The unfinished agenda in child survival

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10 years ago, *The Lancet* published a Series about child survival. In this Review, we examine progress in the past decade in child survival, with a focus on epidemiology, interventions and intervention coverage, strategies of health programmes, equity, evidence, accountability, and global leadership. Knowledge of child health epidemiology has greatly increased, and although more and better interventions are available, they still do not reach large numbers of mothers and children. Child survival should remain at the heart of global goals in the post-2015 era. Many countries are now making good progress and need the time and support required to finish the task. The global health community should show its steadfast commitment to child survival by amassing knowledge and experience as a basis for ever more effective programmes. Leadership and accountability for child survival should be strengthened and shared among the UN system; governments in high-income, middle-income, and low-income countries; and non-governmental organisations.

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Introduction

In June, 2003, *The Lancet* published a Series of five papers about child survival that brought together three streams of work.[1–5] The Series was conceived during a meeting in Bellagio, Italy, in 2002. The authors' intent was to encourage rethinking about global child health strategies by assembling new evidence about the causes and distribution of child deaths, and how the interventions available to address those causes could be delivered to achieve high, sustained, and equitable coverage and effects on mortality. At that time, the Child Health Epidemiology Reference Group (CHERG) had been working since the late 1990s to improve estimates of the cause-specific distribution of under-5 deaths,[6] the Multi-Country Evaluation of the Integrated Management of Childhood Illness was producing results from countries,[7] and the Child Health Equity Working Group was producing new analyses of inequities in service access, coverage, and effect.[8] The scientists working in these three areas came together to address what they considered to be a global public health emergency: decreasing priority for child survival and insufficient funding for proven intervention programmes to reduce child mortality. In this Review, we give our insights on progress and missed opportunities in the decade since the original Series was published. We focus on the themes of the five original Series articles: epidemiology; interventions and intervention coverage; strategies of health programmes; equity; and accountability, leadership, and resources. Additionally, we discuss developments in relevant data, methods, and directions for child health in the post-2015 era.

Changes in epidemiology

The absolute number of under-5 deaths has fallen substantially since 2000. The total number of child deaths has decreased from 10·8 million in 2000 to 7·6 million in 2010,[9] which is especially remarkable in view of the 7% increase in the number of children younger than 5 years in less developed countries during this period. If mortality rates from 2000 had persisted, nearly 11·6 million children would have died in 2010. More than 99% of these deaths continue to happen in low-income and middle-income countries, but they are increasingly concentrated in sub-Saharan Africa (figure 1). That region alone accounted for 48% of global under-5 deaths in 2010. Although mortality rates fell between 2000 and 2010 in all countries monitored by Countdown to 2015 for Maternal, Newborn, and Child Survival (except for Haiti and Somalia, which were both affected by natural disaster or conflict during this period), the toxic mix of population growth and continued failures to address gaps in access to and coverage of life-saving interventions resulted in increases in the absolute number of under-5 deaths in this decade in 15 Countdown countries, all but three of which were in sub-Saharan Africa.[10]

The causes of child deaths have changed in important ways since they were first published in 2003,[1] with neonatal deaths increasing in importance, and deaths due to diarrhoea, pneumonia, and measles decreasing.[9] The cause-of-death structure in sub-Saharan Africa has changed more slowly than it has in other regions. Variations have taken place in the annual rates of reduction by cause; some readers were surprised at the small part played by measles and HIV deaths in our original paper,[1] but these causes now represent even smaller fractions of child deaths.

One important refinement is the progression from a focus on global progress and trends to a more articulated examination of progress at country and subnational levels. Figure 2 shows the absolute and relative reductions in under-5 mortality for each of the 42 countries featured in our original series from 2000 to 2011, with differentiations between low-income and middle-income countries as defined in 2005. The horizontal line at 38% shows the relative reduction needed during the period 2000–2011 to achieve Millennium Development Goal (MDG) 4 for improved child survival. Most countries had substantial reductions on both absolute and relative scales, but the patterns are revealing. For example, nine countries had relative reductions of between 40% and 50% in their rates of under-5 mortality in this period. Of those countries, Mexico and Iran had reduced the number of child deaths by less than 20 per 1000 by 2012,

