Seventy PHUCs were selected from the CBNC early implementing woredas and 50 PHCUs from the late implementing woredas. Prior to data collection in a woreda, a list of all the eligible PHCUs was compiled in collaboration with the woreda health staff. Then from the list of eligible PHCUs, the required number of PHCUs were randomly selected. On average, we selected two health posts within a PHCU for a total of 140 health posts from CBNC early implementing woredas and 100 from late implementing woredas. Where woredas did not have the required number of PHCUs, more than two health posts were sampled form the eligible PHCUs. As mentioned, a health post had to be functional – a primary care facility with a physical structure for provision of health services and with at least one appointed HEW. At least one HEW had to have been at the health post for the last three months. Additionally, for the health posts in CBNC early implementing areas, at least one HEW had to have received CBNC training at least one year before the time of the midline survey assessment.

Table 1. Areas of CBNC programme implementation in Ethiopia

	ZONE	WOREDA	TOTAL PHCUs
CBNC early implementing areas			
Oromia	North Shoa	18	55
	East Shoa	13	56
Amhara	East Gojam	17	100
SNNP	Sidama	19	112
	Gurage	15	68
	Wolayita	13	67
Tigray	Eastern	11	35
Total		*106*	*493*
CBNC late implementing areas			
I. Oromia	Ilu Aba Bora	24	63
	East Wellega	18	52
II. Amhara	North Gondar	21	119
III. SNNP	South Omo	8	29
IV. Tigray	Southern	11	26
Total		*82*	*289*

Table 2: Sample size estimation

EARLY IMPLEMENTERS No. of health posts/ no. of children under 2 months per health post	LATE IMPLEMENTERS No. of health posts/ no. of children under 2 months per health post	TO DETECT A MINIMUM DIFFERENCE OF:
70/6	50/6	15%
140/3	100/3	15%
210/2	150/2	15%

FIELD OPERATIONS

Formative phase

Study protocol and tool development

The development of the study protocol and instrument was a result of extensive formative fieldwork involving exploratory field visits and iterative periodic field testing to ensure that the tools were comprehensive and accurate, and that operational details of data collection were attainable.

The study protocol and tools were developed by the IDEAS–LSHTM research team, in close partnership with the field team of JaRco Consulting, Ethiopia, which was responsible for data collection. The research instruments strictly followed CBNC guidelines laid down by the Ethiopian Health Ministry, and Integrated Management of Newborn and Childhood Illnesses (IMNCI)/iCCM assessment endorsed by the World Health Organization.

In addition, the following new techniques were developed for the purpose of this survey:

A. Clinical simulation to assess HEWs' injection skills using an injection model
B. Clinical vignette for HEWs specifically addressing CBNC programme-related illnesses
C. Young infant quality of care observation and re-examination
D. Images from the family health card (a MNH-care behavioural change communication tool distributed by the Federal Ministry of Health), without text, were enlarged to create A4 laminated flash cards and were used to assess WDA leaders' knowledge

Study protocol and tool pretesting

The near-final versions of the protocol and tools were pre-tested in health posts in Oromia (near Addis Ababa). The field test was an attempt to approximate actual data collection procedures and was carried out by the study team over the course of six days. At this point, the protocol and instruments were shared with the Ministry of Health and CBNC implementing partners for the final review. The finalised instruments were translated into local languages: Amharic, Oromifa and Tirginia. Back translation into English was carried out to ensure accuracy of the translation. Table 3 details the midline survey instruments along with the different modules included in each instrument.

CBNC midline data collection team

Field team composition

There were 12 teams in the CBNC midline survey, each with four team members: team leader, community mobiliser, observer and re-examiner. Team members were grouped and assigned to specific regions based on their language skills.

Team roles

Each member of the team had specific roles detailed below:

1. *Team leaders:* mainly served as supervisors.
2. *Observers:* observed the HEWs' performance (HEWs' consultation with sick young infants, injection assessment and clinical vignettes) and filled out the HEW questionnaire.
3. *Re-examiners:* conducted the health centre questionnaire and re-examined an infant independently after the infant's consultation with a HEW.
4. *Community mobilisers:* engaged with HEWs, the kebele command post [6] and WDA leaders about sick infants. In addition, they conducted interviews with WDA leaders and the entry-exit interviews with caregivers of sick babies.

In addition to these members of the team, the CBNC midline evaluation also had a Field Coordinator and Quality Assurance Supervisor. The Field Coordinator and Quality Assurance Supervisor planned and oversaw the data collection and were responsible for organising the survey, quality control and monitoring the progress of survey teams. In addition, the Field Coordinator was responsible for recruiting and hiring survey personnel, and for other human resources matters.

Table 3: Content of CBNC midline instrument

INSTRUMENTS	MODULES
1. HEW questionnaire	1. Background
	2. Knowledge
	3. Training received
	4. Supervision received
	5. Services provision
1. HEW clinical vignettes	1. VSD case management
	2. VSD follow-up care
	4. General counselling for healthy newborn
3. HEW injection assessment	1. Injection skill assessment
4. Observation of newborn examination by HEW	1. Interaction with caregiver and young infant
	2. Physical examinations of young infant
	3. General care and record keeping
	4. Counselling of care taker
	5. Referrals and admissions
	6. Diagnosis
	7. Treatment
5. Re-examination of newborn	1. Verbal inquiry
	2. Physical examinations
	3. Referrals and admissions by HEW
	4. Diagnosis
	5. Prescribed treatment
6. CBNC supplies and record review at health centre	1. PHCU information and health centre staffing
	2. Supportive supervision conducted
	3. Facility equipment, medicines and job aids
	4. Register review
	5. Availability of diagnostics
7. CBNC supplies and record review at health post	1. Equipment, medicine and job aids
	2. Register review
8. WDA questionnaire	1. Background
	2. Knowledge
	3. Orientation and materials
	4. Planning meeting, practice and reporting
9. Maternal exit interview	1. Caregiver and family background information
	2. Health status of young infant
	3. Information provided to caregiver about illness treatment and care
	4. Referral
	5. Caregiver satisfaction

Table 4 further summarises the different evaluation tools along with the individual responsible for the tool and where the activity or interview took place.

Team credentials

The majority of team leaders and community mobilisers were identified from the pool of data collectors that had worked with JaRco in the past. For each category of data collectors an additional individual was trained and retained during the course of the survey, in case data collectors dropped out.

Team leader selection

All thirteen team leaders had a master's degree in public health or similar field, as well as experience in coordinating and supervising surveys.

Community mobilisers

Thirteen individuals were recruited for the community mobilisation role. All of the selected community mobilisers had a first degree in different disciplines and had extensive experience in data collection and supervision of community based and health facility based surveys.

Re-examiners and observers selection

The recruitment for re-examiners and observers involved several processes. Through consultation with the Ministry of Health's Maternal, Child Health and Nutrition directorate and CBNC implementing partners (UNICEF, L10K, IFHP and Save the Children) it was agreed that government employed health officers trained in CBNC should hold the positions of observer and re-examiner. From the 26 individuals that met the criteria, 23 had attended a CBNC training for trainers while three had basic training in CBNC. Observers and re-examiners were assigned to their specific roles based on their performance during the training and pilot testing for this survey. In the end, there were 13 re-examiners and 13 observers. Re-examiners and observers were assigned to woredas that were not within their regular working area while ensuring they were able to speak the local language.

Team training

Training for the CBNC midline survey was conducted over eight days, three days in Addis Ababa (1-3 October, 2015) and remaining five days in Adama (5-9 October, 2015). Overall, the classroom training in Addis Ababa covered the study procedures,

Table 4: CBNC midline evaluation study instruments - conducted by whom and where

INSTRUMENTS	RESPONSIBILITY	LOCATIONS
1. HEW questionnaire, including clinical vignettes	Observer	Health post
2. WDA questionnaire	Community mobiliser	Health post
3. Identification of eligible young infants	Community mobiliser	Health post
4. Observation of young infant examination by HEW	Observer	Health post
5. Re-examination of young infant	Re-examiner	Health post
6. CBNC supplies and record review at health centre	Re-examiner	Health centre
7. CBNC supplies and record review at health post	Observer	Health post
8. Maternal exit interview	Community mobiliser	Health post

the questionnaires, data-collection techniques, clinical guidelines, quality-assurance procedures and study ethics. Specifically, the first day involved a pre-test and review of the protocol and questionnaires related to the health centre, health post and HEW interviews. The second and third days of the training included covering the protocol and questionnaires according to the specific roles of data collectors. The training utilised both paper questionnaires and questionnaires programmed in personal digital assistants (PDAs).

The second part of the training, conducted in Adama, pilot-tested survey procedures and tools. This was intended to further train the survey personnel under conditions that simulate the actual survey. The pilot followed the exact procedures of the study to replicate the actual data collection context, including quality assurance measures. Adama was selected for its close proximity to Addis Ababa and the availability of a CBNC early implementing woreda. On day four, individuals were grouped into teams and used the field manual to map out their specific roles for the upcoming pilot. The pilot test took place over the course of the three days, with each team visiting one health centre and two health posts, strictly following the protocol to be carried out in a given PHCU. Each day involved an afternoon feedback session to clarify concepts and modify questionnaires, as well as discuss challenges faced in the field.

Day eight of the training involved discussions on data from the pilot test, a post-test and assignment of teams to their study woredas. Each team leader was also trained on how to compile and upload data from PDAs onto a secure server at JaRco's office.

Data collection

A. Data collection lasted from October-December 2015. On average, each survey field team completed two health posts in three days.
B. Arrival at the selected woreda: the woreda was informed of the study team's arrival beforehand and upon arrival woredas were provided with a copy of a permission letter from the zonal office. The field team visited the woreda health office and formally explained the purpose of the visit using a standardised formal introductory statement.
C. Data collection at the woreda health office level: A PHCU was randomly selected in consultation with the woreda health office, using the predefined criteria. The person overseeing the CBNC programme at the woreda health office communicated with the respective health centres regarding the research team's visit to the selected PHCUs.
D. Data-collection at the health centre level: the research team carried out two key activities in collaboration with the person overseeing the CBNC programme within the PHCU:
    - Random selection of the required number of health posts according to the predefined criteria, and their respective HEWs were notified of the upcoming study visits, and
    - Conducting of the health centre CBNC supplies and record review questionnaire by the re-examiner.
E. Data collection at the health post level: two days of data-collection activities were scheduled at each health post. A health post field team (observer and community mobiliser) arrived at each health post before regular working hours began (e.g. at 8:00 am). All HEWs working in the selected health posts were asked to facilitate data-collection (e.g. provide records). However, for the young infant examination,

"TWO DAYS OF DATA COLLECTION ACTIVITIES WERE SCHEDULED AT EACH HEALTH POST"

skills assessment and interview, the HEWs were selected on the basis of length of service at the health post. The survey field team met with the HEWs to introduce themselves and explain the purpose of the visit (emphasising that results would be used to assess and improve health services—not to individually assess or 'punish' HEWs). The observer asked the selected HEWs to give their consent to participate in the study and noted this down on the interview form.

Day one at the health post

A. *Community mobilisation:* A list of 1 to 30 WDA leaders and their phone numbers, obtained from HEWs, was compiled by the community mobiliser. She/he also reviewed postnatal care (PNC), infant immunisation and growth monitoring registers, and prepared a list of names of women who had given birth within two months prior to the field team arriving at the health post. After completion of both lists, community mobilisers called all WDA leaders to communicate to them that any infants 0-2 months of age considered ill by their mothers should be brought to the health post for a consultation in the morning on the following day. Additionally, community mobilisers attempted to meet a kebele focal person from the command post to mobilise WDA leaders to facilitate the identification of eligible infants. Community mobilisers also selected WDA leaders who had recently referred a sick newborn, and set up an appointment for an interview in the afternoon.
B. *Data collection from HEWs and WDA leaders:* The observer communicated the purpose of the study to the HEW and made her feel at ease; she/he then conducted a HEW questionnaire, including clinical vignettes. In the afternoon the community mobiliser conducted a WDA questionnaire. One HEW and WDA questionnaire were completed for each health post.
C. *Health post information:* The field team's observer asked the HEWs to show the health post's complete current stock of CBNC/iCCM drugs. For stock-outs the duration was assessed based on the HEWs' recall. In addition, the observer recorded their physical observations of the health post. One health post questionnaire was completed per health post. The observer completed the health post records module, drawing from information recorded in the CBNC/iCCM registers in the previous three months' consultations of sick infants aged 0-2 months.

Day two at the health post

A. *Establishment of three data-collection stations:* Each enrolled caregiver and young infant passed through them in a given sequence.
    - Enrolment and entry-exit interview station: This was established outside the entrance of the health post, and was manned by the community mobilisers.
    - Consultations-observation station: This was in the main room of the health post where HEWs conduct most of their patient consultations. The observer from the field team was based here.
    - Re-examination station: The field team set up a folding table and chair in the storage or ANC room of the health post for re-examination of an infant by the re-examiner. After the re-examination, the caregiver reported back to the first station to complete the exit interview.
B. *Enrolment of young infants:* As caregivers with infants arrived at the health post, the team leader confirmed their eligibility. First, she/he was asked the age of the baby. If the age was less than two months, the team leader asked if the infant has any physical illness or complaints and if this was the first consultation with these HEWs for this illness episode. The team leader also asked the age of the caregiver and their relationship to the infant. If the infant was eligible, a 'caregiver and infant enrolment card' was filled out, and the caregiver's acceptance for participation in the study was recorded. Additionally, the community mobiliser filled in the first two modules (facility/infant identifiers and caregiver/family background) of the entry-exit interview.
C. *Observation of the consultation:* The observer silently observed the consultation and used the observation form to record the

HEW's assessment, classification, treatment and counselling in relation to the young infant. At the end of the consultation, if any information was unclear the observer asked the HEW: 1) what their classification of the infant was, and 2) what treatments were given to the infant during the encounter. One observation checklist was completed per eligible baby.

D. *Infant re-examination:* The re-examiner performed a re-examination of the patient using the re-examination form and following the Ethiopian CBNC/iCCM chart booklet. The re-examination, was used to obtain gold-standard classifications and treatment with which to compare the HEW's classifications and treatment later, in the analysis. One re-examination form was completed per eligible patient.

E. Caregivers' exit interview: Once the HEW's consultation and re-examination were completed, the community mobiliser asked the caregiver about their understanding of the medicines that were prescribed for home treatment, when they are supposed to return for follow-up and their satisfaction with the consultation experience at the health post.

- Before releasing the patient, the community mobiliser carefully checked the 'caregiver and infant enrolment card' to ensure that all sections of it have been completed. At the end, she/he thanked the caregiver and responded to any queries they had.
- The team facilitated a referral to the nearest health centre if any infant was observed to have a life-threatening illness.
- All the data collection was recorded on PDAs, except for information about the observation of the HEW consultation, clinical vignettes and injection assessment, which were manually recorded. At the end of day two, the team leader reviewed all data collected at the health post for completeness and consistency. Missing or inconsistent data were rectified before leaving the health post.
- Once all data-collection at the health post was concluded, the field team thanked the HEWs and provided any necessary feedback to them.

Data themes

The data collected provide information on the status of staff's technical capabilities to deliver CBNC services, demand generation activities, and the utilisation and quality of services provided by HEWs. The data include:

A. Quality of services provided by HEWs - in terms of adherence to standardised CBNC/iCCM guidelines
B. Training, knowledge and skills of HEWs in CBNC/iCCM
C. Availability of essential CBNC/iCCM commodities
D. Supportive supervision of HEWs
E. Community mobilisation, including early identification of VSDs by WDA leaders
F. Utilisation of health posts for VSD
G. Referral of cases of newborn VSD from health post to health centre

CBNC midline survey supervision

Supervision by team leader

At the end of each day the field team handed their completed questionnaires – both electronic and paper-based data - to their team leaders, who carried out a preliminary check of each questionnaire for completeness and accuracy of the data. Any issues identified by the supervisors were discussed with the relevant enumerator(s) and, if required, a data-correction sheet was completed. All issues were expected to be resolved before leaving the health post. At the health post (cluster), the team leader randomly re-interviewed mothers after their exit interview to verify the key information recorded.

Supervision by Field Coordinator and Quality Assurance supervisor

The 12 survey teams were divided and overseen by the Field Coordinator and Quality Assurance supervisor. Each directly supervised six teams, but provided their specific consultations to all 12 teams as needed. Furthermore, the Field Coordinator and Quality Assurance supervisor communicated on a daily basis to discuss both logistical and technical aspects of the survey. The

two also communicated daily with the IDEAS Country Coordinator who in turn provided progress reports including any technical and operational challenges faced during the course of the survey to the IDEAS Scientific Coordinator.

The supervision for the CBNC midline was undertaken in two ways: 1) through field level supervisory visits, and 2) through telephone communication conducted on a daily basis with all team members throughout the survey period.

A. *Field level supervisory visits* - field level supervision for the CBNC midline survey was conducted immediately after the teams were deployed to the field. The supervision was conducted by the Field Coordinator and Quality Assurance supervisor who visited seven out of the 12 survey teams. The supervision covered the following aspects:
   - Supported the field teams in clarifying concepts learned in the training
   - Conducted spot-checks of the field teams at random times and without warning
   - Provided refresher training
   - Observed the teams' adherence to the CBNC midline survey protocol
   - Reviewed PDA questionnaires and paper questionnaires for consistency and completeness, and
   - Provided feedback on the overall execution of the team's responsibilities
B. *Daily supervisory calls* – the Field Coordinator and Quality Assurance supervisor had daily calls with the six teams that they each oversaw. The supervisory call covered the following aspects:
   - Ensuring random selection of PHCUs and health posts
   - Clarifying questions on the questionnaires or modules
   - Tracking the number of sick children observed and re-examined at each health post
   - Strategising on effective methods for mobilisation if any mobilisation challenges arose
   - Addressing any PDA related technical issues in consultation with the JaRco PDA programmer/data manager
   - Ensuring that survey teams were utilising the data error capture sheets for PDA related problems

Data management

Electronic data entry was conducted by the data collectors in the field using PDAs. The PDAs were password protected and data were stored on the PDA only during periods of data collection. At the end of each day, data-collectors reviewed the survey data on the tablet and then the data were transferred to the team leader. Once reviewed, the team leader saved the data on his/her laptop in an encrypted folder. Once data collection for a health post was completed, the team leader uploaded the PDA data to a secure JaRco server. Data that were uploaded by team leaders were reviewed by JaRco's data management team during the course of the survey. The data management team was oriented on monitoring consistency and accuracy checks, and provided feedback to each team leader on a constant basis.

The HEW consultation forms, clinical vignettes and injection assessment re-examination forms (observation-based data) were recorded in paper format and transported to Addis Ababa, where they were entered into CSPro survey software at JaRco's offices. Each questionnaire was entered into the software twice, each time by a different member of the data entry team. The two electronic versions of each questionnaire were compared and reconciled by a JaRco data manager. Range and consistency checks were carried out on the data, and values which appear to be out-of-range or inconsistent were raised with the appropriate survey supervisor for checking where possible. Paper questionnaires will be stored securely at the JaRco offices for a period of three years. Electronic data at JaRco are stored on a central secure server; backups are kept on an external hard drive kept in a secure fire-proof cabinet. Backups are also stored on a secure server at the London School of Hygiene & Tropical

Medicine (LSHTM). Overall, JaRco was responsible for data collection and management, while systematic data archiving was the direct responsibility of LSHTM.

Analysis

The midline survey analysis focused mainly on the quality of care delivered through CBNC. Primarily, the midline evaluation focused on the estimation of rates of correct diagnoses and treatment of severely sick young infants by HEWs based on an adherence to standardised CBNC care and treatment algorithms.

The midline evaluation report presents comparative analysis between CBNC early and late implementing areas. The CBNC programme started in March of 2014 for early implementers, as part of Phase I implementation, giving them on average 19 months of programme implementation at the time the midline survey was conducted. Late implementers are areas where CBNC was rolled out as Phase II. CBNC implementation for late implementers started a few months (average of three months) prior to the midline survey, indicating that HEWs had a shorter period of time to put their training into practice. The midline survey thus evaluates CBNC programme maturity by comparing areas where CBNC had been fully implemented for a year or more (early implementers) to areas where the programme had just started prior to the survey (late implementers).

Analysis involving calculations of means for continuous variables and categorical variables are presented as percentages. The primary statistical analysis will be carried out at the health post level. The point estimates for each of the indicators were calculated and compared between early and late implementing study areas. The focus was to describe the quality of CBNC implementation processes at the service delivery level and recommend means of improvement.

Significant differences (p value <0.05) between early and late implementing areas should be interpreted with caution since the sample size calculations for this survey aimed to detect a minimum 15 percentage points change in correct classification of young infant health status. This study was not powered to identify a difference between zones or by implementing partners: any such analysis would be misleading, and caution is therefore needed in interpreting its findings.

ETHICAL CONSIDERATION

Risks / benefits to subjects

Risks to study participants for involvement in the CBNC midline evaluation were low. Participants were also informed of their right to refuse answering any questions with which they were uncomfortable. Respondents did not gain any direct benefits by participating in the evaluation study. However, information obtained will be used to improve health service delivery in the community, as well as at health facilities. With respect to HEW assessment of sick young infants, the data collection team facilitated a referral to the nearest health centre of any infant observed to have a life-threatening illness.

Costs and compensation

Respondents did not receive monetary compensation and they did not incur any out-of-pocket costs.

Confidentiality assurances

Confidentiality of every respondent was guaranteed. Unique identifiers were constructed for the questionnaires and no identifiers will be released. All questionnaires have been stored under lock and key, with access restricted to selected study investigators. Data collection and entry was conducted by JaRco Consulting with technical assistance from IDEAS. All data are stored on password-protected computers with access only to the investigators. The data sets collected through the evaluation will be made available for public access as soon as possible.

Conflict of interest

There are no gains from taking part in this study other than the normal scholarly gains.

Ethical clearance

The investigators obtained a letter of approval from the Institutional Review Boards of the London School of Hygiene & Tropical Medicine and the Ethiopian Science and Technology Ministry. Prior to the data collection, formal permission was acquired from the Oromia, Amhara, Tigray and SNNP regional health bureaus.

DISSEMINATION PLAN

The CBNC midline evaluation will be promoted through the communication channels available to all components of the IDEAS project. These include: the IDEAS website at http://ideas.lshtm.ac.uk/; Research Online (an open access, searchable repository of LSHTM-authored research outputs), peer-reviewed journal articles, quarterly newsletters, IDEAS' twitter account, web and face-to-face seminars, learning workshops, LSHTM institutional publications and professionally designed and produced research reports and policy briefs. All communication activities are supported by the IDEAS Communications Officer.

In-country communications will be the joint responsibility of the IDEAS Communications Officer and the Ethiopia Country Coordinator.

The Ethiopia Country Coordinator, Dr Della Berhanu, leads the Ethiopia-based CBNC team in developing and maintaining regular communication with key stakeholders for the CBNC evaluation, in between the production of key outputs from the evaluation.

The London-based CBNC leadership team will be present for key stakeholder meetings and dissemination events. Records will be kept by the IDEAS Communications Officer of all dissemination activities and outputs relating to the CBNC evaluation.

National: Dissemination of results at national level will first be to the Federal Ministry of Health, the Technical Working Group (TWG) for the CBNC evaluation, and the Ministry of Science and Technology. Wider dissemination of CBNC evaluation results will only take place once approval has been granted by them.

The CBNC implementing organisations are represented on the TWG, but discussions with each implementer regarding the evaluation study findings will also be held on request. The CBNC evaluation team is open to suggestions by the TWG of relevant fora in which to present the study findings, in collaboration with TWG members, including Federal Government, where appropriate.

Ethiopian regional: Regional dissemination events will take place in the regional health bureaus for Amhara, Oromia, SNNP and Tigray. These will be planned and delivered in partnership with each region's government. Key stakeholders representing community-level, primary and secondary health care, government and implementing partners (non-governmental organisations -NGOs) will be invited.

International: Research reports and policy briefs from the CBNC evaluation will be made available globally via the IDEAS website and the London School of Hygiene & Tropical Medicine's Research Online portal. Academic and policy-relevant conference papers and peer reviewed journal articles will also be produced, in collaboration with members of the TWG, where there is mutual interest to work together.

5. Farrington, C. P. and Manning, G. (1990). "Test statistics and sample size formulae for comparative binomial trials with null hypothesis of non-zero risk difference or non-unity relative risk." Statistics in Medicine, Vol. 9, pages 1447-1454.
6. Keble command post: kebele level administrative group responsible for oversight of WDA leaders.

3. HEALTH SYSTEM READINESS FOR QUALITY CBNC SERVICES

This chapter provides information on the health system readiness to provide quality of CBNC services. The study included 30 woredas (18 early and 12 late implementing area). A total of 117 PHCUs (70 early and 477 late implementing area) and 240 health posts (140 early and 100 late implementing area) were visited. Interviews were conducted with staff members at the 117 PHCUs as well as interviews with 240 HEWs and 240 WDA leaders

CHAPTER SECTIONS

1. Facility readiness for CBNC services
2. Function of health facilities

In the facility readiness for CBNC services section, we will provide a description of facility structure, equipment, medicine, background on health workers and staff numbers. Service utilisation, linkages and supportive supervision are described under the function of health facilities section.

FACILITY READINESS FOR CBNC SERVICES

Facility infrastructure

This study conducted an observation of infrastructure at the health centre (Table 5A) and health post (Table 5B). Almost all health centres had a patient toilet and steriliser. Sixty-nine percent had water on the day of the survey, which was higher among facilities in early implementing areas (81% vs 51%, $p<0.001$). Electricity and cell phone signal was available in over 70% of health centres. Only 22% reported having a facility phone. Staff member phone was the main means of communicating with other health facilities (84%).

Among health posts, 66% had water on the day of the survey. In contrast to health centres, a smaller proportion of health posts in early implementing areas had water on the day of the survey (56% vs 80%, $p<0.001$). A patient toilet was available in 78% of health posts, with the proportion being higher among early implementing areas (83% vs 70%, $p=0.02$). The availability of a cell phone signal was also higher among early implementing areas (71% vs 56%, $p=0.01$). Only 10% of health posts had electricity on the day of the survey. Similar to health centres, the main means of communication with other facilities was staff phone. In-person communication was reported in about half of the health posts visited.

