Neonatal Survival 3

Systematic scaling up of neonatal care in countries

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Every year about 70% of neonatal deaths (almost 3 million) happen because effective yet simple interventions do not reach those most in need. Coverage of interventions is low, progress in scaling up is slow, and inequity is high, especially for skilled clinical interventions. Situations vary between and within countries, and there is no single solution to saving lives of newborn babies. To scale up neonatal care, two interlinked processes are required: a systematic, data-driven decision-making process, and a participatory, rights-based policy process. The first step is to assess the situation and create a policy environment conducive to neonatal health. The next step is to achieve optimum care of newborn infants within health system constraints; in the absence of strong clinical services, programmes can start with family and community care and outreach services. Addressing missed opportunities within the limitations of health systems, and integrating care of newborn children into existing programmes—eg, safe motherhood and integrated management of child survival initiatives—reduces deaths at a low marginal cost. Scaling up of clinical care is a challenge but necessary if maximum effect and equity are to be achieved in neonatal health, and maternal deaths are to be reduced. This step involves systematically strengthening supply of, and demand for, services. Such a phased programmatic implementation builds momentum by reaching achievable targets early on, while building stronger health systems over the longer term. Purposeful orientation towards the poor is vital. Monitoring progress and effect is essential to refining strategies. National aims to reduce neonatal deaths should be set, and interventions incorporated into national plans and existing programmes.

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Every year, 4 million newborn babies die in the first month of life, 99% in low-income and middle-income countries.[1] Babies born in the poorest countries have the highest risk of death, and within these countries the neonatal mortality rate (NMR) among the poorest families is 19–44% higher than among the richest (regional averages based on 48 demographic and health surveys [DHS], 1995–2002). Up to 70% of deaths could be prevented if proven interventions were implemented effectively with high coverage where they are needed most[2]—a modern-day example of the inverse care law (figure 1).[3] Although universal recommendations can be given for evidence-based interventions, the delivery strategy for a particular intervention varies across settings[4] and should be adapted to local reality.[5] Health care can be delivered through population-oriented outreach services, family-oriented and community-oriented services, and individual-oriented clinical services.[6]

Interventions that have the greatest effect on neonatal deaths are less dependent on technology and commodities than on people with skills. Ideally, every woman should be able to choose to deliver with a skilled attendant present, and if either the mother or her newborn baby have complications, both have the right to access safe professional care. In high-income countries, this ideal exists. In south Asia and sub-Saharan Africa, however, where two-thirds of neonatal (and maternal) deaths happen, only about a third of women deliver in the presence of a skilled attendant. Coverage of postnatal care is lower still, although comparable DHS data are available for only a handful of countries. The average number of mothers giving birth with a skilled attendant in Africa has

risen by 0·2% per year for the past decade (http://www.childinfo.org). At this rate, by the year 2015 the average skilled attendant coverage in Africa will still be less than 50%. Rates of caesarean sections are low in the highest mortality countries in Africa.[7] Clinical care is even less equitable than antenatal care: within poor countries the richest women have two-times to three-times higher antenatal care coverage than the poorest, but about six-times higher skilled attendance (figure 1). Thus, coverage is low, progress is slow, and inequity is high.

In countries with low coverage of skilled clinical care for maternal and child health, the staff, infrastructure, and support needed to achieve universal coverage are
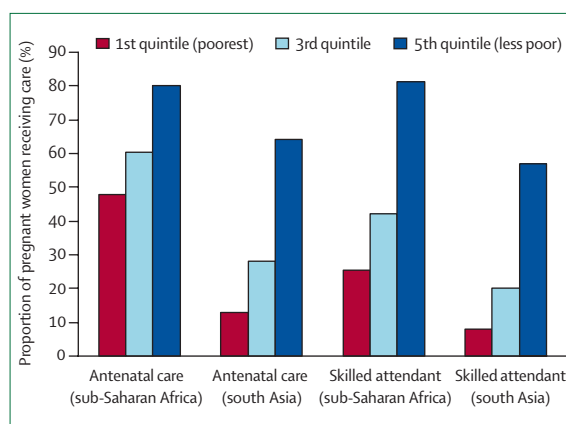

Figure 1: **Variation across quintiles of socioeconomic status in regional average coverage for antenatal care (≥3 visits) and skilled attendance at birth**
Analysis of DHS data in 53 countries. Based on data in The Wealth Gap in Health. Washington: Population Reference Bureau, 2004.

attainable with major investments, but not in the short term.[8] Increasing coverage depends on new commitment to a massive increase in the numbers of midwives and doctors as well as innovative approaches to retaining staff, especially in poor rural communities. Even with many new resources, there are no shortcuts: achieving universal coverage of skilled care will take decades. Meanwhile, most neonatal deaths continue to arise in underserved and poor communities—the same communities that will wait the longest for access to skilled care.

In this third paper of the neonatal survival series, we use an adaptation of the four-step management cycle as a guide for scaling up care for newborn babies in different settings (panel 1).[9] Two parallel, inter-dependent processes are needed: a systematic prioritisation and management process, and a rights-based political process, including identification and engagement of key stakeholders. A rights-based approach is necessary to focus attention on tailoring services to the needs of the poor and empowering mothers and communities to adopt good health practices and demand quality care.[5,6,10] This notion involves a major shift from neonatal care as charity, to a view that holds politicians and providers accountable for the health of babies. We describe the processes with case studies from two countries (Ethiopia and Madagascar) and one large Indian State (Gujarat), and include estimates of the effect and cost of the strategies selected by the governments in these settings (panel 2).[2,10,12,13]

Step 1: assess situation and create good policy environment

Neonatal survival does not have a one-size-fits-all solution.[14] There is variation between and even within countries; the numbers and causes of neonatal deaths, the capacity of the health system, and the obstacles faced and resources available vary greatly.