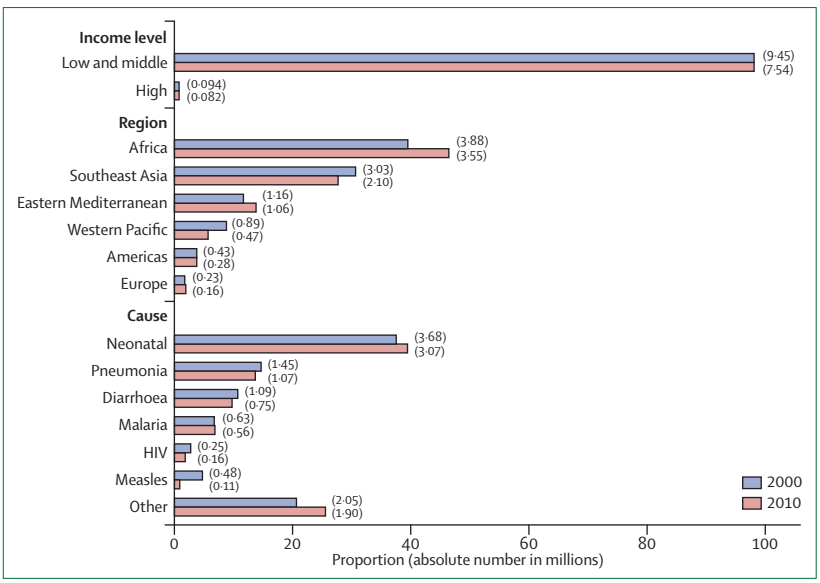

***Figure 1*: Proportion (and number in millions) of under-5 deaths by income level, region, and cause, between 2000 and 2010**

Mortality estimates based on research from the UN Inter-agency Group for Child Mortality Estimation (IGME). Cause-of-death estimates from Liu and colleagues, 2012.[9]

For the **IGME database** see http://www.childinfo.org/mortality_igme.html

whereas Zambia had reduced the number by more than 70 per thousand, and Niger by more than 90 per thousand. A cluster of middle-income countries in the top-left quadrant have quite large relative reductions and small absolute reductions, because there are few remaining preventable deaths. Countries in the top-right quadrant mostly represent low-income countries like Rwanda and Niger that are doing well in reducing rates of under-5 mortality. In retrospect, the sharp focus of the Series on child survival overlooked the importance of child development and did not give enough importance to the role of maternal and child undernutrition, gaps that have been addressed in subsequent series,[13–16] and major initiatives.[17]

Changes in interventions, coverage, and underlying assumptions

In 2003, we examined interventions that were feasible for delivery at high and sustained levels of coverage in low-income settings. We classified them on the basis of evidence available at that time of their effectiveness in reducing child mortality due to diarrhoea, pneumonia, measles, malaria, HIV/AIDS, undernutrition, and a small group of causes of neonatal deaths.[2] The results showed that if high-impact interventions were universally available, 63% of under-5 deaths could be prevented.

We assess progress in two dimensions: the availability of effective interventions, and gains in population coverage with presently implemented interventions. The original list of 16 preventive and eight treatment interventions has expanded. A WHO review identified 52 interventions for which there is "agreed upon" evidence of a "significant impact" on newborn and child survival.[18] Pneumococcal and rotavirus vaccines, which had been in development for decades, are now available and their introduction is subsidised in low-income countries. There are newly recognised interventions (eg, chlorhexidine for umbilical-cord care, insecticide-treated bednets to prevent malaria, and, within the decade, long-lasting versions of these nets), better diagnostics (eg, rapid tests for malaria), and a clearer understanding of when and how an intervention achieves clinical effectiveness (eg, the importance of early start of breastfeeding). Although some of these interventions will make a difference, they are not as powerful as anticipated or are facing difficulties that are only being identified now, after widespread implementation. For example, the effectiveness of long-lasting bednets is shorter than was expected,[19–22] and rotavirus vaccine is being shown to have only moderate effectiveness in low-income settings.[23] These findings reinforce the need for complementary interventions (eg, vaccines will not eliminate the need for treatment) and additional research to continue to improve these technologies and their delivery, and to assess their performance when scaled up in real-life conditions.

However, the greatly expanded set of effective interventions for child survival reinforces the basic message we proposed in 2003: health programmes working with scarce human and financial resources should be ruthless in prioritisation of quality delivery at scale for a small number of interventions that address the major causes of child deaths in their specific context, despite pressures from donors. Improved country-specific data for cause of death, and applications of the Lives Saved Tool (LiST), can help countries make these essential choices.[24]

With regard to progress towards achievement of high, sustained, and equitable coverage for these proven interventions, the 2013 report from Countdown shows that of the 75 countries that account for more than 95% of child deaths, none has yet achieved anything close to full population coverage for even a minimum set of essential interventions.[25] An analysis using historical trends in coverage to project under-5 mortality in 2035 shows that there would be 71% fewer deaths in that year (2·3 million rather than 7·6 million) if each Countdown country could scale up coverage at the same pace as they are in the best-performing country with a similar level of baseline coverage.[26]