Table 5A. Health centre: observation of infrastructure

	EARLY IMPLEMENTERS N=70 %	LATE IMPLEMENTERS N=47 %	TOTAL N=117 %
Facility description			
Water available on the day of survey*	81	51	69
Patient toilet	100	98	99
Electricity available on the day of survey	78	64	72
Functional steriliser	100	93	97
Functional fridge	100	100	100
Cell phone signal available on day of survey	76	68	73
Means of communication with other health facilities			
Facility phone	19	28	22
Staff phone*	91	72	84
Community member phone*	13	2	9

*p<0.05 for test of difference between early and late implementers

Table 5B. Health post: observation of infrastructure

	EARLY IMPLEMENTERS n=140 %	LATE IMPLEMENTERS n=100 %	TOTAL N=240 %
Facility description			
Water available on the day of survey*	56	80	66
Patient toilet*	83	70	78
Electricity available on the day of survey*	6	15	10
Functional steriliser	15	23	18
Functional fridge	4	10	7
Cell phone signal available on day of survey*	71	56	65
Means of communication with other health facilities			
Facility phone*	18	2	11
Staff phone	59	69	63
Community member phone*	1	7	4
In-person communication *	38	65	49

*p value<0.05 for test of difference between early and late implementers

Table 6A. Health centre: observed availability of newborn health related equipment and supplies

	EARLY IMPLEMENTERS N=70 %	LATE IMPLEMENTERS N=47 %	TOTAL N=117 %
Equipment			
Clinical Thermometer, digital	80	70	76
Clock	99	96	97
Infant scale	99	98	98
Tape measure	89	85	87
Stethoscope	99	98	98
Ambu bag	97	96	97
Suction bulb	91	92	92
Warmer for newborn care	31	38	34
Nasogastric tube	21	26	23
Supplies			
Clean gloves	93	94	93
Syringes with needles for gentamycin	94	96	95
Sharps container	97	98	97
Soap	54	57	56
Hand sanitiser (alcohol)	49	47	48
Surgical gloves	96	98	97
Water for injection	80	92	85
IV cannula	59	72	64
IV fluid 5% DW	61	70	65
IV fluid 5% NS	87	85	86

Figure 4. Health centre and health post: source of drinking water

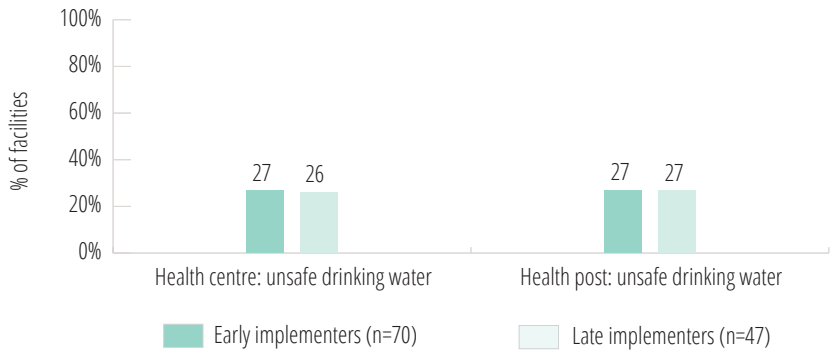


Figure 4 shows the source of drinking water for health centres and health posts. A little over a quarter of health posts and health centres in both early and late implementing areas used unsafe drinking water. The definition of safe and unsafe drinking water is shown in Box 1.

Table 6A shows the observed availability of newborn health related equipment and supplies at health centres. Over 90% had a clock, infant scale, stethoscope, suction bulb and ambu bag. Facilities were also well supplied with respect to clean gloves (93%), surgical gloves (97%), gentamycin syringes (95%) and sharps container (97%). Thirty-four percent had a warmer for newborns. Hand sanitiser (alcohol) and soap were observed in only 48% and 56% of health centres, respectively. Overall, there was no evidence of a difference between early and late implementing areas with respect to equipment and supplies at the health centre level.

Table 6B shows the observed availability of newborn health related equipment and supplies at health posts. Distribution of equipment and supplies was more or less similar between early and late implementing areas. Over 90% had a digital clinical thermometer, weighing sling and mid-upper arm circumference (MUAC) tape measure. Clock and tape measure were observed

Table 6B. Health post: observed availability of newborn health related equipment and supplies

	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
Equipment			
Clinical thermometer, digital	97	99	98
Clock	63	55	60
Infant scale*	96	79	89
Weighing sling	94	95	94
Tape measure	56	55	55
Stethoscope	75	67	72
MUAC tape measure*	99	94	97
Supplies			
Clean gloves	84	75	80
Syringes with needles for gentamycin	84	88	86
Sharps container	84	87	85
Soap	30	34	32
Hand sanitizer (alcohol)	19	27	23

*p<0.05 for test of difference between early and late implementers

in 60% and 55% of health posts, respectively. Eighty-nine percent had infant scales, with the proportion being higher among early implementers (96% vs 79%, p<0.001). With respect to supplies, over 80% of health posts had clean gloves, gentamycin syringes and a sharps container. Similar to health centres, less than a third of health posts had hand sanitiser (alcohol) and soap.

This survey also observed the availability of newborn health related drugs at facilities. Almost all health centres (Table 7A) had some form of gentamycin (90%) or amoxicillin (93%), while 83% had both. A higher proportion of health centres in early implementing areas were observed to have gentamycin 20mg/2ml (49% vs 11%, p<0.001). Sixty-eight percent of health centres had ampicillin. Over 75% of health centres had Vitamin A, Tetracycline (TTC) eye ointment, paracetamol, BCG and polio vaccine. Vitamin K and chlorohexidine was available in 34% and 38% of health centres, respectively.

The availability of drugs for treatment of very severe disease at health posts is shown in Table 7B. Following the CBNC protocol, a neonate with severe bacterial infection should be provided with a pre-referral dose of gentamycin injection (20mg/2ml) and amoxicillin tablet (half of a 250 mg or 125 mg dispersible tablet) or syrup (125 mg/5ml). If referral is not possible, then the neonate is given gentamycin injections by a HEW for seven days. The care provider is then informed to give the baby amoxicillin at home for seven days. A neonate with a local bacterial infection is treated with amoxicillin for five days.

Amoxicillin (250 mg dispersible tablet, 125 mg dispersible tablet and/or 125 mg/5ml syrup) was available in 97% of all health posts. Among the 3% of health posts that had no amoxicillin the average duration of non-availability was 69 days. The detailed availability of amoxicillin in the different forms is also shown in table 7B. Gentamycin 20mg/2ml was available in 91% of health posts. Where stock-out was reported the average length of non-availability was 94 days. Figure 5 shows the availability of gentamycin and amoxicillin drugs by implementation areas. A smaller proportion of early implementing areas had both drugs available compared with late implementing areas (77% vs 93%, p=0.03). Overall, 84% of health posts had both drugs, 13% had one and 3% had neither.

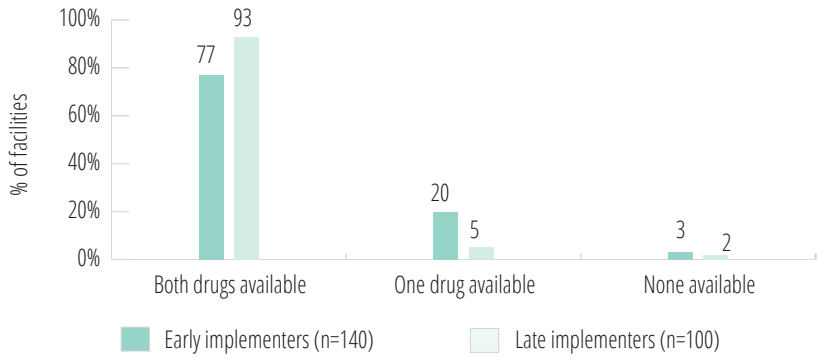
The survey also assessed the availability of drugs for treatment of infants 0-2 months old at health posts (Table 7C). As per the treatment protocol, infants between the ages of 0-2 months with mild dehydration are treated with zinc for ten days. Newborns with mild dehydration, severe dehydration, severe persistent diarrhoea or dysentery require oral rehydration solution (ORS). Two-thirds of health posts had ORS on the day of the survey while only 26% had zinc. Approximately a quarter of health posts had expired ORS and half had expired zinc. Both zinc and ORS were available in around a quarter of health posts, with approximately 31% having neither drug (Figure 6).

Human resources: staff profile

Health centres on average had 15 staff members, eight nurses, two health officers, two midwives, one pharmacist and two laboratory technicians (Figure 7). Early and late implementing areas had a similar distribution of staff members except for nurses, for which on average, early implementing areas had a higher number (9 vs 7, p<0.01).

By design a health centre and, on average, five satellite health posts comprise a PHCU. Each health post in turn is staffed by two HEWs. Figure 8 shows the distribution of health posts and HEWs by implementation area. Early implementing area PHCUs had a fewer number of health posts (4 vs 6, p=0.001). Furthermore, on average early implementing areas had more than twice as many HEWs as health posts, indicating that they are well staffed. In contrast, late implementing areas on average had fewer than two HEWs per health post, suggesting a relative shortage of staff.

Figure 5. Health posts: observed availability of drugs[!] for VSD



[!] Both gentamycin (20mg/2ml) and amoxicillin (250 mg dispersible tablets, 125 mg dispersible tablets and/or 125 mg/5ml syrup)
* p-value <0.05 for test of difference between early and late implementers

Figure 6. Health post: observed availability for neonatal diarrhoea related drugs (ORS and zinc)

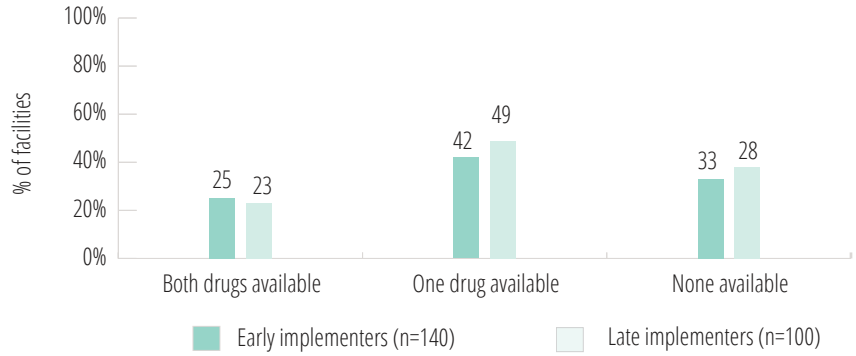
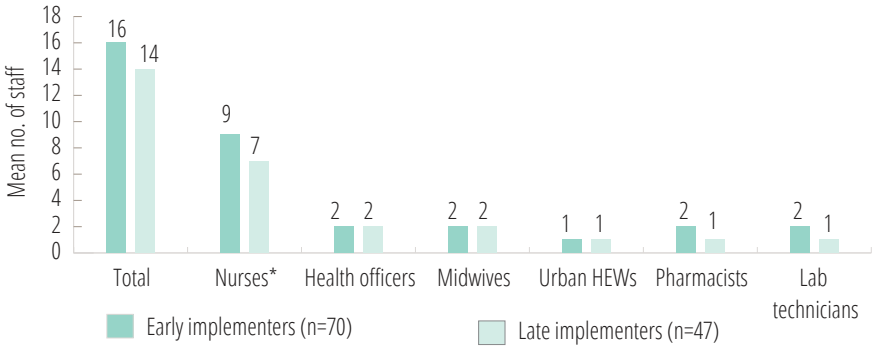


Figure 7. Health centre: available staff



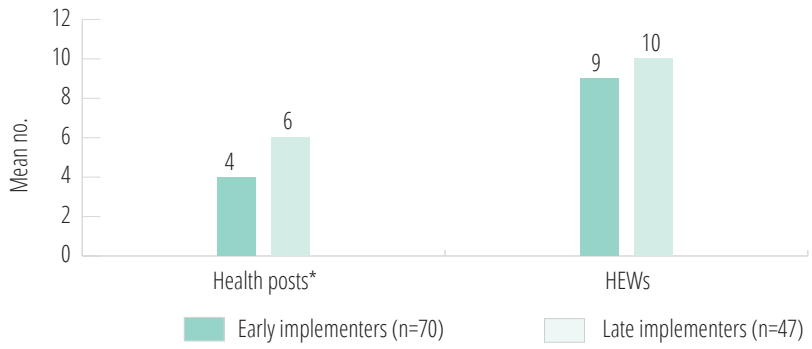
*p value <0.05 for test of difference between early and late implementers

Table 7A. Health centre: observed availability of MNH related drugs

DRUGS	EARLY IMPLEMENTERS N=70 %	LATE IMPLEMENTERS N=47 %	TOTAL N=117 %
Management of very severe disease			
Amoxicillin dispersible tablet 250 mg	53	55	54
Amoxicillin dispersible tablet 125 mg	34	17	27
Amoxicillin suspension 125mg/5ml	79	79	79
Any Amoxicillin	93	94	93
Gentamycin injectable 20mg/2ml*	49	11	33
Gentamycin injectable 80mg/2ml	86	85	86
Any gentamycin	91	87	90
Any gentamycin and any amoxicillin	84	81	83
Ampicillin 500 mg	64	74	68
Newborn care and vaccinations			
Iron	83	81	82
Folate*	79	22	56
Vitamin K 1mg	30	40	34
Vitamin A 200,000 IU*	24	0	15
Vitamin A 100,000 IU	76	79	77
TTC eye ointment	80	92	85
Chlorohexidine*	51	17	38
Ampicillin powder	64	75	68
Paracetamol	87	75	82
BCG	86	75	81
Polio vaccine	89	83	86

*p<0.05 for test of difference between early and late implementers

Figure 8. PHCU: average number of health posts and HEWs



*p value <0.05 for test of difference between early and late implementers

Table 7B. Health post: observed availability of newborn drugs for treatment of very severe disease

	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
Any Amoxicillin	96	98	97
Amoxicillin dispersible tablet 250 mg*	55	19	40
Amoxicillin dispersible tablet 125 mg*	41	82	58
Amoxicillin suspension 125 mg/5 ml	34	30	33
Gentamycin injectable 20mg/2ml*	87	96	91

*p<0.05 for test of difference between early and late implementers

Table 7C. Health post: observed availability of newborn drugs for treatment of dehydration

	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
ORS			
Available	66	69	67
Not available	9	10	10
Expired	25	21	23
Duration of non-availability (mean days)[a]	100	105	102
Zinc			
Available	26	26	26
Not available	28	16	23
Expired	46	58	51
Duration of non-availability (mean days)[a]	95	104	99

[a] Among the drug stock-out/expiry

Health post operations: availability of CBNC services over the course of a week

The number of HEWs per health post is shown in Table 8. HEWs reported that about a quarter of health posts only had one HEW, 65% had two and 11% had three or more. Approximately 15% of health posts were open less than five days of week, with 85% operating for five working days a week or more. Figure 9 shows the health post operational days by implementation area. HEWs were also asked where community members seek care during weekends or holidays. A little over a half stated that the community sought care with them, with the proportion being smaller among early implementing area HEWs (41% vs 67%, $p<0.001$).

The availability of HEWs in close proximity of the community is essential to ensure that a newborn with VSD receives gentamycin injections for seven days. In this study, only 46% of HEWs were provided with official housing in the kebele where they work.

FUNCTION OF PHCUS FOR CBNC RELATED SERVICES

This section presents the level of linkages, service utilisation and supportive supervision within PHCU.

CBNC related linkages

This study explored the linkages at the different levels of the PHCU. Linkages between health posts, WDA leaders and the community were explored specifically looking at meetings, pregnant women's conference and other community level activities.

Meetings

Seventy-three percent of WDA leaders reported more than one meeting with HEWs in the last three months, while 14% had had no meeting. WDA leaders were asked if they were satisfied with their HEW interactions and 91% reported that they were satisfied.

Pregnant women's conference

Midwives from the health centres jointly with HEWs and WDA leaders are expected to conduct a pregnant women's conference at least once a month, most commonly at the kebele level. Almost all health centres (98%), a majority of health posts (87%) and WDA leaders (82%) reported the conduct of a pregnant women's conference in the last three months. Compared with HEWs (66%) and WDA leaders (61%), a higher proportion of health centres (79%) reported organising a conference once a month. This can be explained by the fact that health centres are likely reporting on all the conferences organised in the multiple kebeles within their PHCU.

There were notable differences between early and late implementing areas with respect to the organisation of conferences by HEWs and WDA leaders. A smaller proportion of early implementing area HEWs reported having monthly

Box 1: Source of drinking water

Unsafe drinking water

Boreholes
Rainwater collection
Surface water
Open dug wells
Unprotected springs
Tanker

Safe drinking water

Piped connection into health post
Piped connection into yard
Public standpipes
Protected dug wells
Protected springs
Vendor provided water
Bottled water

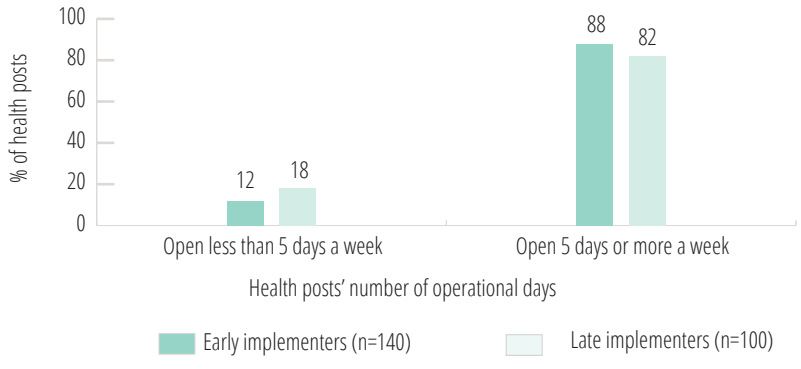
Table 8. Health post: characteristics [a]

	EARLY IMPLEMENTERS N=140 (%)	LATE IMPLEMENTERS N=100 (%)	TOTAL N=240 (%)
Number of HEWs at health post*			
One	18	33	24
Two	66	64	65
Three or more	16	5	11
Facility operational days/week (mean)	5	5	5
Community place of care seeking during weekend/holiday reported by HEWs			
Health centre	84	87	85
Health posts/HEW*	41	67	52
Pharmacy	6	9	7
Official housing provided to HEWs by kebele	50	41	46

[a] Reported by HEWs leader

*p<0.05 for test of difference between early and late implementers

Figure 9. Health post: number of operational days in a week



conferences (56% vs 81%, p<0.001). In contrast, a greater proportion of early implementing area WDA leaders reported having monthly conferences compared with late implementing area leaders (70% vs 48%, p<0.001). It is expected that a higher proportion of HEWs would report organising a conference, as the WDA leaders interviewed might not have assisted in the organisation of a conference. However, a higher proportion of WDA leaders than HEWs reporting organising a conference, as seen in early implementing areas, indicates that the task of organising conferences might be up taken by WDA leaders, but more research is needed to understand the phenomena further.

With respect to attendance, 59% of HEWs reported that all the pregnant women in their catchment population were present at the most recent pregnant women's conference. This number increased to 85% among WDA leaders.

Other linkages

WDA leaders reported that they undertake the following activities with HEWs: plan together (68%), organise pregnant women's conference (80%), provide household visits (86%), and conduct health campaigns (81%). Of these activities, conducting health campaigns was different between early and late implementing areas (88% vs 72%, p<0.01).

WDA leaders were also asked about their linkages with key figures in the community to discuss MNH related issues in the last six months (Figure 10). Forty-seven percent reported that they had met with religious leaders, 53% with *edir*[8] groups, 59% with women's saving groups, 49% with the kebele command post and 26% with traditional birth attendants. Of these, a greater proportion of early implementing areas reported linking with religious leaders (52% vs 39%, p=0.04) and command post (65% vs 27%, p<0.001).

Supervision

In this section the level of supervision that is provided to health posts is assessed. There are four types of supervision that were explored (Figure 11):

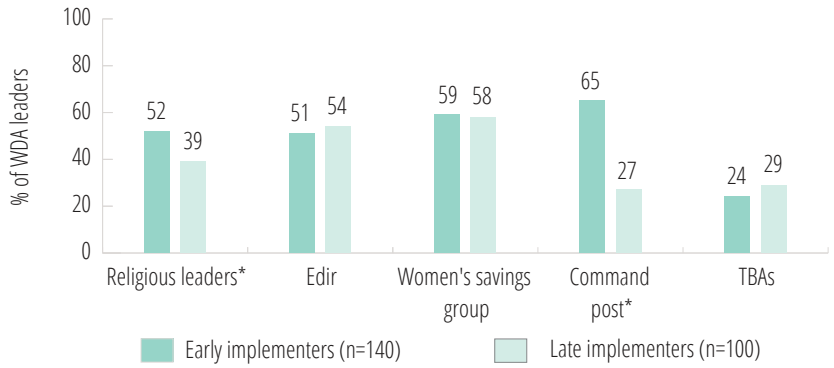
1. Integrated supportive supervision
2. CBNC/iCCM programme based supervision
3. Performance Review and Clinical Mentoring (PRCM) meetings, and
4. CBNC post-training follow-up visit

Integrated supportive supervision covers the different packages of the Health Extension Program and takes place twice a month. HEWs are also supposed to receive a programme-focused supervision for CBNC and iCCM from health centre staff, woreda health office and programme implementing partners, ideally once per month. PRCM meetings are group meetings held twice a year for HEWs trained in CBNC/iCCM and supervisors trained in IMNCI/CBNC. The meetings aim to improve the technical skills and knowledge of HEWs and their supervisors. A PRCM is a biannual meeting, planned to take place six months after the initial CBNC training. HEWs are also supposed to receive a post-training follow-up visit within six weeks of their CBNC training.

Figure 12A shows the reported level and type of supervision by health centres to health posts. Ninety-eight percent of health centres reported that they had visited a health post in their catchment population in the last six months for integrated supportive supervision and 75% had provided a visit in the last month. The level of integrated supportive supervision in the last six and one months were similar between early and late implementing areas.

A higher proportion of early implementing areas reported having organised a PRCM meeting (87% vs 60%, p=0.001) in the last six months. Given that a PRCM meeting is planned to take place six months after the initial CBNC training, late implementers might not have been eligible for such a meeting since on average CBNC training had taken place approximately three months prior to

Figure 10. Linkage between WDA and community stakeholders: meeting with key community figures to discuss MNH in the last six months



*p<0.05 for test of difference between early and late implementers

Figure 11: Supervision: recommended types and frequency of supervision provided to HEWs

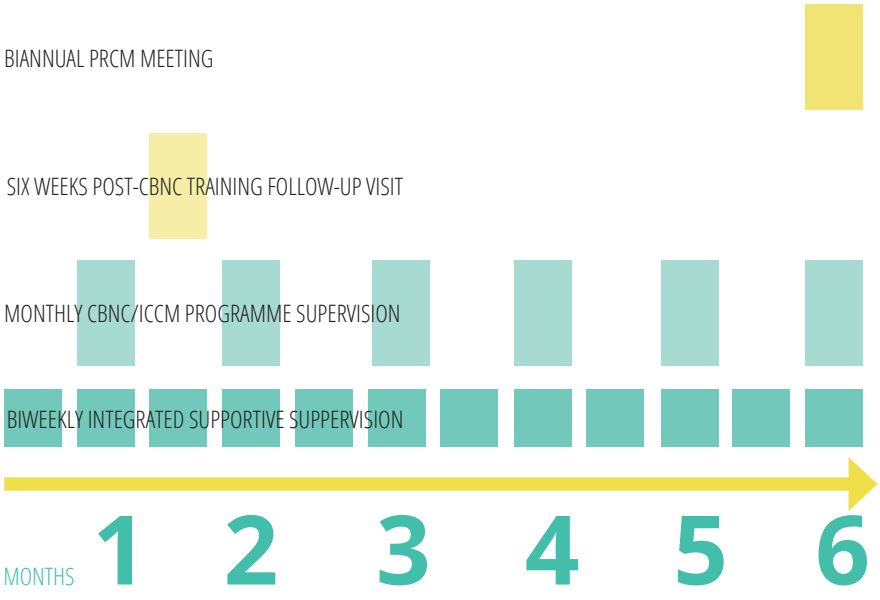
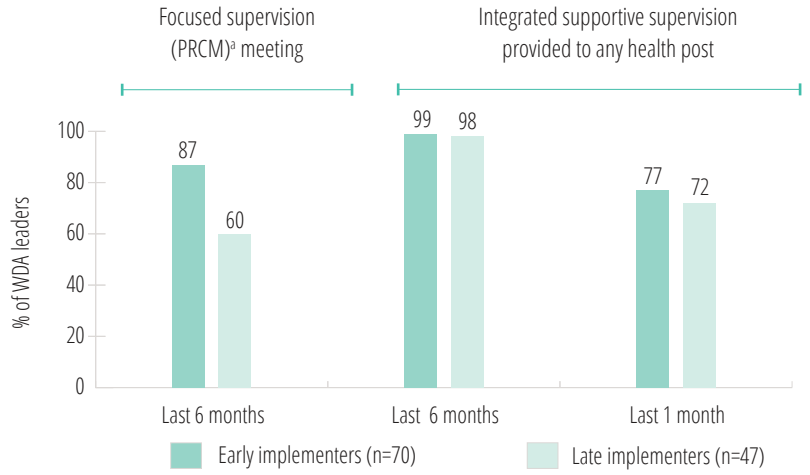
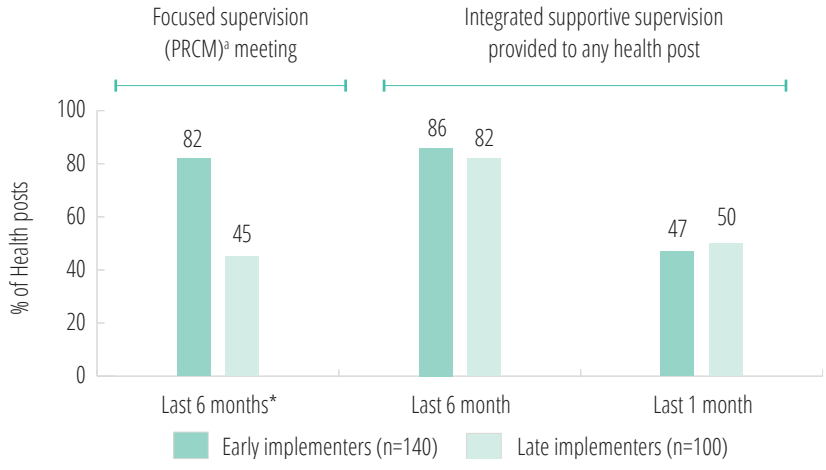


Figure 12A. Supervision provided: reported by health centres for any of their respective health posts



[a] Performance Review and Clinical Mentoring
*p<0.05 for test of difference between early and late implementers

Figure 12B. Supervision received: reported by health posts



[a] Performance Review and Clinical Mentoring
*p<0.05 for test of difference between early and late implementers

Table 9A. Supportive supervision: visits to health posts during last six months.

AMONG THOSE RECEIVING SUPERVISION IN LAST SIX MONTHS	EARLY IMPLEMENTERS %	LATE IMPLEMENTERS %	TOTAL %
A. Integrated supportive supervision[a]			
Woreda health office	73	67	70
Health Centre*	80	63	73
Implementing partner (NGO)	62	48	56
*Provider of most recent visit**			
Woreda health office	13	24	18
Health centre	66	34	53
Implementing partner (NGO)	10	18	13
Joint visit[b]	11	23	15
B. CBNC/iCCM supervision[c]			
Woreda health office	32	40	34
Health centre	52	56	53
Implementing partner (NGO)*	73	49	66

[a] Among the 202 HEWs (120 in early and 82 in late implementing areas) who received an integrated supportive supervision in the last six months

[b] Joint visit: Woreda health office, health centre and/or implementing partner (NGO)

[c] Among the 140 HEWs (97 in early and 43 in late implementing areas) who received an CBNC/iCCM supervision in the last six months

*p<0.05 for test of difference between early and late implementers

Table 9B. Supervision: CBNC post-training follow-up visits to health posts.

	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
Follow-up visit within 6 weeks of training*	51	28	41
Among those receiving supervision			
Provider of post-training supervision			
Zone	6	7	6
Woreda*	14	68	29
Health centre	39	43	40
Implementing partner	70	57	67

*p<0.05 for test of difference between early and late implementers

the date of the midline survey. Overall, 76% of health centres reported organising a PRCM meeting in the last six months.