Assess the situation

We have distinguished four broad settings for neonatal health on the basis of NMR (table 1).[15] This simple classification could be applied to national and sub-national analyses—for example, different states in India represent very different settings, and even within one state, the urban and rural populations can differ greatly. The causes of neonatal mortality vary between (and within) countries and are closely correlated to NMR.[1] In very high NMR settings, almost 50% of neonatal deaths are due to infections, with a median of 13% due to tetanus—these causes of death are the most feasible to address immediately. In the absence of cause-of-death

	Mortality setting			
	NMR >45	**NMR 30–45**	**NMR 15–29**	**NMR <15**
Approximate proportion of global neonatal deaths (%)	30%	45%	20%	5%
Place of birth (median % births in health facility)	Mainly home (33%)	Mix of home and health facility (48%)	Most in health facility (65%)	Almost exclusively in health facility (98%)
Service delivery situation				
Clinical	<30% skilled attendance (median 41%) Limited emergency obstetric and neonatal care	30–60% skilled attendance (median 50%) Moderate coverage, but poor access and affordability	61–95% skilled attendance (median 85%) Moderate to high coverage, but inequities exist and quality is variable, especially for more complex care	>95% skilled attendance (median 99%) Universal coverage and increasing coverage with intensive care
Outreach	Limited coverage with antenatal care (median 66%), little postnatal care	Moderate to high coverage of antenatal care (median 77%)	High coverage (median 82%) but quality might be uneven; inequities remain	High coverage (median 98%) and reliable quality
Community*	Traditional birth attendants or no attendants Other cadres of community health/nutrition workers might exist but usually not trained in neonatal care Lack of community-based organisations Unsafe traditional practices might be common	Traditional birth attendants, community health/nutrition workers, or auxiliary midwives available, but might not be optimally involved in neonatal care Weak community-based organisations Unsafe traditional practices less common	Community health/nutrition workers, traditional birth attendants, and auxiliary midwives work as partners/ facilitators Strong community-based organisations	Health visitors and other home-based health promoters Unhealthy individual behaviours might be prevalent (eg, smoking)

*Cadres and actors at community level might vary even within countries. Data from reference 15 and from unpublished work (VKP).

Table 1: Variation in health system coverage and capacity and functioning across settings with different NMRs (based on 192 countries)

data for neonates, the degree of NMR could act as a simple surrogate for classification of the major causes of death, thus guiding prioritisation of interventions. Three-quarters of neonatal deaths happen in countries with an NMR greater than 30 (table 1). The settings with high NMR and low coverage of skilled care at delivery are the most challenging, and yet present the greatest opportunities to save neonatal lives.

When designing health-care programmes, the strengths and weaknesses of the health system and the societal context matter as much as the epidemiology of neonatal mortality; yet these factors are often not adequately assessed or addressed.[16] Knowledge of the coverage and quality of health care,[9] as well as home neonatal care practices and underlying cultural beliefs,[17] are essential to programme success. Barriers to care involve supply factors—eg, access, human resources, commodities, quality of care—and demand factors—eg, affordability, acceptability, compliance. In very high NMR settings, coverage of clinical care, such as skilled delivery and emergency obstetric and neonatal care, is lacking (table 1). Specific poor and marginalised groups might be excluded due to acceptability or affordability barriers, or lack of information or transport. Ethiopia (panel 3, figure 2) is an example of a setting with a very high NMR (52 per 1000 livebirths) and very low coverage of care. Although almost 40% of the population lives within 5 km of a staffed health clinic, only 5% of women have skilled care at delivery. Clearly, although access is a problem for 60% of the population, even when

accessible, poverty and low demand for care limit use of services. In the poorest quintile, only 1% of women deliver with a skilled attendant present, compared with 25% in the richest quintile. Madagascar (panel 4, figure 3) and Gujarat State, India (panel 5, figure 4), are both examples of settings with high NMRs (34 and 40 per 1000, respectively), yet their health-system coverage, obstacles, and challenges are very different. In Madagascar, coverage of obstetric care is much lower than that of antenatal care, largely because of a shortage of skilled staff. In Gujarat State, skilled attendance coverage is fairly high, but has stagnated, and the key obstacle to care is affordability for the poor. In every setting, discussion with local experts, health staff, and community representatives is important to identify the specific barriers and to discuss strategies to overcome them.[9]

Clinical versus community care: a conflict?
More than 60 million women deliver without skilled care every year. Meanwhile, the pendulum of global policy swings, detracting from progress in both skilled facility-based care and community-based care. The 1970s and 1980s saw a rise in primary health care and mass training of community health workers and traditional birth attendants, with little focus on skilled care. Often traditional birth attendants were trained briefly and then left unsupervised, without links to a referral system. A meta-analysis[18] of mainly observational studies notes a small decrease in perinatal mortality (8%) and birth

Panel 3: Ethiopia—providing interventions through outreach and community services while strengthening clinical care

Step 1: Assess the situation for neonatal health and create a policy environment conducive to neonatal health
Ethiopia is one of the poorest countries in the world, with a gross domestic product per person of US$100—less than half sub-Saharan Africa's average. Public expenditure on health is among the lowest in the world with government and donor spending about $2·7 per person per year. Neonatal deaths account for 29% of child deaths, some 135 000 per year, with an NMR of 52 per 1000 livebirths. Only 6% of women deliver with a skilled attendant, and 8% receive postnatal or neonatal care within 48 h of delivery. The poor and those in rural areas have even lower coverage. There is a shortage of health professionals. Obstetric services are often unused even when accessible because of their high cost and low acceptability (most health workers are men). In 2004, the government and major stakeholders held a National Partnership Conference to agree on a plan to scale up child survival interventions. Use of the marginal budgeting for bottlenecks (MBB) method has been part of this process.

