Can the world afford to save the lives of 6 million children each year?

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Summary

Background **In July, 2003, the Bellagio Study Group on Child Survival estimated that the lives of 6 million children could be saved each year if 23 proven interventions were universally available in the 42 countries responsible for 90% of child deaths in 2000. Here we assess the cost of delivering these interventions, and discuss whether the achievement of the Millennium Development Goal (MDG) for child survival falls within the financial capacities of donors and developing countries.**

Methods **All child survival interventions shown to reduce mortality from the major causes of death in children younger than 5 years were incorporated into a delivery timetable comprised of 18 contacts between a child or mother and a health-care provider in the period from before birth until the child reaches 5 years. The running costs of delivering the interventions at universal coverage levels were calculated as the sum of unit costs for drugs and materials, delivery costs, and programme management and support costs, including supervision. We estimated the cost of providing interventions at coverage levels reported for 2000 and the additional costs of providing services at universal coverage levels.**

Findings **US\$5·1 billion in new resources is needed annually to save 6 million child lives in the 42 countries responsible for 90% of child deaths in 2000. This cost represents \$1·23 per head in these countries, or an average cost per child life saved of \$887. Sensitivity analyses for salary levels for community delivery agents, drug costs, and coverage rates for 2000 were used to develop uncertainty estimates around the US\$ 5·1 billion annual price tag that range from about \$3·1 billion to \$8·0 billion.**

Interpretation **Achieving the MDG for child survival is affordable for donors and developing countries. Scaling up health delivery is the challenge, and, along with the lack of funds, will be the limiting factor in reducing child mortality by two-thirds by 2015.**

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Introduction

As part of the Millennium Development Goals (MDGs), nations pledged to ensure a reduction of two-thirds in child mortality by 2015 from the base year 1990·[1] An early analysis established that prevention and treatment technologies exist to achieve the child mortality MDG.[2] However, a prerequisite for achieving this goal is adequate and targeted financial resources.[3]

Estimates of the cost of delivering comprehensive child survival interventions are overdue. In their best-case scenario for 2007, the Commission on Macroeconomics and Health identified limited investments in health services at peripheral levels as one of the most important barriers to improving health worldwide. The Commission estimated that about US\$1 billion would be needed annually to scale up vaccinations, \$4 billion to scale up the treatment of childhood illnesses, and an additional \$2·5 billion for malaria prevention and treatment for all age-groups combined.[4] This finding represents about 1% of gross national product for low-income and middle-income countries. These estimates, developed in 2000–01, were as precise as possible given the evidence available at that time on the causes of child deaths as well as the effectiveness and cost of health interventions. However, these estimates were restricted to specific interventions for selected diseases rather than including a more complete set of interventions needed to achieve a substantial reduction in overall child mortality.[2]

Cost estimates for reducing mortality from single diseases, such as HIV/AIDS,[5] malaria,[6] and measles[7] seem to have been associated with increased international support focused on these diseases.[7–9] At country level, the World Bank and others are increasingly requesting cost estimates (usually direct costs to governments) as a basis for providing financial support, and governments need financial data for sector-wide planning and health-system reform.[10] Costing exercises based on disease-specific interventions, however, have little use for decision makers seeking to achieve the broad MDG of reducing child mortality because countries will achieve the goal in different ways on the basis of their epidemiological profile, health-system capability, and opportunities for economies of scope.[11] The recent publication of cause-of-death estimates for children younger than 5 years[12] and cause-specific estimates of the number of child lives that could be saved through full implementation of effective preventive and treatment interventions[2] makes it possible, for the first time, to estimate the global cost of implementing comprehensive child survival programmes.