Figure 12B shows the type and frequency of supervision received by HEWs. Integrated supportive supervision visits in the last six months were reported by 84% of HEWs and only 48% reported a visit in the last month. This indicates that over half of the health posts in this study did not get supportive supervision visits in the last month, which among other things, are intended to reinforce HEWs' service provision skills.

Overall, 67% of health posts reported attending a PRCM meeting in the last six months. As mentioned earlier, PRCM meetings are planned to take place six months after CBNC training which explains the higher proportion of HEWs in early implementing areas who reported a PRCM meeting attendance (82% vs 45%, p<0.001). Fifty-eight percent of HEWs (69% in early and 43% in late implementing area, p<0.001) reported receiving an CBNC/iCCM programme specific supervision in the last six months.

Table 9A shows who provided supervision to HEWs in the last six months. Supervision for CBNC/iCCM was mainly provided by the implementing partners (66%) and health centres (53%). Some of these visits are likely to have taken place jointly between a government health worker and an implementing partner, although this was not assessed for CBNC/iCCM programme specific supervision.

Over 70% reported that they had received an integrated supportive supervision visit in the last six months from health centre and woreda health office staff, with over half reporting that they had also received a visit from the programme-implementing partner. With respect to the most recent supervisory visit, 18% reported a visit from the woreda health office. Fifty-three percent said that the most recent visit was from health centre staff, 13% from implementing partners and another 15 reported a joint visit from all three. A joint visit by health centres and implementing partners together was reported by 8% of health posts.

As mentioned previously, HEWs are expected to receive a post-training follow-up supervision visit within the first six weeks of training. As shown in Table 9B, 41% of HEWs reported receiving a such a visit, with the proportion being greater among early implementing areas (51% vs 28%, p <0.001). For some HEWs it might not be clear that a visit falls under the category of a regular supportive supervisory visit or a post-training follow-up visit, which might result in the under reporting of post-training follow-up visits. Two-thirds of health posts reported that implementing partners were present at the post-training visit and 40% reported that health centre staff members were present. Woreda staff presence was also reported by 29% of HEWs, with the proportion being smaller in early implementing areas (14% vs 68%, p<0.001).

Health centre staff that provided supportive supervision in the last six months (N=115) were provided with a list of CBNC

"OVER HALF OF THE HEALTH POSTS STUDIED DID NOT GET SUPPORTIVE SUPERVISION VISITS IN THE LAST MONTH."

Table 10A. Supportive supervision provided by health centres (prompted): content of supervision in the last 6 months

CONTENT OF SUPERVISION AMONG THOSE PROVIDING SUPPORTIVE SUPERVISION	EARLY IMPLEMENTERS N=69 %	LATE IMPLEMENTERS N=46 %	TOTAL N=115 %
A. Discussion			
Maternal			
Early identification of pregnancy	100	98	99
Focused ANC	97	96	97
Institutional delivery	99	96	97
Newborn			
Immediate newborn care*	87	59	76
Asphyxia management*	77	35	60
Hypothermia prevention and management*	84	30	62
Pre-term and low birth weight*	80	26	58
VSD management*	94	57	79
Staff			
HEW activity with WDA	96	91	94
Written feedback on HEWs' work	86	85	85
B. Observation			
HEW interaction with mother and newborn*	64	39	54
Record keeping*	97	87	93
Register*	93	74	85
Availability of supplies	88	74	83
C. Provision			
Supplies*	91	65	81

*p<0.05 for test of difference between early and late implementers

programmatic themes and were asked to pick topics they covered during their supervisory visit (Table 10A). With respect to maternal care, almost all health centres reported discussing pregnancy identification, focused ANC, and institutional delivery. A large proportion of health centres also addressed HEWs' activity with WDA leaders (94%) and provided written feedback on HEWs' work (85%). However, discussion around newborn care was not as high. For example, VSD management and immediate newborn care were covered by 76% and 79% of health centres, respectively. Coverage of these and other newborn care topics were higher in early implementing areas (VSD: 94% vs 57%, $p<0.001$; immediate newborn care: 87% vs 59%, $p<0.01$). Over 80% reported observing HEWs' record keeping, registers and availability of supplies. However, observation of HEWs interaction with mothers and newborns was done by only 54% of health centres. Over 80% reported that supervisory visits were also used to provide health posts with supplies.

HEWs who received supportive supervision in the last six months (N=202) were also provided with a list of CBNC programmatic areas and asked to choose themes that were covered during the supervisory visit (Table 10B). The supervision that was provided, as reported by health centres, and the supervision that was received, as reported by health posts, followed the same trend. However, the health centre reports overestimated reports from health posts, because they reported on supervision to any health post in their catchment area. In contrast, health post values reflect specific activities undertaken in that location and therefore better reflect the level of supervision provided by health centres to a specific health post. Overall, there were differences between early and late implementing areas, however the differences were minor.

With respect to maternal care, the majority of HEWs reported that early identification of pregnant women and institutional delivery were discussed during visits in the last six months (90% and 78%, respectively). In contrast, discussion on focused ANC was reported by 44% of HEWs.

Supervision on newborn care was consistently low, with less than 50% of HEWs reporting discussion on immediate newborn care and VSD management. Observation of HEW interaction with mother and newborn was reported by only 29% of HEWs.

Discussion on HEWs' activity with WDA leaders during a supervisory visit was reported by three quarters of HEWs. Written feedback by health centre staff on HEWs' work was verified among 42% of HEWs, and this was higher among early implementing areas (51% vs 29%, $p<0.01$). Over 70% of HEWs reported that supervision covered observation of record keeping and registers. A smaller proportion of early implementing areas reported that supervision observed their record keeping (68% vs 83%, $p=0.02$). A little over a third of HEWs reported that supervisory visits were also used to provide health posts with supplies.

Health centres that had organised PRCM meetings in the last six months (N=89) were asked to select from a list, the content covered during the meeting (Table 11A). With respect to maternal care, almost all reported that early identification of pregnancy was discussed and 83% reported discussing focused ANC. Around 70% addressed institutional delivery.

With respect to newborn care, 98% reported discussing neonatal diarrhoea management, and around 80% reported discussing immediate newborn care, asphyxia management, hypothermia and preterm/low birth weight. Breastfeeding and neonatal immunisation was discussed 75% and 70%, respectively. Only half of the health centres reported covering VSD management. Seventy-one percent reported that data was extracted from the 0-2 month iCCM registers and 78% provided skills mentoring for HEWs on newborn care. Compared with late implementing areas, there was a consistent pattern of PRCM meetings in early implementing areas covering more content on MNH management practices.

HEWs who had participated in a PRCM meeting the last six months (N=161) were asked to select from a list of thematic areas, those areas covered during the meeting (Table 11B). With

Table 10B. Supportive supervision received by health posts (prompted): content of supervision visit in the last 6 months

CONTENT OF SUPERVISION AMONG THOSE RECEIVING SUPPORTIVE SUPPERVISION (HEW)	EARLY IMPLEMENTERS N=120 %	LATE IMPLEMENTERS N=82 %	TOTAL N=202 %
A. Discussion			
Maternal			
Early identification of pregnancy	91	88	90
Focused ANC	43	45	44
Institutional delivery	83	72	78
Newborn			
Immediate newborn care	39	40	40
Asphyxia management	24	28	26
Hypothermia prevention and management	23	27	24
Pre-term and low birth weight	32	29	31
VSD management	39	44	41
Staff			
HEW activity with WDA	78	66	73
Written feedback on HEWs' work (verified)*	51	29	42
B. Observation			
HEW interaction with mother and newborn	28	31	29
Record keeping*	68	83	74
Register	73	74	73
Availability of supplies	40	40	40
C. Provision			
Supplies	42	28	36

*p<0.05 for test of difference between early and late implementers

Table 11A. Supportive supervision provided by health centres (prompted): content of group PRCM meeting in the last six months

CONTENT OF PRCM MEETING AMONG THOSE PROVIDING PRCM	EARLY IMPLEMENTERS N=61 %	LATE IMPLEMENTERS N=28 %	TOTAL N=89 %
A. Discussion			
Maternal			
Early identification of pregnancy	98	100	99
Focused ANC*	77	96	83
Institutional delivery*	87	29	69
Newborn			
Immediate newborn care*	95	57	83
Asphyxia management *	95	64	85
Neonatal diarrhoea management *	100	93	98
Breastfeeding*	89	46	75
Neonatal immunisation*	82	43	70
Hypothermia prevention and management*	92	54	80
Preterm and low birth weight *	90	64	82
VSD management*	61	29	51
B. Demonstration			
Skills mentoring newborn care to HEWs*	98	32	78
C. Data extraction			
iCCM 0-2 month register*	89	32	71

*p<0.05 for test of difference between early and late implementers

Table 11B. Supportive supervision received by health posts (prompted): content of group PRCM meeting in the last 6 months.

CONTENT OF PRCM MEETING AMONG THOSE RECEIVING PRCM (HEW)	EARLY IMPLEMENTERS N=131 %	LATE IMPLEMENTERS N=30 %	TOTAL N=161 %
A. Discussion			
Maternal			
Early identification of pregnancy	99	100	99
Focused ANC*	88	100	90
Institutional delivery	95	93	95
Newborn			
Immediate newborn care	70	60	68
Asphyxia management*	63	37	58
Neonatal diarrhoea management*	83	57	78
Breastfeeding	77	67	75
Neonatal immunisation	79	83	80
Hypothermia prevention and management*	63	33	58
Preterm and low birth weight*	70	40	65
VSD management*	79	57	75
B. Demonstration			
Skills mentoring newborn care to HEWs*	92	70	88
Newborn care at home	51	53	52
C. Data extraction			
iCCM 0-2 month register*	95	70	90

*p<0.05 for test of difference between early and late implementers

respect to maternal care, over 90% reported that the meeting covered early identification of pregnancy, focused ANC and institutional delivery.

With respect to newborn care, 58% reported that asphyxia and hypothermia management were discussed, while round two-thirds reported discussion on immediate newborn care and preterm and low birth weight. Around 75% said that neonatal diarrhoea, breastfeeding and VSD management were discussed. Eighty percent said that the meeting covered neonatal immunisation. With the exception of immunisation, discussions on all other aspects of newborn care were higher in early implementing area meetings. Data extraction from the 0-2 month iCCM register was reported by 90% of HEWs. Eighty-eight percent said that skills mentoring for newborn care were demonstrated to HEWs. In contrast to what was reported by health centre staff (0%), 52% of HEWs reported conducting a joint visit to demonstrate newborn care at home.

HEWs were asked about their level of satisfaction with the supervision that they had received (Table 12). About half of HEWs (53%) said that they were not fully satisfied with their supervision. Satisfaction with supervision did not differ by implementation areas. When asked how their supervision might be improved, the majority (69%) reported the need to increase visits. This mirrors the results shown in Figure 12B (above) where less than half of HEWs reported receiving supportive supervision in the last month. In addition, 64% of HEWs reported that supervision would be improved by more technical supervision.

Service utilisation

The maternal and child health department focal person at health centres was asked about expected services for the PHCU and actual service provided at the health centre (Table 13A) in the quarter preceding the date of the midline survey (July-September 2015). On average each PHCU expected 208 pregnancies in the previous three months and the expected number were similar between implementation areas.

Women are encouraged to have a minimum of four ANC consultations during their pregnancy, of which visit one (1st trimester) and visit 4 (late 3rd trimester) are encouraged to take place at the health centres while visit two (2nd trimester) and visit three (early 3rd trimester) are provided by HEWs. From the register review, it was evident that in some health centres ANC visits were recorded based on the number of visits a pregnant women had (where the average ANC visit one ≥ ANC visit two ≥ ANC visit Three ≥ ANC visit four), while in other health posts it depended on the timing of the visit (where the average ANC visit one was smaller than ANC visit four). If, for example, a woman has her first ANC visit late in her third trimester, it is likely to be recorded as ANC visit four. This difference in practice potentially leads to misclassification in record keeping.

Service records maintained at the health centre indicated that on average 149 women had ANC visit one at the health centre in the three months preceding the survey. The fact that the average number of ANC visits for visit one (149) and four (86) are higher than averages for visits two (58) and three (44) indicates that, as per the guidelines, the first and last visits are taking place at the health centre.

Although the two implementation areas were similar with respect to expected pregnancies as well as ANC visits one and two, early implementing areas had a higher average number of women seeking ANC visit three (51 vs 33, $p=0.04$) and ANC visit four (103 vs 61, $p<0.01$). With respect to targets, if on average a PHCU expects 208 pregnant women and on average 149 women had at least one ANC visit, it indicates that 28% of expected pregnant women did not receive any ANC visits.

On average PHCUs expected to have 204 facility births in the three months preceding the survey and had recorded 133mean deliveries. Early implementing areas had a higher mean for deliveries (156 vs 98, $p<0.0001$). On average health centres had one stillbirth in the previous three months.

Table 12. Supportive supervision received by health posts: HEW satisfaction [a]

	EARLY IMPLEMENTERS N=124 %	LATE IMPLEMENTERS N=77 %	TOTAL N=201 %
Satisfaction with supportive supervision	57	47	53
Suggestion to improve supervision			
Increase visits	68	71	69
More technical supervision	61	68	64

[a] Among HEWs receiving supervision in the last 6 months

Table 13A. Health centre register review: services provided for pregnant women in the last three months

	EARLY IMPLEMENTERS N=70 MEAN	LATE IMPLEMENTERS N=47 MEAN	TOTAL N=117 MEAN
Expected services			
Pregnancies	206	212	208
Facility births	203	206	204
Provided services			
ANC			
Visit one (1st trimester)	152	146	149
Visit two (2nd trimester) [a]	63	51	58
Visit three (3rd trimester)* [a]	51	33	44
Visit four (3rd trimester) *	103	61	86
Number of total facility deliveries*	156	98	133
Number of live births	156	97	132
Number of still births*	<1	1	1

[a] N=113: 4 Health centres that did not record ANC not included (1% of early 6% of late implementers)
*p<0.05 for test of difference between early and late implementers

HEWs were also asked about expected services and actual services provided at the health post in the quarter preceding the date of the survey (Table 13B). On average each health post expected 44 pregnancies in the previous three months. According to service records maintained at the health post, on average 22 women were provided with ANC visit one, 12 with visit two, 19 with visit three and 14 with visit four. Early implementing areas had a higher number of mean expected pregnancies (47 vs 39, p=0.01), which could have resulted in the higher mean number of ANC visit one (25 vs 20, p=0.02) and ANC visit four (16 vs 10, p<0.01).

Similar to health centres, the health post data indicates ANC visits are probably recorded based on the timing of the visit rather than the number of visits, although the rather high mean number of women getting ANC visit in the first trimester may indicate that data might be recorded differently in different health posts. In some health posts a woman in her third trimester having a first visit might be recorded as having ANC visit one, hence artificially inflating the number of women receiving ANC in the first trimester. With respect to targets, if on average a PHCU expects 44 pregnant women and on average 22 women actually had at least once ANC visit, it indicates that 50% of expected pregnant women are not receiving any ANC visits within their catchment health post.

Registers at health centres were also reviewed for PNC provided in the previous three months (Table 14A). According to national

Table 13B. Health post register review: services provided for pregnant women in the last three months

	EARLY IMPLEMENTERS N=140 MEAN	LATE IMPLEMENTERS N=100 MEAN	TOTAL N=240 MEAN
Expected services			
Pregnancies in health post catchment area*	47	39	44
Provided services			
ANC			
Visit one (1st trimester) * [a]	25	20	22
Visit two (2nd trimester) [b]	13	11	12
Visit three (3rd trimester) [c]	10	9	19
Visit four (3rd trimester) * [d]	16	10	14
Number of live births [e]	24	17	21

[a] N=236: 4 Health posts that did not record ANC 1not included (2% of early 1% of late implementers)
[b] N=220: 20 Health posts that did not record ANC 2 not included (8% of early 8% of late implementers)
[c] N=219: 21 Health posts that did not record ANC 3 not included (9% of early 8% of late implementers)
[d] N=231: 9 Health posts that did not record ANC 4 not included (4% of early 3% of late implementers)
[e] N=239: 1 Health post that did not record live births not included
*p<0.05 for test of difference between early and late implementers

Table 14A. Health centre register review: services provided for newborns in the last three months

	EARLY IMPLEMENTERS N=70 MEAN	LATE IMPLEMENTERS N=47 MEAN	TOTAL N=117 MEAN
Newborn PNC			
Day one	86	80	84
Day three [a]	7	14	10
Day seven *[a]	5	12	7
Day one PNC based health centre definition of first PNC			
Care provided at the facility prior to discharge	116	85	104
Care provided after discharge and within 24 hours of delivery	44	75	57
Birth asphyxia treatment*	<1	1	<1

[a] N=110: 7 Health centres that did not record PNC not included (4% of early 9% of late implementers)
*p<0.05 for test of difference between early and late implementers

Table 14B. Health post register review: services provided for newborns in the last three months

	EARLY IMPLEMENTERS N=140 MEAN	LATE IMPLEMENTERS N=100 MEAN	TOTAL 240 MEAN
Newborn PNC			
Day one [a]	15	8	12
Day three [b]	12	7	10
Day seven [c]	10	7	9

[a] N=236: 4 health posts that did not record PNC 1 not included (1% of early 2% of late implementers)
[b] N=228: 12 health posts that did not record PNC 2 not included (1% of early 10% of late implementers)
[c] N=227: 13 health posts that did not record PNC 3 not included (2% of early 10% of late implementers)

"SIMILAR TO ANC VISITS, MISCLASSIFICATION OF RECORD KEEPING OF PNC VISITS MAY OCCUR IF THEY ARE RECORDED BASED ON THE TIMING OF THE VISITS VERSES THE ACTUAL NUMBER OF VISITS."

guidelines, three PNC visits should be made in the first week of a newborn's life: PNC one within 24 hours of delivery; PNC two on day three post-delivery; and PNC three on day seven post-delivery. Similar to ANC visits, misclassification of record keeping of PNC visits may occur if they are recorded based on the timing of the visits versus the actual number of visits. For example, a newborn visited for the first time on day seven, might have the visit recorded as PNC visit three.

At the health centre level, on average 84 newborns were provided with a day one visit, 10 with a day three visit and 7 with day seven visit. We also looked at the PNC data based on how health centres define a day one visit. Among those facilities that consider a day one visit as any care provided to the mother and newborn during their stay at the facility after delivery, the mean day one PNC increased to 104 and was higher in early implementing areas. When looking at PNC among facilities that define the day one visit as any care provided to the mother and newborn after their discharge and within 24 hours of delivery, the mean number drops to 57 and is smaller in early implementing areas. This indicates that the level of day one PNC coverage is dependent on differences in definition.

If on average a PHCU had 133 deliveries and on average 84 newborns actually had PNC within 24 hours, this indicates that 63% were provided with their first PNC at the health centre. Health centres recorded on average less than one treatment for birth asphyxia in the previous three months.

Similar PNC data for health posts are shown in Table 14B. On average 12 newborns were provided with PNC on day one, 10 on day three and 9 on day seven.

At the health post level, there were a total of 5,069 (3,384 in early and 1,685 in late implementing areas) recorded births in the last three months. In the same time period health posts had recorded total 43 neonatal deaths, of which 20 were in early implementing and 23 in late implementing areas, making the overall proportion of recorded deaths to be 0.8% (0.6% in early and 1.4% in late implementing areas).

As shown in the footnotes of Tables 13 and 14, there were some missing data from registers. We checked the quality of record keeping with PHCU to see if health centres with missing data also had health posts with missing data. However, most of their health posts had recorded ANC and PNC visits, indicating missing data was not a systematic issue at the health post level within a PHCU.

7. Three PHCUs in North Gondar zone (late implementing zone) were not visited due to civil unrest. More health posts in other PHUCs of the same zone were visited to ensure the desired sample size.
8. Edir: Traditional community organisation whose members assist each other during the mourning process

HEW visits family to wash the newborn baby.
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4. HEALTH SYSTEM INTEGRATION WITHIN THE PHCU FOR QUALITY CBNC SERVICES

This chapter assesses how well the PHCU level health system is integrated to provide CBNC services.

CHAPTER SECTIONS

1. CBNC job aids
2. CBNC drugs supply
3. CBNC referral linkages

Under the CBNC job aids section we provide information on the availability of registers, administrative materials and forms. We explore CBNC drugs supply with respect to the availability of gentamycin and amoxicillin at the health centre intended for supplying health posts. In the referral linkages section we assess if the referral system for young infant care from health posts to health centres is working. We also assess the level of referral from WDA leaders to HEWs.

CBNC JOB AIDS

This survey observed the availability of job aids, further defined in Box 2, necessary to provide MNH care (Table 15A). We observed IMNCI registers, chart booklets and health management information system (HMIS) forms in over 95% of facilities. Around 85% had PNC registers, stock card/bin card, request/re-supply forms and vaccination cards. Only three-quarters had a family health card, with the proportion being higher among early implementers (87% vs 60%, $p<0.01$). Availability of supervision checklist was observed in 79% of all health centres and was higher among early implementers (87% vs 66%, $p=0.01$).

A similar assessment of job aids and administrative forms at the health post level is shown in Table 15B. Chart booklet and iCCM registers (0-2 months) were available in 99% of health posts and 97% had copies of the family health card. Ninety percent had PNC registers and 85% had vaccination cards and the proportion was higher in early implementing areas (90% vs 79%, $p=0.02$). There was a relatively low availability of stock card/bin card, request and re-supply forms and HMIS forms (45%, 55% and 72%, respectively). A smaller proportion of early implementing areas had HMIS forms (64% vs 84%, $p<0.01$). In addition, 98% of health posts

Table 15A. Health centre: observation of CBNC job aids

	EARLY IMPLEMENTERS N=70 %	LATE IMPLEMENTERS N=47 %	TOTAL N=117 %
IMCI registration book (0-2 months)	97	94	96
Chart booklet	99	94	97
Family health card*	87	60	76
Pregnant woman and outcome registration book	86	85	86
PNC register	84	92	87
Stock card/bin card*	90	75	84
Vaccination cards	84	89	86
Request and re-supply forms	87	85	86
HMIS forms	99	98	98
Supervision checklist*	87	66	79

*p value <0.05 for test of difference between early and late implementers

Table 15B.Health post: observation of CBNC job aids

	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
iCCM registration book (0-2 months)	100	98	99
Chart booklet	99	99	99
Family health card	98	96	97
PNC register*	94	85	90
Stock card/bin card	54	42	45
Vaccination cards*	90	79	85
Request and re-supply form	51	61	55
HMIS forms*	64	84	72
Additional materials			
ANC register	94	91	93
Delivery register	81	81	81
Family folders	99	97	98

*p value <0.05for test of difference between early and late implementers

had family folders, although the survey did not assess if the forms were filled and up-to-date.

Job aids and forms provided to WDA leaders are shown in Figure 13. Eighty-six percent of WDA leaders had a family health card, with the proportion being slightly higher among early implementing area WDA leaders (90% vs 80%, p=0.03). WDA leaders' understanding of the content of the family health card is further presented in the Knowledge section of Chapter 5: Potential of health workers and volunteers to deliver quality CBNC services. Data collection forms were available among 39% of WDA leaders.

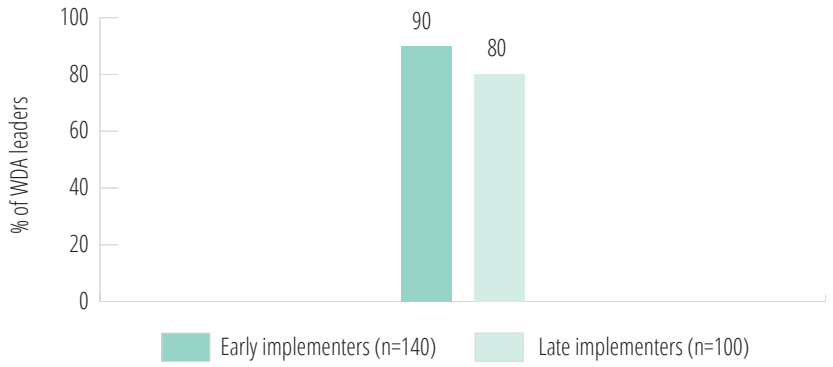
CBNC DRUGS SUPPLY

HEWs are provided with a starter kit at training that includes gentamycin (20 mg/2ml) and amoxicillin dispersible tablets (125 mg or 250 mg). The starter kit is intended to sustain service delivery for up to 12 months.

Box 2. CBNC job aids

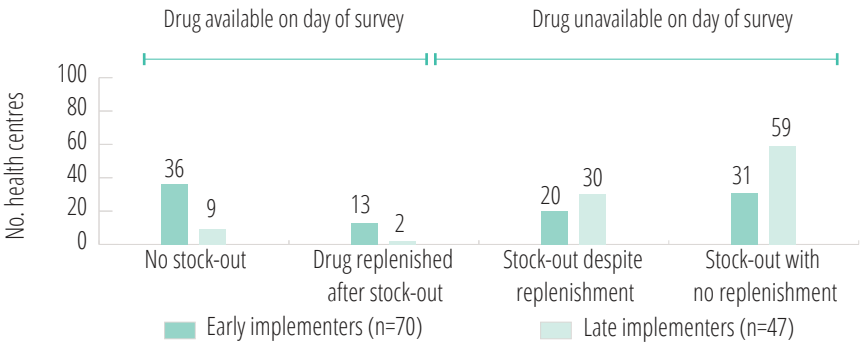
1. **IMNCI and iCCM registration books:** registers used for classifying, treating and keeping record of sick newborns at the health centre and health post, respectively.
2. **Chart booklet:** guide used for classifying and treating sick newborns.
3. **Family health card:** MNCH behaviour change job aid used by HEWs and WDA leaders to educate on key MNH messages.
4. **Pregnant women and outcome registration book:** record of pregnant women and their delivery outcomes (e.g. type of delivery, complications encountered...etc.).
5. **PNC register:** record of PNC visits 1, 3, 7 and 42 days.
6. **Stock card/bin card:** drug inventory system.
7. **Vaccination cards:** record of primary vaccination and booster doses for child.
8. **Request and re-supply forms:** forms used for replenishing drugs.
9. **HMIS forms:** forms for routine data collection on facility provided services.
10. **Supervision checklist:** used to monitor and assess health posts' activities, services, supplies and coverage of target indicators.
11. **Family folder:** a family-centered information collection tool for integrated health service delivery by HEWs.
12. **ANC register:** record of ANC visits made during pregnancy.

