Newborn survival in low resource settings—are we delivering?

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The annual toll of losses resulting from poor pregnancy outcomes include half a million maternal deaths, more than three million stillbirths, of whom at least one million die during labour and 3.8 million neonatal deaths—up to half on the first day of life. Neonatal deaths account for an increasing proportion of child deaths (now 41%) and must be reduced to achieve Millennium Development Goal (MDG) 4 for child survival. Newborn survival is also related to MDG 5 for maternal health as the interventions are closely linked. This article reviews current progress for newborn health globally, with a focus on the countries where most deaths occur. Three major causes of neonatal deaths (infections, complications of preterm birth, intrapartum-related neonatal deaths) account for almost 90% of all neonatal deaths. The highest impact interventions to address these causes of neonatal death are summarised with estimates of potential for lives saved. Two priority opportunities to address newborn deaths through existing maternal health programmes are highlighted. First, antenatal steroids are high impact, feasible and yet under-used in low resource settings. Second, with increasing investment to scale up skilled attendance and emergency obstetric care, it is important to include skills and equipment for simple immediate newborn care and neonatal resuscitation. A major gap is care during the early postnatal period for mothers and babies. There are promising models that have been tested mainly in research studies in Asia that are now being adapted and evaluated at scale including through a network of African implementation research trials.

Keywords Intrapartum-related neonatal deaths, low-income countries, Millennium Development Goal 4, neonatal, neonatal infections, neonatal tetanus, newborn, preterm birth.

Introduction

Each year, around a half a million women die of pregnancy related causes, and more than three million babies are stillborn, of whom at least one million die during labour. A further 3.8 million babies die in their first month of life—up to half of these on the first day. Twenty million low birth weight (LBW) babies and others with neonatal complications live but may not reach their full potential. This enormous burden is wholly related to pregnancy outcomes, yet remains under-appreciated and has attracted less investment than other conditions with a lower burden.

Why is this large burden so invisible? Some of the reasons are the lack of data, lack of clearly articulated solutions, and the complexity and expense of some solutions. There are also societal reasons. Many of these deaths, especially stillbirths and early neonatal deaths occur at home, unseen and uncounted in official statistics. In some societies, babies are not named until 6 weeks of life and may not be brought out in public until an older age. When a baby dies, the mourning of mothers and families is often hidden. Thus, these traditions contribute to concealing the size of the problem and perpetuate a resigned acceptance of birth as a time of death and danger for both mothers and babies.

However, one important reason that this problem is underemphasised is the failure of health professionals and policymakers to link these numbers, and solutions together, and to work together to implement the highest impact solutions that save women and babies. How can progress to reduce maternal, neonatal and under-five mortality rates be accelerated to meet the Millennium Development Goals (MDGs)? How can stillbirths—not explicitly mentioned in either of these MDGs—also be reduced? One cornerstone for progress is to make better use of existing data, to improve the data and to connect these data to selecting...
and implementing the ‘best buys’. Available information is not always used to strengthen existing programmes especially at district level or to strategically present the case for more investment.

This article reviews current progress for newborn survival globally, with a focus on the least developed countries where most of these deaths occur. The highest impact interventions to address the main causes of neonatal death are summarised and some priority opportunities to address newborn deaths through existing maternal health programmes are highlighted, as well as a major gap—postnatal care. Estimates are provided for the potential number of neonatal lives saved if high coverage and quality services are attained.

**Neonatal survival—are we progressing?**

The target of MDG 4 is a two-thirds reduction in under-five mortality between 1990 and 2015 (Figure 1). Remarkable progress has been made prior to 1990, with a halving in risk of death for children under five between 1960 and 1990. A number of Asian countries have made substantial progress and are on track to meet the goal. In sub-Saharan Africa, progress in the 1990s was much slower, but since 2000, there are grounds for optimism, with a number of large African countries recording major reductions in under-five mortality including Tanzania, Uganda, Malawi, Ethiopia and Ghana. One important barrier to progress for MDG 4 is the failure to reduce neonatal deaths (deaths in the first four weeks of life). Child survival programmes have primarily focused on important causes of death after the first 4 weeks of life—pneumonia, diarrhoea, malaria and vaccine preventable conditions. However, in the last few years, it has become obvious that deaths during the first weeks of life (neonatal deaths) account for an increasing proportion of under-five deaths and are reducing more slowly. Globally, over 41% of under-five deaths are neonatal. Particularly striking is the lack of any measureable progress over the last decade to reduce deaths in the early neonatal period—the first week. As child health programmes succeed in reducing deaths after the first month and year of life, an increasing proportion of under-five deaths will be neonatal, and action must be taken to reduce neonatal deaths now.