Step 2: Achieve optimum neonatal care within the constraints of the situation
The government has designed a health services extension package, deploying two female health extension workers (HEW) to every kebele (commune of 5000 inhabitants), all having received a year of training. The HEW's main responsibilities are for maternal and child-health interventions, such as immunisation, micronutrient supplementation, and family planning, but other public-health and clinical responsibilities are included. A health promoter—one primary school graduate for 50 families—will assist the HEW to encourage healthy family practices, including home neonatal care and breastfeeding. During the first 3 years, the coverage of HEWs and health promoters will be progressively scaled up.

Step 3: Systematically scale up neonatal care
Medium-term to long-term strategies include the upgrading of clinical-care services, including increased deployment of midwives and improved obstetric care and clinical care of ill neonates and children.

Step 4: Anticipated coverage, effect, and cost
The MBB output shown in figure 2 indicates the predicted effect and cost per person of a series of phased packages of care with interventions to reduce child deaths, some of which address neonatal deaths. Over the first 8 years, scaling up of the health services extension package and community promoters package, with some upgrading of clinical services, is predicted to cost more than $4 per person per year—potentially resulting in a greater than 30% reduction in NMR mostly attributable to improved behaviours, such as clean delivery and exclusive breastfeeding. Outreach services alone (especially tetanus toxoid vaccination) would reduce the NMR by less than 10%. The expansion of clinical primary care from 2012–15 increases expected NMR effect to almost 50%. The estimated additional cost of $8–9 per person per year represents a tripling of current spending on health of $2·7 by the Ethiopian government and donors. This scenario allows the achievement of MDG-4 (two-thirds reduction in mortality rate of children aged younger than 5 years between 1990 and 2015), but is expected to reduce the maternal mortality ratio (MMR) by only a quarter by 2015. Achieving the MMR MDG will depend on additional substantial expansion of clinical referral services that take time to train and deploy additional health professionals and expand the hospital and road infrastructure, and the costs rise to more than $10 per person per year.
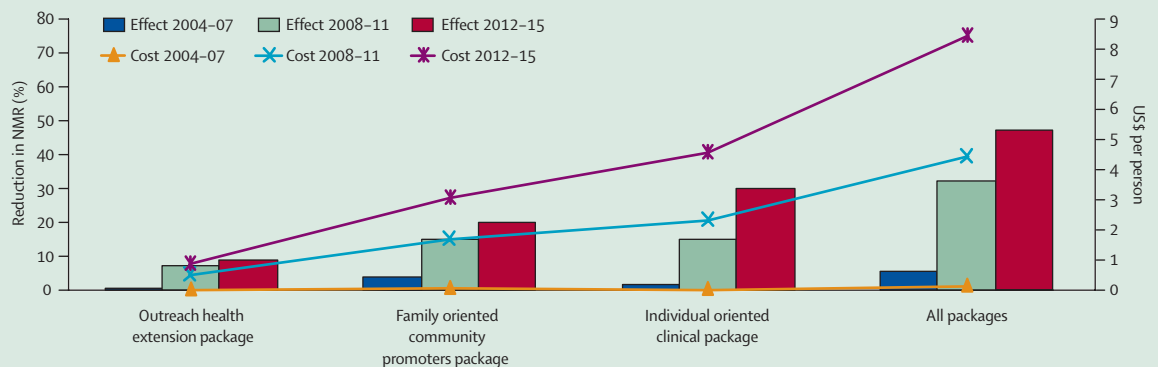
Figure 2: Projected cost and reduction in neonatal mortality associated with phased implementation of three service delivery packages in Ethiopia, 2004–15

asphyxia-specific neonatal mortality (11%) in those cared for by trained traditional birth attendants, but there is more uncertainty in assessing any effect on maternal outcomes. Some countries, such as Malaysia, used training for traditional birth attendants as a stepping-stone towards skilled care; others did not progress from that point.[19] By the end of the 1990s, interest in community health systems fell and global policy refocused almost exclusively on the promotion of skilled care in childbirth. Governments were advised to stop

training traditional birth attendants, since this factor was seen as ineffective and impeding investment in skilled care. In these policy shifts, the losers are today's poor women and children, who have the highest mortality risk, yet face deteriorating community-health systems and weak clinical-care systems.

Conflict can be transformed into progress. Community and clinical care are both included in the definition of health systems.[16] With phased programme planning, outreach and family-community services can be effective in ensuring access of the poor to basic services while professional clinical care is being strengthened and made more equitable. Furthermore, strong community services can promote demand for skilled care.[20] Indeed, integrated management of childhood illness (IMCI) assessments suggest that clinical system strengthening or community activities alone have little effect—the greatest success comes when both are linked.[4] Similarly, findings of studies that show a great effect on NMR at family-community level also have health system strengthening[20–22] or build a parallel health system at the community level to provide clinical care.[23]

Few countries with a large burden of neonatal mortality have a neonatal health strategy. Political commitment at national level is essential to sustained progress. Country obligations to meet the MDGs provide a timely trigger to initiate policy dialogue.[5] Strong leadership is needed to integrate neonatal health into national plans and funding cycles—eg, poverty reduction strategies and credits—or other national opportunities such as the medium term expenditure framework, which Madagascar used (panel 3), and to link between programmes that do not usually collaborate. The decision-making level (national, subnational, or district) will identify which key stakeholders need to be engaged, possibly including: ministries of health, finance, or planning; health professionals; donors; and the private sector and community members. In 2002, the Government of Nepal developed a national newborn health strategy plan to the year 2017 through a consultative process, involving representatives from diverse backgrounds—eg, neonatology, safe motherhood, and community mobilisation.[25] In India, the National Neonatology Forum raised the visibility of neonatal health issues through publications, expert meetings, engagement of national policymakers, and a successful neonatal resuscitation programme,[25] resulting in the inclusion of neonatal care in the national child survival and safe motherhood programme in 1992.[26] Although strong leaders are important, the power of civil society, including the press, should not be ignored. Community empowerment should be a cornerstone of programme design.[9] Involving and empowering communities—not merely targeting them—seems to magnify the effect of interventions[20,23] and increases accountability of clinical care providers.[6]

