

Every Child Counts: The Global Reality of Child Survival

Barbara Oettgen, MD, MPH

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CME EDUCATIONAL OBJECTIVES

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2. Review the history of child public health and progress that has been made in reducing child mortality, and articulate the goals for continued amelioration of child morbidity and mortality.
3. Identify the major causes of global child mortality, especially the large role played by neonatal mortality and infectious diseases and which interventions are potentially effective to decrease mortality.

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Dr. Oettgen has disclosed no relevant financial relationships.

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EDUCATIONAL OBJECTIVES OVERVIEW

Now, more than ever, America is a citizen in a global village. This places the medical professional in a position of no longer needing to be aware of just local diseases, but also becoming competent in dealing with imported illnesses. With increasing globalization of trade and easier means of crossing borders via air travel, local epidemics in a small part of the world can swiftly become global catastrophes. In the past century, the great winged vector of human disease has metamorphosed from the mosquito to an airliner, allowing greatly compressed speed of disease transmission throughout long distances.

As families elect to take exotic vacations or perhaps visit relatives in developing countries, the challenge arises to keep children safe from infections rarely encountered in the United States. Additionally, with increasing globalization comes a larger immigrant and refugee population, necessitating the acquisition of new skills in delivering culturally competent care.

This issue of *Pediatric Annals* provides six excellent reviews of topics more timely today than ever before. Consideration of the contents of this issue will better prepare the pediatric provider to serve as a resource to families considering travel abroad, as well as to improve diagnostic acumen when delivering care to families returning from travel.

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Every Child Counts: The Global Reality of Child Survival



Barbara Oettgen, MD, MPH

Why should we as primary care practitioners review the topic of global child health? It's certainly not a topic of primary concern in our day-to-day life. We focus on provid-

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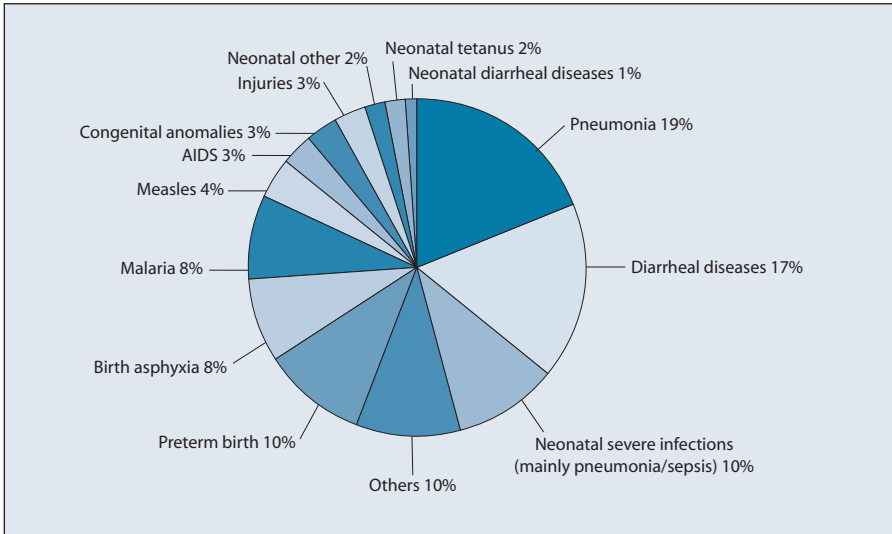


Figure 1. Global distribution of cause-specific mortality among children younger than 5 years. Under-nutrition is implicated in up to 50% of all deaths of children younger than 5 years. Source: World Health Organization and UNICEF.