Controversy continues about the causal model underlying reductions in child mortality. Several studies have suggested, with varying degrees of explicitness, that gains in child survival can be achieved through improvements in broader, more distal determinants alone, and do not necessarily operate through increases in intervention coverage as we suggest here and in our previous work. Such assertions have been made about increases in maternal education,[27] fertility reductions,[28] and broader constructs related to political stability and good governance.[29,30] Both distal determinants and intervention

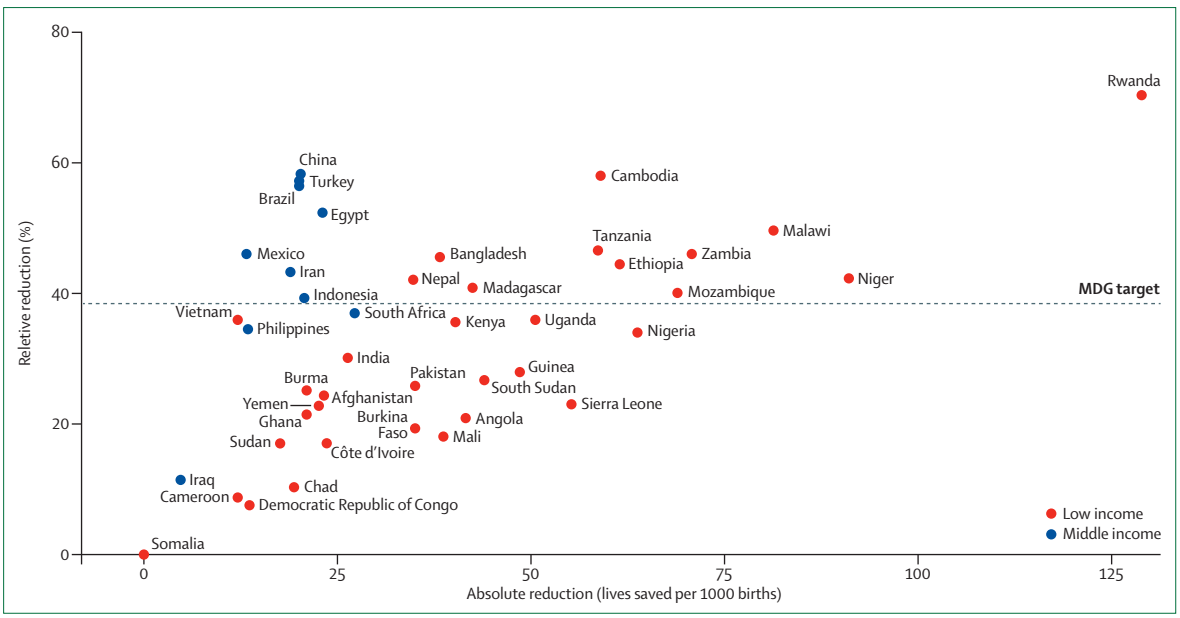

***Figure 2*: Absolute and relative reductions in under-5 mortality for countries monitored by Countdown between 2000 and 2011[11]**
Country income levels based on World Bank estimates, 2005.[12] MDG=Millennium Development Goal.

coverage are important and, in the short term, improvements in intervention coverage are likely to result in faster reductions in mortality. For example, improvements in coverage of measles vaccination prevent deaths immediately, as does correct treatment of pneumonia. Changes in distal determinants can take more time—education of girls might benefit their children and improved income often does not immediately translate into better conditions for child survival.

Changes in strategies of health programmes

In 2003, the Bellagio group attributed low coverage levels to weaknesses in both the provision of and demand for services, and to malfunctioning health systems.[3] At that time, the prevailing child survival strategy was the Integrated Management of Childhood Illness (IMCI), a gold-standard clinical approach for provision of care for sick children in first-level health facilities in countries where the main causes of death are pneumonia, diarrhoea, and malaria. A scarcity of attention to deaths in the first week of life, and restricted emphasis on the management of sick young infants (aged <2 months) relative to older children (aged 2 months to 5 years), came together with inadequately resourced implementation to limit the real versus the potential benefit of the IMCI strategy.[7] Successful child survival programmes at that time were limited to small-scale projects or narrowly focused vertical strategies promoting delivery of a small number of interventions. The Bellagio group proposed four points to improve the equitable delivery of child survival services: (1) building of subnational capacity for programme planning, implementation, and monitoring so that programmes can respond to both challenges and opportunities in their local environment; (2) practical integration of child survival, reproductive health, and nutrition services at the point of delivery, so as to minimise missed opportunities; (3) delinking of specific interventions from a single delivery strategy, and finding new combinations capable of achieving and maintaining high and equitable coverage in various epidemiological, health system, and cultural contexts; and (4) expansion of service delivery at community level.[3] These messages are still relevant.