Panel 4: Madagascar—accelerating progress towards MDG-4 by strengthening neonatal care

Step 1: Assess the situation for neonatal health and create a policy environment conducive to neonatal health

Madagascar has a gross domestic product of US$260 per person. Government health expenditure is low at $2·6 per person per year. Between 1997 and 2004 the mortality rate in children younger than age 5 fell from 142 to 94 (34%), but the NMR only fell from 41 to 34 (17%). A third of deaths in children younger than age 5 years are neonatal—some 24 000 a year—increasing policy attention on neonatal health care. National child survival strategies are being revised, to focus especially on neonatal survival and malaria. Although national antenatal care coverage is 60%, development of clinical obstetric care remains limited. In 2003, only 23% of primary health centres were providing basic emergency obstetric care and only 17% of the second level referral hospitals had comprehensive obstetric care, mainly because of a lack of specialised staff. Madagascar's nursing and medical schools do not produce sufficient staff. Most specialists reside in the cities and many leave the country to work overseas. Planning for the Madagascar medium term expenditure framework (MTEF) presents a funding opportunity to integrate a neonatal health strategy. The government has undertaken provincial consultations to refine national policies, and adapt these to provincial level. The marginal budgeting for bottlenecks (MBB) method has been part of this process since 2002, involving stakeholders in examination of district-level data.

Step 2: Achieve optimum neonatal care within the constraints of the situation

In view of the lack of skilled personnel, priority has been given to strengthening outreach strategies with an emphasis on antenatal care, including tetanus toxoid immunisation. The introduction of community IMCI provides opportunities to incorporate neonatal sepsis management, as well as to promote healthy family behaviours.

Step 3: Systematically scale up neonatal care

With the MBB method, key obstacles in supply and demand were identified and targets set for improved coverage for 2006 and 2011. Traditional birth attendants are an important part of many communities and by linking them to the health system, including on-site training at health facilities and increased accessibility to equipped health centres, the government aims to encourage increased coverage of skilled attendants.

Step 4: Anticipated coverage, effect, and cost

Figure 3 shows how the achievement of MDG-4 in Madagascar will depend on an additional $5 per person per year between 2011 and 2015 and is expected to reduce NMR by almost half. The maternal mortality ratio (MMR) is expected to fall by only one third, however, since outreach and family-community care is more effective at reducing neonatal and child mortality than maternal mortality rates.
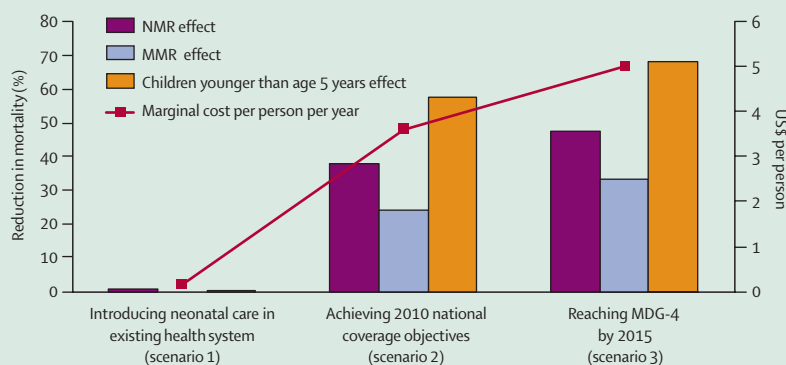

Figure 3: Projected cost and reduction in neonatal, child, and maternal mortality associated with phased implementation of neonatal care in Madagascar, 2004–15

Step 1: Assess the situation for neonatal health and create a policy environment conducive to neonatal health
Although the NMR for India is 43 per 1000 livebirths, there is considerable variation by state from 14 in Kerala to 55 in Madhya Pradesh. The NMR for Gujarat State is 40, close to the national average for India. Gross domestic product is US$447 per person and national government health expenditure is $5 per person per year. The main challenge for neonatal health in Gujarat is stagnation in the coverage rates of skilled attendance (at 54%) and limited geographical access in some districts. With the launch of the second 5-year phase of the national reproductive and child health (RCH-II) programme, there is an opportunity to strengthen strategies and increase resources to scale up neonatal health activities. Gujarat State has used the marginal budgeting for bottlenecks (MBB) method as part of their planning process since November, 2003; stakeholders have reviewed interventions and prioritised those with the highest expected effect.

Step 2: Achieve optimum neonatal care within the constraints of the situation
The priority interventions identified are to promote healthy household and community behaviours, and strengthen emergency obstetric care and emergency neonatal care. This action is being implemented in UNICEF's border district cluster strategy by improving the subcentre degree of care through strengthening and integrating existing health and nutrition activities.

Step 3: Systematically scale up neonatal care
IMNCI is being scaled up, and emphasises at least three home visits within the first 10 days of life to promote exclusive breastfeeding, early recognition of illness, and timely management of complications. Furthermore, private sector involvement is planned, with the state government purchasing insurance to increase use of skilled attendants at birth.