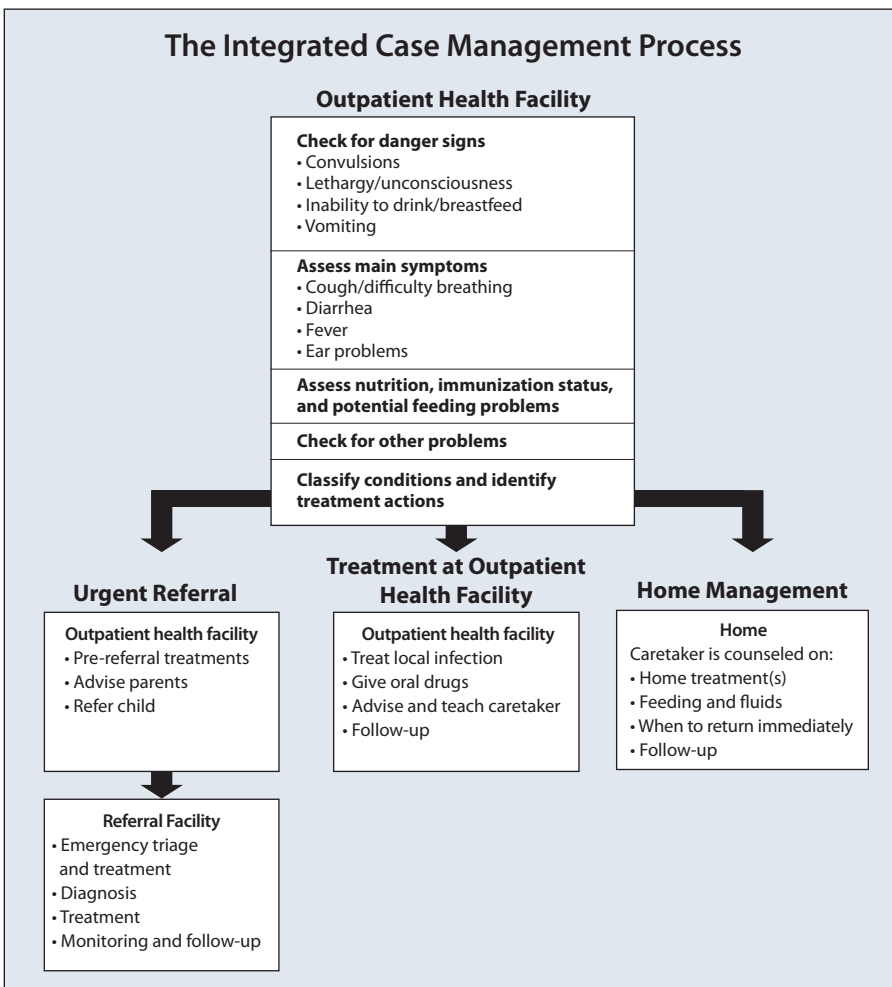


Figure 2. IMCI case management in the outpatient health facility, first-level referral facility, and at-home for the sick child from 2 months to 5 years. Source: World Health Organization and UNICEF, *Model Chapter for Textbooks: Integrated Management of Childhood Illness*. New York, NY; and Geneva, Switzerland: WHO and UNICEF; 2001:6.

ing care to children in our local healthcare facilities in the industrialized world. But hopefully this presentation of the statistics of global child mortality will make it clear why we, as advocates for children and child health, need to understand what is going on with the health of the majority of the world's children. Increased travel and migration will bring these children and their health problems to our local practices. Additionally, travelers from the United States to other countries are increasingly exposed to diseases now rarely seen in the United States, as witnessed by the increased number of measles outbreaks (due to imported measles) in the United States in recent years.¹ We should be concerned about providing the 90% of the world's children who live in developing countries with the care necessary to have an adequate chance to grow and become mature members of society, and we should treat all children equitably. Supporting child and maternal health is an investment in a safer and more secure world.

THE CURRENT STATUS OF CHILD MORTALITY

Although we frequently see images of children in developing countries, clearly in dire need, it is still difficult to imagine the scale of this need and how we might participate in improving their circumstances. Every day nearly 26,000 children die around the world (approximately 10 million in 1 year).² That is the equivalent of the death of one-half of the children under 5 years in the United States in 1 year. Nearly all of the deaths occur in 60 developing countries.² More than one-third of these children dies before they reach 1 month.² Figure 1 shows the breakdown of the major causes of child death globally. In most cases, the causes are infectious and preventable.² Malnutrition contributes to approximately 50% of those deaths.² In sub-Saharan Africa, one of the most troubled regions, one in six children dies before 5 years, and mortality rates have decreased only by 14% since 1990.²

TABLE 1.