Point-of-service integration of health services has been the subject of systematic reviews,[31,32] and of analyses and projects designed to show the potential efficiencies of combined delivery.[33–37] The term integration seems to have become a catch-all for the idea that we seek efficient delivery of services that both reach those in need and take advantage of patient–health worker encounters to assure a core set of preventive and curative services are received, all too often in the context of too few, undertrained, and overworked first-level health facility and community health workers.

The decade has seen enormous gains in expansion of the continuum of health services towards the community level in both Africa and Asia. Management of childhood illness by trained health workers at community level has been adopted as policy by many low-income countries and implemented at scale by some, with positive assessments using rigorous designs (Miller N, Institute for International Programs, Johns Hopkins Bloomberg School of Public Health, personal communication).[38–41] Policy support for and implementation of community-based delivery of interventions to support healthy pregnancies, deliveries, and newborn babies are also

gaining momentum in low-income countries.[42] However, in retrospect, the Bellagio group might have been overly optimistic in suggesting that improvement of access to services through community-based services would yield immediate gains in terms of use and population coverage. Early results from several countries show high variability in rates of use for community-based health workers (Miller N, personal communication).[40] In 2003, we were concerned that IMCI-trained health workers were sitting in refurbished first-level health facilities waiting for sick children to seek them out.[3] In 2013, we are concerned that trained community health workers, with adequate supplies of essential medicines, are sitting in their homes or health posts waiting for communities to demand their services. More attention should be given to the complex determinants of care-seeking behaviour for childhood illness, and how they can be changed.[43]

One important development is the now widespread recognition that child survival, health, and development are best viewed as one part of the lifecourse continuum of care from adolescence through pregnancy, birth, early childhood, and beyond, with important implications for policies and programme strategies. The lifecourse perspective supports an understanding of the implications of early health and development, including the health of the mother and fetus, for health and productivity in adulthood.[44] What this approach does not and should not do is discourage research, programmatic, or advocacy actions that address one group within the continuum. Targeted advocacy efforts have important roles on behalf of women (eg, Women Deliver), newborn babies (eg, Saving Newborn Lives), and child survival (eg, A Promise Renewed), but at the service delivery level, these efforts should come together in support of a continuum of care that functions effectively to meet the needs of women and children, and this continuum should be expanded to address child development.[13,14]

For **Women Deliver** see http://www.womendeliver.org/

For **Saving Newborn Lives** see http://www.savethechildren.org/site/c.8rKLIXMGIpI4E/b.6234293/k.6211/Saving_Newborn_Lives.htm

For **A Promise Renewed** see http://www.apromiserenewed.org/

Country-level achievements in scale-up of the treatment of AIDS and the prevention of malaria have set new standards that should now be used as a yardstick for childhood pneumonia, diarrhoea, and other major causes of mortality.[26] But these advances are coupled with new and worrisome issues. For example, just because the resources are available to prevent HIV infection, this does not mean they are cost-effective in settings such as much of West Africa, where HIV prevalence is less than 1%.[45] Furthermore, in West Africa particularly, the negative remnants of the Bamako Initiative are visible in some countries, where the poorest people in the world still have to pay out of pocket for the most essential medicines. The evidence is in on user fees—they should be abolished, at the very least for the poor.[46] In Mali, for example, even the poorest families still have to pay for oral rehydration salts for their children.[47] Several low-income countries are making progress towards removal of formal user fees and ensuring that they are not replaced by informal, under-the-table fees, but this progress needs to be universal.

Effective delivery of services will continue to need local capacity to collect and use local information about who needs services, who receives them, and how those presently excluded can be reached by public or private providers. The role of the private sector varies widely by country and region, with positive examples from Bangladesh about coverage gains in diarrhoea treatment driven largely by the commercialisation of oral rehydration salt solution and zinc,[48] negative experiences from other countries with inappropriate marketing of food products,[49] and poor quality treatment of illness by private providers.[50] Urbanisation and its implications for health service delivery also needs further attention.

