



Applying the Three Delays Model: Improving access to care for newborns with danger signs

April 2013





ABOUT THIS REPORT

From 2005-2011, the Bill & Melinda Gates Foundation funded the Saving Newborn Lives program (SNL) to test and implement newborn interventions in 18 countries. SNL has undertaken a series of secondary analyses to take stock of what was accomplished, identify lessons learned and share findings with the global health community. One aim was to examine program approaches and lessons learned regarding access to care, care-seeking, and referral systems for newborns with danger signs in four countries where SNL supported early implementation and testing of community-based maternal and newborn programs within existing health systems. Findings from this analysis are presented in two separate, but linked, reports. This report focuses on access to care and care-seeking using the three delays model as a framework. Findings related to referral are presented in a report entitled “Facilitated referrals for newborns with danger signs: the role of community health workers” available at: <http://www.healthynewbornnetwork.org>

It should be noted that these analyses were based primarily on review of program documents and interviews with program staff to explore how programs were designed and some implementation issues; they were not meant to capture fidelity to program design.

ACKNOWLEDGEMENTS

This report was written by (alphabetical): Erica Corbett, Tanya Guenther, and Deborah Sitrin. We acknowledge the contributions of the following people in conceptualizing and reviewing the report (alphabetical): Al Bartlett, Emmanuel Chimbalanga, Nathalie Gamache, Steve Hodgins, Kate Kerber, Joy Lawn, Reuben Ligowe, Honey Malla, Allisyn Moran, Claudia Morrissey, Rubayet Sayed, Uzma Syed, Lara Vaz, Peter Waiswa, and Steve Wall. In addition, we acknowledge the following for their roles in program implementation, management, and data collection: Save the Children staff in Bangladesh, Nepal, Malawi and Uganda supported by Saving Newborn Lives; the Ministry of Health and Social Welfare and BRAC in Bangladesh; the Reproductive Health Unit of the Ministry of Health and UNICEF in Malawi; the Ministry of Health and Population and Community-based Neonatal Care Package (CB-NCP) partners in Nepal; and the Ministry of Health and Makerere University in Uganda.

PHOTO CREDITS

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INTRODUCTION

Save the Children's Saving Newborn Lives (SNL) program seeks to achieve equitable and effective coverage of high impact newborn services and practices. SNL serves as a catalyst for action by working with governments and partners to put newborn health on global and national agendas and by advocating for increased availability and access to routine and emergency newborn care services and supplies, improved quality of newborn care services, and increased knowledge about and demand for newborn care. SNL also works to develop, apply, document and sustain packages of effective evidence-based newborn care services and practices at scale.

This report applies the three delays model (Box 1) to examine program approaches to address access to care and care-seeking practices for newborns with danger signs in program areas of four countries— **Malawi, Nepal, Bangladesh, and Uganda**. We also summarize relevant program results on care-seeking practices available through baseline and endline household surveys. Implications and recommendations are provided to inform future programming.

Box 1. Three Delays Model

1. Delay in recognition of danger signs and decision to seek care
2. Delay in reaching an appropriate source of care
3. Delay in obtaining adequate and appropriate treatment

Source: Thaddeus S, Maine D (1994) *Too far to walk: maternal mortality in context. Social Science and Medicine* 38 1091-1110.

BACKGROUND

While global neonatal mortality rates have fallen 28% since 1990 and now stand at 23 per 1,000 live births, over 3 million babies still die annually before the end of their first month of life. Neonatal mortality now accounts for 43% of under-five deaths worldwide [1,2].

Globally, a large proportion of newborn mortality is due to complications of prematurity (35%) and to neonatal infections such as pneumonia, sepsis, and meningitis (23%) [3]. Interventions exist to reduce both the incidence and impact of the neonatal infections and complications from prematurity and low birth weight (LBW) [1,4,5]. For example, the management of newborn sepsis by CHWs can have a positive impact, reducing deaths by as much as 61% in high-mortality settings [5,6,7,8]. Similarly, Kangaroo Mother Care (KMC) can improve outcomes for preterm and LBW babies. A meta-analysis conducted of randomized trials on KMC found a greater than 50% reduction in mortality for stable newborns with a birth weight of less than 2000g upon application of this simple initiative [9]. More recently, a review of 16 randomized control trials found KMC to be associated with decreased mortality and severe illness and with increased weight gain and breastfeeding [10].

In 2009, UNICEF and the WHO released the “*Joint Statement on Home Visits for the Newborn Child: a strategy to improve newborn survival*”, presenting evidence on and endorsing home visits to deliver newborn care [5]. The Joint Statement was informed by research studies—notably SEARCH¹ in Gadchiroli, India and Projahnmo in Bangladesh—that demonstrated home visits by CHWs improved neonatal survival. The statement recommends that home visits include counseling on newborn danger signs and identification of newborns in need of care. Home treatment for local infections and some feeding problems may also be included, depending on the context. The Joint Statement recommends home visits in the first 24 hours after home birth or as soon as possible after facility birth, as well visits on the 3rd and 7th days after birth.

¹ Society for Education, Action & Research in Community Health (SEARCH) – the Indian NGO founded by Dr. Abhay and Rani Bang that designed and implemented a field trial of a home based newborn care package in rural villages of Gadchiroli, India.

Programs are now being designed and implemented to deliver home visits and to improve availability of newborn services at scale, *using existing health systems*. Where SNL has helped adapt and test newborn programs in the context of existing delivery platforms (including the four programs examined in this report), some elements from the landmark studies on community-based newborn care, such as SEARCH and Projahnmo, have been included while others have not. In addition, the programs include varying degrees of support to improve newborn care at health facilities. This report examines these adapted programs and how they address care-seeking and access to appropriate care, and identifies some implementation gaps that should be addressed in future program design and implementation.