Health and the Millennium Development Goals

Goal	Health Targets	Health Indicators
Goal 1: Eradicate extreme poverty and hunger	Target 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	Prevalence of underweight children younger than 5 years; proportion of population below minimum level of dietary energy consumption
Goal 4: Reduce child mortality	Target 5: Reduce by two-thirds, between 1990 and 2015, the under-5 mortality rate	Under-5 mortality rate; infant mortality rate; proportion of 1-year-olds immunized against measles
Goal 5: Improve maternal health	Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio	Maternal mortality ratio; proportion of births attended by skilled health personnel
Goal 6: Combat HIV and AIDS, malaria, and other diseases	Target 7: Halt and begin to reverse, by 2015, the spread of HIV and AIDS	HIV prevalence among pregnant women 15 to 24 years; condom use rate of the contraceptive prevalence rate; ratio of school attendance of orphans to school attendance of non-orphans 10 to 14 years
Goal 6: Combat HIV and AIDS, malaria, and other diseases	Target 8: Halt and begin to reverse, by 2015, the incidence of malaria and other major diseases	Prevalence and death rates associated with malaria; proportion of population in malaria-risk areas using effective malaria prevention and treatment measures; prevalence and death rates associated with tuberculosis; proportion of cases detected and cured under Directly Observed Treatment Short-course (DOTS)
Goal 7: Ensure environmental sustainability	Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	Proportion of population using an improved water source (urban and rural)
Goal 7: Ensure environmental sustainability	Target 10: By 2020, achieve a significant improvement in the lives of at least 100 million slum dwellers	Proportion of population using improved sanitation (urban and rural)
Goal 8: Develop a global partnership for development	Target 17: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries	Proportion of population with access to affordable essential drugs on a sustainable basis

Source: Adapted from World Health Organization, *Health and the Millennium Development Goals*. Geneva, Switzerland: WHO; 2005:11.

Looking at the past 50 years, significant strides have been made in child survival. Specifically, the under-5 mortality rate (U5MR), a measure of the number of children dying before the age of 5 (per 1,000 live births), has dropped by more than 50% from 1960-1999, but there is still a long way to go.³ In an effort to prevent stagnation and promote continued progress across all aspects of human well-being, governments worldwide met in 2000 and adopted a set of eight Millennium Development Goals (MDGs, see Table 1). The goals address poverty, health, nutrition, and the environment. MDG #4 aims to reduce the U5MR by two-thirds by the year 2015 from the level in 1990, or from 13 million to < 5 million deaths annually.²

WHERE HAVE WE BEEN?

The approach toward child mortality reduction has evolved over time. An excellent review of the history is outlined in UNICEF's *State of the World's Children 2008*.² In the 1950s to 1970s, mass campaigns to control specific diseases were launched, most successfully exemplified by the eradication of smallpox in 1977. In 1974, the Expanded Program on Immunization (EPI) was established. At baseline in 1974, only 5% of children worldwide were adequately immunized, but through efforts such as EPI, rates are now closer to 75%. In 1982, UNICEF began to promote a group of interventions to positively impact more causes of child mortality called GOBI (growth monitoring for undernutrition, oral rehydration, breastfeeding, im-

munization). In the late 1980s and early 1990s, there was an increased interest in improving the primary care infrastructure in countries and strengthening healthcare at the community level. It was recognized that a community health infrastructure could disseminate a greater number of interventions to positively impact maternal and child health. This led to the development of the Integrated Management of Childhood Illness (IMCI) in the mid-1990s. Case workers are identified at the local level (within rural communities and urban areas). They are trained to provide health education and support to families for a variety of maternal and childhood diseases and conditions (see Figure 2, page 800). The current effort to decrease child mortality uses a combina-

tion of targeted single interventions (such as vaccines), grouped interventions, and programs such as IMCI.

WHAT IS CURRENTLY BEING DONE?

Reviewing the major causes of mortality, current statistics, interventions, and suggested improvements will be helpful in understanding in a more detailed manner what the global public health community is trying to accomplish.

Acute respiratory infection (ARI)

Acute respiratory infection (ARI) is the number-one killer of children younger than 5 years worldwide (2 million deaths per year).² The public health approach to decreasing ARI mortality includes 1) prompt detection and early treatment of significant ARI through the use of selective antibiotics; 2) education of families about nutrition and seeking early care for their children; and 3) vaccination. IMCI workers are trained to perform rapid assessment of children using clinical signs such as respiratory rate and either refer children to a local physician or start antibiotics based on a predetermined set of clinical findings. It is estimated that selective use of antibiotics with effective case management could decrease the mortality due to pneumonia by 37% or 700,000 lives.² IMCI workers can also promote breastfeeding and encourage improved nutrition practices. The expanded use of *Haemophilus influenzae* B (Hib) and pneumococcal conjugate vaccines is predicted to decrease mortality rates due to pneumonia by 1 million deaths per year.^{4,5} The establishment of the Hib initiative in 2005 has greatly increased the number of countries using Hib vaccine with the assistance of financing from the Global Alliance for Vaccines and Immunizations (GAVI). Likewise Pneumococcal Vaccines Accelerated Development and Introduction Plan (Pneumo ADIP) was established to encourage the use of pneumococcal vaccine.⁴