Policy, legal, and taxation measures that have been effective in improvement of healthy behaviours and access to proven interventions are needed to remove impediments to more downstream, personal-level interventions. Policies for maternity leave and regulation of advertising of breastmilk substitutes are good examples of upstream actions for child survival. Financial measures, such as conditional cash transfers[51] and financial protection, are also important in this context. We need to reconsider how to reach the unreached with services, from both the supply and demand perspectives. e-Health and m-Health are promising approaches, but thorough assessments are needed.[52,53]

Weak health systems and shortages of appropriately trained health workers continue to present serious difficulties, and unlike the concrete action plan generated to address the issues of commodities,[54] little progress has been made in the defining and assessment of tangible approaches or interventions in this area.[55] Despite increased attention, including two high profile global conferences about health systems research (in Montreux in 2010, and Beijing in 2012)[56] and earmarked set-asides by both the Global Fund and GAVI, clear guidance and evidence of improvements at scale are scarce. Countries should have step-wise opportunities to make initial progress, review the components that work, and move forward to broaden the scope and build efficiencies.

Changes in equity

The paper about equity in the original child survival series aimed to heighten awareness of the importance of monitoring and incorporation of equity in policies and programmes.[4] Before 2000, concerns about within-country inequalities were almost completely absent from the global scientific literature about child survival, and the MDGs were criticised for ignoring within-country inequalities.[57]

Much progress has been made in the past 10 years. The various dimensions of inequalities are now recognised, including not only socioeconomic position, but also urban or rural residence, subnational areas, and ethnic group. Gender inequities in child mortality have also received greater attention than they did previously, with the availability of new, comprehensive sets of analyses.[58] There is also growing attention to how strategies outside

the health sector, including conditional cash transfers and female education, can reduce inequalities.

Most importantly, global players such as UNICEF,[59] WHO's Commission on Social Determinants of Health,[60] and the Commission on Information and Accountability for Women's and Children's Health[61] have brought equity to the forefront. Equity is also playing a large part in defining the post-2015 health agenda, and is central to the so-called universal access agenda.[62,63]

Looking forward, equity analyses and actions need to be an integral part of programme strategies rather than an afterthought. Programmes for reproductive, maternal, newborn, and child health (RMNCH) should focus on reaching the unreached, recognising who these families are, and identifying the most effective ways to work with them. Some important challenges remain. First, how can unreached groups within any given country be identified? Asset indices show that the poorest families are not being reached, but who are these families? Where do they live and how can they be located to ensure that services reach them? Second, when does it make sense to target specific population subgroups for service delivery, rather than striving for universal coverage, which, if successful, will eventually reach those who are presently excluded? Third, what are the cost implications of targeted versus untargeted coverage increases, and what is the relative effect of different strategies in specific contexts? Work on these issues has begun,[29] but rigorous monitoring and evaluation are essential.

Changes in evidence and methods

One of our key messages in 2003 was the need for more and better data for child health epidemiology, for accurate measures of coverage change and for independent, rigorous evaluations of programmes being implemented at scale.[5] What score has the global public health community earned in these areas?

Important progress has been made in country-level estimation of neonatal, infant, and under-5 mortality.[64] Methodological work on how to measure under-5 mortality in real-time,[65] experience with sample-based registration systems,[66] and the disappointing performance of the Health Metrics Network[67] are leading to an increasingly realistic appreciation of the challenges involved in the collection of nationally representative data for vital events that are of adequate quality and ensuring their use in decision making. Work by CHERG on causes of child deaths has intensified for children aged 0–59 months, and extended its scope to address a broader range of pregnancy outcomes, such as stillbirths,[68] prematurity,[69,70] and size for gestational age.[69] Particular progress has been made in understanding of the cause structure of neonatal deaths[9] and the importance of child nutrition—both undernutrition, which contributes to nearly half of all child deaths, and the growing problem of overweight in children.[16] The outcome of these efforts is a much improved understanding of child health epidemiology. The value of collection of cause of death data through verbal autopsy methods has been reconfirmed,[71] and innovative work about social autopsies offers evidence-based insights into programmatic opportunities to prevent child deaths.[72] A systematic review in 2005 showed that few population-based studies had yielded estimates of child morbidity and mortality, especially those from poor countries, and that their number had decreased since 1980.[73] The time has come to update this review and to ask whether the gains in understanding of the epidemiology of child health have been informed by new data, or only by new techniques to extrapolate and extend the inadequate data presently available.