Here we estimate the additional annual running costs for universal delivery of the child survival interventions capable of preventing 6 million annual deaths among children younger than 5 years. We focus on the 42 countries with 90% of worldwide deaths in children younger than 5 years in 2000, and on proven interventions and levels of implementation feasible for delivery at high levels of population coverage in low-income countries.[2] We do not cost the scaling up of delivery systems needed to achieve all the health MDGs, such as training and placing thousands of new midwives or building new health facilities; instead, we estimate the costs of child survival service provision after a successful scale up to universal coverage. We consider the cost implications of basic policy choices, including trade-offs between prevention and treatment interventions; integrated versus disease-specific delivery strategies; and the balance between health facility-based and community-based approaches to achieving universal coverage. We know these child survival interventions are effective. If they are also affordable, governments and their partners must step forward to provide the political and financial commitments needed to achieve the child survival MDG.

Methods

A detailed description of the methods used is published online. The webtables define the interventions and describe our assumptions about how they are delivered, and describe the full model used to estimate costs.

See Lancet Online for webtables 1–6

The cost estimates presented here, as well as early estimates of preventable deaths,[2] are based on the assumption that coverage with basic effective interventions should be universal—ie, delivered to all children who need them. Specific policies are needed to reach the poor.[13] If achieved, universal coverage ensures equity by providing the same benefits to all irrespective of level of resources, sex, or ethnic group.[14] Universal coverage is defined as 99% of the population in need for all interventions, except exclusive breastfeeding among children younger than 6 months for whom the target was set at 90%.

We defined possible delivery methods based on: (1) temporal dimension, indicating whether the intervention is delivered during pregnancy and in the early neonatal period (the first week after childbirth) or at a later time; and (2) coverage dimension, reflecting whether a child or mother is currently receiving the intervention. At birth and in the early neonatal period, delivery of interventions involves the presence of a skilled attendant at birth who is assumed to be capable of providing the neonatal interventions under consideration here, apart from those marked as needing inpatient care. For other interventions the delivery methods are associated with contact with a trained health-care professional, either in a primary outpatient health facility or through systematic outreach activities; hospital admission; or community-based delivery activities, including context-specific education and communication efforts, as well as provision of curative care at a community level.

For each intervention we estimated the number and type of delivery units needed to achieve universal coverage for those currently receiving the intervention and those outside the reach of the health services for whom community-based delivery activities are needed. Whenever possible these estimates were based on international health-care standards, such as the integrated management of childhood illness guidelines for the care of ill children in first-level facilities[15] and the integrated management of pregnancy and childbirth.[16]

Coverage for these child survival interventions has stagnated.[17] In most countries, fewer than 50% of children and mothers are currently receiving even these essential interventions. Recent reviews have shown that high levels of coverage can be achieved with community-based delivery strategies, although more and better effectiveness evaluations focusing on the feasibility of attaining and sustaining high coverage with these approaches are needed.[18] For the purposes of this costing, we have assumed that facility-based services and outreach have reached a coverage plateau, and further increases will largely involve community-based delivery methods. This approach reflects a balance between more rational use of facilities for the most ill, and more emphasis on community-based approaches to achieve high coverage, especially among the poor. The potential benefits of expanded community-based delivery include opportunities to reduce inequities, the potential for improved cost-effectiveness, and responsiveness to family needs and priorities.

Another critical issue is the age at which children need to receive each of the preventive interventions (treatment interventions are delivered in response to illness). With the exception of water and sanitation, each preventive intervention must be delivered at specific age intervals to be effective. If each intervention is delivered separately from the others, however, a child and mother would need 35 separate contacts with the health-care system during the first 5 years of the child's life just to receive essential prevention interventions, plus the additional contacts needed for appropriate care of the sick child. We therefore developed a schema for the timely delivery of preventive interventions through a set of 18 contacts with a primary-care provider within the period from about one month before birth until the child reaches age five (figure).