Diarrhea

The improvements in mortality rates secondary to diarrhea have been one of the public health success stories over the past 20 years, mostly due to increased use



Acute respiratory infection is the number-one killer of children younger than 5 years worldwide.

of oral rehydration therapy (ORT). Diarrheal deaths have decreased by two-thirds since 1980 (4.6 million annually to 1.5 million), so that diarrhea is no longer the number-one cause of death.⁶ As with ARI, other interventions could also impact diarrhea deaths including education about increased breastfeeding, healthier weaning practices, and adequate nutrition including vitamin A and zinc.² Improved sanitation and hygiene would also impact mortality. It is estimated that simple hand washing could decrease the rate of diarrheal illness by 30%, saving about 500,000 lives.⁷ Rotavirus is the number-one cause of viral diarrhea globally. Routine vaccination with rotavirus vaccine has been effective in the United States, Europe, and Latin America. Studies to prove efficacy in high mortality regions such as sub-Saharan Africa and Asia are pending. Hopefully, they will likewise show high efficacy, and the use of the vaccine globally will further help decrease diarrheal morbidity and mortality.⁸

Malaria

Malaria has proven to be a difficult opponent secondary to drug resistance, mosquito resistance to insecticides, and lack of drug availability. Malaria is the cause of 1 million deaths per year, 90% of which occur in children younger than 5 years.² Every 30 seconds, a child dies from malaria. Political will to decrease malaria disease was manifested on April 25, 2000 when 44 African leaders signed the Abuja Declaration to cut malaria deaths in half by 2010. Programs such as the Roll Back Malaria Partnership (a collaboration of the World Bank, UNICEF, President's Malaria Initiative, and the Global Fund to fight TB, AIDS, and Malaria) use a multi-pronged approach.⁹ First, families are encouraged to seek early care for their febrile, ill-appearing children in malaria-prone areas, either by physicians or other healthcare providers (such as IMCI). These providers are encouraged to give prompt and early medical treatment based on clinical findings. The effectiveness of this intervention is currently impaired by lack of readily available effective medicines and increasing resistance to medicines, especially in the most rural areas. Secondly, women are given preventive intermittent treatment for malaria during pregnancy. Thirdly, there is targeted spraying for mosquitoes. Lastly, insecticide-treated bednets (ITN) are distributed. It is estimated that 20% to 40% of deaths could be prevented by the regular use of these bednets.¹⁰ Fortunately, thanks to increased global funding for malaria control, the use of ITNs has tripled since 2000 in the 16 of 20 countries reporting such data in sub-Saharan Africa.² Combining programs such as national/supplemental immunization days with ITN distribution has been a successful way to increase distribution, and the rate of use can be as high as 74%.^{11,12}

Measles

Measles can be associated with significant morbidity and mortality but even

more so among children who have significant malnutrition and vitamin A deficiency. Fortunately, significant progress has been made in increasing rates of immunization, especially in sub-Saharan Africa where the lowest rates existed. Between 1999 and 2005, immunization rates (with a first dose of measles vaccine) increased globally from 72% to 80%, with an accompanying decline of 528,000 deaths due to measles. The Measles Initiative (UNICEF, WHO, and other international and private organizations), launched in 2001, has been instrumental in the decline of deaths, using a four-pronged approach. First, there is aggressive implementation of immunization activities to make sure at least one dose of vaccine is provided to infants and children who are at least 9 months, aiming for 90% vaccination rates. Secondly, a second dose of measles vaccine is provided through supplemental immunization days. Thirdly, children with measles are managed more aggressively once the disease is clinically apparent including administering two doses of vitamin A. Finally, there is an effort to provide more accurate and adequate disease surveillance.¹³ Looking ahead, the initiative aims to decrease deaths by 90% from 2000-2010, focusing on the India/Pakistan region, which now has the largest number of measles deaths.