**Variation in progress between countries**

For both neonatal and maternal deaths, over two-thirds occur in Sub Saharan Africa and South Asia (Table 1). The regional variations in neonatal mortality rate (NMR) and maternal mortality ratio (MMR) are wide. However, some low-income countries, such as Thailand and Sri Lanka, have managed to reduce their NMR to under ten deaths per 1000 live births. Low income countries that have achieved major reductions in maternal and neonatal mortality have also reached high coverage of skilled attendance during childbirth.

**Countries with the most neonatal deaths**

Five countries account for just over two million deaths, over half the total newborn deaths, and ten countries account two thirds of the total (Table 2). Because of their large population sizes, these same countries also have high numbers of maternal deaths and stillbirths. Several of the biggest countries are also in the list of ten countries with the highest NMR—notably Pakistan. In India alone, over one million babies die every year.

**Countries with the highest risk of neonatal death**

Liberia has the highest risk of newborn death globally, with 6.6% of babies dying in the first month of life. Many of the ten African countries with the highest risk of newborn death are countries that have experienced recent war or other disasters and there is limited information to guide newborn survival programming in such settings. However, the list of highest risk countries also includes some such as Mali, which is relatively stable politically, and Nigeria, which has relatively much higher gross national income (GNI) per capita, compared with other African countries with lower NMR.

**Variation within countries**

Poverty and the ill health of newborns are closely linked. Mothers and newborns in poor families are at increased risk of illness and face more challenges in accessing timely, high quality care compared with wealthier families. The newborn health gap between rich and poor countries is unacceptably high, ranging from a NMR of 1 in Japan (GNI = US$37 670) to 66 in Liberia (GNI = US$1110). There is also an unacceptably large gap between rich and poor within nations. An analysis of 13 African DHS datasets with a relative index of economic status indicates that
families in the poorest quintile experience, on average, 68% higher neonatal mortality than the richest quintile. Among countries with these recent asset indices calculated from household surveys, the largest disparity is in Nigeria, with an NMR of 23 among the richest quintile compared to 59 in the poorest quintile, representing a gap of 156%. If all of Nigeria experienced an NMR of 23 per 1000 live births, 133 000 fewer babies would die each year. More systematic policy and support for implementation to benefit the poorest families is required. Governments should be held accountable for reducing and eliminating inequities in health outcomes.

More than half of the newborn babies who die do so at home. In Northern Ghana, only 13% of neonatal deaths are in hospital. Babies born to families living in rural areas are at greater risk of death than babies born to families living in urban areas. For 22 countries in Africa with Demographic and Health Surveys (DHS) published during the last 5 years, the NMR was, on average, 42% higher among rural families. This apparent urban advantage

### Table 1. Neonatal and maternal mortality by region

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Sub-Saharan Africa</td>
<td>41</td>
<td>1 243 243</td>
<td>920</td>
<td>278 972</td>
</tr>
<tr>
<td>Middle East and North Africa</td>
<td>25</td>
<td>243 150</td>
<td>210</td>
<td>20 425</td>
</tr>
<tr>
<td>South Asia</td>
<td>41</td>
<td>1 557 426</td>
<td>500</td>
<td>189 930</td>
</tr>
<tr>
<td>East Asia and Pacific</td>
<td>18</td>
<td>535 914</td>
<td>150</td>
<td>44 660</td>
</tr>
<tr>
<td>Latin America and Caribbean</td>
<td>13</td>
<td>147 953</td>
<td>130</td>
<td>14 795</td>
</tr>
<tr>
<td>Central and Eastern Europe and the Commonwealth of Independent States</td>
<td>16</td>
<td>88 960</td>
<td>46</td>
<td>2558</td>
</tr>
<tr>
<td>Industrialised countries</td>
<td>3</td>
<td>33 063</td>
<td>8</td>
<td>882</td>
</tr>
<tr>
<td>Developing countries</td>
<td>31</td>
<td>3 790 246</td>
<td>450</td>
<td>550 197</td>
</tr>
<tr>
<td>Least developed countries</td>
<td>40</td>
<td>1 163 040</td>
<td>870</td>
<td>252 961</td>
</tr>
<tr>
<td>World</td>
<td>28</td>
<td>3 801 560</td>
<td>400</td>
<td>543 080</td>
</tr>
</tbody>
</table>