Step 4: Anticipated coverage, effect, and cost
Figure 4 shows how the achievement of MDG-4 in Gujarat is predicted to depend on an additional $5 per person per year between 2011 and 2015, but is expected to reduce NMR by two-thirds and the maternal mortality ratio (MMR) by almost half, mainly through strengthening of clinical services.
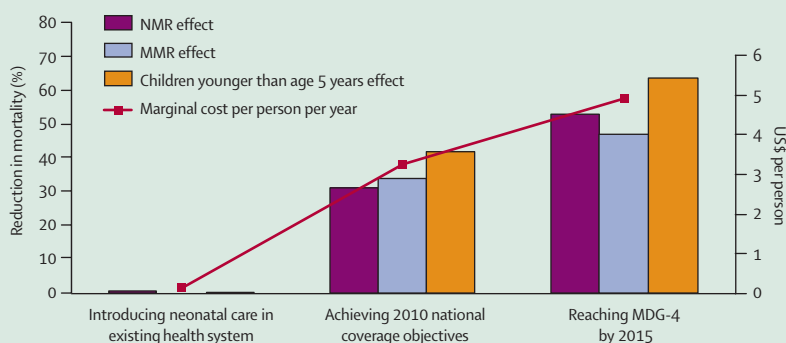

Figure 4: Projected cost and reduction in neonatal, child, and maternal mortality associated with phased implementation of strategies to increase coverage with skilled maternal and neonatal care in Gujarat

Step 2: achieve optimum neonatal care within system constraints

Programmes at any level—local, national, or international—depend on effective management.[9] Amounts of maternal and neonatal health funding are inadequate for the size of the problem, further emphasising the need for data-driven prioritisation and efficient programme management. A phased approach to building a health system starts with the most achievable mortality reduction strategies, such as outreach campaigns for tetanus toxoid coverage, and progresses to more comprehensive community and outreach packages, while building steadily towards higher coverage and quality of skilled clinical care (table 2).[14,15,27] In the long term, the focus shifts to quality and equity of skilled care in a stronger health system, including comprehensive emergency obstetric and neonatal care. The details of the adaptation process vary from place to place, but common principles can be identified.

Start with outreach or family-community care
Beginning with outreach and family-community activities adapted to the local context might be the most feasible option and bring early success in saving neonatal lives.[2] When implementing, adaptation of strategies is needed to achieve optimum effect, and can take various forms, including altering the service delivery approach or the cadre(s) of worker involved. For example, most recommendations stipulate the treatment of neonatal infections with intravenous antibiotics in a health facility. However, oral antibiotics have been used for neonatal pneumonia at the community level, and findings of a meta-analysis[28] indicate a subsequent 27% reduction in NMR. This approach is now part of community-based IMCI in India and Madagascar. The use of injectable antibiotics at community level is controversial, but warrants further study in view of the potential effect.[29] Where skilled personnel are scarce, use of other cadres of workers for specific tasks might be possible; in some countries, for example, medical assistants do caesarean sections.[30] Another strategy is to combine skills across teams. For instance, community-based birthing homes staffed by traditional birth attendants and supervised by skilled attendants raise coverage of skilled care over time.[19] Bringing traditional birth attendants into facilities as part of their training increased emergency obstetric referrals in Brazil.[31] Community-based workers can also collaborate as a team—for example, in Gadchiroli, India, traditional birth attendants have primary responsibility for the mother whereas a village health worker is responsible for the newborn baby.[23]

A specific cadre of community-based health workers capable of effectively addressing neonatal health might or might not exist (table 1). An important question is whether expanded availability of skilled care could be accomplished by retraining existing community workers, or whether a new cadre of workers needs to be trained.[1] Ethiopia has decided on a new multipurpose family-level worker (panel 3). The effort and expense of training new community health workers and the necessity for careful supervision and strong referral systems and the costs they entail should not be

	Mortality setting			
	NMR >45	NMR 30–45	NMR 15–29	NMR <15
Immediate strategies				
Principles	Build on outreach services; focus on high priority family behaviours; start strengthening at least district level facilities	Further strengthen outreach services and family and community care; increase coverage of skilled care; improve services in district and sub-district level facilities	Universalise outreach and family and community care as well as skilled care; strengthen care in facilities down to the first referral level	Ensure equity; promote quality; monitor and improve long-term outcomes after neonatal complications
Outreach	Increase coverage of maternal TT2; consider TT2 campaigns; provide family planning	Strengthen antenatal care (increase coverage, introduce standards of care, improve supply of commodities)	Achieve full coverage with antenatal care targeting unreached populations; consider introducing additional antenatal care interventions[2]	Provide close-to-client care and continuity of personnel
Family and community	Consider social marketing of clean delivery kits; teach TBAs clean delivery practices and appropriate referral (where they provide care at delivery); discourage harmful practices (eg, cow dung on the cord); promote demand for care (eg, women's groups); introduce family-community care (consider home visiting to promote breastfeeding, thermal care, clean cord care, extra care for low birthweight infant)	Continue to promote demand for care; strengthen family-community care and identify specific behavioural targets such as increasing the practice of exclusive breastfeeding to 6 months of age; consider community-based case management for pneumonia	Continue to promote healthy home behaviours and care seeking	Develop community approaches to address unhealthy behaviours such as smoking and drug abuse
Clinical	Introduce emergency obstetric care and emergency neonatal care, at least in district hospitals	Increase skilled attendance; ensure emergency obstetric and neonatal care at district and sub-district level facilities; develop comprehensive obstetric and neonatal care at referral hospitals; strengthen referral system and links between communities and facilities	Attain full coverage with skilled attendance, targeting unreached populations; ensure emergency obstetric and neonatal care at peripheral facilities; develop comprehensive obstetric and neonatal care at district hospitals	Achieve full coverage with clinical care, including intensive neonatal care, addressing inequities; improve the clinical quality of care and promote family-friendly care
Medium-term and long-term strategies				
Principles	Develop plans to increase human resources, finances, and commodities to scale up coverage of skilled attendance, outreach services, and family-community care; strengthen links between communities and facilities; promote community participation and empowerment	Implement plans to increase coverage of skilled personnel, especially in hard-to-work places; introduce clinical guidelines, supervision, and managerial methods; design financing mechanisms to protect the poor	Improve quality of obstetric and neonatal care—eg, maternal-perinatal audit; address remaining inequities; prepare for full coverage of neonatal intensive care	Consider establishing regionalised perinatal care; provide long-term follow-up for infants with major complications