HIV

The tremendous impact of the HIV epidemic is felt by children both directly and indirectly. Currently, 2.5 million children (younger than age 15) are infected with HIV, 90% of whom live in sub-Saharan Africa.¹⁴ Children become infected by vertical transmission at birth, a preventable cause as seen in the United States. Yet in 2006, only about 20% of HIV-infected mothers had access to therapy to prevent transmission of HIV, to their infants.² The group that is becoming infected at the highest rate is the 15- to 24-year-old age group because they engage in risky behaviors (both sexual and drug abuse). Indirectly, children are affected because

they become orphans or because their families and communities are being disrupted economically, which leads to malnutrition and poor health. It is estimated that 15 million children have lost at least one parent with HIV, and that number is expected to exceed 25 million by the end of the decade.¹⁵ It has been difficult to make headway with child survival goals, which have stagnated or worsened in those countries because of the epidemic's devastating effects on the infrastructure of these countries in Africa.¹⁶

Perinatal/neonatal deaths

We will have a hard time achieving the MDG4 by 2015 if we do not spend more time addressing neonatal deaths. In the past, child survival programs have focused on causes of mortality in the children older than 1 month,³ and the reduction in deaths for these older infants and children has resulted in an increased proportion of neonatal deaths. Four million neonatal deaths were estimated in 2000, equivalent to all the babies born in the United States in one year. Two-thirds of these deaths were concentrated in the African and southeast Asian regions.³ Morbidity and mortality are often related to maternal health, because maternal malnutrition often leads to low birth weight infants and low birth weight is related to 60% to 80% of deaths.³ Sub-Saharan Africa has had the least reduction in neonatal mortality in the world, while significant progress has been reported in Latin America with a decrease of 50%.³ The most significant causes of neonatal mortality are infections (36%), preterm birth (28%), and asphyxia (23%). Renewed attention to this significant cause of child mortality has focused on both improvements in prenatal care and maternal education as well as postnatal interventions, especially in the first week of life when 75% of neonatal deaths occur.³ With full implementation of the interventions known to be effective at preventing neonatal mortality, it is estimated that about 59% of neonatal deaths could be

prevented. Implementing just the interventions known as "family community care" (through family education and community health workers), such as breastfeeding promotion, clean cord care, and thermal care, etc., would decrease deaths by 18% to 37% or nearly 1.5 million deaths.¹⁷ In order to achieve the MDG4, we will need to provide not just family-community care but also clinical care services (such as skilled maternal and immediate neonatal care, emergency obstetric care, and emergency neonatal care) even though they are more costly and complicated to implement.¹⁷

Malnutrition

Poor nutrition contributes to at least one-half of child deaths worldwide. When mothers are malnourished during pregnancy, children are born preterm or at low birth weight and are already at increased risk for disease. Breast feeding promotion messages still need to reach families.² Although malnutrition may not always manifest itself as underweight, deficiencies in vitamin A, zinc, and iodine can all contribute to a weakened immune system. Recently, the Child Undernutrition Study Group reviewed the interventions that could affect malnutrition. These interventions include micronutrient supplementation with iron and folate in pregnant women, vitamin A supplementation in the neonatal and infancy period, preventive zinc supplementation, and universal promotion of iodized salt. Implementation of these interventions could decrease stunting by 36% and mortality for children 0 to 3 years by 25%.⁷

War

Armed conflicts have a profound impact on children. It is estimated that the proportion of civilian deaths in armed conflict has climbed in recent decades and is now about 90%, one-half of whom are children. About 2 million children have died in the past 10 years because of war. Six million more have suffered a disability, and many more (nearly 20 million)

TABLE 2.

Interventions Effective in Reduction of U5MR²⁰

Disease	Intervention
ARI	Breastfeeding promotion; complementary feeding; Hib vaccination; zinc supplementation; selective antibiotics
Diarrhea	Breastfeeding promotion; complementary feeding; hygiene and sanitation; zinc and vitamin A supplementation; oral rehydration therapy
Measles	Complementary feeding; vitamin A treatment; vaccination
Malaria	ITN; complementary feeding; prompt anti-malarial use
HIV	Nevirapene; replacement feeding
Neonatal	Breastfeeding; maternal tetanus vaccination; clean delivery; intermittent anti-malarial treatment during pregnancy; antibiotics for sepsis

have been forced to flee their homes and become refugees. Children are recruited to become child soldiers, often forcibly. They become orphans, are the victims of rape, and experience unimaginable psychological stress. War disproportionately affects countries in poverty. Of the 10 countries with the highest U5MR, seven were involved in an armed conflict. Those countries facing war or emergencies also have fewer resources to improve child health. Frequently children face greater health risks due to lack of access to healthcare including immunizations.¹⁸

Poverty

The contribution of poverty to the poor health of children cannot be underestimated, and most of the diseases described here would not have such a significant stronghold if there was less poverty. The chance of dying before 5 years can be almost 90 times greater in Sierra Leone (U5MR 270/1,000 live births) compared with Sweden (U5MR 3/1,000 live births). A child in Sierra Leone faces a greater than one in four chance of dying before 5 years.² MDG #1 addresses poverty: eradicate extreme poverty and hunger with the goal of cutting in half the number of people whose income is less than \$1 per day between 1990 and 2015. We can make headway with health interventions on the

child mortality rate. However, to make a lasting impact, we need to address the economic inequities in a world where the world's 225 richest people have a combined wealth equivalent to the annual income of the poorest 2.5 billion people.¹⁹

WHERE DO WE GO FROM HERE?