### Table 2. The ten countries with the highest numbers of neonatal deaths

<table>
<thead>
<tr>
<th>Countries and territories</th>
<th>Neonatal mortality rate per 1000 live births</th>
<th>Annual number of neonatal deaths</th>
<th>Maternal mortality ratio per 100 000 live births</th>
<th>Annual number of maternal deaths</th>
<th>National MNCH plan*1</th>
<th>National newborn situation analysis**2</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>39</td>
<td>1 057 641</td>
<td>450</td>
<td>122 036</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>China</td>
<td>18</td>
<td>312 732</td>
<td>45</td>
<td>7818</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Nigeria</td>
<td>47</td>
<td>280 073</td>
<td>1100</td>
<td>65 549</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pakistan</td>
<td>53</td>
<td>235 638</td>
<td>320</td>
<td>14 227</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>DR Congo</td>
<td>47</td>
<td>146 546</td>
<td>1100</td>
<td>34 298</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>36</td>
<td>143 928</td>
<td>570</td>
<td>22 789</td>
<td>Neonatal only</td>
<td>Yes</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>41</td>
<td>131 241</td>
<td>720</td>
<td>23 047</td>
<td>Child only</td>
<td>-</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>60</td>
<td>78 840</td>
<td>1800</td>
<td>23 652</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Indonesia</td>
<td>17</td>
<td>74 562</td>
<td>420</td>
<td>18 421</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td>Tanzania</td>
<td>35</td>
<td>56 000</td>
<td>950</td>
<td>15 200</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Total number (Percentage of the global total) 2 517 201 (67%) 347 037 (64%)

**Saving Newborn lives/Save the Children.
masks sharp disparities between rich and poor in urban and peri-urban areas—disparities that are much sharper than those in rural areas. Neonatal mortality among the urban poor is similar or worse than that of nearby rural populations where it has been examined, and is uniformly much greater than urban averages. At the same time, special conditions of the urban poor require urban-specific program approaches and, where implemented, rapid progress can be achieved. Considering the demographic trend towards population growth among the urban poor in low-resource settings, more information on maternal and neonatal health issues in this scenario and how to best address them is needed.

When do newborns die?
The birth of a baby should be a time of celebration. Yet during the entire human life span, the day of birth is the day of greatest risk of death (Figure 2):

- Mothers—approximately 50% of maternal deaths take place within 1 day of childbirth. Considering the demographic trend towards population growth among the urban poor in low-resource settings, more information on maternal and neonatal health issues in this scenario and how to best address them is needed.

Delivering solutions for the main causes of neonatal death

Most newborn deaths in Africa and Asia are due to conditions that are rarely seen in high-income countries, and if they are seen, would usually not result in death. Table 3 shows the top three causes of newborn deaths: infections, intrapartum related deaths or ‘birth asphyxia’, and complications of preterm birth which together account for 86% of newborn deaths globally. These data are from estimates for 192 countries as used in the World Health Report 2005 and updated in 2008 for Countdown to 2015 for maternal, newborn and child health.

The three major causes of neonatal death are the same for all high mortality settings. However, the relative proportions of these three causes vary between and within countries. For settings with very high NMR (>45 neonatal deaths per 1000 live births), around half of the neonatal deaths are estimated to be due to infections, including tetanus. These deaths are the most feasible to prevent. Thus, the higher the NMR, the more deaths are easily preventable. In high mortality settings, rapid reductions of NMR are possible with public health measures such as tetanus toxoid vaccination for pregnant women, clean childbirth practices, improved hygiene and cord care, and early and exclusive breastfeeding. Adding antibiotic treatment of newborn infections further increases the number of lives that could be saved.