Country-specific UN Population Division estimates for 2000 were used for annual birth rates and the number of children aged between birth and 1 year and birth and 5 years.[19] Specific assumptions are described in webtable 3. In general, all children potentially exposed to a disease agent were presumed to be in need of interventions designed to prevent infection, and all

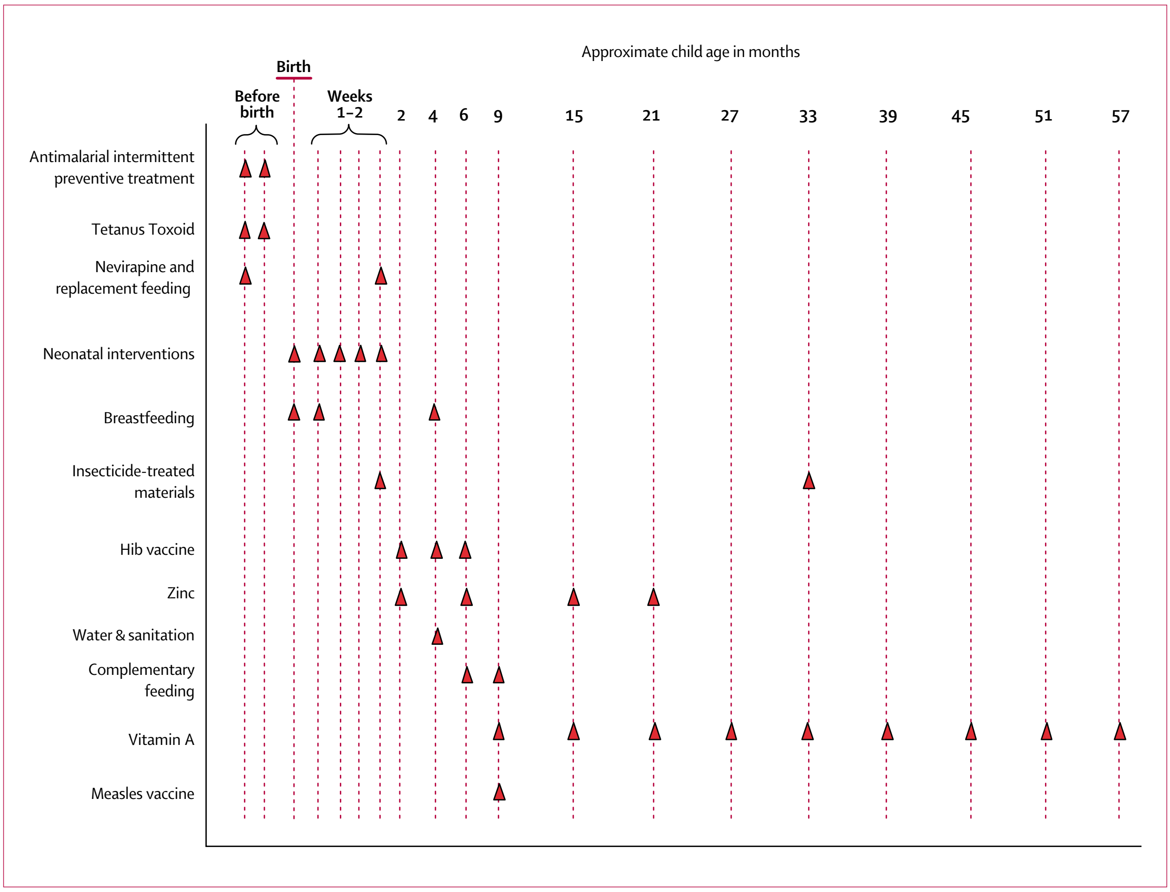

***Figure:* Schedule for integrated child-oriented delivery of interventions**
Neonatal interventions include clean delivery with a skilled attendant, temperature management, antibiotics for premature rupture of membrane and neonatal sepsis, and steroids.

children with nutritional deficits were assumed to be in need of interventions that target nutritional status. Interventions needed only by subsets of the population include insecticide-treated materials and intermittent preventive treatment with antimalarials during pregnancy in malarious areas, nevirapine and replacement feeding in settings of high HIV prevalence, and vitamin A or zinc supplementation for children living in geographic areas deficient in these micronutrients.