METHODS

This review focuses on program areas in four countries - **Malawi, Nepal, Bangladesh and Uganda** - where SNL supported early implementation and testing of community-based newborn care programs within existing systems. The review explores service availability and care-seeking for danger signs indicating newborn infections (see Box 2) and complications due to preterm birth. Services and care-seeking for danger signs occurring at the time of birth and requiring immediate attention, such as newborn resuscitation, are excluded from this review.

Analysis

We undertook two analyses: 1) a cross-country comparison of how program designs addressed access to care for newborns with danger signs; and 2) analysis of program data from baseline and endline household surveys on prevalence of newborn danger signs and care-seeking practices as reported by mothers.

Box 2. WHO-UNICEF list of newborn danger signs that can be detected by CHWs with appropriate training and equipment:

1. Not feeding since birth or stopped feeding
2. Convulsions
3. Respiratory rate of 60 or more
4. Severe chest in-drawing
5. Temperature ≥ 37.5 C
6. Temperature ≤ 35.5 C
7. Only moves when stimulated, or not even when stimulated
8. Yellow soles (sign of jaundice)

Signs of local infection:

9. Umbilicus red or draining pus, skin boils, or eyes draining pus

Source: WHO, UNICEF (2012) *Caring for the Newborn at Home: A training course for community health workers: Community Health Worker Manual*. Geneva.

We used two methods to document program approaches and activities. First, we completed a desk review of relevant program documents including proposals and protocols, training materials and job aids, monitoring tools and final reports (see Annex I for the list of documents reviewed by country). We then consulted SNL country staff familiar with the studies to fill in any information gaps. We concentrated on assessing how access to care and care-seeking for newborns were addressed within program designs and materials for implementation (implementation plans, training packages, job aids, description of activities and strategies, etc.). We applied an adapted version of the model of delays in accessing quality maternal care as a framework to guide the analysis of program designs. Program data sources included:

Data source	Malawi CBMNC	Nepal CB-NCP	Bangladesh CB-PNC	Uganda UNEST
Baseline household survey year	2007	2008	2008	2007
Number of women with live births asked about newborn danger signs	Not collected	625	I: 394 C: 394	I: 194 C: 201
Endline household survey year	2011	2011	2010	2011
Number of women with live births asked about newborn danger signs	900	615	I: 398 C: 396	I: 894 C: 893

I=Intervention areas; C=Comparison area

Program description

Box 3 provides a brief description of the selected studies in each country. There were similarities in terms of the package of interventions and delivery mechanisms. For example, all programs emphasized home visits by CHWs during pregnancy and in the first week after delivery, in line with the WHO/UNICEF Joint Statement. The home visit packages were designed by governments and stakeholders to fit into existing health systems and use existing cadres of CHWs.

Box 3. Overview of program and implementation areas

- Malawi's **Community-Based Maternal Newborn Care (CBMNC)** initiative was a four-year (2007-2011) implementation research project conducted jointly with the Reproductive Health Unit of the Ministry of Health. The project aimed to develop and implement high impact interventions for mothers and newborns within a maternal, neonatal and child health (MNCH) framework and delivered through existing systems. The project was implemented in 22 health facility catchment areas of three districts (Chitipa, Dowa, and Thyolo) and covered approximately 711,000 people.
- Nepal's **Community-Based Newborn Care Package (CB-NCP)** pilot, developed by the Ministry of Health and Population with support from SNL and other partners, was introduced between 2008 and 2011 in 10 districts. The pilot study aimed to test an integrated community-based package to improve neonatal health and survival. The package components were based on the successful Morang Innovative Neonatal Intervention (MINI) study. SNL provided support for implementation and monitoring in Bardiya district, with a population of approximately 460,000.
- Bangladesh's **Community-Based Postnatal Care Study (CB-PNC)** was designed in partnership with the Ministry of Health in 2008 and the package was implemented from April 2009 to March 2010. The study aimed to compare the added package of interventions to the standard level of care in each region. The study covered a population of 400,000 across two geographically separate study regions, with different service delivery mechanisms – one through the government health system in partnership with the large scale National Nutrition Program and the other through the NGO BRAC's health service delivery platform in partnership with the government – and included comparison areas for each region.
- The **Uganda Newborn Study (UNEST)** was conducted in the Iganga-Mayugye Health and Demographic Surveillance Site over four years (2007-2011). The objective of UNEST was to investigate ways to improve newborn health and survival through community-based initiatives linked to health facility strengthening activities to improve quality of care. The study was a cluster randomized control trial with 31 intervention and 32 comparison clusters covering a population of 70,000 in the East-Central districts of Iganga and Mayugye.

Table 1 summarizes the characteristics of the CHW cadres in each country. In Bangladesh, three cadres already engaged in delivering health services to women were identified to conduct home visits for women and newborns as part of the community-based postnatal care study; other studies used a single cadre. With the exception of Malawi, CHWs were selected from within the communities they serve. CHWs in all countries were given some remuneration, ranging from government paid salaries in Malawi and Bangladesh to incentives for meetings in Uganda and performance-based incentives in Nepal.

Table 1. CHW characteristics by program

Characteristics	Malawi	Nepal	Bangladesh – GOV'T	Bangladesh – BRAC	Uganda
Name	Health Surveillance Assistant (HSA)	Female Community Health Volunteer (FCHV)	Family Welfare Assistant (FWA); Health Assistant (HA); Community Nutrition Promoter (CNP)	Shastho Kormi (SK)	Village Health Team (VHT) member
Community Health Worker Selection/ Recruitment	Centrally recruited through district health teams and assigned to a catchment area	Volunteers selected by community mother groups	FWA, HAs: Recruited from community under MOH&FW CNPs: Recruited from community under Nutrition Program	SKs: Recruited by BRAC under their health service delivery program	Nominated by community, selected in cooperation with project staff
Education level	12 years	Primary education preferred	FWA and HAs: Secondary education CNPs: Grade 8	Secondary education	Literate
Pre-service (basic) training	60 days (12 weeks)	18 days	FWAs: 21 days HAs: 21 days CNPs: 24 days	18 days	None †
In-service training on maternal and newborn health	9 days (+6 days community mobilization)	7 days	5 days	Monthly community MN package refresher	6 days
Remuneration and/or incentives	Government salaried	Volunteer - stipends for meeting attendance and performance-based incentive	FWA/HAs: Government salaried CNPs: Volunteer (paid a stipend)	Salaried by NGO with incentive payments for program MNCH visits	Volunteer with stipend for attending monthly meetings

† Most VHTs trained as part of UNEST only received the 6 day UNEST newborn-specific training, since the VHT basic training package had not been finalized at the time of the study. Lessons learned from the UNEST training were used to inform the development of the pre-service training.