With respect to the measurement of coverage, most low-income countries continue to rely on the two major programmes through which large-scale, nationally representative surveys are done: the USAID-supported Demographic and Health Surveys and the UNICEF-supported Multiple Indicator Cluster Surveys.[74] Without these surveys, which are usually done every 5 years, most countries would not be able to monitor the progress of their programmes and global monitoring would be lost. Assessments of the validity of coverage estimates produced through household surveys are improving our measurement of coverage and our understanding of its limitations.[75] One clear lesson is that coverage should be reported both as proportions and as absolute numbers, because high fertility rates in sub-Saharan Africa are driving coverage proportions down or leaving them unchanged, even despite increases in the numbers of women and children who receive services. High-quality household surveys that are linked to assessments of the content and quality of services will still be needed. Universal health coverage, defined by WHO as "universal access to needed health services without financial hardship in paying for them",[76] could be a global health goal, but will not serve well as a quantified objective or target because it requires defining of both the need for health services and financial hardship, thus creating a compound indicator with two different constructs in which health is held hostage to strategies for financial risk protection, therefore endangering both.

The modelling methods pioneered by the original series, which generated the estimated number of lives that could be saved through delivery at scale of known and affordable interventions targeting the major causes of child deaths,[2] have been updated and can now identify the longer-term effects of underlying risk factors such as wasting and stunting. The most widely used of these models, LiST, can now estimate maternal and newborn deaths, and child deaths; is linked to similar models for family planning and HIV/AIDS;[77] and is supported by peer-reviewed systematic reviews of intervention effectiveness.

Notable progress has been made in development of the evidence base and improvement of the measurement and reporting of equity. Asset indices have been broadly accepted as reliable proxies for socioeconomic position

and have been incorporated in surveys.[25] Furthermore, recognition has increased of the need to express inequalities in both absolute and relative terms, because each scale has a different interpretation.[78] Repeated surveys are available for many countries, allowing the study of equity trends over time.[79]

Evaluations of programmes at scale are a continuing and largely unmet need.[80] Too few such evaluations are supported, and new designs are needed that take into account the simultaneous implementation of several different programmes with potential effects on child survival.[81] The last few years have seen an increase in efforts to evaluate programmes at scale with appropriate designs;[82–84] more such evaluations are needed.[85]

Fortunately, public calls for evidence-based decisions in child survival and for greater accountability have increased substantially, and regular series in *The Lancet* have made important contributions.[86] The independent External Review Group (iERG) responsible for monitoring follow-up of the recommendations of the Commission on Information and Accountability for Women's and Children's Health has played a crucial part in identifying gaps in the evidence needed to guide strong, evidence-based policies and programmes.[52]

One disturbing trend in this area is an increase in evidence reviews and evaluations done by the same institutions that are implementing health programmes. Our experience suggests that there is resistance to independent evaluations, notably within the UN, but also among some funders. The objectivity of evaluations controlled by those implementing a programme should be questioned. In addition to publication bias that can suppress negative findings,[87] retrospective evaluations might be commissioned only for programmes that are perceived to produce positive results. This risk-avoidance behaviour is in conflict with the ideals of science. A true culture of evidence welcomes new knowledge of failures as well as successes. There should be a fence—if necessary electrified, but always sufficiently porous to ensure an exchange of information—between those who recommend, fund, and implement a policy or programme, and those who assess its effectiveness.

Changes in accountability, leadership, and resource flows

Accountability

The commitment to accountability made in the final paper of the 2003 series[5] has been realised in Countdown. Countdown has become a supra-institutional movement that brings together a broad range of academics, UN agencies, non-governmental organisations, and Ministries of Health to focus on holding countries and their partners accountable for achievement of equitable gains in coverage for proven interventions. Every 2–3 years since 2005, and now annually, Countdown publishes a set of country profiles that brings together levels and trends for key indicators related to reproductive, maternal, newborn, and child health and nutrition. Translation of the Countdown approach into country-level activities has been a long process, but now seems to be moving.[88] Countdown is more data for the people than it is high science, and has needed substantial investment of time and resources, but has succeeded in serving as a steady source of progress measurement.

Leadership

In 2003, we identified the urgent need for credible, strong, and unified leadership for child survival at international, national, and subnational levels.[5] Leadership in this context involves the setting of technical and political agendas, pioneering of responses to recognised failures, and ensuring that credible evidence is produced showing that present strategies are effective. Who is providing this leadership for child survival?