Estimates of need for treatment interventions were obtained by multiplying the annual incidence rate for each disease by the appropriate population subset (eg, all children younger than 5 years for pneumonia; children younger than 5 years living in malarious areas for malaria). Most country-specific annual incidence figures were adapted from those developed by the Child Health Epidemiology Reference Group for pneumonia, diarrhoea, malaria, and deaths in the neonatal period.[12] Estimates of measles incidence were developed by the immunisation, vaccines, and biologicals department of WHO on the basis of a model that calculates mortality using incidence and case-fatality inputs, and were provided to other WHO units as a basis for modelling measles mortality.[20]

Even in the presence of ideal health-care delivery at primary and community levels, some children with these diseases will need advanced treatment and supportive care over and above what can be provided in a first-level facility (eg, oxygen for pneumonia). We estimated current costs of admission on the basis of the estimated proportion of episodes for each disease presented at hospital in 2000. We assumed that fewer children would need hospitalisation after the 23 prevention and treatment interventions were universally available. The specific values were arrived at after consultation with disease-specific experts from the Child Health Epidemiology Reference Group.[12]

For each intervention, best available estimates of current coverage were used to determine the proportion of children, by country, who received each intervention in 2000. Most coverage estimates were obtained from UNICEF's childinfo website. For countries without coverage data for an intervention, we used the median coverage level for other countries with similar epidemiological profiles.[21]

See http://www.childinfo.org

Nationally representative estimates of coverage do not exist for four neonatal interventions: antibiotics for sepsis, resuscitation for neonatal asphyxia, antenatal steroids, and antibiotics for premature rupture of the membrane. Coverage levels for these interventions were therefore calculated by banding countries into one of four groups based on the level of neonatal mortality and the coverage of institutional delivery patterns.[22] We calculated estimates of unmet need by subtracting the current coverage rate from the universal coverage rate and multiplying this proportion by the number of children needing each intervention.

We estimated the cost of providing the 23 child survival interventions at universal coverage levels. Our approach is partly financial and partly economic to reflect the value of the resources used when the services are running at universal coverage.[23] We estimate only the costs to providers of delivering these interventions, and have not included other economic costs borne by the families.

The annual running costs of delivering the interventions at universal coverage levels are estimated as the sum of: (1) the unit cost of the drug or other biological intervention, based on estimated needs for one year; (2) the cost of delivery including an adjustment factor for the increasing costs of delivering interventions as coverage levels increase; and (3) programme management and support costs. Most information on unit costs for drugs or other materials (eg, insecticide-treated materials for the prevention of malaria) were obtained from the UNICEF supply list and are a reasonable estimate of the prices paid by ministries of health and their partners. For items not available in the UNICEF list, best estimates of current prices were obtained from various sources (webtable 3).

See www.supply.unicef.dk

See Lancet Online for webtables 3

Delivery costs were divided equally among the interventions delivered in each contact (figure) and include all services that do not involve specific drugs or materials, such as patient education. We applied regional estimates of unit costs per hospital-bed day, for a 10-min outpatient visit, for inpatient deliveries, and for clean delivery with a skilled attendant, developed by the WHO-CHOICE project of WHO. Each cost estimate includes both recurrent costs (personnel; materials and supplies; transport; maintenance; utilities; and other recurrent costs including rents) and depreciated capital costs including buildings, equipment, and furniture.[24,25]

We obtained country-specific estimates of the annual cost of a trained midwife developed by the World Bank and assumed that a community worker capable of providing the interventions described here would be paid an average of 75% of a midwife.

Programme management and support costs were estimated at 10% of the costs of delivery for primary-care contacts and 30% for community delivery activities. They include training, supervision, monitoring, and evaluation, as well as other management costs.[26] The programme management and support costs for community delivery were assumed to be higher than those for facility-based delivery because of greater needs for supervision and on-going training.

The WHO-CHOICE estimates also take into account the rising cost of delivering interventions as population coverage rises above 50%.[26] In this analysis, the total annual costs of providing the individual interventions were estimated by multiplying the adjusted patient costs by the number of children needing the intervention at each of four levels of coverage (0–50%, >50–80%, >80–95%, >95–100%) and then summed across coverage levels. The added costs of achieving universal coverage were obtained in the same way after removing those children who were already reported to be receiving the intervention in 2000.