Neonatal infection—1 076 000 newborn deaths globally

The single most common killer of newborns is neonatal infection, particularly sepsis, pneumonia and meningitis. These deaths could be averted through existing programmes. Prevention is mainly dependent on maternal health programmes such as antenatal care, hygienic care during childbirth and the postnatal period, and early and exclusive breastfeeding. Treatment is possible through existing child health programmes, particularly Integrated Management of Childhood Illness (IMCI) and referral care in hospitals. The scaling up of case management to date has probably contributed to some reduction of deaths from infection in the late neonatal period. The addition of new algorithms for care of babies in the first week of life to IMCI has provided a further opportunity to reduce neonatal and under-five mortality.

Tetanus

Tetanus was not a major killer of babies in the industrialised world, even before the tetanus toxoid vaccine was developed. Traditional practices in many low-income countries such as putting harmful substances on the cord contribute to this burden. Recent investments in vaccine coverage have resulted in global coverage of maternal tetanus immunisation climbing to 81%. Since the year 2000, 14 countries and 15 states in India have been certified as having eliminated tetanus. Although tetanus is responsible for fewer newborn deaths each year (now only 4% of newborn deaths), it is unacceptable that in the 21st century neonatal tetanus still accounts for around 165 000 newborn deaths.
<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Estimated deaths globally</th>
<th>Timing of deaths</th>
<th>Prevention solutions</th>
<th>Treatment solutions</th>
<th>Potential lives saved</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatal infections (sepsis, meningitis and pneumonia, diarrhoea)</td>
<td>1 076 000</td>
<td>Sepsis, meningitis: first week. Pneumonia and diarrhoea: increases towards end of first month</td>
<td>Treating maternal infections. Clean childbirth practices and hygienic care, especially cord care. Breastfeeding</td>
<td>Case management as an outpatient. Inpatient care with full case management but coverage is very low due to physical and cultural barriers to access in the first month of life. In countries with IMCI, adding neonatal illness case management is an important opportunity. Enabling policies for what to give and where and by whom, e.g. ‘Gold standard’ regimen (7–10 days injectable antibiotics, usually in hospital) may block community-based treatment.</td>
<td>47–82%</td>
<td>Highly feasible through routine increased skilled attendance, PNC, IMCI and improved hospital care of sick newborns</td>
</tr>
<tr>
<td>Intrapartum-related deaths ('birth asphyxia')</td>
<td>904 000</td>
<td>First day of life</td>
<td>ANC, especially to identify/manage hypertension in pregnancy and pre-eclampsia. Skilled attendance including use of partograph. EmOC for complications e.g. obstructed labour, haemorrhage.</td>
<td>Resuscitation. Care of babies with neonatal encephalopathy. Lack of capacity and staff with necessary skills for resuscitation, even in countries where more births are in health facilities. Lack of supplies, e.g. bag &amp; mask.</td>
<td>39–71%</td>
<td>Feasible with more commitment to scaling up skilled attendance during childbirth and EmOC and adequate referral and transport</td>
</tr>
<tr>
<td>Complications of preterm birth</td>
<td>1 144 000</td>
<td>First week for many (in the absence of intensive care) but ongoing increased risk especially from infections</td>
<td>Treating maternal infections. Iron/Folic acid supplements. Preventing malaria in pregnancy. Antenatal steroids.</td>
<td>Resuscitation at birth. Improved breastfeeding practices. KMC. Early identification and treatment of complications, especially infections.</td>
<td>37–71%</td>
<td>Prevention feasible through ANC, especially with malaria prevention in endemic areas. Treatment feasible through existing facility care especially KMC, extra support for feeding. Improved coverage and quality of PNC. Highly feasible through routine ANC and immunisation outreach campaigns</td>
</tr>
</tbody>
</table>
Intrapartum-related (‘Birth asphyxia’)—904 000 newborn deaths globally

Babies born in the world’s least developed countries have a very high risk of ‘birth asphyxia’ and of intrapartum stillbirth. The most effective interventions for intrapartum-related newborn deaths involve prevention through skilled attendance and emergency obstetric care. Once obstructed labour or haemorrhage have resulted in severe intrapartum injury, the baby may be stillborn or have a high chance (around 30 to 50%) of dying on the first day of life. The only two published studies from low income settings of long-term follow-up of babies with neonatal encephalopathy are from hospital based cohorts in South Africa, and Nepal. The limited follow up data from these studies suggest that initial mortality is very high, and survivors with disability are less than expected but more data are required on long term outcomes. Primary prevention through skilled birth attendance and emergency obstetric care is the most cost-effective solution.

