INTRODUCTORY COMMENTARY

Living beyond the first 28 days of life remains a major accomplishment, particularly in most of southern Asia and sub-Saharan Africa. Dr Cooper presents critical data bringing forward the facts that provide evidence that straightforward and simple medical interventions will help infants get off to a safe and healthy start. Unfortunately, the pace of improvement in the availability of these basic health care services is occurring extremely slowly. Countries that are chronically underresourced have multiple factors contributing to poor neonatal survival rates. Yet, greater progress in improving survival rates could occur with increased attention to providing basic perinatal care. The 2015 Millennium Development Goal for improved child survival will not be achieved in large part due to the inadequate focus given to this critical issue.

—Jay E. Berkelhamer, MD, FAAP
Section Editor

The mortality rate for children under the age of 5 years has been declining for a number of decades in most parts of the world. Impetus for this decline was provided by Millennium Development Goal (MDG) 4, which was approved by the United Nations General Assembly at the turn of the millennium. As reviewed recently in this journal, MDG 4 had as its main target the reduction by two-thirds, between 1990 and 2015, in the mortality rate in children younger than 5 years of age. The number of deaths in children under 5 has fallen from an estimated 12 million in 1990 to ∼6.9 million in 2011, representing a 41% reduction in mortality. Although this reduction is not sufficient to achieve MDG 4, it is nevertheless impressive.

Over the same period, the global neonatal mortality rate (NMR, deaths in the first month per 1000 live births) has fallen from 32 of 1000 to 22 of 1000 live births. Although also impressive, this continued a trend from previous decades whereby the neonatal component of the under-5 mortality rate was falling more slowly than the other components. The result is that it is now estimated that ∼40% of all under-5 deaths occur in the neonatal period.

The complications related to preterm births now constitute the second commonest cause of all under-5 deaths (deaths due to pneumonia are the commonest), whereas intrapartum-related deaths are now on par with the numbers due to malaria.

The recognition that a major focus on the causes of neonatal deaths was needed if MDG 4 was to be achieved led to a series of papers on neonatal survival in *The Lancet* in 2005. In the first of these, Lawn et al highlighted the causes of the 4 million neonatal deaths that occurred annually, most of which could be prevented by relatively simple interventions.

CAUSES OF NEONATAL DEATHS

In most high-income countries, the NMR ranges between 1 and 4 per 1000 live births, and neonatal deaths in these countries make up only 1.4% of the total neonatal deaths worldwide. However, more than three-quarters of the 3 million neonatal deaths that occurred in 2011 took place in sub-Saharan Africa and South Asia where the rates for 2011 were reported by the United Nations Children’s Fund (UNICEF).
The main causes of neonatal deaths globally in the UNICEF report are shown in Table 1.2 These causes are vastly different from the causes of neonatal mortality in industrialized countries where deaths related to prematurity and congenital abnormalities predominate, the former mainly occurring in extremely premature infants, many of whom would not be regarded as viable (and often not even entering the statistics) in developing countries.

### MORTALITY TRENDS SINCE 1990

Countries with high NMRs invariably have inadequate civil registration of births and deaths that allow accurate estimates of neonatal mortality. As a result, multilevel statistical models have been developed to predict NMRs in these countries. Using such a model, Oestergaard et al4 estimated the trends in NMRs for 193 countries between 1990 and 2009. Whereas there was a reduction in all regions over this period, the rates were significantly lower than those for children between 1 and 59 months of age. The slowest rate of reduction was seen in sub-Saharan Africa and, of the 40 countries with the highest NMRs in 2009, 34 were in sub-Saharan Africa. From these figures, it was estimated that if the current rate of reduction in the NMR in sub-Saharan Africa continued, it would take more than 150 years to reach the current NMR of high-income countries.

### TABLE 1 Causes of Neonatal Deaths Globally

<table>
<thead>
<tr>
<th>Cause</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preterm birth complications</td>
<td>35</td>
</tr>
<tr>
<td>Complications during birth (mainly</td>
<td>23</td>
</tr>
<tr>
<td>intrapartum hypoxia)</td>
<td></td>
</tr>
<tr>
<td>Sepsis/meningitis/tetanus</td>
<td>15</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>11</td>
</tr>
<tr>
<td>Congenital abnormalities</td>
<td>9</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>2</td>
</tr>
<tr>
<td>Other conditions</td>
<td>6</td>
</tr>
</tbody>
</table>

Data from ref 2.

### INTERVENTIONS

As part of The Lancet’s Newborn Survival Series in 2005, Darmstadt et al5 outlined a number of evidence-based, cost-effective interventions that could be implemented to reduce the NMR. However, until then, there were few data regarding cause of death in countries and regions with a high NMR, with neonatal deaths classified either as “perinatal cause” or included in other categories.6 The classification of neonatal deaths as listed in the UNICEF reports has allowed a much more targeted approach to these causes whereby more effective policies and programs can be developed to meet specific local circumstances.

The most impressive reduction in cause-specific neonatal mortality between 2000 and 2010 was seen in the reduction in the incidence of neonatal tetanus, which had an annual rate of reduction of 9.5%.7 This reduction was brought about by widespread immunization of pregnant mothers and, probably to a lesser extent, by improved delivery practices. However, the 2 most important causes of neonatal deaths, prematurity and intrapartum-related complications, showed only a 2.0% and 2.4% annual reduction. Rapid progress in the reduction in neonatal mortality has been made in a number of countries in Eastern Europe and Latin America, often linked to economic progress. However, some countries such as Sri Lanka and Bangladesh have been able to show significant improvements in neonatal mortality in the absence of economic growth by using relatively simple and cost-effective interventions.8

Evidence-based interventions described in The Lancet Newborn Survival Series, with minor modifications, were assessed by Darmstadt et al9 with respect to cost and impact if these interventions were scaled up in Asia and Africa. Their analysis revealed that neonatal mortality could be reduced by approximately 50% (range: 38%–68%) at a relatively modest cost. A number of these interventions apply to pregnancy and delivery, such as antenatal steroids and detection of fetal complications during labor to prevent fetal hypoxia. The major neonatal interventions include newborn resuscitation, breastfeeding, prevention and management of hypothermia, kangaroo mother care for low birth weight infants, and community-based pneumonia case management.

Although these interventions, if carried out on a global scale, would have a major impact on neonatal mortality, such programs would require a significant up-scaling of human resources as well. Currently in those areas where neonatal mortality is high, there is a huge gap between the numbers of trained staff required to carry out these interventions and the numbers and training of those on the ground. This situation has been recognized by the World Health Organization, and there are significant initiatives in this regard.

With the worldwide lack of progress in reducing the rates of prematurity over many decades together with the reduction in other causes of childhood mortality, prematurity-related deaths are likely to make up an even larger proportion of childhood deaths in the future. In recognition of this likelihood, a number of experts and organizations contributed to a publication by the World Health Organization in 2012 entitled Born Too Soon: The Global Action Report on Preterm Birth.10

### CONCLUSIONS

The rate of reduction in neonatal mortality worldwide over many decades has been slower than the reduction in mortality of those 1 to 59 months of age. However, the past decade has seen a much stronger global focus on reducing the NMR in many countries where progress has been
slow. Evidence-based cost-effective interventions are well described. Implementation of these interventions on a global scale is required to effect a more rapid reduction in the NMR.

REFERENCES

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# The Challenge of Reducing Neonatal Mortality in Low- and Middle-Income Countries

Peter A. Cooper

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