Figure 13. Health post: family health card available with WDA leaders



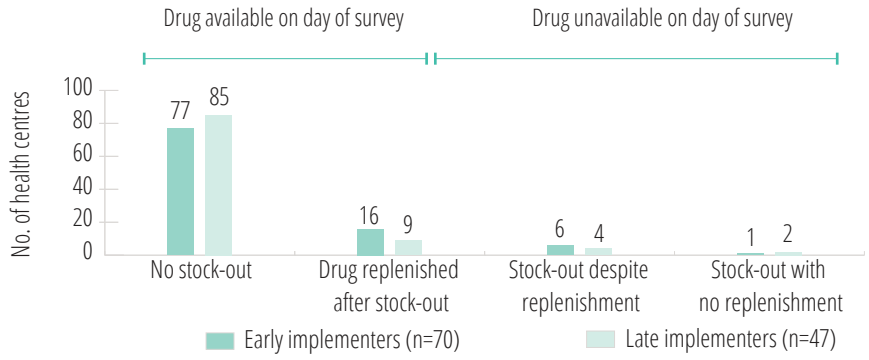
*p value <0.05 for test of difference between early and late implementers

Figure 14A. CBNC drug supply at the health centre: observed supply of gentamycin 20mg/2ml in the last three months*



*p value <0.05 for test of difference between early and late implementers

Figure 14B. CBNC drug supply at the health centre: observed availability of amoxicillin (125mg and 250 mg dispersible tablet as well as 125 mg/5ml syrup) in the last three months



This study assessed the availability of these drugs at the health centre level for resupplying health posts. A quarter of health centres had gentamycin on the day of the survey with no stock-out in the last three months and 8% had it on the day of the survey despite reporting stock-out at some point in the three months preceding the survey. Twenty-four percent of health centres had no gentamycin on the day of the survey despite having the drug replenished at some point in the previous three months and 43% had no gentamycin for at least three months. Overall, 75% of health centres had experienced stock-out of gentamycin 20mg/2ml at some point in the previous three months. The reason for this high level of stock-out could be that health centres are encouraged to pass this drug to health posts rather than retain it at their facility. The availability of gentamycin by early and late comparison areas is shown in Figure 14A.

Similarly, 80% of health centres had some form of amoxicillin (125 mg/250 mg dispersible tablet and or 125mg/5ml syrup) on the day of the survey with no stock-out in the last three months and 13% had it on the day of the survey despite reporting stock-out at some point in the three months preceding the survey. Five percent of health centres had no form of amoxicillin on the day of the survey, despite having the drug replenished at some point in the previous three months, and 2% had no amoxicillin for at least three months. Overall 20% of health centres had experienced stock-out at some point in the last three months. The availability of any form of amoxicillin by early and late comparison areas is shown in Figure 14B.

Within a woreda, drugs procured by Pharmaceuticals Fund and Supply Agency are normally distributed from woreda health office to health centres and finally to health posts. For the CBNC programme however, drugs for the treatment of VSD were procured by UNICEF, as amoxicillin dispersible tablet and gentamycin 20mg/2ml were not part national essential medicine's list at the start of CBNC programme. To ensure immediate service delivery, drugs were distributed to HEWs at end of their CBNC training. In this survey, we assessed who was directly providing drugs to health centres for replenishing health posts. Of those receiving gentamycin and amoxicillin over half were supplied directly by woreda health office with the rest being supplied mainly by implementing partners. A smaller proportion of early implementing areas were supplied by woreda health offices for both gentamycin (40% vs 64%) and amoxicillin (52% vs 70%).

REFERRAL AND SERVICE DELIVERY LINKAGE

In this section we will explore data abstracted from 0-2 month IMCNI registers at health centres, as well as 0-2 month CBNC/iCCM registers at health posts. We present data on diagnosis, treatment and referrals of young infants. Mechanisms for referral between health posts and health centres are also assessed. In addition, we also look at referrals from community to HEWs, via the WDA leaders.

IMNCI and CBNC/iCCM register review

IMNCI registers at health centres were reviewed and information on 0-2 month old young infants seen in the three months preceding the date of the survey (July-September 2015) were collected. A total of 825 young infants were seen across 104 health centres. The remaining 13 (11%) health centres (5 in early and 8 in late implementing areas) did not have any records of 0-2 month infants seen in the previous three months.

Similarly, at the health post level, 0-2 CBNC/iCCM registers were reviewed and a total of 428 young infants (289 in early and 139 in late implementing areas) had been seen in 194 health posts in the last three months (July-September 2015). The remaining 46 (19%) health posts (13 in early and 33 in late implementing areas) had no information recorded on sick babies in the specified time. We further looked at the data to see if these 46 health posts were from the PHCUs where the health centres had no recoded data on sick young infants. However, only a few (9 out of the 46) of the health posts were from the 13 health centres with missing records on sick babies. This shows that missing records were not systematic at the PHCU level.

Table 16A. Health centre IMNCI register: review of record completeness & content in last three months

		EARLY IMPLEMENTERS N=378 (%)	LATE IMPLEMENTERS N=447 (%)	TOTAL N=825 (%)
A. Completeness of record	First and last name	100	100	100
	Address	100	100	100
	Date of visit	100	100	100
	Age of baby	99	99	99
	Gender of baby	100	100	100
	Weight of baby at birth	100	100	100
	Baby weight *	94	86	90
	Gestational age in weeks	100	100	100
	Temperature of baby *	91	78	84
	Respiratory rate of baby*	74	53	63
	Signs and symptoms of baby*	88	98	93
	Disease classification *	74	90	83
B. Recorded information	**Age of baby in weeks (mean)** [a]			
	0-1 week	14	15	15
	2-4 weeks	51	53	52
	5-8 weeks	34	32	33
	Gender of baby			
	Male	54	53	53
	Female	46	47	47
	Birth weight of baby*			
	<1500g	0	<1	<1
	1,500-2500 g	1	1	1
	>= 2500	15	17	16
	Unknown	84	81	83
	Weight of baby (mean) [b]*	4254	4118	4183
	Gestational age in weeks			
	<32 weeks	0	1	<1
	32-36 weeks	2	1	1
	>= 37 weeks	29	26	27
	Unknown	69	72	71
	Respiratory rate of baby			
	60 breaths/min or more* [c]	21	30	25
	Temperature [d]			
	Low (<35.5 °C)	4	5	4
	Normal (35.5-37.5 °C)	89	87	88
	High (>37.°C)	7	9	8

[a] 7 missing records for age of baby (4 from early and 3 from late implementing areas)
[b] 86 missing data for weight of baby (22 from early and 64 from late implementing areas)
[c] 305 missing (97 from early and 208 from late implementing areas)
[d] 133 missing (35 from early and 98 from late implementing areas)
*p value <0.05 for test of difference between early and late implementers

Health centre IMNCI register review

Table 16A shows the completeness of the recorded data in the IMNCI registers as well as the recorded information pertaining to background information and initial assessment of the young infants receiving care at the health centre. Data that were recorded were complete for some (name, address and date of visit) and missing for others (age, weight, temperature, respiration rate, signs and symptoms, and disease classification). Of these, the most amounts of missing data were for respiratory rate (37% missing), followed by disease classification (17% missing) and temperature (16% missing). Compared with early implementers, a smaller proportion of late implementers had recorded baby's weight, temperature and respiratory rate, while a higher proportion had recorded signs and symptoms, and disease classification.

According to 0-2 month IMNCI registers, on average there were 7.5 sick infants seen across the 117 health centres (5.4 in early and 9.5 in late implementing areas). As mentioned earlier, a total of 825 young infants were seen across 104 health centres, with 378 being in early and 447 in late implementing areas. The remaining 13 (11%) health centres had no recorded data in their 0-2 month IMNCI registers for the three months preceding the date of the survey. The majority (52%) of babies were between the ages of 2-4 weeks, while 15% were a week old or less. Fifty-three percent were males. Birth weight was unknown for the majority of babies (83%) seen in the last three months and was similar by implementation area. Mean weight on the day of consultation was 4,183 grams.

High temperature (>37.5 °C) was recorded in 8% of young infants and 25% had a breath count of 60/min or more. Of the 131 babies that had 60 breaths/min or more recorded, 81 (62%) were then classified as having fast breathing. Of the 56 young infants that had a high temperature recorded, 36 (64%) were classified as having fever. Among those that had normal breath rate and temperature, the majority were classified correctly as not having these signs (98% and 84%, respectively).

The overall disease classifications are shown in Table 16B. Among all the babies diagnosed at the health centre level in the last three months, about a quarter of were classified as having a VSD and a similar proportion as having a local bacterial infection. A VSD for this analysis included cases classified as VSD, sepsis, pneumonia and acute febrile illness. Only 4% had a feeding problem.

Treatment provided to those classified as having a particular disease is also shown in Table 16B. Among those that were classified as having a VSD, 15% received a combination of gentamycin and ampicillin, 6% were given a combination of gentamycin and amoxicillin, and 1% a combination of amoxicillin and ampicillin. Forty-three percent were given amoxicillin only, 14% were given gentamycin only, 3% were given ampicillin only and 5% were given another kind of antibiotic only. Of the total 190 cases (73 in early and 117 in late implementing area), 14% (n=27, 16 were in early and 11 were in late implementing areas) of young infants classified as having a VSD did not get any antibiotics and of these 48% (n=13, 11 in early and 3 in late implementing areas) were recorded as being referred to a higher level facility for treatment.

For local bacterial infection, 85% were provided with amoxicillin and another 7% were provided with other antibiotics. Of the 5 young infants recorded as having dehydration, 80% were provided with ORS and 20% with zinc.

Among the 24 VSD cases that got treated with gentamycin at the health centre, 71% were recorded as completing treatment. Among all VSD cases treated at the health centre, the vast majority (69%) were recorded as having an unknown outcome and this was similar between the two implementation areas.

Health post CBNC/iCCM register review

Table 17A shows the completeness of the recorded data in the CBNC/iCCM registers as well as the recorded information pertaining to background information and initial assessment of the young infants receiving care by HEWs. Similar to the IMNCI

Table 16B. Health centre IMNCI register: disease classification and treatment

		EARLY IMPLEMENTERS N=378 (%)	LATE IMPLEMENTERS N=447 (%)	TOTAL N=825 (%)
A. Disease classification	VSD* [a]	19	26	23
	Severe dehydration	0	0	0
	Some dehydration	<1	<1	<1
	Local bacterial infection	27	21	24
	Jaundice	<1	0	<1
	Severe jaundice	0	0	0
	Feeding problem or low weight*	5	4	4
	Very preterm and/or very low birth weight	<1	0	<1
	Preterm and/or low birth weight	0	0	0
B. Treatment among those classified with disease	**Treatment for VSD***			
	Gentamycin and ampicillin	22	10	15
	Amoxicillin and gentamycin	11	3	6
	Amoxicillin and ampicillin	0	1	1
	Gentamycin only	16	13	14
	Amoxicillin only	26	53	43
	Ampicillin only	1	3	3
	Other antibiotic only	1	7	5
	No antibiotic	22	9	14
	Treatment of other diseases			
	Amoxicillin for local bacterial infection	87	84	85
	Other antibiotics for local bacterial infection [b]	4	9	7
	ORS for dehydration	100	67	80
	Zinc for diarrhoea	50	0	20
C. Referral	Sick newborn referred*	10	5	8
	VSD cases refereed*	44	16	27
D. VSD treatment completion and outcome	Gentamycin completion at health centre among VSD diagnosed cases [c]	82	43	71
	Outcome of all VSD cases			
	Health improved	37	25	30
	Same	>1	0	<1
	Died	>1	0	<1
	Unknown	60	75	69

[a] Includes VSD, sepsis, pneumonia and acute febrile illness
[b] Co-trimoxazole and cloxacillin
[c] Among VSD cases not referred to higher facility
*p value <0.05 for test of difference between early and late implementers

. Health post iCCM register: review of record completeness & content in last three months

		EARLY IMPLEMENTERS N=289 (%)	LATE IMPLEMENTERS N=139 (%)	TOTAL N=428 (%)
A. Completeness of record	First and last name	100	100	100
	Address	100	100	100
	Date of visit	100	100	100
	Age of baby	99	99	99
	Gender of baby	100	100	100
	Weight of baby at birth	100	100	100
	Baby's weight	99	98	99
	Gestational age in weeks	100	100	100
	Temperature of baby	97	97	97
	Respiratory rate of baby*	88	63	80
	Signs and symptoms of baby	100	99	99
	Disease classification of baby*	56	80	64
B. Recorded information	**Age of baby in weeks (mean) * [a]**			
	0-1 week	46	34	42
	2-4 weeks	33	36	34
	5-8 weeks	21	30	24
	Gender of baby			
	Male	56	54	55
	Female	44	46	45
	Birth weight of baby*			
	<1500g	<1	0	<1
	1,500-2500 g	1	4	2
	>= 2500	82	50	72
	Unknown	17	49	27
	Weight of baby (mean) * [b]	3723	3535	3662
	Gestational age in weeks			
	<32 weeks	0	1	<1
	32-36 weeks	3	4	4
	>= 37 weeks	57	51	55
	Unknown	40	44	41
	Respiratory rate of baby			
	60 breaths/min or more * [c]	16	32	20
	Temperature [d]			
	Low (<35.5°C)	3	7	5
	Normal (35.5-37.5 °C)	91	84	89
	High (>37°C)	5	8	6

[a] 5 missing data for age of baby (4 from early and 1 from late implementing areas)
[b] 5 missing data for weight of baby (2 from early and 3 from late implementing areas)
[c] 12 missing data for respiratory rate of baby (8 from early and 4 from late implementing areas)
[d] 86 missing data for temperature of baby (35 from early and 51from late implementing areas)
*p value <0.05 for test of difference between early and late implementers

Table 17B. Health post iCCM register review: recorded treatment for sick 0-2 newborns in last three months

		EARLY IMPLEMENTERS N=289 (%)	LATE IMPLEMENTERS N=139 (%)	TOTAL N=428 (%)
A. Disease classification	VSD*	17	27	20
	Severe dehydration	0	<1	<1
	Some dehydration	1	4	2
	Local bacterial infection	18	20	19
	Jaundice	0	<1	<1
	Severe jaundice	0	>1	<1
	Feeding problem or low weight	12	14	13
	Very Preterm and/or very low birth weight	<1	0	<1
	Preterm and/or low birth weight	<1	<1	<1
B. Treatment among those classified with disease	**Treatment for VSD***			
	Amoxicillin and gentamycin	45	35	41
	Gentamycin only	37	16	28
	Amoxicillin only	10	46	26
	No antibiotic	8	3	6
	Treatment for other diseases			
	Amoxicillin for local bacterial infection	96	93	95
	ORS for dehydration	100	100	100
	Zinc for dehydration	100	100	100
	Nutritional counselling for feeding problem	44	74	55
C. Referral	Sick newborn referred*	10	19	13
	VSD cases refereed	43	51	46
D. VSD treatment completion and outcome	Gentamycin completion at health post among VSD diagnosed cases [a]	82	77	80
	Outcome of all VSD cases			
	Health improved	76	81	77
	Same	0	5	2
	Died	2	5	3
	Unknown	22	8	16

[a] Among VSD cases not referred to higher facility

*p value <0.05 for test of difference between early and late implementers

records, some data were recorded with 100% completeness (age, name and address), while others had missing data (age, weight, temperature, respirator rate, signs and symptoms, and disease classification). Of these, the most amounts of missing data were for disease classification (36% missing), followed by respiratory rate (20% missing). The proportion of missing data on disease classification was higher in early implementing areas, while the reverse was observed for missing data on respiratory rate. This level of missing data on disease classifications undermines the CBNC programme.

According to 0-2 month iCCM registers, on average there were 1.8 sick children seen across the 240 health posts (2.1 in early and 1.4 in late implementing areas). As mentioned earlier, a total of 428 young infants were seen across 194 the health posts, with 289 being in early and 139 in late implementing areas. The remaining 46 (19%) health posts had no recorded data in their 0-2 month iCCM registers for the three months preceding the survey. The majority (42%) of babies were a week old or less, while 34% were aged of 2-4 weeks. This is in contrast to the age of infants seen at health centres, of which the majority were 2-4 weeks old. Fifty-five percent were males. Birth weight was unknown in 27% infants seen in the last three months with the proportion rising to about half in late implementing areas. Mean weight on the day of consultation was 3,662 grams. Gestational age was unknown for 41% of the infants and about 5% were born before reaching 37 weeks.

High temperature (>37.5 degrees Centigrade) was recorded in 6% of babies and 20% had a breath count of 60/min or more. Of the 68 newborns that had recorded 60 breaths/min or more, 56 (82%) were classified as having fast breathing. Of the 26 infants that had a recorded high temperature, 17 (65%) were classified as having a fever. Among those that had normal breath rate and temperature, the majority were classified correctly as not having these signs (99% and 97%, respectively).

The overall disease classifications are shown in Table 17B. Among infants diagnosed at the health post level in the last three months, about a fifth were classified as having a VSD, 19% had a local bacterial infection and 13% had a feeding problem.

Treatment provided to those classified as having a particular disease is also shown in Table 17B. Of the 86 (49 in early and 37 in late implementing areas) VSD cases, 41% were provided with both gentamycin and amoxicillin, while 28% were provided with gentamycin only and 26% with amoxicillin only. The remaining 5 (6%) infants were referred to a higher facility without a pre-referral dose of antibiotics.

For those identified as having a local bacterial infection, 95% were provided with amoxicillin and for dehydration 100% were provided with ORS and zinc. Nutritional counselling was provided to the caregivers of 55% of infants identified as having feeding problems.

"THE IMPROVEMENT IN THE LEVEL OF MISSING DATA ON DISEASE CLASSIFICATION IN FACILITY REGISTERS WILL FACILITATE THE MONITORING OF THE CBNC PROGRAMME."

Figure 15: Connectedness of referral system: infants that were referred from health post to health centre who followed up on their referral

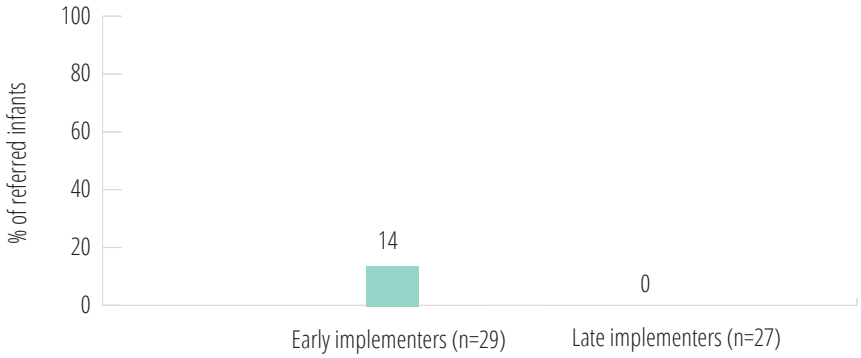


Table 18. Referral linkages between health post and health centre[a]

	EARLY IMPLEMENTERS N=70 %	LATE IMPLEMENTERS N=47 %	TOTAL N=117 %
Use of referral form			
Health centres receiving forms from health posts *	51	21	39
Use of government transport from health post to health centre during last obstetric referral	67	58	63
Motorised transportation at health centre			
Motorcycle*	49	30	41
Ambulance	13	13	13
Motorcycle and ambulance	13	9	11
None	51	66	57

[a] Information provided by health centre staff
*p value <0.05for test of difference between early and late implementers

Among those classified as having VSD, 46% were referred to health centres. Among the 54% that received treatment at the health post, 80% completed their gentamycin injection. Among all VSD cases, 77% were recorded as having their health improved, 3% had died, and for 16% outcome was unknown.

Referral between health posts to health centres

Figure 15 shows the referrals between health post and health centre. According to the 0-2 iCCM registers, 56 sick infants (29 from early and 27 from late implementation areas) were referred from health posts, of which only four (7%) were cross-linked to the referral health centre's IMNCI register. All four were among the 29 newborns referred from early implementing areas.

CBNC training covers the use of referral forms by HEWs when referring sick newborns. Health centres were asked if they receive referral forms from health posts for MNH care and 39% reported that they do. Use of referral forms was higher among early implementing areas (51% vs 21%, $p<0.01$). Availability of motorised transport is also essential for referrals from health post to health centre and in this study 13% of health centres had their own ambulance. A motorcycle was available in 41% of health centres, with the proportion being higher among early implementers (49% vs 30%, $p=0.04$). Yet, 57% of health centres had no motorised transport. About two-thirds reported that a government owned vehicle was used for the most recent obstetric referral from a health post to a health centre (Table 18). District level information on the availability of functional ambulances showed that all 30 visited districts had an ambulance. On average districts had two ambulances and this was similar by early and late implementing districts.

Referrals between WDA leaders and health posts

WDA leaders play a key role in the CBNC programme by referring community members to the health post for MNH care. This survey assessed WDA leaders' ANC and PNC counselling activity in the last six months, which primarily implies referral of pregnant women and newborns to HEWs. ANC referral was high (84%). About three-quarters provided PNC referral and the proportion was higher among early implementers (88% vs 62%, $p<0.001$).

5. POTENTIAL OF HEALTH WORKERS AND VOLENTEERS TO DELIVER QUALITY CBNC SERVICES

This chapter presents the potential of health workers and volunteers to deliver CBNC services and contains three sections.

CHAPTER SECTIONS

1. Training
2. Knowledge
3. Practice

Under the training section, we explore training received by health centre staff, HEWs and WDA leaders. In the knowledge section, we measure HEW and WDA leaders' understanding of the CBNC protocol and lastly we present their overall practice in the last three months.

TRAINING

To understand the quality of CBNC services provided at the PHCU level, the midline survey assessed the level of training provided to health centre staff, HEWs and WDA leaders. Findings are presented below.

Health centre staff

IMNCI trained staff at the health centre are important for providing appropriate treatment for sick newborns that are referred from the community by HEWs, as well as those that come directly to the health centre seeking care. CBNC programme implementation intends to train two IMNCI trained health centre staff members in CBNC. It also aims to train two additional staff members in both IMNCI and CBNC. In addition to improving the quality of care provided at health centres and the referral linkages, these trained staff members are integral for improving the quality of the support from the health centres to the health posts.

In this study, 111 (95%) facilities had an IMNCI trained staff, with early implementing areas having 68 (95%) and late implementing areas having 43 (91%). Overall, there were an average of two IMNCI trained staff members at each health centre and the majority of were nurses. Among the 111 facilities, 22 (20%: 16% in early and 26% in late implementing areas) reported that a staff member had

Table 19A. Health post: training received by HEWs on newborn health

	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
Status of trainings received at any point			
CBNC	100	96	98
iCCM	100	97	99

*p value <0.05 for test of difference between early and late implementers

Table 19B. Health post: HEW satisfaction with training

	EARLY IMPLEMENTERS N= 107 %	LATE IMPLEMENTERS N=93 %	TOTAL N= 200 %
Satisfaction with training*	78	47	64
Suggestion to improve training			
Post training supervision	79	81	80
Further training	51	60	56
Practice sessions	48	52	50
Training aids	42	54	48

*p value <0.05 for test of difference between early and late implementers

left after being trained in IMNCI. These facilities reported that on average one IMNCI trained staff member had left after being trained. Fifty-five percent reported that the individual had been transferred to another health centre, 18% that they had been promoted and 27% that they had moved to another organisation. Three out of the 22 facilities (14%) that had reported staff turnover said they had replaced the person with another trained staff member. All three facilities were in early implementing areas.

This study also assessed the availability of CBNC trained staff at health centres. Sixty-eight percent of health centres (70% in early and 66% in late implementing areas) had CBNC trained staff. Among the 80 health centres with CBNC trained staff, 19% (20% in early and 16% in late implementing areas) reported that they had a staff member leave after being trained in CBNC. Seventy-three percent of these reported that the individual had been transferred to another health centre, 7% that they had been promoted and 13% that they had moved to another organisation. None of the facilities replaced the person with another trained staff member.

respect to HEW training within the PHCU were similar by in early and late implementing areas.

HEW training

The success of the CBNC programme relies on early contact of HEWs with newborns, so that they can provide PNC visits at home or at the health post. HEWs are expected to support appropriate care for newborns, including screening the newborn for danger signs and referring those with a VSD, after providing a pre-referral dose of amoxicillin and gentamycin. If referral is not possible, HEWs treat the sick newborn at the health post level.

HEWs in this study were asked about the training they had received in CBNC, iCCM and Integrated Refresher Training on MNCH (Table 19A.) All HEWs in early and 98% in late implementing areas had received CBNC training. Similarly, 100% of HEWs in early and 97% of HEWs in late implementing areas had received iCCM training. Although Integrated Refresher Training is annual, over a quarter of HEWs (39% of early and 11% of late implementing areas, $p<0.001$) had not received such a training.

"HEALTH EXTENSION WORKERS ALSO ADDED THAT MORE TRAINING PRACTICE SESSIONS... AND ADITIONAL TRAINING AIDS WOULD IMPROVE TRAINING OVERALL"

Health centres were asked about HEWs' CBNC training and turnover in their satellite health posts. Almost all facilities (98%, n=115) reported that HEWs in their catchment health posts had been provided with CBNC training. On average, health centres had trained nine HEWs in CBNC. Among health centres with trained HEWs, a quarter (n= 30) reported that HEWs had left since getting the CBNC training. None of the health centres replaced the vacancy with a CBNC trained HEW. Findings with

HEWs were asked about their level of satisfaction with the training they had received in the last 12 months. Among those that received CBNC, iCCM and Integrated Refresher Training (n=200), only 64% were fully satisfied (Table 19B). The level of satisfaction was much higher among early implementers (78% vs 47%, $p<0.001$). The majority reported that a post training supervision would improve their overall training. Around 50% of HEWs also added that more training practice sessions (which

at times are omitted from the training sessions) and additional training aids would improve their overall training.

WDA leaders' orientation

As part of their Integrated Refresher Training, HEWs are trained to orient WDA leaders to support rollout of MNCH services in the community, including CBNC. Implementing partners do not play a direct role in the training and supervision of WDA leaders. WDA leaders are expected to counsel and carry out social mobilisation activities to increase the knowledge, attitude and health seeking behaviour of mothers. In addition, they are expected to notify HEWs of pregnancies and births, visit newborns, refer sick children to health posts, counsel families to follow-up on referrals to health posts and health centres and also support treatment compliance for sick newborns.

MNH training was provided to 83% of WDA leaders in the last 12 months and was similar between implementation areas. Among those trained, over 90% had received training across the continuum of care, including providing home visits, referring for PNC care, educating on newborn danger signs and referring sick newborns. Implementation areas were similar except for training on use of the family health card and referring for PNC care, where a greater proportion of early implementing area WDA leaders reported receiving these trainings.

WDA leaders' satisfaction with their newborn care orientation in the last 12 months was also assessed. The majority (84%) were satisfied with their training, with satisfaction level being greater among early implementing area WDA leaders (87% vs 79%, p=0.001).

KNOWLEDGE

In this section we present the assessment of HEW and WDA knowledge on the different components of the CBNC programme. Specifically, for HEWs we assessed their knowledge on newborn general care, signs of newborn illness, management of newborn illness and side effects of antibiotic use. For WDA leaders we assessed their knowledge on general MNH as well as their understanding of the family health card.

HEWs' unprompted knowledge of relevant CBNC components

According to government guidelines, HEWs are instructed to use the iCCM chart booklet when assessing a newborn. The chart booklet provides the specific steps a HEW should follow when assessing and managing newborns. The knowledge section of this survey however, assessed their unprompted knowledge of newborn danger signs, classification and treatments. As such, it is expected that if HEWs had accessed their chart booklet, they are likely to have performed better than what is shown in the following section.

HEWs' knowledge: newborn general care

HEWs were asked about their knowledge on providing care in the postnatal period. Table 20A shows their knowledge with respect to the main components of the PNC one visit (within 24 hours of delivery) and subsequent visits (on days 3, 7 and 42).