Preterm birth complications—1 144 000 newborn deaths globally

At least half of newborn deaths are among preterm babies. The direct cause of death is only attributed to preterm causes, however, if the death is in a severely preterm baby or results from complications specific to preterm birth. For example, if a moderately preterm baby has an infection and dies, the death is most appropriately attributed to infection—thus, many babies recorded as dying from infection are also preterm. Babies born between 33 and 37 weeks of gestation should survive with careful attention to feeding, warmth and early treatment of problems, including breathing problems, infections and jaundice. Babies <33 weeks gestation or approximately 1500 g are more likely to need advanced care, especially for breathing problems and feeding. If possible, these very small babies should receive care in a referral hospital. Kangaroo mother care (KMC), involves caring for small, particularly preterm babies by having them strapped skin-to-skin to the mother’s front. KMC is simple, effective and empowers mothers and can be feasibly introduced in most facilities in low-income settings where care for small babies is provided. Extra care of small babies at home care with skin-to-skin care and additional support for breastfeeding has great potential but requires more evaluation at scale.

Small babies—big risk of death

Globally, an average of 14% of babies are born with LBW, or a weight at birth of <2500 g. LBW babies account for the majority of neonatal deaths and this may be because of preterm birth, term babies who are growth restricted or a combination. Preterm babies have a risk of death that is around 13 times higher than full term babies.
are preterm and growth restricted have an even higher risk of death. The limited data available suggest that most LBW babies in Africa are preterm. This differs markedly between sub-Saharan Africa and South Asia. In South Asia, the LBW rate is almost twice that of Africa but approximately half of South Asia’s LBW babies are term babies who are small for gestational age. Babies in Africa are at high risk of being born preterm—the regional estimate for preterm birth is around 12%, which is almost double the frequency of preterm birth in European countries and probably related to infections, particularly sexually transmitted infections, malaria, and HIV/AIDS. Indeed, co-infection during pregnancy with HIV and malaria is more than ‘double trouble’—the two infections act synergistically with serious consequences for maternal and newborn health, especially increasing the LBW rate. Increased attention to prevention of LBW, especially preterm birth, and to identification of small babies and extra support for feeding, warmth and care has great potential to reduce neonatal deaths.

**Coverage of care and trends—are we delivering?**

Evidence-based strategies to save the lives of women and babies include a wide menu of interventions, which are usually provided through common service delivery packages along the timeline of the continuum of care notably: (1) reproductive health services to provide family planning support; (2) antenatal care for pregnant women; (4) skilled attendance and emergency obstetric care during birth; and (5) postnatal care services. Global tracking data tends to collect information on the contact point but not always on the provision of effective care at that point although there is more information available on the numbers of visits and visit content for antenatal care than for intrapartum or especially for postnatal care.

In Sub-Saharan Africa, 72% of women now have at least one antenatal visit, although fewer have four or more visits (42%) (Fig. 3). Between care during pregnancy and the time of delivery there is a big decrease in coverage with only 32% of women in the 50 least developing countries having a skilled attendant present during childbirth. Except for Eastern and Southern Africa, all developing regions have increased their coverage of skilled delivery attendance during the past decade, with a particularly marked increase in the Middle East/North Africa. However, regional and country averages hide large inequities in care especially for skilled attendance. For example, while 6% of women in Ethiopia overall have a skilled attendant at birth, 25% of the wealthiest quintile do so, but only 1% of the poorest. Postnatal care after birth is even lower. Though data are not routinely compiled, an analysis of DHS reveals that less than a quarter of women with newborns receive care in the first 2 days after birth. There is a major data gap around the care received by sick babies, with virtually no population-based coverage data available for case management of neonatal illness.