TBA=traditional birth attendant. TT2=two doses of tetanus toxoid immunisation. Data from references 15 and 27, and from unpublished work (VKP).

Table 2: Phasing of immediate, medium-term, and long-term strategies to improve neonatal survival, according to baseline NMR

underestimated. Such efforts should be designed as a pathway moving towards skilled care, and not a diversion.

Identify and address missed opportunities

An important initial step in improving neonatal health in settings with weak health systems is to identify and address missed opportunities within existing services. In sub-Saharan Africa, for example, almost 60% of women attend at least two antenatal clinics, yet only 42% receive the recommended two tetanus toxoid immunisations. The marginal cost to ensure immunisation of these women is not high, yet the potential benefit is great, especially in countries with a high prevalence of neonatal tetanus. Other frequently missed opportunities during routine antenatal care visits include counselling on birth and emergency preparedness, identifying and treating pregnant women with syphilis,[32] and providing intermittent presumptive treatment for malaria.

Accountability within the health system is necessary to ensure that opportunities are maximised.[6] Auditing maternal and neonatal deaths in facilities can be an effective spur to change, especially if a non-judgmental approach is maintained.[33,34] Audit systems that integrate with policy can be effective in altering district and national policy. The perinatal problem identification programme[35] in South Africa covers 30% of the country's births from more than 100 facilities. These data have helped to galvanise national priorities for reducing perinatal deaths, including: improvements in intrapartum care to reduce deaths associated with birth asphyxia, especially in rural areas (eg, maternity waiting homes); more effective implementation of syphilis screening and treatment; and closer investigation of disparities in low birthweight between settings. Accountability is also crucial in controlling over-treatment, such as unnecessary caesarean sections.[36] A new global WHO initiative entitled beyond the numbers[37] has been launched, which aims to institutionalise maternal mortality audits. Not including fetal and neonatal deaths seems to be a missed opportunity, since many of the underlying system failures are the same, and most maternal deaths involve a stillbirth, a neonatal, or an infant death.

Coordinate across programmes

Coordination along the continuum of care between safe motherhood and child survival programmes is essential if substantial advances in neonatal survival are to be made. Many other types of vertical programmes also affect neonatal outcomes, including family planning, immunisation, sexually transmitted diseases, and HIV/AIDS. Child health programmes are working to strengthen clinical care, integrate outreach services, and step up behaviour-change approaches. These are all opportunities to include aspects of neonatal health interventions, which have often been omitted. For example, until recently, global guidelines for IMCI have not included care of newborn babies in the first week of life, and the drive to add this factor has been led by country demand. India has now renamed IMCI as IMNCI, adding N for newborn baby (panel 5). Likewise, guidelines for emergency obstetric care services can be coupled with emergency neonatal care so that the two are developed simultaneously—increasing cost-effectiveness for both mothers and babies. In countries where skilled attendants are available, core competencies for essential care and care of sick babies should be part of preservice training. The marginal cost, for example, of adding neonatal resuscitation training, equipment, refresher courses, and supervision for midwives is estimated at less than 2 cents per person per year.[38]

Step 3: Systematically scale up neonatal care

If only family-community and outreach interventions are scaled up, without attention to clinical care, the final effect is predicted to be much lower (20–35% *vs* >50%; panel 3).[2] Hence, in the medium term and long term, focus should move to quality and equity of skilled care within a stronger health system, including emergency obstetric and neonatal care; the development of which is more challenging, costly, and time consuming. Supply and demand obstacles should be systematically identified and addressed, since each constitutes an essential condition for effective coverage with neonatal care. Table 3 summarises the most common obstacles in the three service delivery modes and the operational strategies to address these obstacles.