On PNC counselling, the majority of HEWs had knowledge on the need to encourage mothers to breastfeed exclusively (75%). However, more than half of HEWs did not cite advising the caregiver to delay bathing, and the need for skin-to-skin contact and cord care. Furthermore, only around a quarter of HEWs had knowledge on the importance of educating families on hygiene and recognising newborn danger signs. HEWs' knowledge of counselling done on PNC one visit was similar between early and late implementing areas, except for skin-to-skin contact where knowledge was higher among early implementing area HEWs.

With respect to activities that are needed to be carried out by HEWs during the first PNC visit, 68% mentioned checking newborn danger signs. Around 60% stated the need to measure a newborn's weight and temperature, which were both higher among HEWs in late implementing areas. Knowledge of other

Table 20A. HEWs' knowledge (unprompted): newborn general care

	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
1. Main components of first PNC visit			
Counselling			
Exclusive breastfeeding	78	70	75
Cord care	31	39	35
Washing hands before touching baby	30	19	25
Delay bathing	51	53	52
Skin-to-skin contact*	45	20	35
Danger sign recognition using family health card	26	20	23
Activity			
Check for danger signs	69	67	68
Measure weight*	68	50	60
Measure temperature*	65	51	59
Provide cord care	43	44	43
Vaccinate for polio and BCG	43	40	42
Apply TTC eye ointment	31	21	27
Check for congenital abnormalities	11	17	13
2. Main components of subsequent PNC visit			
Counselling			
Exclusive breastfeeding	82	80	81
Cord care	31	39	35
Activity			
Check danger signs	71	59	66
Measure weight *	61	43	55
Assess breastfeeding	89	82	86
Ensure baby is kept warm*	53	31	44
Vaccination	54	60	65

*p value <0.05 for test of difference between early and late implementers

"FOR VERY SEVERE DISEASES ALMOST ALL HEALTH EXTENSION WORKERS KNEW THE NEED TO REFER URGENTLY."

activities, including vaccination (polio and BCG) and providing cord care were mentioned by less than half of all HEWs.

For subsequent PNC visits, over 80% of HEWs had knowledge on exclusive breastfeeding counselling and checking breastfeeding. Two-thirds of HEWs mentioned assessing newborn danger signs.

Overall, knowledge of the assessment and education on breastfeeding during PNC visits was relatively high. However, knowledge of ensuring that the newborn is kept warm and cord care, across PNC visits was low. Knowledge of assessing newborn danger signs during first and subsequent visits was not cited by around a third of HEWs.

HEWs' knowledge on signs of newborn illness: VSD

HEWs' knowledge on newborn signs of illness is shown in Table 20B. For VSD, over 70% of cited convulsions and feeding problems as danger signs. Over half mentioned high temperature, fast breathing and limited movement. However, severe chest in-drawing and low temperature were cited by less than half of the HEWs. A higher proportion of early implementing area HEWs cited severe chest in-drawing (54% v s26%, p<0.001), convulsions (82% vs 66%, p<0.01), limited movement (60% vs 39%, p<0.01) and high temperature (74% vs 60%, p=0.03) compared with HEWs in late implementing areas.

HEWs' knowledge on signs of newborn illness: local bacterial infection

For local bacterial infection over 70% of HEWs had knowledge of red umbilicus and skin pustules as signs, and 65% cited umbilicus that was draining pus. A greater proportion of early implementing area HEWs cited red and pus draining umbilicus compared with late implementing area HEWs.

HEWs' knowledge on signs of newborn illness: feeding problems

With respect to feeding problems, 80% of HEWs had knowledge of newborns' proper attachment to the breast. Around 70% cited ineffective suckling and lack of exclusive breastfeeding. The rest of the symptoms were known by less than half of the HEWs, with only 17% mentioning thrush. A greater proportion of early implementing area HEWs had more knowledge on four out of the seven signs of feeding problems, where the difference reaches statistical significance (p<0.05).

HEWs' knowledge on signs of newborn illness: jaundice and severe jaundice

For jaundice, 79% of HEWs mentioned yellow skin while 68% mentioned yellow eyes. With respect to severe jaundice, around three-quarters of HEWs cited yellow palms and soles as signs. However, around two-thirds did not know the signs of severe jaundice with respect to the age of a newborn (jaundice in those less than 24 hours and those over 14 days), although the proportion was higher (over 50%) among HEWs in early implementing as compared with those in late implementing (<20%) areas.

HEWs' knowledge on the management of newborn illness: VSD

HEWs' knowledge on the management of newborn illness is shown in Table 20C. For VSD, almost all HEWs knew the need to refer urgently. Counselling the mother to continue breastfeeding was mentioned by 60% of HEWs. Around 75% cited the need to provide a pre-referral dose of amoxicillin and gentamycin. Fifty-

Table 20B. HEWs' knowledge (unprompted): signs of newborn illness

	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
1. Very severe disease			
Convulsions*	82	66	75
Stopped or reduced feeding	75	69	73
Temperature greater than 37.5*	74	60	68
Fast breathing	69	57	64
No or limited movement*	60	39	51
Severe chest in-drawing*	54	26	43
Temperature less than 35.5	45	38	42
2. Local bacterial infection			
Red umbilicus*	82	59	73
Skin pustules	79	76	78
Umbilicus draining puss*	74	53	65
3. Feeding problem			
Not well attached to breast	81	78	80
Receives other foods or drinks	71	72	71
Not suckling effectively	74	64	70
Less than 8 breastfeeds in 24 hours*	68	47	59
Switching to another breast before one is emptied*	59	33	48
Underweight for age*	55	35	47
Thrush*	26	4	17
4. Jaundice			
Yellow skin	78	81	79
Yellow eyes	72	62	68
5.Severe jaundice			
Palms yellow	83	73	79
Soles yellow*	80	66	74
Jaundice in newborn age 14 days or more*	53	18	38
Jaundice in newborns of age less than 24 hours*	51	15	36

*p value <0.05 for test of difference between early and late implementers

Table 20C. HEWs' knowledge (unprompted): management of newborn illness

	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
1. Very severe disease			
Refer urgently to higher facility	92	94	93
Pre-referral dose of amoxicillin*	78	66	73
Pre-referral dose of gentamycin*	81	68	75
Continue to breastfeed	65	53	60
Provide 7 day amoxicillin if referral is not possible*	54	33	45
Treat with 7 day gentamycin if referral is not possible*	51	36	45
2. Local bacterial infection			
Give amoxicillin for 5 days*	85	63	76
Follow-up care on 2ndday*	49	19	36
3. Feeding problem			
Advise mother to breastfed often and as long as infant wants*	91	80	87
Teach mother correct positioning and attachment	77	76	77
Educate on exclusive breastfeeding*	76	62	70
Follow-up on feeding problem*	50	29	41
Teach mother to treat thrush at home*	29	7	20
Follow-up on thrush cases in two days*	19	5	13
Follow-up on underweight for age cases in 14 days*	16	7	13
4. Jaundice			
Breastfeed more frequently*	76	63	70
Cover baby well*	66	42	56
Advice mother to return if the situation gets worse	35	26	31
Expose child to sunshine *	40	20	32
Follow-up in two days*	39	14	28
5. Severe jaundice			
Refer urgently*	96	87	92
Breastfeed more frequently*	74	53	65
Keep baby warm*	58	24	44

*p value <0.05 for test of difference between early and late implementers

Table 20C. HEWs' knowledge (unprompted): management of newborn illness, continued

6. Moderate dehydration			
Give ORS*	100	91	96
Zinc for 10 days*	94	81	89
Give breast milk	83	79	81
Breastfeed more frequently	83	79	81
Keep infant warm*	44	14	31
Follow-up in 2 days*	53	21	40
7. Severe dehydration			
Refer urgently*	96	86	92
Give ORS on the way to facility	79	74	77
Breastfeed more frequently*	72	59	67
Advice mother to keep newborn warm*	53	19	39
Give first dose of amoxicillin	9	13	10
8. Low birth weight and premature (1.5-2.5 kg/32-27 weeks of gestation)			
Educate on breastfeeding	89	89	89
Make sure baby is warm	78	77	78
Monitor ability to breastfeed*	80	68	75
Monitor baby for the first 24 hours*	34	16	27
Education on cord care*	32	18	26
9. Very low birth weight(less than 1.5kg)			
Refer urgently with mother to hospital	84	84	84
Monitor ability to breastfeed	68	73	70
Cover baby well including head	68	63	66
Continue feeding with expressed breast milk*	71	54	64
Hold close to mother	57	44	52

five percent however, did not cite the need to treat with these two drugs for seven days if referral is not possible. Overall, HEWs' knowledge on the management of newborn illness with gentamycin and amoxicillin was higher in early implementing areas.

HEWs' knowledge on management of newborn illness: local bacterial infection

For local bacterial infection, 76% of HEWs knew to treat the newborn with amoxicillin for five days. However, only 36% mentioned the need to provide follow-up care.

HEWs' knowledge on the management of newborn illness: feeding problems

For the management of breastfeeding problems, advice on frequent breastfeeding, educating on proper attachment and exclusive breastfeeding were mentioned by 87%, 77% and 70% of HEWs, respectively. Other components of managing a newborn with feeding problems were mentioned by less than half of HEWs. HEWs from early implementing areas showed better overall knowledge on the management of newborns with feeding problems.

HEWs' knowledge on the management of newborn illness: jaundice and severe jaundice

For management of jaundice, 70% mentioned breastfeeding more frequently. Less than one-third cited follow-up care and exposing newborn to sunshine. For severe jaundice almost all (92%) mentioned the need to refer urgently. However, only 65% and 44% mentioned the need to breastfeed more frequently and keep baby warm, respectively. A larger proportion of HEWs from early implementing areas had better knowledge on the management of both jaundice and severe jaundice.

HEWs' knowledge on the management of newborn illness: moderate and severe dehydration

For moderate dehydration, HEWs had good knowledge on the need to treat with ORS (96%) and zinc (89%). Over 80% also mentioned giving breast milk and feeding more frequently. For severe dehydration over 90% of HEWs knew to refer urgently.

HEWs' knowledge on the management of newborn illness: very low/low birth weight and premature

For low birth weight and premature newborns, almost 90% mentioned educating on breastfeeding, with around 75% stating the need to monitor baby's feeding and ensure that the newborn is kept warm. For newborns less than 1.5kgs, 84% stated the need to refer urgently and 70% cited the need to monitor the newborn's ability to breastfeed. Make sure baby is warm.

WDA leaders' knowledge of relevant CBNC components

As mentioned previously, it is the HEWs' responsibility to engage WDA leaders to support uptake MNCH services in the community, including CBNC. HEWs provide the necessary orientation to WDA leaders on MNCH issues of importance. This section presents WDA knowledge on relevant CBNC components based on the orientation that is provided to them by HEWs.

WDA leaders' knowledge: newborn care

Table 21 shows WDA leaders' knowledge on newborn health care. WDA leaders were asked about the timing of PNC visits and 50% or less knew that visits should take place day one, three, seven and 42. Only 14% of WDA leaders knew the timing of all three visits that take place in the first week of life, and the proportion dropped to 4% when including day 42. These data are shown by implementation area in Figure 16.

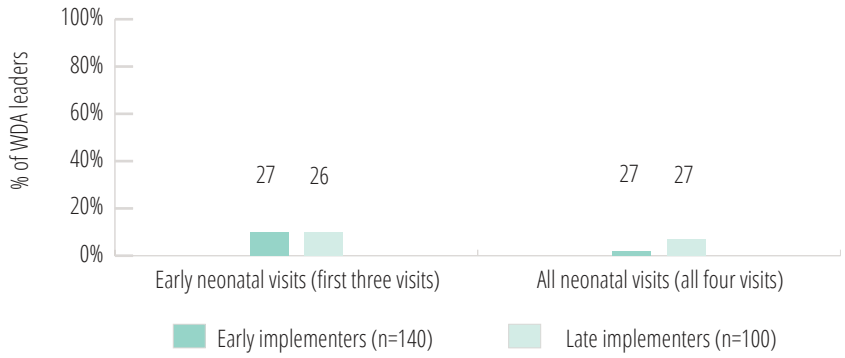
With respect to components of PNC counselling, over half of WDA leaders mentioned promotion of breastfeeding, advice on vaccination and keeping the baby warm. However, less than

Table 21. WDA leaders' knowledge (unprompted): MNH

TOPICS COVERED	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
PNC			
Timing of PNC visits			
Day 1*	56	35	48
Day 3	47	55	50
Day 7	46	51	48
Day 42*	11	42	24
Components of counselling			
Promote breastfeeding*	80	61	72
Vaccination	62	57	60
Keeping baby warm	56	45	52
Keeping cord clean	48	43	46
Refer to health post	37	29	34
Newborn danger signs*	34	18	28
Newborn danger signs			
Significantly reduced or no feeding	100	100	100
Fever	79	72	76
Fast breathing	40	45	42
Convulsions	18	17	18
Significantly reduced or no movement	11	10	11
Chest in-drawing	7	10	8

*p value <0.05 for test of difference between early and late implementers

Figure 16. WDA leaders' knowledge (unprompted): correct timing of PNC home visits



half had knowledge on the need to counsel on keeping the cord clean, referring to a health post, educating on newborn danger signs and vaccination.

With respect to knowledge on newborn danger signs, 100% of WDA leaders said reduced or no feeding and 76% said fever. The rest of the key danger signs were known by less than half of the WDA leaders and the level of knowledge did not differ by implementation areas.

WDA leaders' knowledge: understanding of the family health card

WDA leaders' knowledge of the family health card which was in circulation during the midline survey was also assessed (Figure 17). Since then, the Ministry of Health has issued a new family health card printed containing the same images in colour, however in this report we have presented the black and white versions.

In this study 89% (n=214) of WDA leaders had used the family health card in the past and the proportion was higher among early implementing areas (94% vs 83%, p<0.01). As stated in Box 2, the family health card is a behaviour change communication job aid used by HEWs and WDA leaders to teach key MNCH messages. The images in the family health card are meant to be self-explanatory, allowing users to understand the key messages regardless of their literacy status. We selected a range of images on the continuum of care, including those we deemed hard to understand in the absence of the linked text. WDA leaders were asked if they had ever used the family health card and those that said 'yes' were asked to describe images shown as flash cards.

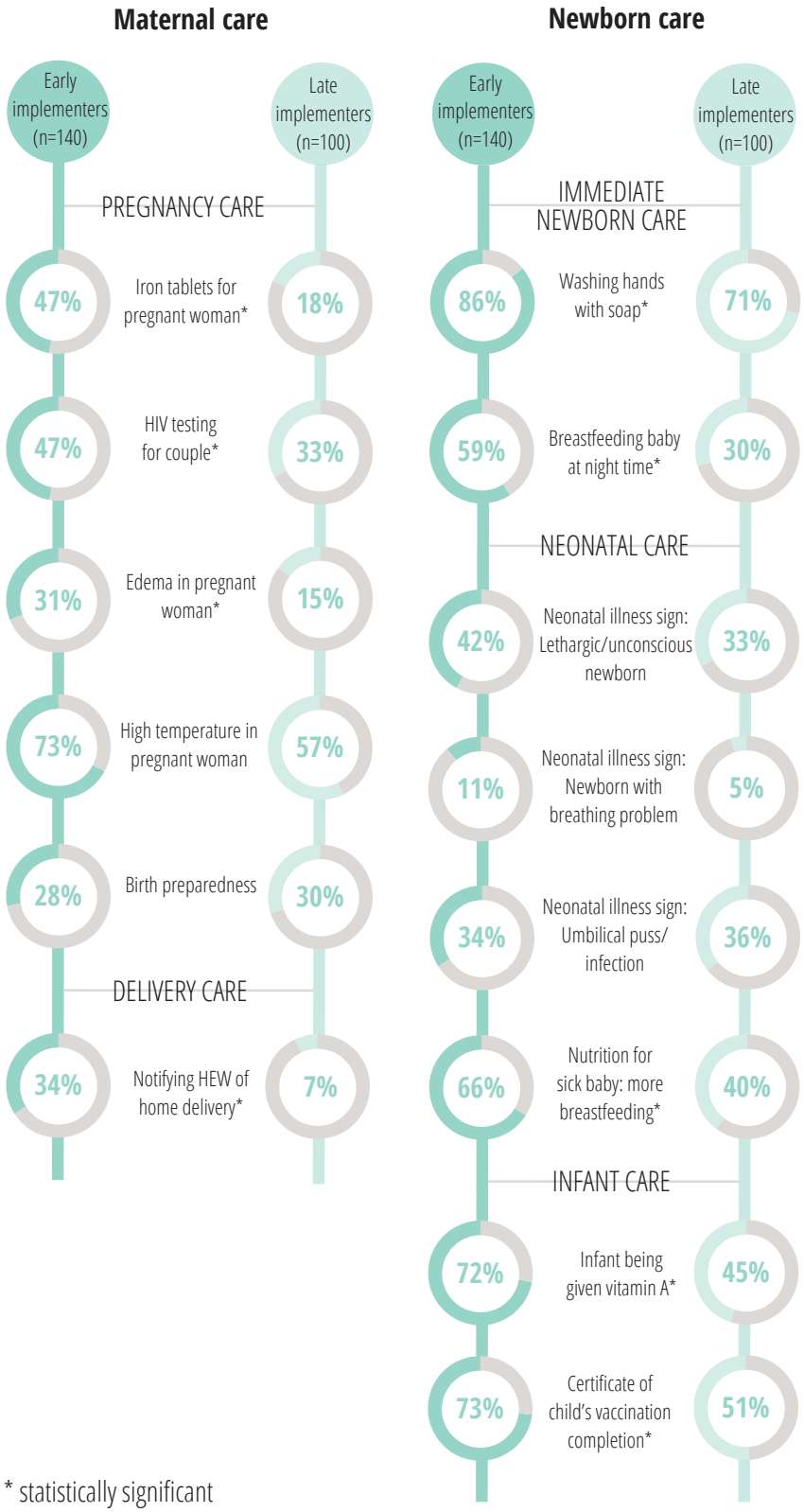
On pregnancy care, less than a third of WDA leaders recognised images linked with birth preparedness components and oedema in pregnant women. Only 36% of WDA leaders could describe the image showing provision of iron tablets for pregnant women, with the proportion being higher among early implementing area HEWs (47% vs 18%, p<0.001). Less than half of the WDA leaders recognised image depicting HIV testing for couples. The image showing high temperature in pregnant women was recognised by two-thirds of the WDA leaders.

On delivery care, over three-quarters of WDA leaders did not know the image depicting the notification of home deliveries to HEWs, although knowledge was higher among WDA leaders in early implementing areas (34% vs 7%, p<0.001).

On images relating to immediate newborn care, 80% recognised washing hands with soap before touching baby and 48% identified breastfeeding baby at night time. In both cases WDA knowledge of these images was higher in early implementing areas (86% vs 71%, p value 0.04 and 59% vs 30%, p<0.001 respectively).

"ON IMAGES RELATING TO IMMEDIATE NEWBORN CARE, 80% RECOGNISED WASHING HANDS WITH SOAP BEFORE TOUCHING THE BABY AND 48% IDENTIFIED BREASTFEEDING BABY AT NIGHT TIME."

Figure 17. WDA leaders' knowledge: family health card (job aid)



* statistically significant

On newborn illness signs, 56% of WDA leaders were easily able to recognise breastfeeding for a sick newborn and knowledge was higher among early implementing WDA leaders (66% vs 40%, p<0.001). Only 8% knew the image associated with a newborn that has a breathing problem. Being lethargic/unconscious and umbilical puss/infection was recognised by a third of WDA leaders.

With respect to infant care, over 60% of WDA leaders were able to describe images showing a child receiving vitamin A and the certificate of vaccination completion.

Overall, the vast majority of WDA leaders reported using the family health card, which is a promising finding. A greater proportion of early implementing area WDA leaders had better understanding of the majority of images used to assess their knowledge, although overall more needs to be done to improve all WDA leaders' knowledge particularly in the area of newborn illness.

PERFORMANCE IN THE LAST THREE MONTHS

In this section HEWs and WDA leaders were asked about the MNH care-related services that they had provided in their community in the three months preceding the date of the survey.

HEWs' performance in the last three months

HEWs were asked about their performance in the last three months (Table 22). Almost all (92%), HEWs said they had provided ANC services during this time period. On average HEWs had provided ANC to 25 women in the last three months. Similarly, the majority of HEWs had provided PNC services for mothers and newborns, (96% and 88%, respectively). On average HEWs had provided PNC for 17 mothers and16 newborns.

Twenty-three percent of HEWs said they had identified newborns with VSD and this was similar by implementation areas. Treatment for VSD was provided by 17% of HEWs and 13% said they had made a referral to a health centre. On average HEWs had provided treatment to two newborns with VSD in the last three months. Very few HEWs provided services for diarrhoea, jaundice and pre-term or low birth weight babies.

WDA leaders' performance in the last three months

The survey also assessed the level to which WDA leaders provide services based on the orientation that is provided to them by HEWs (Table 23). Over 80% had provided pregnancy identification and ANC counselling. There were also 20% of WDA leaders that reported having identified pregnant women with danger signs. Over half (54%) of WDA leaders said they had identified women in labour and 79% had provided PNC counselling. About a third had identified a sick newborn in the last three months. Compared with WDA leaders from late implementing areas, a higher proportion of WDA leaders from early implementing areas reported labour identification (63% vs 41%, p=0.001), PNC counselling (85% vs 70%, p=0.01) and sick newborn identification (45% vs 18%, p<0.001). For each of these activities, on average WDA leaders provided services to two or fewer individuals.

Table 22. HEW performance: services delivered in the last three months

SEVICES PROVIDED	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
ANC	95	88	92
PNC for mother	96	95	96
PNC for newborn	88	87	88
PNC referral for newborn	9	16	12
Hypothermia: prevention	19	28	23
Hypothermia: management	1	2	2
Pre-term and/or low birth weight	3	7	5
VSD: identification	21	27	23
VSD: treatment	17	16	17
VSD: referral	12	14	13
Diarrhoea	10	14	12
Jaundice	0	2	1

*p value <0.05for test of difference between early and late implementers

Table 23. WDA leaders' performance: services delivered in the last three months

SERVICES PROVIDED	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
Pregnancy identification	86	79	83
ANC counselling	89	80	85
Pregnancy danger signs identification	18	22	20
Labour identification*	63	41	54
PNC counselling*	85	70	79
Sick newborn identification*	45	18	34

*p value <0.05for test of difference between early and late implementers

HEW showing new mother how to breastfeed
© Paolo Patruno Photography/IDEAS 2015

6. MANAGEMENT OF YOUNG INFANT ILLNESS

CHAPTER SECTIONS

1. Case management
2. Essential skill assessment
3. Case classification

Under the case management section, we assessed HEWs 'competence in the management of CBNC-related young infant newborn illnesses using three clinical vignettes. HEWs' ability to provide newborns with antibiotic injection using a simulation model is presented under essential skill assessment. Lastly, HEW consultation and independent re-examination of young infants by health officers is shared under case classification.

CASE MANAGEMENT

HEWs' competence to manage CBNC related young infant illnesses was assessed using structured clinical vignettes. The vignettes aimed to cover the key scenarios for an HEW delivering CBNC. There were three vignettes: VSD case, VSD follow-up care and general wellbeing of young infants. The VSD case vignette had four domains (patient identification, assessment, diagnosis treatment and advice/referral), while the VSD follow up had two (treatment and advice/follow up) and the general well-being vignette had three (patient identification, assessment, and advice/follow-up). HEWs were instructed to perform as per their routine, including consulting their chart booklet or CBNC/iCCM register. Each section of the vignette comprised of a narrative illustrating a particular situation, which was read to the HEWs. After each section HEWs were asked a question prompting them to explain how, given the information provided, they would care for the patient. Once the HEWs had provided a response to the question, the following section was read to the HEWs, containing information that the HEW may have provided in answering the preceding section.

The following sections present the findings of HEWs' skills and clinical reasoning with respect to management of VSD, VSD follow-up care and general well-being of young infants.

VSD MANAGEMENT

After the opening narrative that introduced the scenario of a baby girl with a cough, the HEW was asked what she would do. She was then asked about her next steps after being informed that the young infant is eight weeks old, has had the cough for five days and that this is her first consultation for the same illness. She was then asked about her actions after being informed that the baby has no history of vomiting, but had a brief episode of convulsions the previous day. Currently the baby has significantly reduced feeding and is lethargic. The HEW was then informed that the young infants as chest in-drawing and a respiration count of 65 per minute and was asked what she will physically assess. After being presented with final set of signs and symptoms (cough for five days, convulsion, breathing rate of 65/min, temperature of 39°C) the HEW was asked about her specific immediate actions, followed by a question on any advice or referral she may provide to the caregiver. Table 24 shows results from the clinical vignette assessing HEWs' competence in VSD management.

Patient identification

Eighty-five percent of HEWs said they would ask for baby's full name and exact age, which was similar by implementation areas. Asking about the duration of the cough was mentioned by 75% of HEWs, but this was higher in early implementing area HEWs (84% vs 64%, p=0.001). Very few HEWs in both early and late implementing areas said they would ask if the visit was a first visit or revisit.

Patient assessment

Over half of HEWs said they would ask the mother if the baby has reduced feeding while less than half mentioned asking the mother for history of convulsions. The majority (87%) of HEWs said they would then count the babies breathing. However, less than half said they would assess severe chest in-drawing. Only 48% said they would recount the breathing and 27% said they would assess the infant's movement when stimulated. Taking the baby's temperature was mentioned by 60% of HEWs.

Patient diagnosis and treatment

Once presented with final set of signs, 88% said they would classify the young infant with a VSD, and providing a pre-referral dose of gentamycin and amoxicillin was mentioned by around three-quarters of HEWs.

Advice and referral

With respect to advice, 86% said breastfeed more frequently and 55% mentioned keeping baby warm, with a greater proportion of HEWs from early implementing areas mentioning both components of advice. Around 90% of HEWs mentioned that they would advise mother on the need for referral and also refer to the nearest health centre.

VSD FOLLOW-UP

The next scenario presented a young infant in need of a VSD follow-up care. The HEW was told that she has been asked by her HEW colleague to wait at the health post to provide follow-up care for a young infant aged 5-6 weeks. The baby was diagnosed with VSD by her HEW colleague while working in the community the previous day. Her colleague has provided the baby with a pre-referral dose of gentamycin and amoxicillin. As the family was unable to go to the health centre, she also gave them amoxicillin for home care and asked them to come to the health post the next day for a gentamycin injection. The HEW was then informed that the family has now come to the health post and she was asked what steps she would take next, as her colleague is out working in the community. The HEW was then told that the baby's age is six weeks and that her HEW colleague has given the infant an intramuscular injection of gentamycin and the first dose of amoxicillin. Her colleague has also told the family to give the remaining amoxicillin twice a day for the next 6.5 days. The HEW

Table 24. HEW skills of CBNC case management (clinical vignettes): VSD

	EARLY IMPLEMENTERS N=140 (%)	LATE IMPLEMENTERS N=100 (%)	TOTAL N=240 (%)
Correct patient identification			
Full name (baby)	84	88	85
Exact age (baby)	84	86	85
Exact duration of the cough*	84	64	75
First visit or revisit	17	13	15
If revisit, then medications history	4	3	3
Correct assessment			
Ask			
Stopped or significantly reduced feeding *	64	47	57
History of convulsions *	47	31	40
Examine			
Physically observe the infant	53	55	54
Count the breathing	88	85	87
Severe chest in-drawing	53	40	48
Recount the breathing*	51	36	48
Measure temperature	62	56	60
Infant movement on stimulation	29	23	27
Correct classification and treatment			
Classify the neonate has a VSD	90	86	88
Give first dose of amoxicillin	78	76	77
Give first dose IM gentamycin	77	68	73
Correct advice and referral			
Advice			
Breastfeed more frequently*	92	78	86
Keep the infant warm*	61	47	55
Express breast milk if the child conscious but unable to suck	49	38	44
Refer			
Advice mother on the need of referral	89	85	87
Refer to the nearest health centre	90	92	91

*p value <0.05for test of difference between early and late implementers

was then asked about her next steps. The HEW was then told that the baby is stable and the mother has given consent for the injection. The HEW was then asked how she would prepare the infant and herself for the injection. The HEW was then provided with an injection model and asked to perform an injection, while verbally describing the steps she was taking. Lastly, she was asked about what steps she would take prior to the departure of the family. HEWs' responses to the VSD follow-up care vignettes are shown in Table 25.