No one UN agency is presently functioning as an international leader. The technical capacity of WHO in Geneva was restricted even before new policies required decentralisation, and the severe resource shortfalls of the past 5 years have reduced the numbers of technical staff to less than the minimum essential levels. UNICEF has undergone two changes in leadership, resulting in an increased focus on child survival, the most notable being in its new role as the Secretariat for A Promise Renewed for Child Survival initiative being spearheaded by the governments of India, Ethiopia, and the USA.[89] UNICEF has proposed a strategy based on equity that might hold promise, but that in the short term has left country and global partners confused and holding on to what remains of UNICEF's previous commitments to the Catalytic Initiative to Save a Million Lives,[90] the International Health Partnership Plus,[91] and other similar efforts to forge effective partnerships. We hope that the UNICEF equity strategy has more staying power than did their 2006 strategy for more integration of health and nutrition, which we commended at the time,[92] but that has since disappeared, even from the UNICEF website. Organisational divisions between health and nutrition within the UN seem to have deepened in at least some countries.

Bilateral and multilateral donors can be a positive, unifying force, if they so choose. The Bill & Melinda Gates Foundation in particular has adopted many of the functions of an international leader,[93] while accepting little of the responsibility that accompanies the role. Both the Gates Foundation and other bilateral donors provide small amounts of funding to UN agencies and initiatives with the stated aim of improving coordinated research and action for RMNCH, while investing many times more in parallel activities, sometimes with the apparent result of fostering unhealthy competition. A Promise Renewed has made a good start of expanding from its origins within USAID by engaging UNICEF and countries, and could be a positive model for reconciling competing interests behind a common goal. Another positive model is the

Scaling Up Nutrition movement,[17] which has engaged an array of partners to plan and finance interventions to address maternal and child undernutrition.[94] Both initiatives need to be evaluated thoroughly.

Other organisations and initiatives created specifically to foster leadership and coordinated action have been instrumental for specific interventions and diseases, such as the Global Fund to Fight AIDS, Tuberculosis and Malaria; the Global Alliance for Vaccines and Immunisation (GAVI); the US President's Emergency Plan for AIDS Relief (PEPFAR); and the President's Malaria Initiative. A similar global fund for maternal, neonatal, and child survival has been proposed.[95] The Partnership for Maternal, Newborn & Child Health was established in 2004,[96] and has contributed to advocacy efforts, but too often serves as a fourth UN group in

Panel: Child health in the post-2015 agenda

The 2003 child survival series was written at a time of global movement and refocus. The 2000 Millennium Summit gave rise to the UN Millennium Declaration and the establishment of eight Millennium Development Goals (MDGs) with associated targets to be achieved by 2015, of which the fourth goal was to reduce under-5 mortality by two-thirds between 1990 and 2015. Although the overall MDG process has been praised for focusing attention and resources, and for monitoring efforts,[57] important critiques have been made. For MDG 4, crucial questions include the rationale for proposing a reduction of two-thirds, which we now know most countries will be unable to achieve; the setting of a baseline a decade before the goals were established; the decision to include only measles vaccination as a coverage indicator when measles was, and is, responsible for substantially fewer deaths than are pneumonia, diarrhoea, malaria, or neonatal disorders. For the health MDGs as a whole, concern has arisen about the absence of clear action plans for how the goals should be achieved and about inattention to equity issues.

What can these historical perspectives on the MDGs and child survival tell us about needs for the future? We propose three directions:

1. Maintain visibility and investments in child survival

The child survival job is not done and must remain at the top of the post-2015 agenda. We welcome the inclusion of eradication of preventable deaths of children under 5 as one of a small number of proposed indicators for a post-2015 goal on ensuring healthy lives; we hope that in future iterations, the coverage targets are broadened beyond vaccination.[62] Proven existing and new interventions, combined with more granular approaches to increasing access and coverage in women and children who are still unreached, can sustain and even accelerate reductions in child mortality. The millions of children who are dying each year continue to represent the biggest missed opportunity in public health, and attention to this issue should not wane until new knowledge about epidemiology, interventions, and service delivery systems has been fully used. Overall goals for ensuring of healthy lives and good nutrition are not a threat to child health, development, and survival efforts; especially if under-5 mortality, stunting, and wasting are prominent targets. Coverage tracking for proven interventions, with incorporation of findings from research about how best to obtain accurate coverage estimates,[75] should be sustained. Furthermore, serious investments need to be made in research and evaluation to support efforts that go beyond recycling of existing inadequate data sources.

2. Insist on equity, and monitor progress locally

New knowledge and a decade of experience suggest a more nuanced approach to child survival programming and monitoring is likely to yield greater gains. Over-aggregation of results in our monitoring has restricted our understanding of public health problems and the resultant solutions. This issue must be corrected and accompanied by serious investments in institutional capacity at country level to support local monitoring, decision making, and action. The global health community should rethink traditional monitoring approaches to identify people who are not accessing services and develop targeted strategies to reach them. Subnational monitoring of coverage and equity gaps can support local-level planning to reach every family with the essential services they need, free of charge. Efforts to increase equity should be based on a local understanding of the characteristics and opportunities available to reach those who are being missed.