Costs for water and sanitation were calculated as 10% of the estimated capital and recurrent costs needed to scale-up and maintain acceptable sources of clean water and sanitation for each child younger than 5 years. These values were drawn from previous work that estimated the costs per head of providing improved and acceptable water supplies and sanitation by region, and the costs of maintaining these services were estimated at 10%.[27]

The number of current illness episodes needing case management is affected by coverage with preventive interventions. We therefore adjusted our estimates by reducing treatment costs to allow for the estimated number of children who would avoid exposure to the disease agent because of universal coverage with preventive interventions.[2]

We undertook sensitivity analyses to provide an indication of the effect of three key assumptions in ascertaining the final price tag. First, we assessed the effects on the final price tag of paying the community delivery agent either 50% or 100% of a midwife's salary in each country, rather than 75% as in the original estimate. Second, we assessed the effects of either reducing or increasing the cost of drugs by 25%. Third, given the lack of available data for current coverage of interventions, we assessed the effect on the total price tag of either reducing the level of coverage in 2000 by 25% or raising it by 25% or to universal coverage, whichever was less.

We developed an approximation of the uncertainty associated with our estimates by calculating ranges using the three variables assessed in sensitivity analyses. Thus the lower end of the range for each variable indicates lower community delivery agent salaries, lower drug costs, and higher existing coverage rates for 2000, and the upper end reflects the converse for each of the three variables.

Role of the funding source

There were no external sources of funding for this work. The Child Survival Partnership hosted a working meeting, but had no role in the study design, data analysis, data interpretation, or writing of the report. The

corresponding author had full access to all the data in the study and had full responsibility for the decision to submit for publication.

Results

Table 1 shows the annual running costs of providing preventive child survival interventions to all children who need them in the 42 countries responsible for 90% of child deaths in 2000. The estimated cost of providing preventive interventions at 2000 coverage levels is US $3·2 billion. Large proportions of these existing costs are associated with provision of water and sanitation ($1889 million, annually) and delivery with a skilled attendant ($502 million, annually).

The additional annual running costs of providing preventive interventions to all children in these 42 countries who did not receive them in 2000 is $4·7 billion (table 1). Over 50% of the total additional annual cost of prevention shows investments in three sets of interventions: vaccines to prevent infection with *Haemophilus influenzae* type b (Hib) ($1051 million); interventions to improve water, sanitation, and hygiene ($753 million); and delivery by a skilled birth attendant ($653 million). All other preventive interventions assessed would be less costly to provide at universal coverage levels, ranging from $26 million to $420 million per intervention per year.

The estimated annual cost of providing eight essential treatment interventions at 2000 coverage levels in the 42 countries is $1·0 billion (table 2). If the effects of preventive interventions on disease incidence and resultant treatment needs are taken into account, the annual existing cost of treatment at 2000 coverage levels is reduced to $0·4 billion, resulting in a saving of almost $600 million. The full implementation of effective preventive interventions is estimated to reduce the annual cost of treatment at 2000 coverage levels by over 60%. The largest savings are realised in the provision of antimalarials ($162 million, annually), antibiotics for pneumonia ($139 million), and antibiotics for dysentery ($150 million).

The additional annual running costs needed to provide treatment for all illness episodes in the 42 countries that were not treated correctly in 2000 is $1·0 billion dollars, assuming universal coverage with prevention interventions (table 2). Antibiotic treatment for pneumonia and dysentery represents over 60% of the additional cost of providing treatment for childhood illness at universal coverage levels.