Patient treatment

Fifty-seven percent of HEWs said that they would ask for mother's consent to give the next injection. Over 70% said they would ensure that the child is comfortable, select the site for injection and prepare syringe as per prescription. With respect to hand hygiene before injection, 52% said they would wash with soap and water. Two-thirds of HEWs said they would use alcohol swab over the injection site and 30% said they would allow the alcohol to air dry. Over 80% identified the correct anatomical injection point, stretched the skin and injected at the right angle. A greater proportion of HEWs in early implementing areas performed all three of these steps compared with HEWs from late implementing area. Only 39% performed aspiration and 59% injected slowly, while 62% applied a cotton ball at the injection site. Only a few HEWs (19%) observed the injection site to check for discomfort, swelling and pain. Over 90% then disposed the used syringe in the appropriate container. With respect to hand hygiene after injection, only 35% said they would wash with soap and water and this was higher among HEWs from early implementing areas (47% vs 17%, $p<0.001$). Another 8% and 6% said they would use water and disinfectant, respectively.

Photo: Injection model to assess HEW injection skills
© Limbs & Things

Advice and follow-up

With respect to steps to take prior to the departure of the family, over 80% said counsel on breastfeeding while a little over 50% said counselling on sign and symptom monitoring and temperature regulation. Almost all HEWs (92%) said they would set up the time and date for the next follow-up visit.

GENERAL COUNSELLING FOR HEALTHY BABY

In this vignette, a HEW was asked about her actions once informed that a boy is brought to the health post by his mother for some advice on childcare and well-being. The HEW was then asked what she would do after being told that the baby is two weeks old and that it is his first visit to a health post. She is then informed that the mother is interested in getting the "best nutritional advice" for her young infant. After the HEW described her next actions, she was told that the mother also wants to know how she can prevent infections for her son. Lastly the HEW was informed that the mother has received all the information she needed and is very satisfied. The HEW was then asked about her actions prior to the departure of the mother and newborn. HEWs' responses are shown in Table 26.

Patient identification

Similar to early scenarios, around 75% said they would get full name and exact age of baby.

Table 25. HEW skills of CBNC case management (clinical vignettes): VSD follow-up visit

	EARLY IMPLEMENTERS N=140 (%)	LATE IMPLEMENTERS N=100 (%)	TOTAL N=240 (%)
Correct treatment			
Mother's consent for infant's injection	59	54	57
Ensure the child is comfortable*	79	64	73
Select site for injection*	87	64	78
Prepare syringe as per prescription	78	69	74
Hygiene before injection			
Water only	7	13	10
Soap and water*	59	42	52
Disinfectant	14	9	12
Use alcohol swab	65	68	66
Allow the alcohol to air dry for 30 seconds	30	32	30
Intramuscular injection			
Identification of the correct anatomical injection point *	92	70	83
Stretch the skin*	84	73	80
Pierce the skin at an angle *	91	71	83
Perform aspiration	41	36	39
Slowly inject*	66	48	59
Apply cotton wool ball to the injection site	67	56	62
Following injection, observe site for at least 15 minutes, checking for swelling, discomfort or pain	20	18	19
Dispose of sharps in appropriate container*	95	84	91
Hand hygiene after injection			
Water only	6	10	8
Soap and water*	47	17	35
Disinfectant	6	5	6
Correct advice and follow-up			
Advice			
Breastfeeding	84	86	85
Sign and symptom monitoring	54	45	50
Temperature regulation	54	51	53
Follow-up			
Set up next follow-up visit: time and date	93	90	92

*p value <0.05for test of difference between early and late implementers

Table 26. HEW skills of CBNC case management (clinical vignettes): general wellbeing of infant including breastfeeding counselling

	EARLY IMPLEMENTERS N=140 (%)	LATE IMPLEMENTERS N=100 (%)	TOTAL N=240 (%)
Correct patient identification			
Full name (Baby)	74	79	76
Exact age (baby)	76	82	78
Correct assessment			
Check the immunisation status	66	65	66
Immunise child accordingly to status	70	61	66
Weigh the baby	39	52	44
Develop/update a family folder/card for the mother and baby	13	24	18
Correct advice and follow up			
Advice			
Nutrition			
Breastfeed as often as the child wants*	89	79	85
Breastfeed at day and night 10-12 times/day	91	90	91
Empty one breast first before switching to the other	68	59	64
Exclusive breastfeeding for the first 6 months	90	91	90
Don't give other fluids including water	89	91	90
Correct positioning for breastfeeding	79	82	80
Correct attachment of the baby	79	80	80
General			
Wash hands with soap before and after touching the newborn	72	61	68
Keep the baby warm*	76	62	70
Get the baby immunised on time	40	41	40
Follow-up			
Give mother the date for the next follow-up visit	69	67	68

*p value <0.05 for test of difference between early and late implementers

Advice

Overall, HEWs' knowledge on advice on nutrition was good. The number and timing of breastfeeding as well as exclusive breastfeeding without additional fluids including water was mentioned by around 90% of HEWs, while 85% said to breastfeed as often as the child wants. Eighty percent said they would give advice on the correct positioning and attachment of a baby. However, fewer HEWs (64%) mentioned emptying one breast first before switching to the other.

With respect to preventing infection, washing hands with soap before and after touching the newborn was cited by 68% of HEWs. With respect to general advice, 70% of HEWs said to keep baby warm while less than half mentioned timely vaccination.

Advice and follow-up

Once informed of the mother's satisfaction, checking immunisation status and immunising child accordingly was mentioned by 66% of HEWs. Only 44% said they would weigh the baby and even fewer (18%) said they would develop/update a family folder/card for the mother and newborn. Setting up a follow-up visit was mentioned by 68% of HEWs.

In order to summarise the findings from clinical vignettes, the essential skills for management of each CBNC service scenario for HEWs were assessed, summed up, converted into percentiles and the mean differences were compared between the two implementation groups (Figure 18a-c). Early implementing area HEWs showed better clinical reasoning and skills for the management of the VSD case and VSD case follow-up. HEWs were similar with respect to clinical reasoning and skills for the general counselling of a newborn.

Figure 18a-c HEWs: overall skill level of CBNC case management

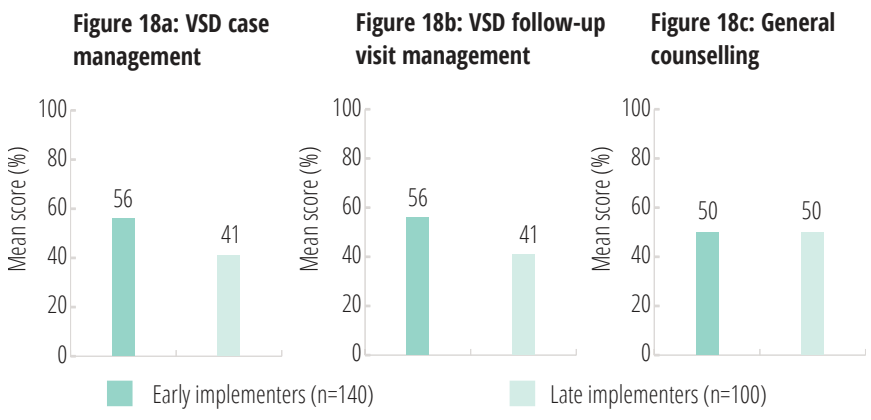
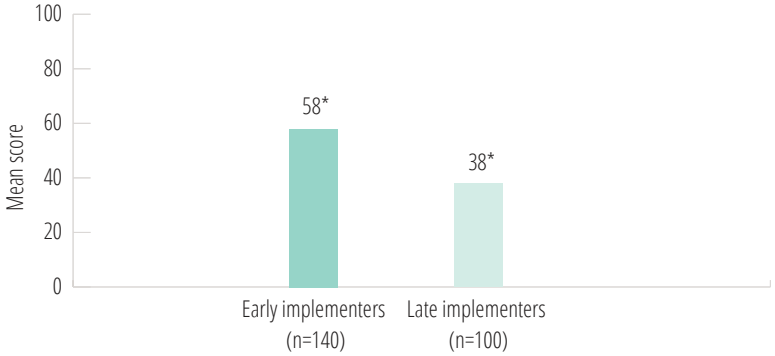


Table 27. HEW essential CBNC skill (clinical simulation): intramuscular injection of gentamycin

	EARLY IMPLEMENTERS N=140 (%)	LATE IMPLEMENTERS N=100 (%)	TOTAL N=240 (%)
Care prior to injection			
Hand hygiene			
Water only	5	6	5
Water and soap*	49	30	41
Use of disinfectant*	16	7	12
Intramuscular antibiotic injection of neonate			
Open the first ampule successfully*	97	88	93
Fill up the syringe 1 ml*	95	81	89
Use alcohol swab	67	64	66
Allow the alcohol to air dry	39	33	37
Selection the correct injection site *	84	64	75
Stretch the skin*	87	52	73
Pierce the skin at an angle *	94	77	87
Perform aspiration *	53	38	47
Slowly inject	73	65	70
Care after injection			
Apply cotton wool ball to the injection site	71	60	66
Appropriate disposal of the needles and syringe	96	97	96

*p value <0.05 for test of difference between early and late implementers

Figure 19. HEW skills of CBNC case management (clinical simulation): overall skill level for newborn injection management



*p value <0.05 for test of difference between early and late implementers

ESSENTIAL SKILL ASSESSMENT

To assess their injection skills, HEWs were provided with an injection model for clinical demonstration. The injection model was strapped on the left thigh of one of the data collectors and the HEW was told assume the model was a thigh of a less than one-month old newborn with all its flesh, blood and skin sensitivity. The HEW was informed that the newborn needed gentamycin. They were then provided with all the materials needed for the injection (alcohol, syringe, cotton swab and gentamycin 20mg/2ml) and were asked to give an intramuscular injection to the 'newborn's thigh' (injection model). HEWs' demonstrated skills on providing an intramuscular injection are shown in Table 27.

Care prior to injection

With respect to hand hygiene, 41% washed with water and soap, 12% used disinfectant and 5% washed with only water. Hand hygiene practice was better among early implementing area HEWs with respect to using water and soap (49% vs 30%, $p<0.01$).

Intramuscular antibiotic-injection of neonate

Assessment of HEWs injection skills showed that 93% opened the ampule successfully and 89% filled up the syringe to 1 ml, with HEWs in early implementing areas performing better in both aspects. However, 33% did not wipe the injection site with alcohol swab and 63% did not allow the alcohol to dry. Around three-quarters of HEWs selected the correct injection site and stretched the skin, again with a greater proportion of HEWs in early implementing areas performing these actions. Although 87% of HEWs pierced the skin at the right angle, only 47% performed aspiration to ensure there was no large blood vessel at the injection site. Seventy percent of HEWs slowly injected the model.

Care after injection

With respect to care provided after injecting the model, 66% applied a cotton ball at the injection site. Almost all (96%) appropriately disposed of the needles and syringes.

Similar to the clinical vignettes, the essential skills for intramuscular injection were summed up, converted into percentiles and mean differences were compared between the two implementation groups (Figure 19). HEWs from early implementing areas performed better than HEWs from late implementing areas (mean difference of 20), although there is room for improvement for their overall skills.

"HAND HYGIENE PRACTICE WAS SIGNIFICANTLY BETTER AMONG EARLY IMPLEMENTING HEWS WITH RESPECT TO USING SOAP AND WATER."

Figure 20. Health post floor plan

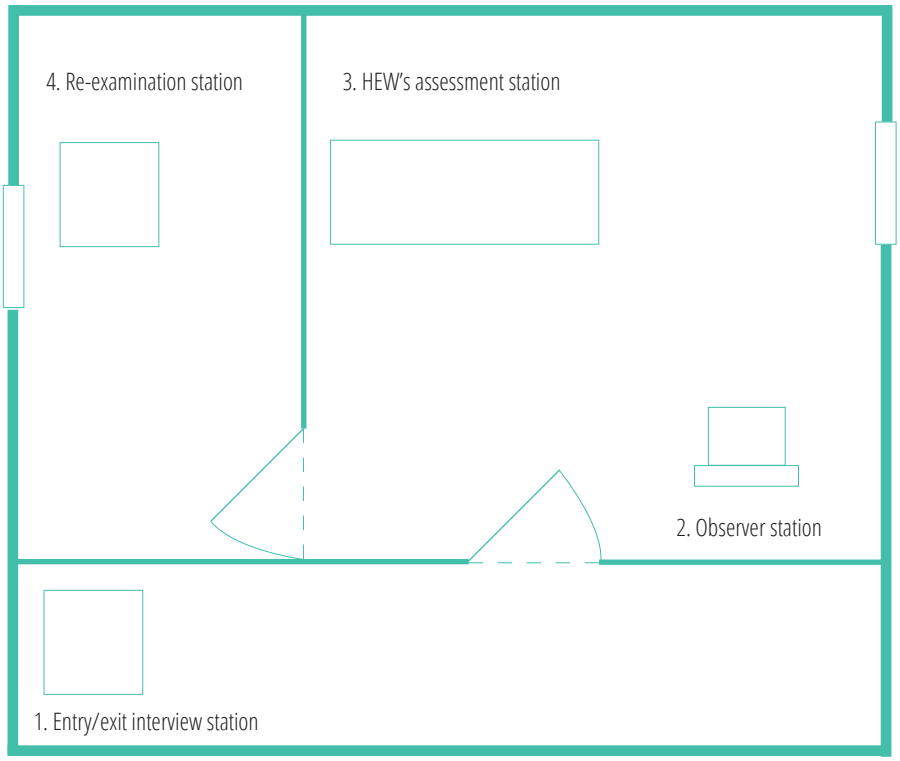
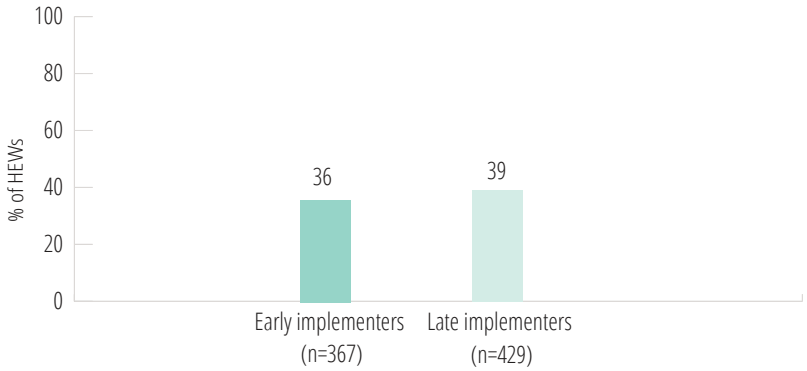


Figure 21. HEW skills of CBNC case management: proportion of correctly classified sick young infants[a]



[a] Based on four key neonatal conditions: VSD, feeding problems/low weight, local bacterial infection and jaundice.

CASE CLASSIFICATION

In this section we present the results of the sick newborn caregiver entry–exit interview, observation of HEWs' consultations of sick young infant, and independent re-examination of the sick infant. Figure 20 shows how the health post was set-up for this purpose.

The major challenge faced in conducing the case classification, was the absence of caregivers spontaneously brining their sick young infants to the health post for treatment. As a result, we mobilised caregivers in the community to bringing their 'sick babies' to the health post. An infant was included in this study if he/she met the following criteria:

1. Was under the age of two months
2. Was considered sick by their caregivers
3. Was being seen for the first time at the health post, or by either of the HEWs for the current illness episode

Caregivers were asked to respond to an entry interview that ascertained background information about themselves and their baby (Table 28). A total of 893 infants between the ages of 0-2 months were assessed, of which 505 were from early and 388 from late implementing areas. The majority of infants were 29 or more days old, with an average age of 35 days. Newborns in the first week of life made up only 3% of the study sample. Males comprised of 49% of the study sample and on average three children less than two months were seen at each health post.

Background information on newborns

With respect to family characteristics, 98% of the individuals accompanying the infants said they were the mothers and their average age was 26 years. Only 39% were literate and a little over half (57%) said they were employed. Almost all (97%) said they were married. Women were asked about the newborn's father and 63% reported that the father was literate and 99% said the father was employed. The average age of fathers was 33 years.

Experience of caregivers at health post

Table 29 shows the caregivers experience at the health post (asked at the time of exit from the health post) and it shows that overall they were content with the service that was provided to them. They were asked if they faced any problems (minor and major) at the health post with respect to waiting time, discussions and explanations with HEWs, privacy, availability of medication, working days and hours of the facility, and cleanness of the facility. Having any major problems was reported by less than 5% of families and 10% or less said they had any minor problems.

Table 30 shows the clinical diagnoses that were made by health officers upon re-examination of the babies. Feeding problems/ low weight was common (73%) followed by local bacterial infection (24%). Diagnosis of VSD was made in 16% of the infants.

The young infant illness clinical classifications comparing the diagnosis made by health officers compared with those made by HEWs is shown in Table 31. Data collectors spent time with HEWs the day before the sick young infant assessment to explain the purpose and process of the study, ensuring that they were comfortable and able to provide services as per their routine. However, it is likely that HEWs performance might have been different in the absence of the observer.

Overall, compared with the diagnosis made by health officers, HEWs showed good specificity (the ability to correctly identify an infant that does not have an illness as not having an illness). Except for local bacterial infection and feeding problems/low weight, 90% of HEWs correctly identified those that did not have an illness. For local bacterial infection 19% of babies were incorrectly diagnosed as having the condition, and 29% were incorrectly diagnosed as having feeding problems.

Despite having good specificity, HEWs skills in correctly identifying those with an illness as having an illness (sensitivity) was poor. Compared with diagnosis made by health officers, HEWs missed 70% of VSD cases and 72% of young infants with feeding

Table 28. Health post level: characteristics of study sample being assessed

	EARLY IMPLEMENTERS N=505 (%)	LATE IMPLEMENTERS N=388 (%)	TOTAL N=893 (%)
Child characteristics			
Child age (days)			
Early neonate (1-7 days)	3	3	3
Late neonate (8-28days	33	37	35
Young infant (29 -59 days)	63	61	62
Age (mean)	35	35	35
Child gender			
Female	51	51	51
Male	49	49	49
Number of children observed per health post (mean)	2	3	3
Family characteristics			
Mother's (caregiver)			
Age in years (mean)	26	26	26
Relationship with the child: biological mother	98	98	98
Literate	43	33	39
Employed	58	55	57
Married	97	96	97
Father's characteristics			
Age in years (mean) a	33	33	33
Literate b	67	57	63
Employed b	99	98	99

[a] N=700 (29 did not have a husband and 164 did not know their husbands age)
[b] N= 864 (29 were did not have a husband)
*p value <0.05 for test of difference between early and late implementers

Table 29. Health post level: experience of care seeking

	EARLY IMPLEMENTERS N=505 (%)	LATE IMPLEMENTERS N=388 (%)	TOTAL N=893 (%)
Waiting time			
Major problem	3	2	3
Minor problem	9	11	10
Opportunity to discuss problems			
Major problem	1	0	<1
Minor problem	5	2	4
Explanation given by the HEW*			
Major problem	1	0	<1
Minor problem	6	3	5
Privacy during consultation			
Major problem			
Minor problem	2	5	3
Availability of medicines*			
Major problem	5	3	4
Minor problem	7	4	6
Working hours of the health facility			
Major problem	2	1	2
Minor problem	6	4	5
Working days of the health facility			
Major problem	1	3	2
Minor problem	5	7	6
Cleanliness of the facility *			
Major problem	3	1	2
Minor problem	6	11	9

*p value <0.05 for test of difference between early and late implementers

problem. Compared with the other illnesses, HEWs had better sensitivity for local bacterial infection (55%).

The overall skill level of HEWs for correctly classifying a sick young infant based on four key neonatal conditions (VSD, feeding problems/low weight, local bacterial infection and jaundice) was assessed and compared between early and late implementing areas (Figure 21). Of the young infants diagnosed as having one of the four conditions by health officers, 37% were captured by HEWs. This was similar between implementation areas. This shows that two out of five sick newborns are identified by HEWs.

Overall, the vignettes show that HEWs lack the skills to recognise the symptoms and correctly diagnose a sick young infant. However, once provided with the symptoms, they are able to correctly classify and provide appropriate treatment. With respect to their injection skills, there were also gaps, although fewer gaps were seen among HEWs in early implementing areas. The case management assessment showed that HEWs had the ability to correctly classify young infants with no illness, but that their competence to correctly diagnose young infants with an illness, as having an illness, was low.

Table 30. Clinical case classification using the iCCM chart booklet: young infant cases diagnosed by health officers (re-examiners)

CASES DIAGNOSED BY THE RE-EXAMINERS	EARLY IMPLEMENTERS N=505 (%)	LATE IMPLEMENTERS N=388 (%)	TOTAL N=893 (%)
VSD	14	17	16
Feeding problems/low weight*	66	81	73
Local bacterial infection*	21	28	24
Jaundice	0	0	0

*p value <0.05for test of difference between early and late implementers

Table 31. Clinical case classification using the iCCM chart booklet: comparability of neonatal cases diagnosed by health officers (re-examiners) vs HEWs

CLASSIFICATION	EARLY IMPLEMENTERS N=505		LATE IMPLEMENTERS N=388		TOTAL N=893	
	Sensitivity (%)	Specificity (%)	Sensitivity (%)	Specificity (%)	Sensitivity (%)	Specificity (%)
VSD	38	95	22	99	30	97
Feeding problems/low weight	30	78	25	53	28	71
Local bacterial infection	58	84	51	75	55	81
Jaundice	-	97	-	93	-	95

7. DISCUSSION

This chapter will provide a discussion on the four domains through which the CBNC quality of care has been conceptualised.

The CBNC midline quality of care survey was done over the course of six-and–a-half weeks, in 30 woredas. Of these, 18 were in CBNC early implementing woredas, where the CBNC programme had been introduced and running for one year and seven months. The remaining 12 woredas were in late implementing areas, where CBNC had been introduced a few months prior to the survey, giving HEWs insufficient time to put into practice skills required to provide key components of the CBNC programme. A total of 117 PHUCs were visited in this study (70 in early and 47 in late implementing areas), 240 health posts (140 in early and 100 in late implementing areas), as well as HEWs and WDA leaders. Furthermore, 893 sick young infants (505 in early and 388 in late implementing areas) were classified clinically by HEWs and then re-examined by health officers.

As mentioned in Chapter 1, early implementing (Phase I) zones were selected by the Government of Ethiopia for having a better health system performance. The start of CBNC Phase II approximately a year after the start of Phase I was intended to strengthen the health system of late implementing areas. As such, early implementing areas might have performed better than late implementing areas, irrespective of CBNC programme implementation.

This section will provide a discussion on the four domains through which the CBNC quality of care has been conceptualised: A) health system readiness to provide quality CBNC services; B) health system integration to provide quality CBNC services; C) the potential of health workers and volunteers to provide quality CBNC services; and, D) management of young infant illness by HEWs.

HEALTH SYSTEM READINESS TO PROVIDE QUALITY CBNC SERVICES

Facility readiness for CBNC services: infrastructure

Overall, there was a lack of water and cell phone signal at both health posts and health centres. Strikingly, only around a half of health centres had soap or hand sanitiser, with the figure dropping to less than a third among health posts. Furthermore, a quarter of health posts and health centres were using a water source that was deemed to be unsafe. These have implications for hygiene at the facilities, including the hand washing practices necessary when providing care for newborns.

Facility readiness for CBNC services: staff and operation hours

There were two or more HEWs present at 76% of health posts. A smaller proportion of early implementing area health posts had only one HEW available (18% vs 33%). Eighty-five percent of health posts were open for five days a week, with the remaining 15% being operational two to four days a week. Insufficient numbers of HEWs and health post closures can undermine CBNC services, which would run more efficiently with a fully staffed health post that is operational on all working days of the week.

Facility readiness for CBNC services: equipment and supplies

Health centres in both early and late implementing areas were well equipped and had sufficient supplies to provide basic newborn care. However, a sizable number of health centres lacked a newborn warmer and a nasogastric tube. The majority of health posts in both early and late implementing areas had most of the basic equipment for providing newborn care.

Facility readiness for CBNC services: job aids

The majority of both early and late implementing area health posts and health centres had the necessary CBNC job aids such as IMNCI/iCCM registers and chart booklets. The majority of WDA leaders also reported having family health cards, with the proportion being higher in early implementing areas.

There is room for improving the availability of supervision checklists at health centres. At health post level, similar attention is needed for HMIS forms. Furthermore, health posts also lacked stock and bin cards, as well as request and resupply forms. To ensure a sufficient supply of drugs and minimise expiry, it is important to provide the necessary forms and trainings to HEWs.

Facility readiness for CBNC services: drugs

When looking specifically at drugs needed for the management of VSD at health centres, a majority have gentamycin (90%) and amoxicillin (93%). Ampicillin was available in 68% of health centres. Given that the standard protocol for CBNC treatment by HEWs is to refer sick newborns to health centres, it is important to ensure that all health centres have the necessary drugs to treat VSD to ensure a functional referral system.

The availability of drugs at the health post level showed that 97% of health posts had amoxicillin and 91% had gentamycin, with 84% of health posts having both drugs. A higher proportion of late implementing area health posts had both drugs, which is likely due to the fact that they were supplied with a year's worth of amoxicillin and gentamycin at the training they had received around the time of the midline survey. The lower availability of CBNC drugs in early implementing areas raises the issue of sustainability of the CBNC momentum.

Availability of zinc and ORS for the treatment of diarrhoea at health posts showed that only a quarter of facilities had both and around a third had neither zinc nor ORS. There was a high level of expiry for both zinc (51%) and ORS (23%) at health posts, creating a false assurance. Supervisory visits to health posts need to ensure that there is a set protocol for the timely removal and replacement of expired drugs.

Function of health facilities: supervision

This study showed a great gap in the level of supervision at the PHCU level. A quarter of health centres had not provided an integrated supportive supervisory visit to any health post in the previous one month. For the same time period, less than half of the health posts reported receiving a supervisory visit from a health centre. This gap is striking, as it is recommended that health posts receive about two visits per month.

Although the number of integrated supportive supervisory visits was not sufficient, when provided, visits covered a variety of themes. Yet, there was a gap in the supportive supervision for newborn care. Less than half of HEWs reported that supervision they had received in the last six months had covered support for VSD management and this was similar among early and late implementing areas. This has implications for the quality of CBNC care that is provided by HEWs. Their technical skills on CBNC related illnesses (signs, classification and treatment) need to be reinforced through mentorship and supportive supervision, as they are unlikely to frequently encounter sufficient VSD cases to put into practice what they have been trained on through the CBNC training.