3. Establish and support shared leadership in child survival by the UN system, governments, and non-governmental organisations

The UN system, and especially WHO, has a responsibility to provide leadership for child survival, but unfortunately this role has been compromised in recent years by budget reductions and reallocations, and attrition of competent technical staff. A leadership role must be re-established for WHO, but with more effective channels for independent scientific input. Countries and their development partners should insist that UN agencies meet the accountability standards they promote. Independent scientific experts must play a crucial part, but also need to prove their commitment to supporting the learning agenda of the UN, countries with high child mortality, and partners, through the provision of high quality, transparent, and reproducible results. Governments of countries with high child mortality must take on the challenge of defining national priorities and leading the implementation process, including allocation of more of their national budgets for child health and nutrition programmes. Bilateral funders should be sufficiently flexible to take country needs and preferences into account, rather than imposing their choice of health interventions. Non-governmental organisations and academic institutions can also have leadership roles in learning how to achieve the most effective coverage of services and in development of evidence for new and improved interventions.

RMNCH that competes with UN groups for attention and resources.

Effective models for UN coordination at global and country levels must be identified and tested with time-framed and rigorous evaluations. What is the ideal role for the UN in future child survival efforts? The dream? We propose a UN system that is driven by evidence, transparent in its decisions, and committed to the application of accountability principles to its own operations and to those of countries. The new UN would have human resource policies that conform with those they recommend to others, including performance-based assessments and retention. The new UN would rely on and respond to independent researchers who have sufficient credibility to bring evidence to bear on policies and normative standards. Now is not the time to abandon the UN system. Instead, the lens of accountability should focus on each agency's ability to engage productively with countries, with each other, and with independent scientific groups to produce transparent, evidence-driven policies and programmes. To make this happen, equal scrutiny should be directed to these independent scientific groups, to hold them responsible for informing and supporting the UN, rather than undercutting its effectiveness and credibility. Proposals for improved accountability structures worldwide, including commissions that can co-opt prominent champions and define unified actions,[97,98] offer encouraging directions.[99,100]

Importantly, high-income countries rely little, if at all, on the UN to define or support their health policy and programming activities. Poor countries do rely on the UN, largely because they have insufficient independent technical and financial capacity, and because funds are channelled through the UN and bilateral donors, each with their own agendas. Middle-income countries have also largely taken over the technical and financial implementation of their own health programmes, and these are the countries making rapid progress towards the MDGs. Until this change is also made in low-income countries, the UN and other non-UN systems have an important responsibility to provide such support. The ultimate goal is for all countries to achieve the high levels of independence and sustainability already achieved by high-income countries.

Resources

How much funding is needed and what funding mechanisms hold promise? Countdown analyses show that annual rates of increase in overseas development assistance funding for child health slowed after 2008,[101] and progress has been slow in increasing the share of government funds directed to child health.[102] Several price tags for scaling up of RMNCH programmes have been produced in the past 10 years, often with widely discrepant costings.[33,103,104] For individuals who are not health economists, and also probably for countries and funders, inconsistent estimates are not helpful.

In 2003, we pointed to a newly competitive marketplace in public health. 2003 was the time of highly publicised initiatives to eradicate polio; roll back malaria; and fight AIDS, tuberculosis, and malaria.[5] Our point was that children constituted high proportions of those with these diseases, and that they were disadvantaged because of the fragmentation of resources and service delivery systems. Appraisals of the MDGs have confirmed that fragmentation was one of the main weaknesses of the approach.[57] However, efforts by the Global Fund, GAVI, and Roll Back Malaria to identify and exploit synergies between their vertical missions and the broader MDGs for maternal and child survival have had positive results, and both the iERG and Countdown are examples of reasonable responses to the governance challenges facing RMNCH within the global health system.

Child survival should remain at the heart of global health and development goals. The panel summarises our suggestions for the post-2015 agenda. Many countries, including those that started the MDG period with the highest rates of under-5 mortality, are now making good progress and should be given the time and support needed to finish the task. Country leaders themselves called for this backing in the 2013 World Health Assembly.[105] The global health community should take this opportunity to show steadfast commitment to child survival and its ability to amass knowledge and experience as a basis for ever more effective programmes.

Contributors

All three contributed to conceptualisation of the report. JB prepared the first draft. All authors contributed to subsequent versions and approved the final manuscript for publication.

Conflicts of interest

We are involved in independent scientific reviews and assessments of global child health programmes.

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