Overview of the three delays model

Thaddeus and Maine [11] outlined three common delays in accessing quality maternal care: 1) delay in recognizing illness and deciding to seek care; 2) delay in reaching an appropriate source of care; and 3) delay in receiving adequate care. Lawn et al. [12] adapted the delays model to the newborn and other researchers have used the framework to understand the major contributing factors to why newborns die in their contexts [13,14,15,16]. Waiswa et al. [14] applied the three delays model to audit data on 64 neonatal deaths in eastern Uganda and found delayed care-seeking to be the predominant factor in newborn mortality in Uganda while Mbaruku et al. [13] in Tanzania and Jammeh et al. [15] in Gambia found that the leading delays resulting in newborn deaths were in receiving quality care and in reaching an appropriate care source (respectively).

Table 2 provides an overview of the three delays model as applied to management of newborns with danger signs, outlining contributing factors and potential interventions for each delay. The three delays are interlinked: several of the contributing factors and potential interventions are applicable to more than one delay. For example, poor quality of care or lack of staff and equipment at the facility level contributes to a perception that adequate care is not available and thus affects the family's decision about whether or not to seek care. Therefore, interventions that address quality of care would also help address some of the factors that contribute to delays in the household level decision to seek care. Similarly, efforts to shift appropriate care closer to the community would reduce both the transport burden on the household in terms of cost as well as time required to reach care and could affect decision making about where and when to seek care.

Table 2. Overview of three delays model applied to management of newborns with danger signs

Delay	Contributing Factors	Possible Interventions
1. Recognition of danger signs and decision to seek care	<ul style="list-style-type: none"> - Lack of knowledge about newborn danger signs and where to seek care - Perceived low quality of care at facility - Traditional beliefs/cultural norms (belief newborns shouldn't be taken outside home or seen by certain people) - Concerns about accessibility and cost of care - Decision-maker not available 	<ul style="list-style-type: none"> - Health communication to raise knowledge and awareness of danger signs and where to seek care - Detection of newborn danger signs through early postnatal home visits by CHWs - Facilitated referral by CHWs² - Improved communication and linkages with source of care - Financial incentives for seeking care - Increasing decision-making power of mother
2. Reaching an appropriate source of care	<ul style="list-style-type: none"> - Distance to source of care - Lack of transport - Transport costs - Time and opportunity costs - Security concerns 	<ul style="list-style-type: none"> - Bringing appropriate care closer to community - Facilitated referral by CHWs - Mobilize/provide transport - Funds to cover or minimize costs
3. Obtaining adequate and appropriate treatment	<ul style="list-style-type: none"> - Lack of equipment and supplies - Lack of trained staff - Poor attitudes of staff 	<ul style="list-style-type: none"> - Provision of equipment and supplies - Improving staff capacity and attitudes through training and supervision - Improving staff availability - Ensuring cases are referred back to CHWs with follow up care instructions (counter-referral), and referral monitoring

FINDINGS

The findings are organized into two sections. The first section applies the three delays model to examine how access to care for newborns with danger signs was addressed within the design of each community-based newborn care program. The second section summarizes program data related to care-seeking and treatment captured through household surveys.

Program design strengths and weaknesses by delay

Table 3 summarizes programmatic approaches undertaken by each study according to the three delays. Table 4 provides an analysis of how systematically the delays were addressed.

All program designs included a strong emphasis on the recognition of danger signs and subsequent decision to seek care (first delay) by training CHWs to counsel on newborn danger signs during pregnancy visits and to counsel and screen for newborn danger signs, reinforce care-seeking messages, and refer as appropriate during postnatal visits. However, efforts to address the second delay were inconsistent and quite weak, with the exception of Nepal and to some extent Uganda. Interventions to facilitate reaching appropriate care in the Malawi CBMNC program and Bangladesh's CB-PNC program relied in large part on CHWs and communities taking the initiative to address transport delays. Systems for CHWs to facilitate referral were established, but the designs were particularly weak in both Malawi and Bangladesh (more details on the role of CHWs in referral is provided in a separate report²).

² Facilitated referral includes three compulsory components: promotion of compliance with referral, monitoring of referral and supervisory support and addressing referral barriers. These are described in more detail in a separate report available at: <http://www.healthynewbornnetwork.org>

Table 5 highlights what was done to shorten the distance to care under the community-based newborn care packages. In Malawi first level facilities could only provide an initial dose of treatment with antibiotics and then refer³; access to a full course of treatment with antibiotics was only available at district level hospital, imposing a heavy burden on the family in terms of travel time and cost. Similarly, in Bangladesh CB-PNC improved access to CHWs who could assess and refer for danger signs, but access to full treatment within the formal system remained distant, only available at referral level facilities. In contrast, under CB-NCP in Nepal, families could access initial oral antibiotic treatment within their immediate community through FCHVs and a full course of antibiotics at the first level health posts (typically serving about 6000-8000 population and located within several kilometers). In Uganda under UNEST, families could access assessment and referral at the community level through trained VHTs and full treatment for newborn infection and KMC at first level health facilities which are typically distributed one per parish (about 5000 population) and within 5 km away; previously the only options were self-referral to referral facilities at the sub-country level.