CBNC focused group supervision in the form of PRCM meetings is intended to be organised twice a year, the first one taking place six months after CBNC training. There is a good indication that this meeting is taking place with the desired frequency; three-quarters of health centres had organised such a meeting in the last six months and about two-thirds of HEWs reported attending a meeting in the last six months. Organisation and attendance of PRCM meetings was higher in early implementing areas. The smaller proportion of PRCM meeting attendance among late implementing HEWs is likely due to the fact that their CBNC training had taken place less than six months before the survey. In contrast with the regular integrated supportive supervision, three-quarters of HEWs said that the PRCM meeting they had last attended had covered VSD management.

Less than half of HEWs reported receiving a CBNC post-training follow-up visit. Even among early implementers who had had their initial training a year-and-a-half prior to the survey, only half reported receiving such a visit. The CBNC post-training follow-up visit is intended to ensure the initiation of services. Such low levels of post-training follow-up can lead to HEWs not providing CBNC services. However, the proportion reported in this survey might underestimate the actual level of post-training follow-up visit, if HEWs are not made aware that such a visit is different from the regular integrated supportive supervisory visit.

The existence of major gaps in supervision is further illustrated by levels of satisfaction with supervision HEWs had received, with only half of HEWs saying that they were satisfied. There was a strong demand from HEWs to increase the number of supervisory visits and the recommendation to increase technical (skills building) supervision.

Facility readiness for CBNC services: service utilisation for ANC, delivery and PNC

Facility service records for the three months preceding the survey (July-September 2015), showed that compared with the number expected pregnancies, there were still gaps in service utilisation for ANC; 28% of expected pregnancies at health centres and 50% of expected pregnancies at health posts had not received ANC. Facility delivery among women who had had at least one ANC at a health centre was relatively high. This shows the importance of ANC visits in promoting facility delivery. When assessing facility deliveries against the number of expected pregnancies, the gap in facility delivery rises to 35%. However, the observed gaps in ANC and facility delivery could be due to high target setting and poor record keeping.

With respect to PNC, the first PNC care at the health centre was relatively high, and even higher when looking at how facilities define the first visit. Among those that count PNC 1 as any care prior to discharge within the first day of delivery, the proportion

receiving care is dramatically higher than among those that define PNC1 as care provided after discharge but within 24 hours of delivery. Problems of misclassification and interpretation are likely to arise due to these varying definitions of the PNC 1 in the field. There is a major gap in all three PNC visits at the health post level, which indicates the decreased opportunities for identifying newborns with illnesses.

The register review of the four ANC visits (ANC visit one = 1st trimester, ANC visit two = 2nd trimester, ANC visit three and four = early and late 3rd trimester) and four PNC visits (visit one = day 1, visit two = day 3, visit three = day 10 and visit four = day 42) indicated that there is some potential for misclassifying ANC and PNC visits during record keeping. It is likely that some HEWs and health centre staff members are recording visits based on the timing of a visit, while others are recording visits based on the number of visits, requiring caution in interpretation of these data.

Facility readiness for CBNC services: linkages

This study found good linkages between WDA leaders and HEWs, with 86% reporting a meeting once or more in the last month. HEWs and WDA leaders also reported that in addition to meeting, they jointly carried out activities such as conducting health campaigns, providing household visits and organising pregnant women's conferences. These strong linkages can be further utilised to provide orientation for WDA leaders on newborn danger signs, as well as sick newborn referrals and reporting.

The organising of pregnant women's conferences was relatively high; 87% of HEWs reported that they had organised a conference in the last three months. The majority of HEWs organised monthly conferences. With respect to community attendance, over half of HEWs reported that at the last pregnant women's conference all of the pregnant women in their catchment populations had attended the meeting. A pregnant women's conference is an effective means for raising community awareness and mobilisation. Given the large proportion of HEWs and WDA leaders organising conferences and high levels of attendance among pregnant women, it is important to ensure PNC and sick newborn care are consistently addressed.

WDA leaders also played an active role in engaging with community members such as religious leaders, women's savings groups and the command post. However, in late implementing areas, engagement of WDA leaders with religious leaders and the command post was lower compared with early implementing area leaders. In both areas WDA leaders' engagement with traditional birth attendants was minimal. Their engagement with all key members of the community to raise awareness on the importance of facility delivery, PNC and sick newborn care is important to bring about an increase in the uptake of such services.

Overall, there are aspects of the health system that indicate readiness to provide quality CBNC services. The linkages between health post, WDA leaders and communities were good. Most facilities have the necessary equipment to provide CBNC services, as well as sufficient supplies and job aids. Yet, some facilities had stock-outs of key CBNC-related drugs. The most notable gap in health system readiness was in supervision, both in frequency and content with respect to newborn care.

HEALTH SYSTEM INTEGRATION WITHIN THE PHCU FOR QUALITY CBNC SERVICE

Supply chain: drugs

Amoxicillin (125 mg dispersible tablets, 250 mg dispersible tablet and 125mg/5ml syrup) availability at health centres for supplying health posts was high, with only 2% reporting stock-out lasting three months or more. In contrast, 43% of health centres reported gentamycin stock-out lasting at least three months. The high level of gentamycin stock-out could be because health centres are encouraged to pass on these drugs to health posts, rather than retaining them in their own storage.

Direct supply of gentamycin for health centres was mainly from the woreda health offices, followed by implementing partners. The majority of early implementing areas were supplied by implementing partners and the majority of late implementing areas were supplied directly by woreda health offices. For the CBNC programme to be sustainable with respect to drugs, it will be important to select the most efficient system and source for the supply of drugs, with implementing partners playing less of a central role in this regard.

Referral: forms

The use of referrals forms is a key part of the CBNC programme, but less than half of health centres reported getting referral forms from health posts. However, a higher proportion of facilities in early implementing areas reported that HEWs in their catchment population did send referral forms.

Referral: register review

Low level of service utilisation for sick young infants was apparent in some PHCUs. Register reviews showed that 11% of IMNCI registers at health centres and 19% of iCCM registers at health posts had not recorded any 0-2 month old sick infants in the three months preceding the survey. Furthermore, among the 13% of sick young infants referred from health posts to health centres, very few (7%) could be cross-linked between the 0-2 months iCCM register at a health post and the 0-2 month IMNCI register at the referral health centre. The problem was further highlighted by the large proportion of health posts and health centres that had recorded a young infant health outcome as 'unknown'. Lack of follow-up on referrals has negative implications on the health outcome of a sick young infants. Furthermore, the possibility of drug resistance increases among those who receive a pre-referral dose of antibiotics with no follow-up care.

Referral: ambulance

Over half of health facilities reported that during the last obstetric referral from the health post to the health centre government-owned transport was used. Although this proportion is promising, more effort is needed to improve the availability of free transport through government-owned vehicles both for pregnant women and sick young infants. This could increase the above mentioned level of follow-up on referrals from health post to health centre, which is currently low.

Overall, health centres had stock-outs of gentamycin (20mg/2ml) lasting three months, indicating a potential problem in their capacity to replenish health posts. With respect to the referral system, the most notable gap is the lack of follow-up of sick newborn referrals from health post to health centre. In addition, the majority of health centres reported not receiving referral forms. Improving the availability of free government transport for sick newborns can also increase the follow-up rate from health post to health centre.

POTENTIAL OF HEALTH WORKFORCE TO DELIVER QUALITY CBNC SERVICES

Training: health centre staff

An IMNCI trained staff member was available in 95% of health centres and on average there were two trained individuals per facility. CBNC trained staff members were available in 68% of health centres and this was similar across implementation areas. Approximately one-fifth of IMNCI and CBNC trained PHCU staff were reported to have left, with minimal replacement by trained staff. The high availability of IMNC trained staff at health centres is promising. The quality of CBNC supportive supervision and mentorship for HEWs can be enhanced by improving the availability of health centre staff trained in both CBNC and IMNCI.

Training: HEWs

Almost all HEWs had received CBNC (98%) and iCCM (99%) trainings. However, a quarter of HEWs reported not attending an annual integrated refresher training in the last 12 months. HEWs' satisfaction with training was much better than their satisfaction with supervision; around 66% of HEWs reported being fully satisfied, with satisfaction being higher among HEWs in early implementing areas. The majority mentioned that their training would be improved by post-training supervision, followed by practice sessions and training aids.

Training: WDA leaders

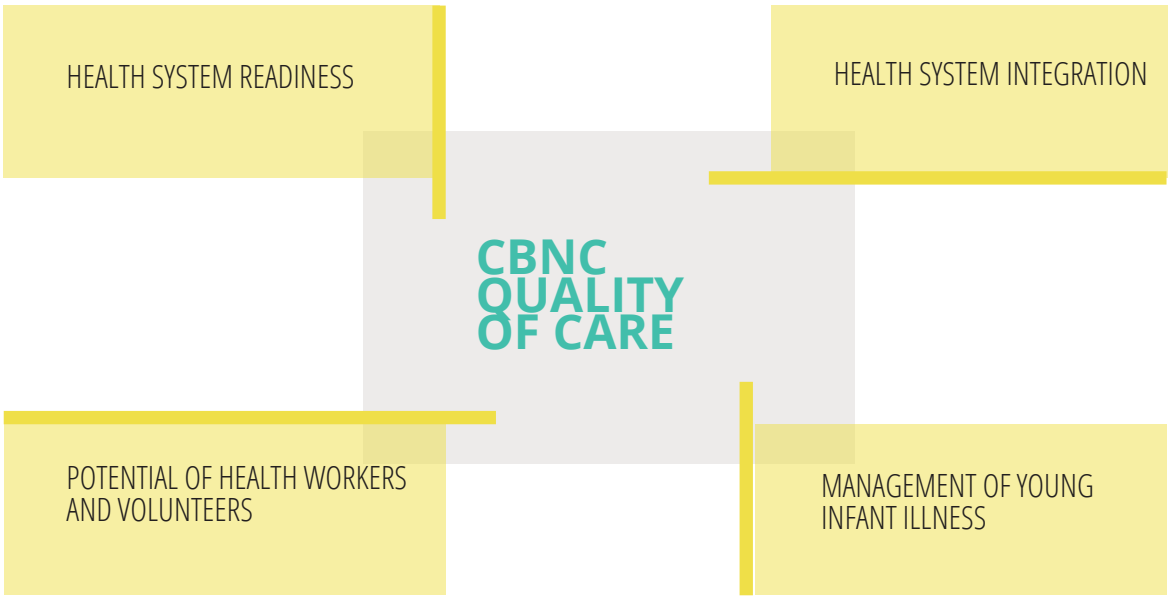
Training for WDA leaders across the continuum of care was impressively high in both early and late implementing areas and the majority were satisfied with their orientation. However, a higher proportion of WDA leaders in early implementing areas were more satisfied with the training they had received. Yet, despite the received training, WDA leaders' knowledge on some aspects of MNH care was lacking (discussed below).

HEW unprompted knowledge: PNC, newborn illness and treatment

Overall, HEWs had good knowledge on breastfeeding counselling during PNC visits. The major gap is checking newborn danger signs during all PNC visits, which a third of HEWs did not mention. Furthermore, knowledge on cord care and keeping baby warm were sub-optimal.

With respect to newborn illness, HEWs did not have sufficient unprompted knowledge on VSD signs; less than two-thirds of HEWs mentioned the majority of signs. Knowledge of signs for local bacterial infection and severe jaundice were also lacking,

Figure 22. The four domains used to conceptualise the quality of CBNC services.



particularly for HEWs from late implementing areas. HEWs are not expected to memorise danger signs, rather they are instructed to follow the chart booklet when assessing, classifying and treating newborns. However, they need to know the key danger signs that should prompt them to refer to the chart booklet.

For treatment, there were gaps in HEWs' knowledge on providing a pre-referral dose of antibiotics for VSD, as well as knowledge on treating local bacterial infection with amoxicillin.

Zinc and ORS for the treatment of moderate dehydration was known by almost all HEWs and the need to refer urgently for severe illnesses was acknowledged by most. The minimal gap in HEW knowledge on the treatment of moderate dehydration indicates that with the proper training, mentorship, support and practice, HEWs can also improve their knowledge on the management of VSD. Ensuring that HEWs attend Integrated Refresher Training, PRCM meetings and other training and mentorship opportunities that can further reinforce their knowledge on the treatment algorithms for CBNC illnesses is key for ensuring the quality of services that HEWs are able to provide.

Knowledge: WDA leaders

Although training for WDA leaders across the continuum of care was good, their actual knowledge varied across thematic areas. There was a gap in knowledge on the exact timing of PNC visits, with less than15% of WDA leaders stating the exact days of visits in the first week and even fewer (4%) still knowing the exact days of all the four PNC visits.

There was an even a greater gap in knowledge on newborn danger signs, with knowledge among early implementing area WDA leaders being better than WDA leaders from late implementing areas. The majority of newborn danger signs were known by less than 50% of WDA leaders.

The survey used novel techniques to assess WDA leaders' knowledge on the family health card, which is a key behaviour changing communication job aid used by WDA leaders to teach key MNCH messages. Although WDA leaders' understanding of the key newborn danger signs (lethargy, breathing problem and infected umbilical cord) conveyed by the family health card images were sub-optimal, overall, leaders from early implementing areas had better knowledge. This is perhaps due to the larger proportion of WDA leaders from early implementing areas who reported receiving training on using the family health card. WDA leaders' lack of knowledge on PNC timing and newborn danger signs indicates that there is a strong need to improve the quality of the orientation that is provided to them by HEWs.

Performance: HEW

HEWs' assessment of performance with respect to service delivery on ANC as well as maternal and newborn PNC in the three months preceding the survey was relatively high. However, only a quarter of HEWs reported having provided care for newborns with VSD. This indicates that HEWs are likely missing some cases of VSD in the community. More mentorship and supervision is necessary to ensure that HEWs and WDA leaders are creating demand for sick newborn services provided by the CBNC programme.

WDA leaders' performance

Given the expected number of pregnancies and deliveries in a given WDA network, the majority of WDA leaders had provided some pregnancy identification, ANC and PNC counselling. A third of WDA leaders said they had identified a newborn with an illness in the last three months. Overall, WDA leaders in early implementing areas performed better than WDA leaders in late implementing areas. This indicates that with the appropriate support from HEWs, the function of the WDA network can be improved.

Overall, HEWs and WDA leaders had some strengths as well as weaknesses. Almost all HEWs in this study were trained in CBNC, indicating a good momentum in the scale up of the CBNC programme throughout the country. HEWs' unprompted

knowledge of VSD signs needs improvement. However, it is also important to note that, as per government guidelines, HEWs are not expected to memorise all danger signs, but rather to follow and adhere to the iCCM chart booklet. Although there were IMNCI trained staff members at health centres, there was a shortage of CBNC trained staff. This has implications for the support that can be provided by health centres to HEWs. WDA leaders' training across the continuum of care in the last year was high, although the quality of orientation that is provided to them needs to be improved. WDA leaders did not know key aspects of PNC (timely visits), or newborn danger signs. They also had limited knowledge of some of the images used in the family health card.

MANAGEMENT OF YOUNG INFANT ILLNESS

HEWs' skills on CBNC case management: clinical vignettes

HEWs' clinical skills and understanding for VSD case management, VSD follow-up care and general counselling for a healthy newborn was assessed using clinical vignettes. Overall, their patient identification was good, although not fully optimal. This is similar to findings from the 0-2 months iCCM and IMNCI register reviews, which showed near complete data on young infant's age, gender, name and address. However, many HEWs did not ask if the visit was a first or second visit, nor did they check the infant's medication history. These omissions have implications for the CBNC programme, particularly for VSD, as the management protocol is different for first and follow-up visits. Furthermore, not assessing prior medications for VSD influences drug resistance, compliance and reaction problems.

HEWs were not competent in identifying the necessary signs to correctly diagnose a sick young infant. Again, this was similar to findings from the iCCM register reviews. However, once they were informed with the correct signs, the majority were able to provide the appropriate diagnosis and treatment. This was similar for both early and late implementing areas.

Overall, HEWs in both early and late implementing areas were similar with respect to their clinical skills to provide counselling for a healthy newborn. HEWs from early implementing areas had relatively better clinical reasoning and skills for the management of VSD cases. Lack of HEW competence in recognising symptoms for specific diseases highlights an area for focused training, which can bridge the observed gap.

HEW essential skill assessment: intramuscular injection of gentamycin

Assessment of HEWs' skills in providing an intramuscular injection of gentamycin to a neonate showed that their overall skill is low, which was surprising as HEWs do have experience of giving vaccinations. However, more HEWs from early implementing areas demonstrated better injection skills than those from late implementing areas.

Clinical case classification: young infant illness

As mentioned earlier in the discussion, this study conducted young infant illness case classification for 893 babies that were considered sick by their caregivers. Although the WHO health facility assessment guide does not include case observation for 0-2 month infants, we adapted the tools used for 2-59 month old children in accordance with the iCCM chart booklet issued by the Ethiopian Ministry of Health. The survey observed HEWs skills to correctly diagnose a sick young infant as per their CBNC training.

Data collectors spent time with HEWs the day before the sick young infant assessment to explain the purpose and process of the study, ensuring that they were comfortable and able to provide services as per their routine. However, it is likely that HEWs performance might have been different in the absence of the observer.

Cases diagnosed by health officers showed that the young infants presented with a range of illnesses, including VSD, local bacterial infection and feeding problems. When comparing the health officers' diagnoses using the iCCM chart booklet with those made by HEWs, it was apparent that HEWs were able to correctly identify infants that did not have a particular illness as not having an illness, which is commendable, as it could potentially lead to less misuse of antibiotics for infant illness by HEWs. However, HEWs' skill to correctly identify infants with an illness as having an illness leaves room for improvement. HEWs had correctly diagnosed two out of five sick infants between the ages of 0-2 months. This indicates that some young infants who were actually sick were not receiving the appropriate life-saving drugs at the health post level.

It is important to note that there are several factors affecting HEWs' ability to correctly diagnose a sick young infant, including opportunities to practice clinical skills, supportive supervision and clinical mentoring. This was not assessed for in this report. Such a nuanced review will be part of future analysis.

Clinical case classification: maternal satisfaction

The experience of caregivers at health posts was very positive. Exit-interviews showed that they were satisfied with the care that was provided to them by the HEWs.

With respect to management of young infant illness, it is evident that HEWs lack skills to recognise danger signs. However, once the danger signs are known, they are competent in correctly diagnosing infants and providing appropriate care. Despite providing injections for vaccinations, the assessment of HEWs' administration of intramuscular injections of gentamycin indicated that they needed further training. Despite these shortcomings, HEWs provided services to caregivers that left them satisfied by the experience, which could potentially endorse positive health seeking behaviour by the community for neonatal illness and create community demand for CBNC services.

RECOMMENDATIONS

This survey provides an overview of the quality of CBNC services provided in early and late CBNC implementation areas. Below we provide recommendations for the overall improvement of the quality of the CBNC programme. However, it is strongly recommended that the results presented in chapters 3–6 are thoroughly reviewed to identify overall gaps in quality, as well as gaps specific to early and late implementation areas. Based on the findings from this midline survey, we present the following key recommendations for improvement across the four domains used to conceptualise quality CBNC service delivery:

HEALTH SYSTEM READINESS TO PROVIDE QUALITY CBNC SERVICES

1. Incorporate supportive supervision activities specific to CBNC and iCCM into routine supervision visits
2. Make provision of MNCH/CBNC related integrated supportive supervision for HEWs as a key responsibility of health centre staff, by including it as an indicator during their performance review
3. Increase the frequency of supervision from health centres to health posts, ensuring that visits cover an assessment of HEWs' VSD service provision as well monitoring drug supply and expiration dates
4. Improve the infrastructure, especially the water supply
5. Develop and implement a well-defined matrix for measurement of ANC and PNC through HMIS
6. Explore the possibility of integrating post-natal care services with CBNC practices, as they are targeting the same timeframe and closely linking them will benefit both services

HEALTH SYSTEM INTEGRATION WITHIN THE PHCU FOR QUALITY CBNC SERVICES

1. Improve the supply chain system for CBNC related drugs, ensuring that the drugs are fully incorporated into the Pharmaceuticals Fund and Supply Agency and Integrated Pharmaceutical Logistics System (IPLS)
2. To ensure follow-up on referrals from the health post, increase access to woreda ambulances for transport of sick young infants to health centres
3. Ensure the availability of official referral forms at health posts and train HEWs to use them when referring sick newborns
4. Provide each sick young infant with a unique identifier for easy follow-up within the PHCU to ensure provision and completion of treatment

POTENTIAL OF HEALTH WORKFORCE TO DELIVER QUALITY CBNC SERVICE

1. Explore the possibility of including CBNC as part of pre-service training to be supported by systematic on the job mentoring
2. Ensure periodic and structured coaching by HEWs to enhance WDA leaders' understanding of MNCH promotion messages spanning all CBNC components
3. Strengthen WDA leaders' capacity for demand creation to increase uptake of newborn services, focusing on their ability to recognise danger signs for young child illness and effective use of the family health card.
4. HEWs and WDA leaders' trainings should incorporate their satisfaction and engagement to inform the content and design of future trainings

MANAGEMENT OF YOUNG INFANT ILLNESS

1. Create innovative, skills based training and mentoring activities for HEWs focusing on the recognition of danger signs in young infants
2. Provide periodic refresher training to HEWs on intramuscular injections for young infants using innovative technologies and methods
3. To overcome limited case load of sick young infants at the health post level, invite HEWs periodically to health centres to observe case management skills practiced by health officers
4. Revitalise the skills labs, especially for HEWs' CBNC refresher trainings.

HEW showing new mother how to breastfeed
© Paolo Patruno Photography/IDEAS 2015

APPENDICES

APPENDIX I

POWER	EARLY IMPLEMENTERS Clusters no./size	LATE IMPLEMENTERS Clusters no./size	ICC	DESIGN EFFECT	CONTROL	INTERVENTION	DIFFERENCE
Case 1							
0.632	70/2	50/2	0	1	40%	55%	15%
0.800	70/3	50/3	0.01	1.01	40%	55%	15%
0.800	70/4	50/4	0.12	1.35	40%	55%	15%
0.800	70/5	50/5	0.17	1.69	40%	55%	15%
0.800	70/6	50/6	0.21	2.03	40%	55%	15%
0.799	70/7	50/7	0.23	2.37	40%	55%	15%
0.799	70/8	50/8	0.24	2.71	40%	55%	15%
0.799	70/9	50/9	0.26	3.04	40%	55%	15%
0.800	70/10	50/10	0.26	3.38	40%	55%	15%
Case 2							
0.799	140/2	100/2	0.35	1.35	40%	55%	15%
0.799	140/3	100/3	0.51	2.03	40%	55%	15%
0.800	140/4	100/4	0.57	2.71	40%	55%	15%
0.800	140/5	100/5	0.6	3.38	40%	55%	15%
0.799	140/6	100/6	0.61	4.06	40%	55%	15%
0.799	140/7	100/7	0.62	4.73	40%	55%	15%
0.799	140/8	100/8	0.63	5.41	40%	55%	15%
0.799	140/9	100/9	0.64	6.09	40%	55%	15%
0.799	140/10	100/10	0.64	6.76	40%	55%	15%
Case 3							
0.807	210/2	150/2	1	3	40%	55%	15%
0.807	210/3	150/3	1	3	40%	55%	15%
0.807	210/4	150/4	1	4	40%	55%	15%
0.807	210/5	150/5	1	5	40%	55%	15%
0.807	210/6	150/6	1	6	40%	55%	15%
0.807	210/7	150/7	1	7	40%	55%	15%
0.807	210/8	150/8	1	8	40%	55%	15%
0.807	210/9	150/9	1	9	40%	55%	15%
0.807	210/10	150/10	1	10	40%	55%	15%

APPENDIX II

A. Health system readiness for CBNC services

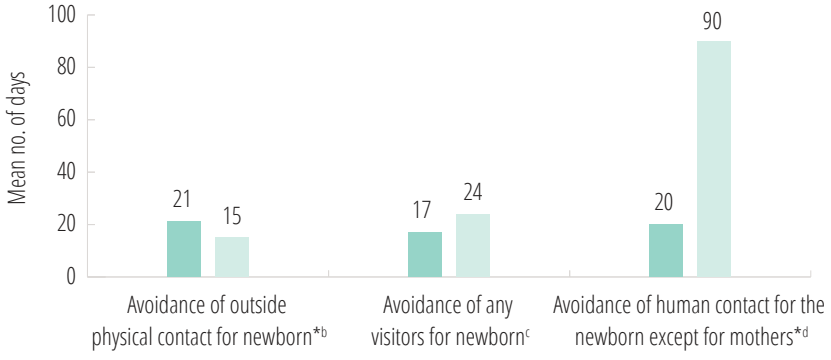
Characteristics of population being served by PHCUs providing CBNC services

Table 1. Neonatal cultural practices and traditions: types of avoiding physical and human contact [a]

TRADITIONAL PRACTICES	EARLY IMPLEMENTERS	LATE IMPLEMENTERS	TOTAL
	N=140	N=100	N=240
	%	%	%
Avoidance of outside physical contact for newborn*	46	64	54
Avoidance of any visitors for the newborn	8	10	9
Avoidance of human contact for the newborn except mothers*	16	5	11

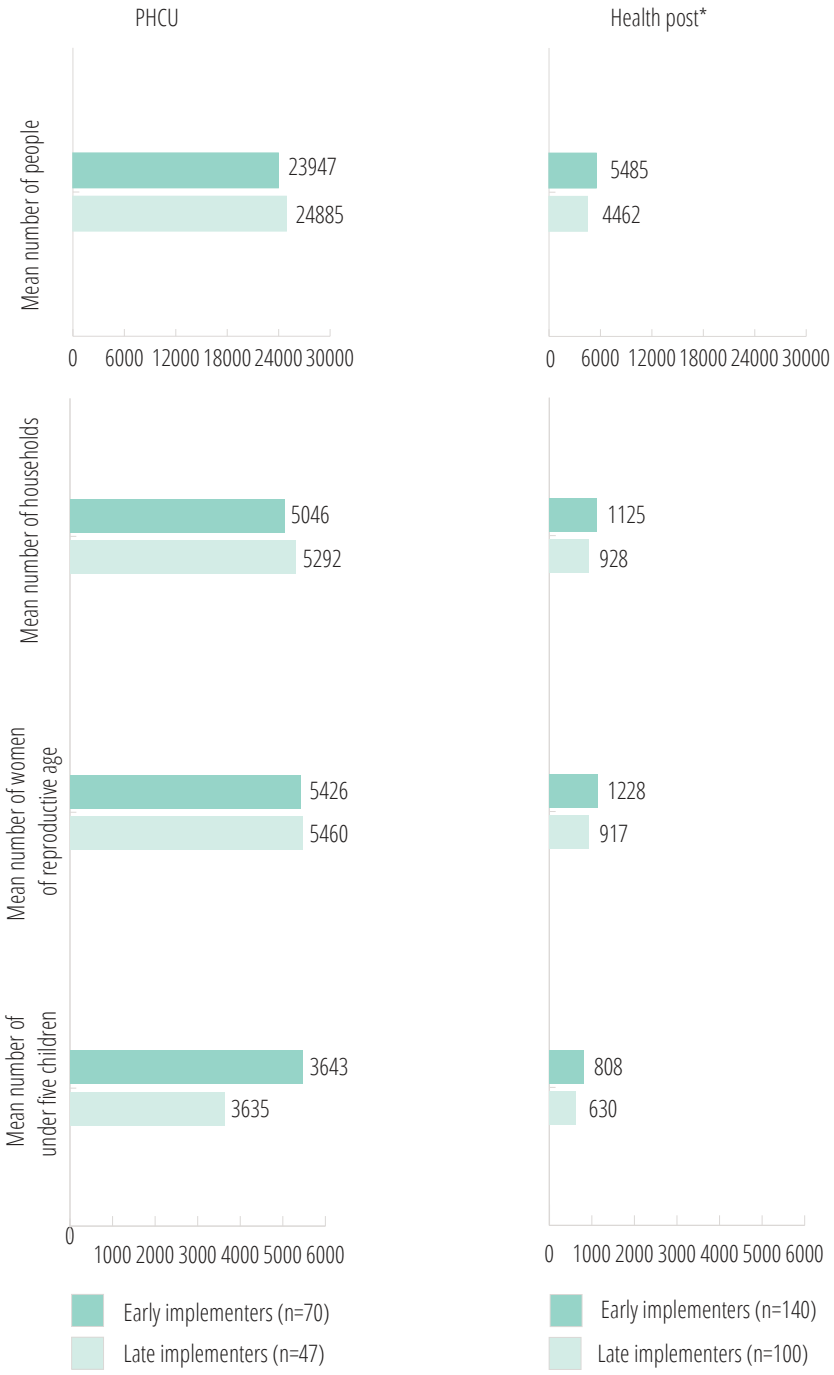
[a] Reported by WDA leaders
*p<0.05 for test of difference between early and late implementers