	Underlying causes	Operational strategies
Family and community care		
Lack of demand for neonatal care	Limited access to media (especially for poor women)	Research to understand practices, beliefs, community roles, and networks
Inadequate information about healthy or unsafe behaviours for neonatal care	Few, irrelevant, or inappropriate messages	Strengthen existing community health workers, if appropriate deploy additional providers
	Cultural milieu such as traditional practices, fatalism	Partner with community opinion leaders and involve women's groups
		Develop specific messages and use culturally appropriate channels
		Promote intrasectoral and intersectoral collaboration—eg, with family planning, education, nutrition—and involvement of non-governmental organisations
Poor supply of affordable household commodities	Poor access for communities: long distances, limited transport	Strengthen supply logistics and legal frameworks
	Cost of commodities	Implement community-based distribution
	Lack of legal framework for retail of commodities	Develop social marketing—eg, for clean delivery kits; consider subsidisation
Population-oriented outreach services		
Low quality of care—eg, antenatal care	Inadequate manpower, absenteeism, competing programmes—eg, polio eradication	Strengthen human resources: promote evidence-based guidelines/standards, provide job aids; strengthen inservice and preservice training; provide
	Lack of standards for care; existing global guidelines not known/adapted/ promoted at national level, poor supervision	supervision and incentives, not necessarily financial; develop/review essential commodity policies; strengthen supply management; consider use of
Erratic supply of essential commodities and diagnostics	Poor management of supply chain	innovative appropriate technologies; engage and educate communities;
	Transport and cold chain failures	monitor drop-out and track defaulters
Relevant commodities not in guidelines		
Low demand for care, late use, and poor compliance	Lack of information, negative experiences with health system	
	Distance, unpredictable contacts, cost	
Individual-oriented clinical care		
Lack of skilled personnel	Inadequate numbers trained, low pay, disincentives to work in rural area; absenteeism; brain drain	Train and regulate informal and qualified health workers
		Consider performance-based payment
		Consider hardship allowances for rural postings, if appropriate
		Implement incentives for starting private services in underserved areas
Poor quality of care in public and private sector	Lack of standards for care, standards not known, low sense of urgency for emergencies	Adapt and promulgate clinical guidelines and accreditation systems
	Training often not skills-based	Strengthen inservice and preservice training
	Low accountability and motivation of health staff	Provide supervision, promote quality assurance
		Institutionalise clinical and mortality audits
Delayed use of services and poor compliance with treatment	Delays in recognition of illness, decision-making, and lack of transportation	Use a mix of strategies as appropriate including: birth preparedness messages, emergency transport schemes, and maternity waiting homes
	Social gap between health staff and poor families	Harness telecom technology for timely response
Affordability barriers for the poor	Low incomes/resources, lack of social security systems	Protect the poor from user fees with a mix of approaches including: community funds and loans, subsidised care, conditional cash transfers, health insurance, voucher-based reimbursements for providers; ensure accountability of the health system
	Corrupt practices by public sector providers	
	High cost of private sector care	

Table 3: Obstacles to and strategies for scaling up of neonatal care for family-community, outreach, and clinical services

	Ethiopia (NMR 52, skilled attendance coverage 5%)			Madagascar (NMR 34, skilled attendance coverage 47%)			Gujarat, India (NMR 40, skilled attendance coverage 54%)		
	Effective coverage*	Expected effect†	Incremental cost (US$ per person per year)‡	Effective coverage*	Expected effect†	Incremental cost (US$ per person per year)‡	Effective coverage*	Expected effect†	Incremental cost (US$ per person per year)‡
Scenario 1: introducing neonatal health packages into the health system									
Family-community care	2–38%	1–4%	$0·1–0·1	2–59%	0–1%	$0·1–0·1	5–30%	0–0%	$0·1–0·1
Outreach	6–15%	0–0%	$0·0–0·0	5–44%	0–0%	$0·0–0·3	15–60%	0–1%	$0·0–0·0
Clinical care	3–14%	1–2%	$0·0–0·0	31–57%	0–0%	$0·0–0·3	6–40%	0–0%	$0·0–0·0
Total		2–6%	$0·2–0·2		0–1%	$0·1–0·2		0–1%	$0·1–0·12
Scenario 2: achieving and sustaining national medium-term health objectives									
Family-community care	31–63%	8–15%	$2·4–2·7	65–80%	4–10%	$1·4–1·6	10–75%	7–16%	$0·6–0·6
Outreach	15–65%	7–12%	$0·4–0·6	35–91%	6–10%	$0·0–0·2	30–87%	3–7%	$0·2–0·2
Clinical care	27–44%	8–15%	$1·4–2·8	49–90%	12–26%	$1·4–1·8	25–95%	16–33%	$2·1–2·5
Total		21–35%	$4·3–6·0		20–38%	$2·9–3·6		24–47%	$2·9–3·3
Scenario 3: reaching MDG-4									
Family-community care	67–85%	11–20%	$3·3–3·5	65–91%	6–13%	$2·2–2·4	83–91%	10–24%	$1·1–1·1
Outreach	15–85%	11–17%	$0·8–1·0	71–91%	7–12%	$0·3–0·3	60–91%	7–16%	$0·3–0·3
Clinical care	40–75%	15–30%	$3·7–5·1	60–90%	16–35%	$2·0–2·3	70–95%	24–48%	$3·1–3·5
Total		32–51%	$7·8–9·5		25–47 %	$4·5–5·0		36–65%	$4·5–4·9
Health expenditure (government and donor)									
Current expenditure (US$)		2·7			3·6			5	

*Range of coverage of interventions considered. †Effect on NMR with lower and upper efficacy levels. ‡Investment phased over 10 years.

Table 4: Predicted effect and incremental cost per year of various scenarios for increasing coverage of neonatal health care in Ethiopia, Madagascar, and Gujarat State, India

Supply obstacles

Lack of skilled personnel is the one of the most important impediment to scaling up clinical care in high and very high NMR settings (table 3). Many countries train insufficient numbers of providers, and these are further depleted by brain-drain.[16] In some countries with high HIV prevalence, deaths due to AIDS might be an important cause of staff loss. Strongly vertical programmes to address HIV could detract from other health-systems' strengthening. Absenteeism is also a problem. In India, an average of 40% of health facility staff are absent at any point in time.[6] Countries, aided by partners, should invest in skilled attendance as a medium-term to long-term strategy. Some countries have successfully enhanced access to professional childbirth care by upgrading the skills of intermediate providers—eg, community midwives in Malaysia[19] and Indonesia.[39] The quality of clinical care for sick newborn babies and mothers can be improved. Global guidelines are available about care in normal pregnancy and childbirth, as well as for complications of mothers and neonates.[40,41] Use of nationally adapted versions of these guidelines in preservice and inservice training is an important step. For example, capacity to use a partograph in childbirth, resuscitate a newborn baby, and manage neonatal sepsis should be taught as competency-based practical skills.[42] Supervision and enforcement of quality control through regulation should also be assured.[43]

Erratic supply of essential commodities could be overcome by innovative mechanisms, such as social marketing, although market forces might not always ensure that commodities are available and affordable, especially for the poor.[44]

Demand obstacles

Low demand for care and late use are often linked to the barriers of low acceptability or affordability.[45] Long waiting times—eg, for antenatal care—result in high opportunity costs, even when services are free. Social distance between mother and health workers, because they are men or from a different caste or ethnic group, reduces cultural acceptability (panel 3). Comparing the profiles of non-users and users of services is essential to overcoming barriers. In Mexico's Progresa programme,[46] families receive financial stipends if they use antenatal and immunisation services, which has increased their use. Women's groups could be an untapped source of influence, as seen in Bolivia[47] and Nepal.[21] In Gujarat, India, it is proposed that families under the poverty line should receive monetary compensation for institutional childbirth (panel 5).