A total of $5·1 billion in additional annual running costs is needed to provide both preventive (table 1) and treatment (table 2) interventions to all children who did not receive them in 2000 in the 42 countries that accounted for 90% of under-five deaths worldwide in 2000. Based on estimates of the number of deaths in children younger than 5 years that could be prevented by achieving universal coverage with these 23 interventions from the earlier analysis,[2] and taking into account prevention effects on the incidence of disease, the additional annual running cost represents $887 for each child life saved. The comparable cost for saving an infant during the first 28 days of life is $784.

These estimates are based on the integrated delivery schedule (figure). Parallel delivery of the same interventions would be more costly. For example, the total annual additional cost of delivering Hib vaccine at universal coverage is estimated here as $1051 million (table 1). The comparable cost of providing Hib vaccine through a parallel, intervention-specific delivery strategy would be $1406 million, an increase of 25%. Similarly, universal delivery of interventions to promote exclusive breastfeeding in the first 6 months of life and continued breastfeeding from 6 to 11 months are estimated here at an annual cost of $414 million; delivery of these interventions in

	Running costs for 2000 coverage levels	Additional running costs to provide universal coverage
Breastfeeding	102	414
Insecticide-treated materials	1	77
Complementary feeding	46	158
Zinc	0	301
Delivery with skilled attendant	502	653
Newborn temperature management	19	79
Haemophilus influenzae type b (Hib) vaccine	66	1051
Water and sanitation	1889	753
Antenatal steroids	61	420
Vitamin A	129	271
Tetanus toxoid	71	161
Nevirapine and replacement feeding	1	82
Antibiotics for premature rupture of membranes	44	52
Measles vaccine	39	30
Antimalarial intermittent preventive treatment in pregnancy	0	26
Cost of additional Expanded Programme on Immunization vaccines	245	165
Total	3215	4694

Data are million US $

Table 1: **Estimated annual running costs of providing preventive interventions for child survival at 2000 coverage levels and universal coverage levels**

	Running costs for 2000 coverage levels without expanded prevention savings	Running costs for 2000 coverage levels (after savings from expanded prevention)	Additional running costs to provide universal coverage
Oral rehydration therapy	29	14 (15)	124
Antibiotics for neonatal sepsis	101	22 (79)	17
Antibiotics for pneumonia	290	151 (139)	332
Antimalarials	200	38 (162)	46
Zinc	0	0 (0)	150
Newborn resuscitation	19	19 (0)	35
Antibiotics for dysentery	284	134 (150)	333
Vitamin A*	52	0 (52)	0
Total	976	378 (598)	1038

Data are million US$. *With universal measles vaccine coverage there would be no need for treatment with vitamin A.

Table 2: **Estimated annual running costs of delivering treatment interventions for child survival at 2000 coverage levels and universal coverage levels**

Variable assessed	Low -end value	Adjusted price tag (million US$)	High-end value	Adjusted price tag
Country-specific cost of community delivery agent relative to cost of a midwife (originally 75%)	50%	4311	100%	5955
Drug costs	−25%	4598	+25%	5669
Existing intervention coverage level in 2000	+25% or universal coverage, whichever is less	4210	−25%	6374
All three variables	--	3111	--	8083

Table 3: **Effects of varying selected assumptions on the estimated additional annual running costs of providing child survival interventions at universal coverage, from reported levels in 2000 (US$5134 million)**

a parallel fashion would cost $656 million, an increase of 58%.

Table 3 shows results of the sensitivity analyses for each variable alone and for the three variables together. Using values for lower salary levels for community delivery agents, lower drug costs and higher coverage rates for 2000 results in a reduction in the additional annual running cost of providing the 23 interventions to all children who did not receive them in 2000 of about $2·0 billion, or 39%. Using the high-end values for each variable increases the total price tag by about $2·9 billion, or 57%.

Discussion

We estimate here that it would cost an additional US$5·1 billion annually over costs in 2000 to save 6 million child lives, representing $1·23 per head in the 42 low-income countries included in the analysis. These estimates should help policymakers, donors, and governments estimate the financial effort needed to achieve the MDG for child survival.