Interventions to improve access to appropriate treatment once at place of care (the third delay) were also weak, especially in Malawi and Bangladesh. All programs included some training of facility-based health workers, but none of the training programs included a competency-based assessment of the ability of health workers to actually manage newborns with danger signs according to the country protocol. Further, opportunities to observe and/or practice identification of newborns with danger signs were very limited in the training curricula. Reinforcement of knowledge and skills through supervision was also very limited in program materials, with only Nepal and Uganda including assessment of knowledge of newborn danger signs and assessment of skills used for screening newborns (e.g. use of screening card and thermometer, counting of respiratory rates, etc.) as part of their standard supervision checklists. Systems for monitoring of referrals and follow-up of referral outcomes for newborns with danger signs were under-developed and poorly operationalized across studies.



³ Due to Malawi's national policies, health workers at first level facilities were not allowed to provide a full course of injectable antibiotics to treat newborn infection and could only refer newborns to a district hospital and as such were only trained in the recognition of danger signs

Table 3. Overview of programmatic approaches to address the three delays

Country & Study	Delay 1 – Recognition and Decision to Seek Care	Delay 2 – Reaching Appropriate Care	Delay 3 – Obtaining Adequate Care
Malawi CBMNC	<ul style="list-style-type: none"> • Trained HSAs to counsel mothers on newborn danger signs and care-seeking during pregnancy and postnatal home visits • Trained HSAs to screen and refer newborns with danger signs during postnatal home visits • Trained facility staff to counsel on newborn danger signs during ANC and PNC • Used various media channels (including radio messages) to disseminate information on newborn danger signs 	<ul style="list-style-type: none"> • Trained HSAs to establish community groups and encourage them to address transport issues (focus on delivery) • Brought care for LBW babies closer to home by training HSAs and first level facility staff to identify and manage preterm/LBW 	<ul style="list-style-type: none"> • Trained providers at first level health facilities to recognize newborn danger signs, provide first dose and refer • Trained and equipped providers at first level health facilities to provide KMC (ambulatory or inpatient)
Nepal CB-NCP	<ul style="list-style-type: none"> • Trained FCHVs to counsel mothers on newborn danger signs and care-seeking during pregnancy and postnatal home visits • Trained FCHVs in identification, classification, initial management and referral of newborn with danger signs • Trained mothers groups to raise awareness of danger signs and appropriate care-seeking • Trained first level facility staff to counsel on newborn danger signs during ANC and PNC • Broadcast ENC messages through local and national media (TV, radio and newspaper) and held a popular awareness event on healthy newborn care and care-seeking behavior • Encouraged FCHVs to accompany newborns to facility for care 	<ul style="list-style-type: none"> • Shifted appropriate care closer to home by training FCHVs to assess for newborn danger signs and to administer pre-referral dose of Cotrimoxazole; VHWs and MCHWs administer full course of injection gentamycin (previously could only refer) 	<ul style="list-style-type: none"> • Trained health providers at lowest level and referral level facilities to manage newborns with possible infection • Provided gentamycin to VHWs and MCHWs and Cotrimoxazole to FCHVs • Trained providers to classify and refer very low birth weight babies • Referral monitoring and counter-referral
Bangladesh CB-PNC	<ul style="list-style-type: none"> • Trained CHWs to counsel mothers on newborn danger signs during pregnancy visits • Trained informal cadre including village doctors on recognition of NB danger sign and referral • Trained CHWs in active case detection and referral in the first week after delivery • Trained first level facility staff to counsel on newborn danger signs during ANC and PNC • Encouraged stronger links between community and CHWs through use of cell phones and posters 	<ul style="list-style-type: none"> • Encouraged community leaders at monthly planning meetings to establish systems to refer mothers and newborns 	<ul style="list-style-type: none"> • Oriented facility based staff on interventions in community being implemented by the CHWs. • Advocated to improve supply of medicines to treat newborn infection • Advocated for CHW job descriptions to include planning and coordinating visits to improve staff availability.
Uganda UNEST	<ul style="list-style-type: none"> • Trained VHTs and facility staff to counsel mothers on newborn danger signs during pregnancy home visits and ANC • Identification and referral by VHTs during pregnancy and first week after delivery; encouraged VHTs to accompany referred newborns to facility • VHTs raised awareness on improved services for NBs at lower level facilities to encourage care-seeking • Mass media: documentary films, national newspaper articles, radio stories and internet content 	<ul style="list-style-type: none"> • Shifted care closer to home by ensuring first level facilities (HC II) could treat newborn infections • VHTs encouraged saving for transport to reach delivery and emergency services 	<ul style="list-style-type: none"> • Provided equipment and supplies (including drugs) to manage newborn infection to first level facilities • Trained 1st level providers on identification and management of NBs with danger signs and KMC • Encouraged facilities to offer 24 hour care and districts to provide drugs through routine PNC • Referral monitoring and counter-referral

Table 4. Analysis of interventions to address three delays to care for newborns with danger signs within selected community-based programs

Delay	Possible interventions	Malawi CBMNC	Nepal CB-NCP	Bangladesh CB-PNC	Uganda UNEST
1. Recognition of danger signs and decision to seek care	- Health communication to raise knowledge and awareness of danger signs and where to seek care	+++	+++	+++	+++
	- Detection of newborn danger signs through home visits by CHWs	+++	+++	+++	+++
	- Facilitated referral by CHWs	+	+++	++	+++
	- Improved communication and linkages with source of care	+	++	++	++
	- Financial incentives for seeking care	o	o	o	o
	- Increasing decision-making power of mother	o	o	o	o
2. Reaching an appropriate source of care	- Bringing appropriate care closer to community	+ (KMC only)	+++	o	++
	- Facilitated referral by CHWs	+	+++	++	+++
	- Mobilize/provide transport	+	+	+	+
	- Funds to cover or minimize costs	o	o	o	o
3. Obtaining adequate and appropriate treatment	- Provision of equipment and supplies for management of newborns with danger signs	+ (KMC only)	+++	+	++
	- Improving staff availability	+	+++	o	++
	- Ensuring cases are referred back to CHWs with follow up care instructions (counter-referral)	o	+++	o	+++
	- Improving staff capacity to manage newborns with danger signs through training and supervision	+	++	+	+
	- Referral monitoring for newborns	+	++	+	++