**Opportunities to deliver care now for newborns through maternal health services**

There are many evidence-based interventions to reduce maternal and neonatal deaths and a detailed review of all of these is beyond the remit of this article. Here we outline a key opportunity at different points in the continuum of care (during pregnancy, birth and the postnatal period) whereby a high impact intervention to reduce neonatal

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**Figure 3.** Coverage of care (median and range) for reproductive, maternal and neonatal service delivery packages by region around the year 2005.
deaths is currently at low coverage and could be added to existing maternal healthcare service delivery.38

Care during pregnancy
Antenatal care is one of the success stories in low-income settings with high coverage and relatively equitable reach to poor and marginalised populations. However, the content of care does not always include the most effective interventions, nor is the service delivered with high quality. Programmes to improve quality of care and address missed opportunities are being expanded in many countries focusing on key interventions such as tetanus toxoid immunisation, syphilis treatment and malaria prevention in pregnancy, as well as improved detection and management of obstetric complications and abnormal lie. However, obstetric care for women in preterm labour remains a major challenge—even in high-income settings prevention of preterm labour has largely failed and reductions in burden have been achieved primarily through improved care of preterm babies although this may be very costly.42 One important opportunity to reduce the burden through secondary prevention is the administration of antenatal steroids (panel 1). Given the high potential to save lives, the low cost and the apparent feasibility in low-resource settings, the current low coverage of antenatal steroids represents a major missed opportunity.

Panel 1: How many newborn lives could be saved by antenatal steroids for women in preterm labour?

A recent Cochrane review shows very significant benefit of antenatal steroid therapy on preterm neonatal mortality (31%) and morbidity outcomes (34% reduction in RDS). A new meta-analysis of four randomised controlled trials from middle-income countries shows an even larger effect.43 No trials from low-income countries were identified. Given that there are more than one million preterm deaths each year,5 most of whom do not benefit from antenatal steroids, the potential for lives saved is up to 500 000 neonatal deaths per year.

Care at the time of birth
Labour and the time of birth are the riskiest time in the human life cycle. Effective care and timely obstetric services are important to reduce maternal deaths and disability, intrapartum stillbirths and term intrapartum-related neonatal deaths as well as the long-term burden of impairment. A series of reviews in the International Journal of Obstetrics and Gynaecology in September 2009 summarises the latest evidence and programmatic experiences regarding the practicalities of reducing this burden in low-resource settings, including ongoing debates regarding community level care and linkages to facility care.44 One key missed opportunity in settings where skilled attendance and obstetric care are being strengthened is the lack of simple essential newborn care or resuscitation for the estimated 10 million babies a year who require attention at birth (Panel 2).

Panel 2: How many newborn lives could be saved by neonatal resuscitation?

Neonatal resuscitation in facilities could reduce mortality of term intrapartum-related neonatal deaths by 30% and also reduce deaths for preterm babies. Primary prevention through improved obstetric care remains the most effective intervention to reduce these deaths, but resuscitation is an important additional intervention with the potential to save up an estimated 190 000 lives a year.46 Several low-income countries have made progress such as Indonesia where many community midwives are now trained in neonatal resuscitation.45 In India and China, national resuscitation training has been implemented in a number of teaching hospitals and Tanzania and Kenya are planning nationwide scale up.45

Postnatal care
For babies and mothers facing complications such as neonatal sepsis or postpartum haemorrhage, delay of even a few hours before receiving appropriate care can be fatal or result in long-term injuries or disability. This early time is also crucial for establishing healthy practices—evidence shows that effective breastfeeding support and counselling for mothers in the first days after birth directly increases rates of exclusive breastfeeding.47 Other key behaviours during the neonatal period, such as hygienic cord care and keeping the baby warm, can make the difference between life and death—particularly for babies who are born prematurely.

Programmatically the postnatal period refers to the first 6 weeks after birth leading up to the first preventive child health contact for immunisation, and the maternal health contact for family planning at the same time. However, in many countries, this 6-week visit is the mother and baby’s first interaction with the formal health system after birth. There is a clear need to better define the package of postnatal practices and also the delivery strategies in varying settings and consensus is increasing (panel 2).5

Who for?
Previously ‘postpartum’ care for the mother and ‘neonatal’ or ‘newborn’ care for the baby were considered separately, but postnatal care is the preferred term for integrated care
for both mother and baby in this time period. Integration of postnatal care for mothers and newborns is more effective and efficient than separate approaches to postpartum and newborn care.