"Nothing just happens in politics. If something happens, you can be sure it was planned that way."

— (Franklin Delano Roosevelt)

In 2003, a series of papers examined child deaths, possible interventions to decrease child mortality, and the ability of the current system to implement those interventions.²⁰⁻²² In one of the papers, existing interventions designed to reduce child mortality from the major causes such as ARI, neonatal disorders, and diarrhea were examined for evidence of effect. It was found that at least one effective intervention was already available for treating each of the major causes of death, and many more showed limited evidence of effectiveness (see Table 2).²⁰ So we know how to improve child survival; now we just need to do a better job of implementation.

As of 2004, the level of official development assistance to maternal, newborn, and child health was only adequate to fund a small proportion of the resources

needed to reach the Millennium Development Goals — only about \$1.3 billion of the \$11 billion needed in the 60 high-priority countries to implement effective interventions.²³ A rapid increase in funding will be needed throughout the next 5 years to make adequate progress.²³ If we make this investment, we could potentially save 16,000 children every day from dying.²⁴ Consider that it is estimated that \$2 billion is spent per week on the war in Iraq,²⁵ and that \$12 billion are spent annually on perfume in Europe and the United States.¹⁹

The Child Survival Countdown, a group of scientists, policy makers, and health program managers, gathers data on a regular basis to monitor how we are doing at achieving MDG #4 and implementing, at the regional level, the interventions known to be successful at decreasing childhood mortality. Every 2 years, the group plans to reconvene, evaluate progress, share new experiences, and continue to urge governments to be accountable. In 2006, the review highlighted the need for a tremendous intensification of effort, especially in certain regions, to move closer to MDG goals.²⁶ Only seven of the 60 countries with the highest U5MR were on track to achieve MDG #4. In fact, mortality rates increased in 14 countries.²⁶

In the most recent evaluation (April 2008), 16 countries were on track to meet MDG #4.¹⁶ But coverage with interventions varied widely within and between countries. Those interventions that can be scheduled (immunizations and antenatal care) were more likely to be implemented than those that required a functional health system and skilled or emergency care. Immunization coverage had increased the most but had also experienced the greatest increase in funding. Of the 26 countries with no reduction in child mortality, many had high HIV prevalence and/or were countries at war or post war. More complex interventions (yet ones which might impact more causes of mortality) such as IMCI, only

reached one-third of children but also received a low rate of funding. The integration of interventions is not occurring routinely either. Although women were receiving routine antenatal care visits, they were not receiving logical antenatal interventions such as preventive intermittent treatment for malaria or medicine to prevent HIV transmission. Issues impeding progress are financing, HIV, and conflict.¹⁶ Within countries, there are also large coverage gaps for interventions between the wealthy and the poor.¹⁶

Per WHO/UNICEF the effort to combat child mortality is focused around several priorities: 1) focus on the 60 countries where child mortality is the greatest (> 50,000 child deaths per year or an U5MR of > 90/1,000 live births); 2) package interventions for mothers and children so that they receive a continuum of care prenatally through childhood; and 3) strengthen community partnerships and health systems that can provide preventive care.²

What can we do at the local level to change the current status quo? First, we need to teach ourselves and our medical students and residents about the global inequities in child survival. We can be leaders and advocate at the political level for increased funding to pay for programs that are already known to improve survival for the leading causes of childhood mortality. At the current rate of donor assistance and program implementation, we will fall well short of MDG #4, so the commitment on the part of developed countries and donor organizations needs to sharply increase in order to meet this goal.²³ The rate of decline in the U5MR must occur much more rapidly than it has been occurring in the past 15 years.² We must increase efforts especially in the poorest areas that also face stumbling blocks of war and HIV. If we don't change our current approach, there will be nearly 4 million excess deaths that could have been avoided if we had met MDG #4.²

Many of us as pediatricians are also parents. Mothers and fathers around the world are no different. As Melinda Gates writes in the State of the World's Mothers 2008, "We must remember that these mothers love their children just as much as we love ours." Like us, they have hopes and dreams for their own children to be happy, healthy, and educated.² Hopefully, together we can all work toward a better future for all the world's children.

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