Figure 1. Neonatal cultural practices and traditions: days of avoiding physical and human contact [a]



[a] Reported by WDA leaders
[b] Early implementers n=65, Late implementers n=64
[c] Early implementers n=11, Late implementers n=10
[d] Early implementers n=22, Late implementers n=5
*p<0.05 for test of difference between early and late implementers

Figure 2. PHCU and health post: characteristics of catchment population



*p<0.05 for test of difference between early and late implementers

Figure 3. PHCU and health post: characteristics of families residing in the catchment ares

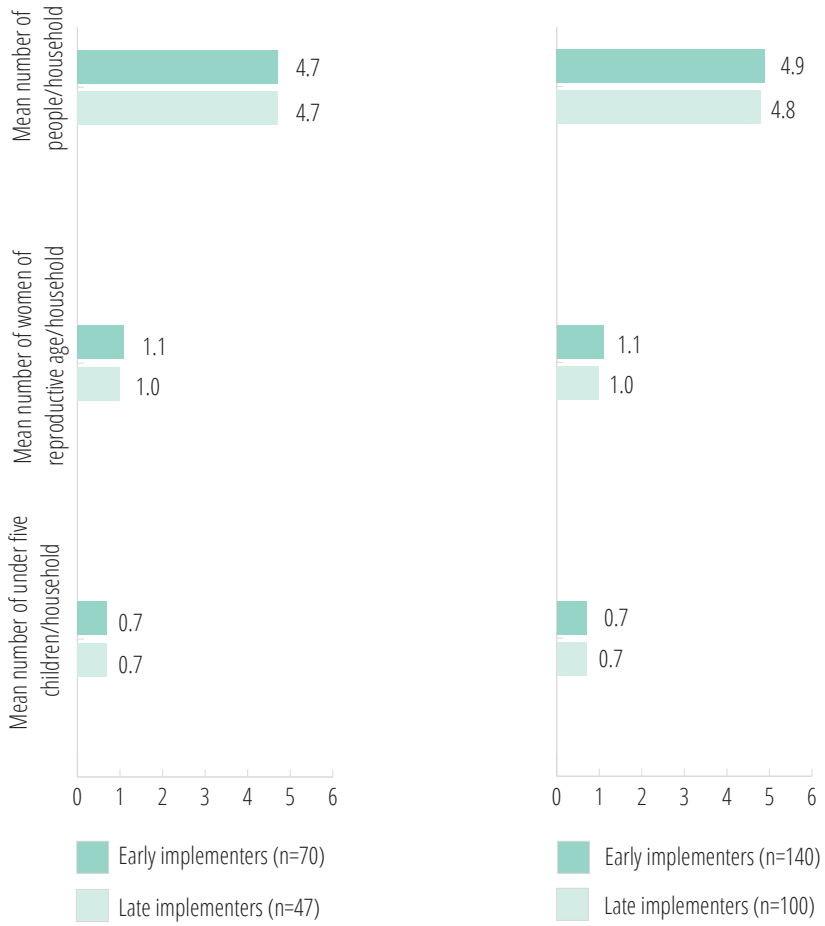
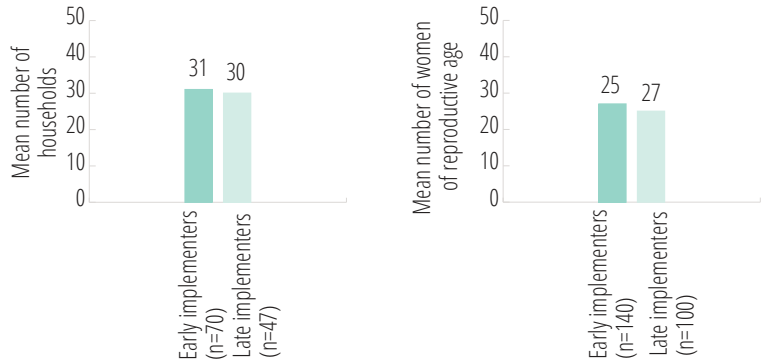


Figure 4. WDA: Characteristics of families residing in the catchment areas



Facility infrastructure

Table 2. Health centre and health post: observation of infrastructure

	EARLY IMPLEMENTERS (%)	LATE IMPLEMENTERS (%)	TOTAL (%)
Health centre facility description	**n=70**	**n=47**	**N=117**
Electricity supply*	73	89	80
Cell phone signal	79	68	74
Health post facility description	**n=140**	**n=100**	**N=240**
Electricity supply	17	13	15
Cell phone signal*	65	77	72

*p value <0.05 for test of difference between early and late implementers

Table 3. Health centre: observed availability of newborn health related equipment and supplies

	EARLY IMPLEMENTERS N=70 (%)	LATE IMPLEMENTERS N=47 (%)	TOTAL N=117 (%)
Equipment			
Blood pressure cuff	97	94	96
Examination couch	100	100	100
Privacy curtain	87	79	84
Washable mackintosh	60	75	66
Dustbin	86	85	86
Supplies			
Chlorine bleach*	97	79	90
Bucket for decontamination solution	87	83	86
Contaminated waste container	90	81	86
Pregnancy test kit	80	89	84
Proteinuria test kit	50	66	56
HIV test kit KHB	89	94	91
HIV test kit Statpak*	64	83	72
HIV test kit Unigold*	37	66	49
Syphilis RPR/VDRA test kit*	24	45	33
Syphilis rapid test kit*	21	49	33
Anaemia test kit	36	53	43
Blood glucose test kit	16	21	18

*p value <0.05 for test of difference between early and late implementers

Table 4. Health post: observed availability of newborn health related equipment and supplies

	EARLY IMPLEMENTERS N=140 (%)	LATE IMPLEMENTERS N=100 (%)	TOTAL N=240 (%)
Equipment			
Blood pressure cuff	63	65	64
Examination couch	82	74	79
Privacy curtain	31	33	32
Washable mackintosh	32	27	30
Dustbin*	46	60	52
Supplies			
Chlorine bleach	19	23	21
Bucket for decontamination solution*	38	20	30
Contaminated waste container	44	37	41
Cups for drinking water	76	77	76

*p value <0.05 for test of difference between early and late implementers

Table 5. Health centre: observed availability of newborn health related drugs

DRUGS	EARLY IMPLEMENTERS N=70 (%)	LATE IMPLEMENTERS N=47 (%)	TOTAL N=117 (%)
Antihelminths	91	79	86
Uterotonics*	21	64	39
Magnesium sulphate	37	40	39
Antibiotics for premature rupture of membrane	66	60	63

*p value <0.05 for test of difference between early and late implementers

Table 6. Health post: observed availability of newborn health related drugs

	EARLY IMPLEMENTERS N=140 (%)	LATE IMPLEMENTERS N=100 (%)	TOTAL N=240 (%)
Malaria			
*Test kit for malaria**			
Available	78	70	75
Not available	2	1	2
Expired	0	6	3
Never in stock	20	23	21
Duration of non-availability (mean days) *	31	92	74
Study area endemic for malaria	71	68	70
Among area where malaria is endemic			
Coartem*			
Available	79	62	72
Not Available	13	21	16
Expired	8	13	10
Never in stock	0	4	2
Duration of non-availability (mean days)	53	62	58
Chloroquine syrup			
Available	28	19	24
Not Available	21	27	23
Expired	17	12	15
Never in stock	34	43	38
Duration of non-availability (mean days)	139	141	140
Artesunate suppository			
Available	22	10	17
Not Available	3	6	4
Expired	6	7	7
Never in stock	69	77	72
Duration of non-availability (mean days)	140	108	12

Table 6. Health post: observed availability of newborn health related drugs, continued

Newborn care and vaccinations			
Vitamin K			
Available	0	1	<1
Not available	1	0	<1
Expired	--	--	--
Never in stock	99	99	99
TTC*			
Available	46	43	45
Not available	43	25	35
Expired	1	2	2
Never in stock	9	30	18
Duration of non-availability (mean days)	90	53	79
Paracetamol			
Available	66	63	65
Not available	11	14	13
Expired	11	7	7
Never in stock	11	16	13
Duration of non-availability (mean days)	94	65	82
BCG			
Available	34	33	33
Not available	51	54	53
Expired	--	--	--
Never in stock	15	13	14
Duration of non-availability (mean days)	24	26	25
Polio vaccine			
Available	34	33	34
Not available	51	54	52
Expired	--	--	--
Never in stock	15	13	14
Duration of non-availability (mean days)	24	23	24

*p value <0.05for test of difference between early and late implementers

Function of PHCUs for CBNC related services

Table 7. Linkage of health centre and health post with community: activities in the last three months

	EARLY IMPLEMENTERS N=70 (%)	LATE IMPLEMENTERS N=47 (%)	TOTAL N=117 (%)
A. By health centre			
Participation in pregnant women's conference[a]			
None	1	2	2
Every two weeks	27	2	17
Once a month	70	92	79
Every other month	1	4	3
B. By Health post			
Organisation of pregnant women's conference[a]			
None	12	15	13
Every two weeks	24	1	15
Once a month	56	81	66
Every other month	4	2	3
Every three months	4	1	3
Attendance of pregnant women during the last conference*	64	50	59
C. By community member (WDA leader)			
*Meeting with HEW**			
None	6	25	14
Once	12	14	13
More than once	82	61	73
Activities undertaken with HEWs			
Plan together	66	71	68
Organise pregnant women's conference	81	78	80
Provide household visits	89	81	86
Conduct health campaigns*	88	72	81
Organisation of pregnant women's conference[a]			
None	8	33	18
Every two weeks	19	10	15
Once a month	70	48	61
Every three months	3	9	5
Attendance of pregnant women during the last conference	86	83	85

a Due to the nominal nature of the variable categories, a Kendall's Tau test was used to assess the significant statistical differences

*p<0.05 for test of difference between early and late implementers

Table 8. Supportive supervision: visits to health posts during the last six and three months

SUPERVISION	EARLY IMPLEMENTERS N=70 (%)	LATE IMPLEMENTERS N=47 (%)	TOTAL N=117 (%)
Health posts visited in the last 6 months	98	99	98
Number visited (mean)*	5	4	5
Health posts visited in the last 3 months	91	90	90
Number visited (mean)*	5	4	4

*p value <0.05 for test of difference between early and late implementers

B. Health system integration within the PHCU for quality CBNC services

Table 9A. Health centre IMNCI and Health post iCCM register review: PHCU level data records of sick young infants, for health centres that did not have any sick infants registered in the previous three months

WOREDA AND PHCU NAME	TOTAL NUMBER OF INFANTS SEEN IN THE HEALTH CENTRE WITHIN THE PHCU	TOTAL NUMBER OF INFANTS SEEN IN THE SAMPLED SATELLITE HEALTH POSTS				AVERAGE NUMBER OF INFANTS SEEN AT THE FUNCTIONAL[a] SAMPLE	
		1	2	3	4	HEALTH CENTRES OF THE WOREDA	HEALTH POSTS OF THE WOREDA
Intervention							
W19 P2	0	18	--	--	--	3	8
W19 P5	0	1	--	--	--	3	8
W19 P6	0	3	1	--	--	3	8
W20 P1	0	2	0			1[b]	2
W23 P4	0	2	1	--	--	15	1
Comparison							
W15 P2	0	1	0	--	--	18[b]	2
W15 P3	0	2	0	--	--	18[b]	2
W15 P4	0	3	0	--	--	18[b]	2
W16 P2	0	7	2	--	--	35[b]	4
W16 P3	0	0	0	--	--	35[b]	4
W16 P4	0	3	--	--	--	35[b]	4
W18 P2	0	0	0	--	--	2	3
W18 P3	0	4	0	--	--	2	3

[a] Among health centres and health posts that had seen sick young infants in the last three months
[b] Only one functional health centre sampled

Table 9B. Health centre IMNCI and Health post iCCM register review: PHCU level data records of sick young infants, for health postsa that did not have any sick infants registered in the previous three months.

WOREDA AND PHCU NAME	TOTAL NUMBER OF INFANTS SEEN IN THE HEATH POSTS WITHIN A PHCU				TOTAL NUMBER OF INFANTS SEEN IN THE SATELLITE HEALTH CENTRE	AVERAGE NUMBER OF INFANTS SEEN AT THE FUNCTIONAL[b] SAMPLE	
	1	2	3	4		HEALTH CENTRES OF THE WOREDA	HEALTH POSTS OF THE WOREDA
Intervention							
W10 P1	4	0	0	0	4	4[c]	4[d]
W2 P1	0	0	--	--	9	5	3
W2 P3	0	0	--	--	2	5	3
W2 P4	5	0	--	--	4	5	3
W4 P3	0	0	--	--	1	4	2
W4 P4	4	0	--	--	6	4	2
W22 P1	1	0	--	--	13	9	1
Comparison							
W5 P2	2	0	--	--	19	15	4
W5 P4	3	1	0	--	11	15	4
W6 P3	0	0	--	--	17	11	2
W7 P3	1	0	--	--	11	13	1
W7 P4	1	0	--	--	8	13	1
W7 P5	0	0	0	--	3	13	1
W9 P1	1	1	0	--	9	20	2
W9 P2	1	1	0	--	7	20	2
W9 P3	4	0	0	--	33	20	2
W9 P4	0	0	--	--	23	20	2
W9 P5	0	0	--	--	27	20	2
W14 P1	1	0	--		4	7	2
W14 P2	1	0	--		4	7	2
W15 P1	1	0	0	--	18	18	2
W17 P1	1	0	--	--	15	11	1
W17 P3	0	0	--	--	11	11	1
W18 P4	1	0	--	--	9	12	3

[a] Health posts with missing young infant record listed in Table 9A are not repeated in Table 9B
[b] Among health centres and health posts that had seen sick young infants in the last three months.
[c] Only one functional health centre sampled
[d] Only one functional health post sampled

Staff profile

Table 10. Health centre IMNCI staff training and staff turnover

	EARLY IMPLEMENTERS N=70	LATE IMPLEMENTERS N=47	TOTAL N=117
IMNCI training of health centre staff			
Number of staff trained (mean)			
Health officers	<1	<1	<1
Nurses*	2	<2	<2
Total*	<3	<2	<3
IMNCI trained health centre staff turnover[a]			
Number of staff turnover (mean)	1	1	1
Reason for leaving (%)			
Transferred to another health centre	36	73	55
Promoted	18	18	18
Moved to another organisation	36	18	27
Replacement with IMNCI trained staff (%)[b]			
Staff replaced	27	0	14

a Among facilities with trained staff (n=111: 68 early and 43 late implementing areas)
b Among facilities where trained staff left (n=22: 11 early and 11 late implementing areas), the proportion of facilities that have got replacement staff
*p value <0.05for test of difference between early and late implementers

Table 11. Health centre CBNC staff training and staff turnover

	EARLY IMPLEMENTERS N=70	LATE IMPLEMENTERS N=47	TOTAL N=117
CBNC training of health centre staff			
Number of staff trained (mean)			
Health officers trained	<1	<1	<1
Nurses*	<2	<1	1
Total	<2	1	<2
CBNC trained health centre staff turnover[a]			
Number of staff turnover (mean)	<1	<1	<1
Reason for leaving (%)			
Transferred to another health centre	70	80	73
Promoted	10	0	7
Moved to another organisation	10	20	13
Replacement with CBNC trained staff (%)[b]			
Staff replaced	0	0	0

a Among facilities with trained staff (n=80: 49 early and 31 late implementing areas)
b Among facilities where strained staff left (n=15: 10 early and 5 late implementing areas) the proportion of facilities that have got replacement staff
*p value <0.05for test of difference between early and late implementers

Table 12. PHCU CBNC staff training and turnover of HEWs

	EARLY IMPLEMENTERS N=70 %	LATE IMPLEMENTERS N=47 %	TOTAL N=117 %
Health post CBNC training			
Number of HEWs trained (mean)	8	9	9
CBNC trained HEW turnover at PHCU level[a]			
Number of staff turnover (mean)	<1	<1	<1
Replacement with CBNC trained HEWs[b]			
Staff replaced[c]	0	0	0

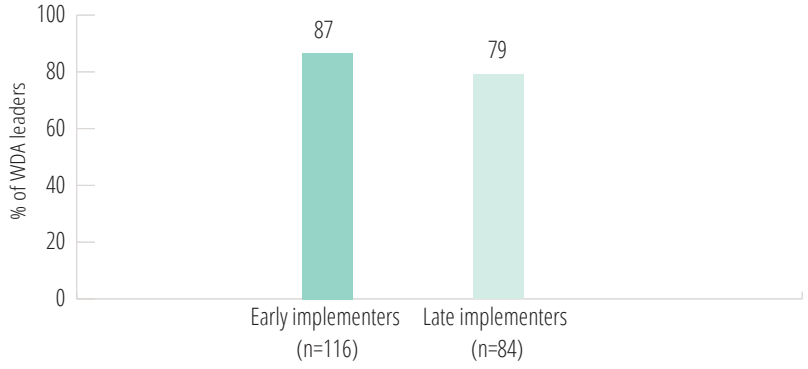
a Among facilities with trained HEWs (n=115: 70 early and 45 late implementing areas)
b Among facilities where strained staff left (n=30: 17 early and 13 late implementing areas), the proportion of facilities that have got replacement staff
c Among PHCUs where trained HEWs left proportion of facilities that have got replacement staff

Table 13. Health post: training received by WDA leaders on MNH promotion in the last 12 months

	EARLY IMPLEMENTERS N=140 %	LATE IMPLEMENTERS N=100 %	TOTAL N=240 %
Any MNH training			
Among WDA who received training	83	84	83
Topics covered			
Antenatal Care	*97*	*98*	*98*
Use of familyhealth card*	100	88	95
Educating on danger signs	97	95	96
Referring for ANC care	100	98	99
Birth preparedness plan	100	99	99
Childbirth care			
Promotion of institutional delivery	98	99	99
Postnatal care			
Providing home visits	96	94	95
Referring for PNC care*	99	94	97
Educating on newborn danger signs	97	93	95
Referring sick newborns	97	94	96

*p value <0.05 for test of difference between early and late implementers

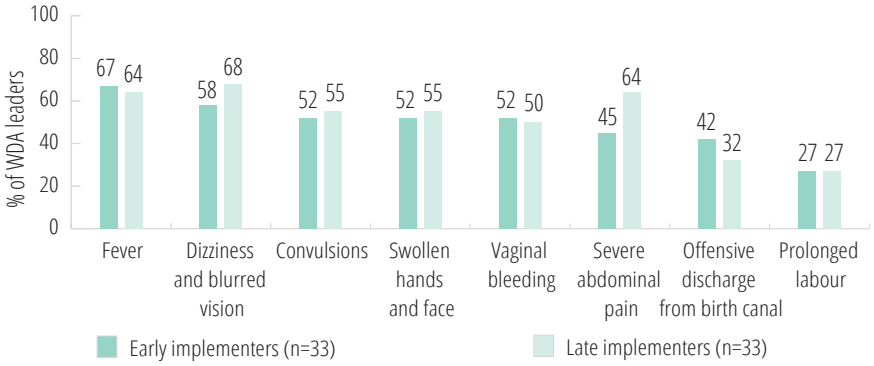
Figure 5. Health post: WDA satisfaction with newborn care training orientation



*p value <0.05for test of difference between early and late implementers

Referral and service delivery linkage: referrals between WDA leader and health posts

Figure 6. Referral and reporting by WDA leaders[a]: pregnant woman danger signs reported to HEWs.



a Among WDA leaders that have identified pregnant women with danger signs in the last six months

C. Potential of the health workers and volunteers to deliver quality CBNC service

HEW knowledge

Table 14. HEWs' knowledge (unprompted): newborn general care

SIGNS OF GOOD ATTACHMENT	EARLY IMPLEMENTERS N=140	LATE IMPLEMENTERS N=100	TOTAL N=240
	(%)	(%)	(%)
Chin touching breast*	77	61	70
Mouth open wide	80	78	79
Lower lip turned out	94	92	93
More areola showing above	86	81	84

*p value <0.05 for test of difference between early and late implementers

Table 15. HEWs' knowledge (prompted): side effects of gentamycin and amoxicillin

	EARLY IMPLEMENTERS N=140 (%)	LATE IMPLEMENTERS N=100 (%)	TOTAL N=240 (%)
Gentamycin and amoxicillin			
Any side effect of improper use of antibiotics	47	39	44
Among those who said 'Yes'			
Possible side effect			
Drug resistance	38	39	38
Injectable gentamycin			
Any side effects of injectable gentamycin	34	42	37
Among those that said there are side effects			
Possible side effects			
Fever	55	48	52
Skin rash*	30	12	21
General anaphylactic reaction	19	21	20
Lethargy*	0	26	12
Nausea/vomiting*	17	2	10
Kidney damage	11	5	8
Nerve damage*	0	12	6
Hearing loss	4	2	3
Poor appetite	2	5	3
Weight loss	0	0	0
Any contraindication for using injectable gentamycin	16	23	20
Among those who said 'Yes'			
Reasons for contraindication			
History of anaphylactic reaction	22	22	22
History of kidney/urine problem	4	4	4
History of skin reaction	3	7	5
Amoxicillin			
Any side effects of amoxicillin*	14	27	20
Among those who said 'Yes'			
Possible side effects			
General anaphylactic reaction	65	52	58
Any contraindication for using amoxicillin*	9	19	13
Among those who said 'Yes'			
Reasons for contraindication			
History of body reaction or shock to amoxicillin	33	47	42

*p value <0.05 for test of difference between early and late implementers

WDA knowledge

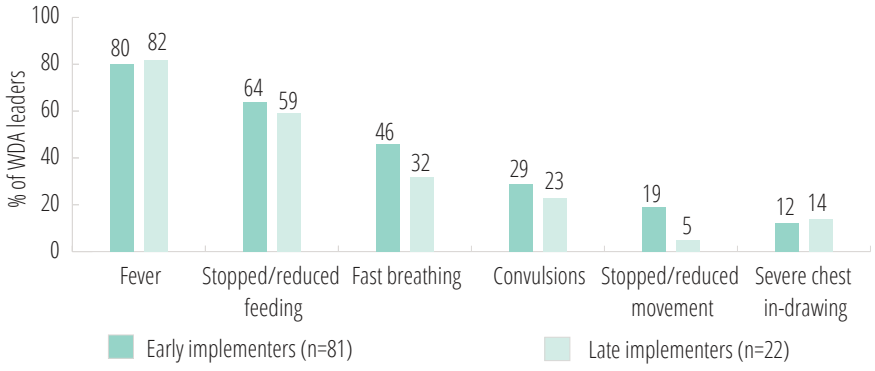
Table 16. WDA leaders' knowledge: family health card (job aid)

	EARLY IMPLEMENTERS N=131 (%)	LATE IMPLEMENTERS N=83 (%)	TOTAL N=214 (%)
Family health card images			
Among users of family health card			
Vitamin A capsule for mother*	30	8	22
Mother holding newborn close to body*	61	19	45
Dry cord care	8	4	7
Diarrhoea: Increasing fluid intake for*	44	29	38
Reason for dry cord care*	37	55	44
Baby's age when getting vitamin A	35	24	31

*p value <0.05 for test of difference between early and late implementers

WDA practice

Figure 7. Referral and reporting by WDA leaders[a]: newborn danger signs reported to HEWs



a Among WDA leaders that have identified sick newborns in the last six months

D. Management of newborn illness

Table 17. HEW skills of CBNC case management (clinical vignettes): diarrhoea

	EARLY IMPLEMENTERS N=140 (%)	LATE IMPLEMENTERS N=100 (%)	TOTAL N=240 (%)
Correct patient identification			
Full name (Baby)	69	79	73
Exact age (baby)	67	78	72
First visit or revisit	13	13	13
If revisit, then medications history	2	1	2
Correct patient assessment			
Exact duration of diarrhoea*	86	67	78
Any blood in the stool	82	59	73
Sunken eyes*	73	47	62
Restless or irritability	40	35	38
Pinching abdominal skin*	74	44	61
Movement on stimulation	41	44	43
Correct classification and treatment			
Classify the neonate as having 'some dehydration'*	84	66	76
Give ORS fluids	91	87	90
Continue breast milk	88	79	84
Observe for next 4 hours*	49	24	39
Give zinc for 10 days*	84	62	75
Correct advice and follow-up			
Advice			
Continue breastfeed day and night, at least 10-12 times in 24 hours*	76	62	70
Breastfeed as often as the child wants*	73	41	60
Advice to report back in case of danger signs*	56	36	48
Keep the baby warm	46	43	45
Follow-up			
Follow-up visit in 2 days*	76	46	63

*p value <0.05 for test of difference between early and late implementers

COMMUNITY BASED NEWBORN CARE PROGRAMME EVALUTAION AND RESOURCES

The Community Based Newborn Care (CBNC) programme is a key milestone of the Ethiopian Health Extension Program. The goal is to reduce newborn mortality through strengthening the primary health care unit approach and the Health Extension Program.

CBNC Products

Berhanu D., Avan B.I. (2017) Community Based Newborn Care: Quality of CBNC programme assessment - midline evaluation report, March 2017. London: IDEAS, London School of Hygiene & Tropical Medicine

Berhanu D., Avan B.I. (2017) Community Based Newborn Care: Quality of CBNC programme assessment - midline evaluation Executive Summary, March 2017. London: IDEAS, London School of Hygiene & Tropical Medicine

Berhanu, D., Avan, B.I., (2014) Community Based Newborn Care: baseline report summary, Ethiopia October 2014. London: IDEAS, London School of Hygiene & Tropical Medicine

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