**Where?**
Routine postnatal visits should be provided at home or close to home, both to promote healthy behaviours and to link with curative care—instead of assuming that the mother or baby will be brought to a health facility if problems arise. The fact that each year 60 million women around the world do not give birth in a health facility poses challenges for implementing postnatal care for mothers and their newborns.

Panel 3: How many newborn lives could be saved by postnatal care?

Community and postnatal packages have been tested in a number of Asian settings. This impact has been greatest in research settings with high NMR where up to 50% of lives can be saved through community mobilisation to improve healthy practices and care-seeking behaviour even without case management or curative care.\(^{34,49}\) In health-system settings, the impact is potentially less but still substantial. A 20% decline in neonatal mortality was recorded in a one-year pilot study in Pakistan.\(^ {50}\) An evaluation of large-scale community-based implementation in eight Indian states reported 34% lower neonatal mortality among babies who did receive a postnatal home visit compared to those who did not, although there was no effect on mortality overall, possibly because of low coverage of these home visits (17% within 3 days of birth).\(^ {51}\) This body of Asian research has greatly contributed to the postnatal care evidence base and a network of studies is underway in eight African countries examining nationally adapted packages and potentially scalable cadres of health workers, in addition to cost analysis that will be comparable across sites.

**Action and research gaps**

There are clear priorities from the data to drive the priorities for action (panel 4). The major gap for saving the lives of mothers and babies is not new science, but implementation science—better understanding of how to deliver effective care, and reach the poorest families with high impact interventions. New technology or improved existing technology may make a substantial difference for some key areas—for example for identifying fetal distress or preventing preterm labour. In many cases the key questions are ‘who, where and how’ regarding task shifting, community-based strategies, and supervision and management at scale. Much of the evidence to date has come from Asia. A new network of studies in eight African countries is examining nationally adapted packages and potentially scalable cadres of workers. Analysis of lives saved, costs and feasibility at scale will help guide policies and programmes to improve maternal and newborn care in varying settings (personal
communication, Joy Lawn for Saving Newborn Lives (African Network).

Panel 4: What to do to save newborn lives?

Immediate opportunities to add or strengthen high impact neonatal interventions within current maternal and child health programmes—for example ensuring tetanus immunisation in antenatal care; administration of antenatal steroids for women in preterm labour; effective intrapartum care and provision of simple immediate newborn care, resuscitation and extra care of small babies (e.g. Kangaroo Mother Care) linked to childbirth care; and case management of neonatal illness linked to IMCI.

Innovation to address key gaps such as reaching all mothers and babies with early postnatal care.

Implementation research to evaluate ‘how to’ questions for delivery of care in various settings and with varying cadres of workers, especially for 60 million non facility births each year.

Conclusion

The lack of public recognition of so many deaths among babies especially in Africa and South Asia, and the apparent acceptance of these deaths contrasts with the mountains of reports and paperwork generated by the death of one baby in the high-income countries and the public outcry if substandard care is suspected. Yet a century ago, maternal and neonatal death rates in Europe were similar to those in much of Africa and South Asia today. In 1905 the NMR in England was 41 per 1000 live births—the average for sub-Saharan Africa today. By 1950, England’s NMR had halved (to 20 per 1000) despite two wars and a decade of economic depression. The NMR had halved again by 1980, even before intensive care and ventilation became widely available for babies. Progress is possible but requires strategic planning and implementation. According to The Lancet neonatal survival series, up to three million newborn lives could be saved each year if all mothers and babies were reached with essential care. The estimated cost of increasing interventions for neonatal survival to 90% coverage in 75 countries is US$4.11 billion. Over half of this cost involves investment in maternal care, particularly obstetric services.

There are many obstetric champions and many voices heard for saving mothers. Mothers want to live but they also want their babies to live—a joint call to save the lives of mothers and babies, including stillbirths, will serve families better, and make clear the enormous benefit of investing in maternal and neonatal care.

Disclosure of interests

None.

Contribution to authorship

JL planned the paper and JL and KK wrote the first draft. All authors contributed significantly to the manuscript. The authors declare no conflict of interest.

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References

Newborn survival—are we delivering?