Rating system: +++ - Systematically addressed; ++ - Partially addressed; + - Weakly addressed/ad-hoc; o – not addressed at all

Table 5. Characteristics of services to manage newborns with danger signs available within the formal health system by level (bold text=services added during study)

Country	Element	System Level		
		Community	First level facility	First level referral
Malawi CBMNC	Facility Level and Provider	HSA's	Health Centre: 1 nurse midwife/clinical officers	District Hospital: Multiple doctors/nurses/clinical officers
	Distribution & Distance to Service	1/1000-3000 pop; ~up to 5km	1 facility/25000 pop; ~up to 25km	1 facility/ ~300000 pop (1-2/district); ~50km
	Newborn case management services	<ul style="list-style-type: none"> • Assessment • Referral 	<ul style="list-style-type: none"> • Assessment • Pre-referral treatment and referral • KMC – ambulatory (selected inpatient) 	<ul style="list-style-type: none"> • Assessment • Treatment with full course antibiotics • KMC (inpatient)
	Service availability	2-3 days/wk M-F (community); 2-3 days (facility)	Maternity services: 24hrs, 7 days/wk Other: 6 days; 8am-4pm	7 days/week; 24h/day
Nepal CB-NCP	Facility Level and Provider	FCHVs	Health Post: VHWs/MCHWs	Primary Health Care Centre: Multiple doctors/nurses/clinical officers
	Distribution	1/400-500 pop	1 post/6000-8000 pop	1 facility/13000-15500 pop
	Newborn case management services	<ul style="list-style-type: none"> • Assessment • Pre-referral treatment and referral 	<ul style="list-style-type: none"> • Assessment • Outpatient care • Treatment with full-course antibiotics 	<ul style="list-style-type: none"> • Assessment • Inpatient care • Treatment with full course antibiotics
	Service availability	Volunteer/as needed	6 days/week; 10am-5pm	6 days/week; 10am-5pm
Bangladesh CB-PNC	Facility Level and Provider	FWA/HA	Union Health and Family Welfare Centre: 2-3 FWV/SACMO	Upazila Health Complex: Multiple doctors/nurses/clinical officers *
	Distribution	FWA: 1/4-6000 pop HA: 1/8-9000 pop	1 facility/25000 pop (total 3,835 in country)	1 facility/0.25-0.35 million pop (total 415 in country)
	Newborn case management services	<ul style="list-style-type: none"> • Assessment • Referral 	<ul style="list-style-type: none"> • Assessment • Referral for treatment with antibiotics 	<ul style="list-style-type: none"> • Assessment • Treatment with full course antibiotics
	Service availability	6 days/week	6 days/week; 8am-2pm	7 days/week; 24h/day
Uganda UNEST	Facility Level and Provider – min. #	VHT	HC II: ~5 staff led by 1 enrolled nurse, 1 midwife	HC III: Multiple doctors/nurses/clinical officers (HC IV and 1 hospital with more staff) †
	Distribution	1-2/village (~1000 pop)	1 facility/parish (5000 pop)	1 facility/sub-country (~20-30000 pop)
	Newborn case management services	<ul style="list-style-type: none"> • Assessment • Referral 	<ul style="list-style-type: none"> • Assessment • Outpatient care • Treatment with full-course antibiotics‡ 	<ul style="list-style-type: none"> • Assessment • Inpatient care • Treatment with full course antibiotics • Full supportive care (including KMC)
	Service availability	During daytime home visits	Daytime hours	7 days/week; 24h/day

* The government has officially sanctioned posts for 8-11 doctors and 9-12 nurses per site but these are not yet present at facilities.

† HC III: ~15-20 staff led by 1 clinical officer, 1 enrolled nurse and 2 midwives.

‡ Policy on this has been changed but operationalizing it has been slow

Program results for care-seeking for newborns with danger signs

This section summarizes available data on prevalence of newborn danger signs and care-seeking for newborns with danger signs. Most information was captured through household surveys of women with live births in the 12 months prior to the survey. Data from comparison areas are included where available.

Prevalence of danger signs among newborns

The proportion of newborns reported to have exhibited at least one danger sign⁴ in intervention areas at endline was 21% in Malawi, 29% in Nepal, 41% in Bangladesh, and 50% in Uganda (Table 6). Fever was the main driver of the high proportion of newborns with reported danger signs in Uganda (43%) though the reasons for such high levels of fever are not clear. Fever was also the most commonly reported danger signs in Malawi, Nepal, and comparison areas of Bangladesh. Convulsions, hypothermia, and lethargy were the least common danger signs. Comparisons over time and between intervention and comparison areas do not demonstrate a clear pattern. In Bangladesh, more mothers reported that their newborn had experienced at least one danger sign in intervention areas versus comparison areas, and both areas were lower at endline than at baseline. There was no difference over time or between study and comparison areas in Uganda.