Affordability, especially of clinical care, is a major obstacle in most countries. Formal user fees, as well as under-the-table payments for care are often great, and act as powerful disincentives to care-seeking.[48] The cost of treating obstetric emergencies could lead to expenditures that are catastrophic to family finances.[49] The poorest seldom enrol in voluntary insurance schemes, even community-based plans.[50] Free provision of basic neonatal care for all works in the context of strong, pro-poor governments—eg, Sri Lanka, Cuba— but free services in other contexts might be captured by the elite[6] or benefit civil servants and their families.[51] Cross-subsidisation is effective.[52] A combination of mechanisms might be necessary to safeguard the poorest.

Low continuity and poor compliance could emerge as problems, even when initial use of services is high.

Improved patient education, defaulter tracing, and home follow-up visits have proven effective in increasing continuity and compliance.[53] Success might be linked to incentive mechanisms for workers: either performance-based payments or specially remunerated outreach workers.

Strengthen supply and demand

Panels 2–4 describe the main supply-side and demand-side obstacles and strategies to increase effective coverage of neonatal health interventions within existing programmes in Ethiopia, Madagascar, and Gujarat State, India. A systematic analysis of the determinants of effective coverage involving a range of partners has guided the identification of operational strategies. Table 4 shows the modelled effect and cost estimates for Ethiopia, Madagascar, and Gujarat. Methods are detailed in panel 2. Little effect on NMR is expected if neonatal health-care packages are implemented within the constraints of the existing health system (scenario 1) with little or no change in coverage. The medium-term objectives selected in every country or state for 2010, if met, would have more effect (scenario 2), with an anticipated 20–47% reduction in NMR, at an incremental cost of $3–6 per person per year. The increased coverage of child and neonatal interventions that would be needed to achieve the Millennium Development Goal for child survival (MDG-4) (scenario 3) and the predicted cost and effect are also shown. The predicted effect on NMR ranges from 25% to 65%, and the estimated incremental costs vary from around $5 in Madagascar and Gujarat to $9·50 in Ethiopia, assuming extensive health systems strengthening over a short period of time, or around $8, if the system strengthening is phased over 10 years (panel 3). This scenario implies an increase in government health expenditures of almost two-fold in Madagascar and three-fold in Ethiopia. These costs per person differ from those given elsewhere in this series, since the specific costs of scaling up human resources and building facilities are included. Hence, the cost given here is higher, but variable dependent on the extent of the health-system strengthening needed.

Step 4: monitor coverage and measure effect and cost

Programme management information systems should include periodical assessments of coverage of neonatal interventions, since in most high-mortality countries changes in NMR are usually measurable only on a periodic—eg, 5-year—basis, through costly and labour-intensive household surveys. Systematic attention to equity assessment, in addition to overall population coverage, is important if high coverage is to be achieved for the poor.[54] Locally important obstacles to demand for and supply of care should be tracked, along with coverage and mortality indicators. Existing data are often

Figure 5: A newborn baby is examined by a community nurse in Chad

underused; if 50% of deliveries are in facilities, service statistics data cannot be considered representative, but might still be useful for assessing the predominant causes of death and illness and for audit of substandard care within the facilities.[55]

Research tends to focus on assessing effect of the biological intervention, with little consideration for the requirements of the health-care system for effective delivery,[43] including examination of alternative strategies and cadres of workers. Learning from implementation in diverse settings is essential. There is an absence of careful assessment of the marginal benefit and cost of adding neonatal interventions to existing programmes, such as safe motherhood, IMCI, prevention of mother-to-child transmission of HIV, malaria, and sexually transmitted diseases in pregnancy. Developing high-tech devices for neonatal care is a large for-profit industry focused on the 1% of neonatal deaths that happen in rich countries; yet little is spent on the development and testing of simple, low-cost methods, technologies, and devices for the prevention, detection, and management of neonatal illnesses and emergencies in the places where most fetal and neonatal deaths take place (figure 5). Such a wide research remit will be most successful through partnerships.[56,57]

Conclusion

In the very countries with the highest burden of neonatal deaths, coverage of cost-effective interventions is low, inequitable, and slow to progress. There is no one solution to these problems: individual solutions need to be designed that take into account local obstacles and opportunities. The phasing-in of strategies is an important management approach, facilitating the strengthening of systems in the long term, while saving newborn lives now. Even with a weak health system, measurable mortality reduction can be achieved—by starting with outreach and at the family-community level. Conditions for successful scaling up at the country level are strongly affected by national policy and global factors, which will be covered in the last paper of this series.[58] There are examples of governments in poor countries who have committed themselves to and succeeded in strengthening maternal and neonatal health systems. To improve the system and save the lives of newborn children and their mothers, the analysis presented here suggests the need to double or even quadruple the health budget in many of the world's poorest countries, while increasing accountability for use of those resources. Action in countries, driven by countries, is essential.

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