Table 6. Newborns experiencing danger signs by country

	Malawi ¹		Nepal		Bangladesh		Uganda	
	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline	
Sample size	900	625	615	I: 394 C: 394	I: 398 C: 396	I: 194 C: 201	I: 894 C: 893	
1. Difficulty feeding	3.2%	8.8%	7.3%	I: 5.6% C: 3.3%	I: 5.5% C: 4.8%	I: 19.6% C: 16.4%	I: 7.6% C: 8.4%	
2. Convulsions	0.7%	0.2%	0.3%	I: 1.5% C: 2.8%	I: 1.0% C: 0.5%	I: 2.1% C: 3.5%	I: 1.2% C: 1.1%	
3. Difficulty breathing (fast/chest in-drawing)	4.2%	10.4%	7.8%	I: 12.2% C: 9.1%	I: 11.3% C: 5.8%	I: 13.4% C: 17.4%	I: 11.7% C: 11.9%	
4. Fever	13.6%	14.2%	16.3%	I: 21.8% C: 24.6%	I: 13.6% C: 15.4%	I: 36.1% C: 39.3%	I: 42.7% C: 46.6%	
5. Hypothermia	3.7%	0.5%	1.0%	I: 4.6% C: 1.8%	I: 3.8% C: 2.5%	Same as fever ²	I: 3.0% C: 2.9%	
6. Movement only when stimulated/lethargy	2.6%	1.4%	2.9%	I: 3.1% C: 2.3%	I: 0.5% C: 0.51%	I: 4.1% C: 5.5%	I: 4.7% C: 5.8%	
7. Yellow soles (jaundice)	3.0%	6.4%	5.4%	I: 8.4% C: 6.4%	I: 5.3% C: 6.3%	I: 3.1% C: 3.0%	I: 2.5% C: 1.8%	
8. Signs of local infection – Umbilical cord/skin	1.3%	4.8%	10.7%	I: 23.4% C: 14.5%	I: 17.6% C: 8.6%	I: 8.3% C: 11.4%	I: 3.5% C: 3.8%	
9. Signs of local infection – Eyes	5.0%	1.3%	1.3%	I: 6.6% C: 4.6%	I: 6.3% C: 5.3%	NC	I: 1.9% C: 3.7%	
At least one of the above signs of newborn illness	23.4%	21.4%	28.8%	I: 52.3% C: 42.1%	I: 40.7% ^{†*} C: 33.8% [†]	I: 51.6% C: 57.2%	I: 50.0% C: 51.2%	

I=Intervention areas; C=Comparison areas; NC= Not Collected

[†] Statistically significant difference from baseline to endline at p<0.05.

* Statistically significant difference between intervention and comparison area at endline at p<0.05.

¹Women in Malawi were not asked at baseline if their newborns experienced danger signs.

²At baseline in Uganda, responses for fever/low body temperature were recorded as a single category

⁴ The list of collected danger signs varied across countries, so a standard and comparable list was selected based on WHO guidelines (WHO UNICEF 2012). Our list of newborn danger signs differs slightly from the WHO guidelines because fast breathing and chest in-drawing are combined into one indicator (difficulty breathing) and 'signs of local infection' is split into cord/skin infection and eye infection.

Care-seeking and treatment for newborns with danger signs

Levels of care-seeking and provider type: Care-seeking for newborns with signs of illness was high across studies at both baseline and endline and in intervention and comparison areas (Table 7). A majority of newborns with danger signs were taken to medically trained providers in intervention areas in Malawi (71% of all newborns with reported illness), Nepal (80%, or 98% if FCHVs are included), and Uganda (86%). In Bangladesh, most newborns were taken to unqualified providers at baseline; the type of provider was not collected at endline.

Table 7. Care-seeking for newborns with danger signs by country

	Malawi ¹	Nepal		Bangladesh		Uganda ¹
	Endline	Baseline	Endline	Baseline	Endline	Endline
# NB with suspected illness	211	134	177	I: 206 C: 166	I: 162 C: 134	I: 447 C: 457
Any care sought	82.9%	85.8%	98.9%	I: 82.0% C: 75.3%	I: 88.3% C: 92.5%	I: 94.2% C: 93.7%
Care sought from²						
CHW	7.6%	0.8%	18.6%	I: 0.0% C: 0.0%	NC	I: 0.5% C: 0.0%
Medically trained provider	70.6%	76.9%	79.7%	I: 32.0% C: 25.9%	NC	I: 85.9% C: 84.9%
Unqualified provider	2.4%	8.2%	0.6%	I: 53.9% C: 53.6%	NC	I: 6.9% C: 8.3%
Missing	4.3%	0%	0%	I: 0.0% C: 0.0%	NC	I: 6.7% C: 6.8%
Place of first care³						
Home	0.9%	NA	NA	I: 23.3% C: 9.6%	I: 16.7% C: 14.2%	NA
CHW home	NA	0%	13.0%	NA	NA	NA
Public health facility	64.0%	38.8%	62.2%	I: 12.1% C: 7.2%	I: 17.3% C: 16.4%	I: 43.2% C: 40.9%
Private health facility	9.5%	30.6%	17.0%	I: 12.6% C: 11.5%	I: 13.0% C: 14.2%	I: 26.9% C: 26.0%
Pharmacy/drug shop	2.8%	16.4%	1.1%	I: 18.9% C: 22.3%	I: 19.8% C: 30.6%	I: 23.3% C: 26.3%
Other	1.4%	0%	0%	I: 11.7% C: 21.7%	I: 21.6% C: 17.2%	I: 1.1% C: 0.2%
Missing	4.3%	0%	5.7%	I: 3.4% C: 3.0%	I: 0.0% C: 0.0%	I: 0.2% C: 0%
When care sought outside home⁴						
<=24 hours	46.9%	50.8%	74.0%	NC	I: 41.4% C: 40.3%	I: 67.8% C: 63.7%
25-48 hours	11.8%	14.2%	14.7%	NC	I: 11.1% C: 14.2%	I: 11.4% C: 13.1%
More than 48 hours	13.7%	15.7%	10.2%	NC	I: 15.4% C: 21.6%	I: 14.1% C: 16.0%
Missing	10.4%	5.2%	0%	NC	I: 0% C: 0%	I: 6.7% C: 7.2%
Sought care <=24 hours at a facility (public or private)⁵	41.2%	36.6%	67.8% [†]	NC	I: 20.4% C: 15.7%	I: 48.3% C: 44.4%

I=Intervention; C=Comparison; NC= Not Collected; NA=Not Applicable. [†] Statistically significant difference from baseline to endline at p<0.05. * Statistically significant difference between intervention and comparison at endline at p<0.05.

¹Women not asked about care-seeking at baseline.

²In Malawi, Uganda, and Bangladesh (BL) women were asked about all providers seen. In Nepal, women were asked about the first provider seen *outside the home*. Bangladesh endline did not collect provider.

³In Nepal, women were asked about the first place of care *outside the home*. In Uganda, 'home' was not an answer option. For Nepal, CHW home refers to home of FCHV.

⁴In Bangladesh, women asked when care was sought outside the home only if the first place of care was outside the home.

⁵Also includes 'FCHV home' in Nepal. There may be underreporting if the first place of care was not a facility, but the newborn was subsequently taken to a facility for care within 24 hours after onset of illness.

First place of care: In Malawi study areas the first place of care was usually a first-level public facility; few used private facilities or sought care at home. Public facilities were also usually the first point of care in CB-NCP implementation areas of Nepal, although the survey specifically asked only about the first place of care *outside the home*. There is some evidence of a shift in first place of care towards the public sector and away from private providers and pharmacies/drug shops in Nepal (62% first sought care from public facilities at endline compared to 39% at baseline, and only 1% went first to a pharmacy at endline compared to 16% at baseline). There was also a moderate increase in the role of FHCVs as initial providers (from 0% at baseline to 13% at endline). In Bangladesh, only 17% of newborns with danger signs were taken first to a public facility at endline in implementation areas; other places (including unqualified doctors) were the most common first place of care. This finding is similar to trends observed in a recent review of care-seeking for neonatal illness in South Asia [17]. Patterns of care-seeking were similar between intervention areas and comparison areas in Bangladesh and Uganda at baseline and endline.

Timeliness of care-seeking: The percent of newborns taken to a facility (public or private) within 24 hours after recognition of a danger sign was 41% in Malawi, 68% in Nepal, 20% in Bangladesh, and 48% in Uganda (in intervention areas at endline). These percentages are based on when care was sought at the first place of care outside the home. There may be underreporting, especially in Bangladesh, if the first place of care was not a facility but the newborn was quickly taken to a facility subsequently, within a 24 hour period. In Nepal, the proportion of newborns taken to a facility within 24 hours of the onset of danger signs nearly doubled between baseline and endline (from 37% to 68%).

Treatment for newborn infection: The CB-NCP study in Nepal captured information on treatment of newborn infection. The proportion of newborns who received Cotrimoxazole at first point of care increased significantly from 3% at baseline to 42% at endline among those taken to either a skilled provider (doctor/nurse/auxiliary nurse midwife), trained provider (health assistant/auxiliary health worker/maternal child health worker/village health worker), or FCHV. At endline, FCHVs were the source of Cotrimoxazole for about one third of these cases. Nearly half (47%) of the sick newborns reportedly received gentamycin injection at the first point of care (data not collected at baseline).



DISCUSSION AND RECOMMENDATIONS

This analysis of four community-based programs that addressed access to care for newborns with danger signs using existing health systems highlights some lessons that can help inform future programming. We adapted and applied the Thaddeus and Maine three delays model as a lens to identify strengths and weaknesses in program designs and approaches. Our analysis revealed several issues related to the comprehensive management of newborn danger signs that we believe have implications for program design and implementation.

- **Challenges in applying intensive models from research studies to existing systems:** The programs reviewed here initially set out to replicate the model tested in India's SEARCH study, which showed that CHWs could be trained to successfully manage newborns with signs of possible infection and complications of prematurity. The SEARCH study model trained CHWs to deliver a full package of services to manage newborn danger signs within the community, including home visits to assess newborns using a standard algorithm, treatment of potential infection with a full course of injectable antibiotics and management of LBW babies with special sleeping bags, improving both demand and supply simultaneously. Delivering an intensive package was possible in a very controlled research setting that allowed close supervision of a relatively small number of CHWs within a supportive policy environment. In an effort to establish sustainability from the outset, community-based newborn care programs in Malawi, Bangladesh, Nepal and Uganda were incorporated into existing systems. However, policy and operational constraints in most settings meant treatment for newborns with suspected infection and low birth weight babies could only be delivered through health facilities and not by community health workers. Only in Nepal was case management for possible newborn infection introduced closer to the community level, with FCHVs initiating treatment and nearby health posts serving relatively small catchment populations offering full course treatment. This intervention was possible in large part due to the success of previous research done in Nepal's Morang district with engagement of the Ministry of Health, which trained FCHVs to identify newborns with possible serious infection, initiate treatment and then refer to nearby health posts for complete treatment [18]. In Uganda, UNEST was able to influence policy change that allowed staff at first-level facilities to administer full course treatment of injectable antibiotics for newborns with signs of possible severe infection (whereas previously they could only refer). It should be noted, however, that training and equipping of health workers to implement this policy has been poorly rolled out to date and remains an area for quality improvement.
- **Importance of balancing supply and demand:** As community-based programs faced limits on their ability to train and supervise CHWs to treat newborns with danger signs, they focused on training CHWs to conduct home visits to promote essential newborn care, sensitize family members on how to recognize danger signs and promptly seek care, and to assess and refer newborns with danger signs to the nearest point where appropriate case management was available. In most cases, program interventions were weighted towards increasing demand for services without a corresponding attention to ensure provision of appropriate care at facility level. Programs in Malawi and Bangladesh were unable to shift full treatment for newborn infection to even first level facilities. Malawi, however, was able to increase the availability of KMC services at lower level facilities. While these community-based programs focused on the community level and anticipated implementing a comprehensive package through CHWs based on evidence from research studies, the implementing reality was far different; this may be a common experience in other countries and demonstrates the need to address the availability and quality of services within existing service delivery platforms so that the local service delivery system adequately meets the needs of the population. The three delays model should be used as a planning tool to ensure that optimal balance between supply and demand can be delivered within an existing health system and to ensure linkages between community and facility levels.

- Systematically addressing barriers to reaching care:** Although barriers such as transport to facilities were acknowledged as delaying access to care, programs approaches were mostly *ad hoc* and no concrete plans were made to facilitate transporting newborns with danger signs from community to facility or from first level to referral facilities or to encourage families to save money in case of newborn illness. While programs relied heavily on counseling through CHW home visits, more could have been done using community mobilization and mass media strategies around care-seeking for newborn danger signs, as has often done to promote facility deliveries. Existing health education and community mobilization efforts under community-based packages to improve birth preparedness (identifying place of care, saving money, identifying transport, etc.) might be extended to more explicitly focus on helping families plan for addressing sick newborns as well.
- Need for standardized approaches to measurement of care-seeking and treatment for newborns with danger signs:** There are no standard indicators for care-seeking or treatment for newborn danger signs. As a result, data are only available from studies or programs with limited comparability. Agreement on a menu of standardized indicators that can be tailored to a given setting would increase our understanding of care-seeking patterns and the type of care that sick newborns actually receive. Developing such indicators will require arriving at consensus on the most important aspects of care-seeking and treatment. For example, is it most important to know about the first point of care or are we interested in all skilled care received? Are we interested in care-seeking and treatment for only the most serious episode, or all episodes of illness during the newborn period? There also is need to improve quality of information collected routinely through the health system, to ensure this information is reported to sub-national and national levels and, especially, is used to improve service coverage and quality.
- Stronger training packages and reinforcement of knowledge and skills:** All programs included training of health workers on aspects of identification and management of newborn danger signs. However, a review of the training and supervision materials revealed some important gaps in development, assessment and reinforcement of these competencies. Future programs should ensure that training programs include clinical practice on real cases or video/simulated cases in identification and management of newborn danger signs and that these competencies are assessed during the training. Ongoing supervision of service provision should include assessment and reinforcement of these knowledge and skills. As a relatively small proportion of newborns (~10-15%) will experience danger signs, health workers should be made to feel confident in normal presentation; case scenarios can be used to assess health worker abilities and to provide targeted coaching/refresher training as needed.
- Attention to treatment completion:** This report focused on initial care-seeking for newborns with danger signs. In many of these cases, prolonged treatment will be necessary. For example, treatment of sepsis usually requires injectable antibiotics for 7 days; KMC should be provided until at least the 40th week of the infant's gestational age. These treatment schedules may place a large burden on families due to direct financial and opportunity costs. There may be other difficulties such as cultural insensitivities at the facility or lack of a place for the family to stay if the newborn is admitted. In addition, a family may opt to stop treatment if improvements in the newborn's health lead them to believe the child has been cured before treatment is complete. Facilities often do not have systems for tracking treatment completion, making it difficult to follow-up and trace newborns that have treatment lapses. There is need for better understanding and addressing of barriers to completion, because improving access to initiation of treatment alone will not ensure that sick newborns receive the care needed to save lives, if treatment completion is inadequate.

ANNEX I – Documents Reviewed

Report Type	Malawi	Nepal	Bangladesh	Uganda
Proposal and Planning Documents	<ul style="list-style-type: none"> Community-based Maternal Newborn Care Programme: Full Proposal – Sept 2007 	<ul style="list-style-type: none"> Eight Pilot districts of Community Based Newborn Care Program (CB-NCP): Monitoring and Evaluation Plan – Aug 2009 	<ul style="list-style-type: none"> Community Based Postnatal Care Package: Designing an Effectiveness Trial in Bangladesh – Oct 2007 	<ul style="list-style-type: none"> Improving Newborn Health and Survival in Uganda Through a Community Based Intervention Linked to Health Facilities: Full Proposal – Nov 2007
Baseline and Endline Reports	<ul style="list-style-type: none"> Community Based Maternal and Newborn Care in Three Districts of Malawi. Household Survey Findings : Baseline and Endline – Jan 2012 	<ul style="list-style-type: none"> A Baseline Survey on Community Based Newborn Care Package in Two Districts in Rural Nepal – April 2009 Baseline & Endline Survey Results - Comparative Report. Community Based Newborn Care Programme: Bardiya district – Aug 2011 	<ul style="list-style-type: none"> Baseline PNC Household Report – Dec 2008 Household Survey Report – Baseline and Endline Findings – Aug 2011 	<ul style="list-style-type: none"> The Uganda Newborn Survival Study: A Draft Report of Formative Research Findings in Eastern Uganda – Nov 2009 The Uganda Newborn Study Endline Report – June 2012
End of Study and End of Project Reports	<ul style="list-style-type: none"> Community Based Maternal and Newborn Care Program: End of Study Report (Draft) – Dec 2011 Malawi Newborn Health Program – End of Program Report (Draft) – Oct 2011 	<ul style="list-style-type: none"> End of Project Report Nepal – Dec 2011 Assessment of the Community-Based Newborn Care Package in Nepal – July 2012 	<ul style="list-style-type: none"> Documentation of SNL Research: PNC OR and PNC Expansion. End of Study Report: “Community based PNC study in Bangladesh” – April 2011 End of Country Program Report Bangladesh – September 2011 	<ul style="list-style-type: none"> Saving Newborn Lives End of Country Program Report Outline - Uganda
Training Materials and Job Aids	<ul style="list-style-type: none"> Trainers Manual in Integrated Maternal and Neonatal Care 	<ul style="list-style-type: none"> MINI training materials – FCHV Training Facilitators Guide. 	<ul style="list-style-type: none"> Community worker manual for maternal and newborn care 	<ul style="list-style-type: none"> Trainers Manual for Community-Based Newborn Care
Other Reports	<ul style="list-style-type: none"> Malawi Health Services Assessment Findings – Jan 2012 	<ul style="list-style-type: none"> CB-NCP After Training Follow-up Report: Competency of Service Provider and Peripheral Health Facility to Deliver the Newborn Care 	<ul style="list-style-type: none"> Assessing the quality of community based postnatal care in Bangladesh – Aug 2010 	<ul style="list-style-type: none"> Improving Newborn Survival: Experiences from the Integration of Community Health Workers in Service Delivery in Uganda

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