The average cost per child life saved through the combined and integrated delivery of the 23 interventions assessed is about $887. The subset of interventions effective in preventing death during the neonatal period can be delivered at the even lower average cost of $784 per infant life saved. These estimates reflect the running cost at scale, including all drugs and equipment; the cost of delivering the interventions; and additional programme costs, including management and supervision.

$4·7 billion of these new resources are needed for preventive interventions, and $1 billion are needed for treatment of illness episodes that occur despite optimum prevention efforts. The total cost of prevention in our analysis is therefore higher (roughly four times higher) than the cost of treatment. In part, this difference lends support to our assumption to provide preventive care first, which then reduces the cost of curative care by over 60%. Additionally, although the cost per person is usually lower for preventive than curative interventions, the target population for preventive interventions is large, so the total cost is often more than for curative interventions, which are needed by the few children who become ill. Prevention interventions also address a broader range of conditions than do treatment interventions (eg, nutritional deficits), and can prevent disorders that might not be feasible to treat, such as neonatal tetanus.

Unlike previous costing estimates based on reducing deaths from a single disease,[5–7] these costs include all interventions with proven efficacy for the major causes of death in children younger than 5 years, and have been calculated based on country-specific epidemiological profiles. The final price tag is roughly equivalent to that proposed by the Commission on Macroeconomics and Health.[4]

A recent exercise that used a similar approach and assumptions for interventions to reduce neonatal deaths reported the cost per death averted to be about $2100,[28] about two and a half times the cost reported here. There are various reasons for this discrepancy. First, the neonatal-specific costing includes more interventions as well as more expensive ones—notably, emergency obstetric care, which alone accounted for more than half the total cost estimate. Second, the neonatal exercise was for 75 countries, and our exercise is for 42 countries. Third, only neonatal lives saved were included in the denominator when calculating costs, despite the fact that many of the interventions also save older children (eg, breastfeeding, and management of acute respiratory infections) and women (eg, obstetric care). Only 47 cents of the $1·42 cost per head of delivering the neonatal interventions in the 75 countries was for interventions specific to neonates, so all the costs are included but only some of the benefits.[28]

Our estimates represent only a proportion of the total costs. We have not included the costs of training sufficient human resources, developing management capacity, and other aspects of the health system needed to scale up and sustain these coverage levels. Also not included are health services that must be provided to children with disorders or diseases other than the major ones addressed here, such as injuries, or the costs of service provision to children whose lives are extended through receipt of these interventions. We have not added costs to provide these interventions in the remaining countries of the world, representing the other 10% of global child deaths. We have limited the interventions to those with cause-specific evidence of a direct effect on mortality, and to interventions and levels of implementation judged feasible for immediate implementation at high levels of coverage in low-income countries. Also not included are the extra costs of ensuring equity, especially during scale up when those who receive services first are likely to be those who need them least.[29]

Our estimates are also low because they do not take into account demographic trends. The number of children will continue to increase, especially in poorer countries where child mortality rates are high. The antidote to this expanding need is effective provision of family planning services, especially to support birth spacing. The benefits to children would be twofold: a direct reduction in under-five mortality, and a reduction in the number of children needing services. Historical experience with the demographic transition has shown that improved rates of child survival will speed fertility decline only if adequate family planning services are available.[30] The alternative is increased births and larger households, placing ever-greater demands on families, communities, and governments.

Finally, we have focused exclusively on provider costs because they were most relevant to policymakers' questions about affordability, and because few data are available for costs to consumers. These costs are only part of the total societal costs: poor children's families also shoulder substantial direct costs (transportation, food for complementary feeding, etc.) and opportunity costs (earnings foregone while seeking care). Full coverage is unlikely to be achieved by financing only provider costs. Demand-side strategies to ensure uptake among those who most need services are likely to need additional resources not included here.[31]

On the other hand, our estimates of the additional annual running costs of providing Hib vaccine and antimalarial treatment may be high because we have used the 2004 unit prices for drugs provided in the UNICEF supply catalogue. These costs are likely to go down as demand increases; an estimate of future vaccine prices predicts that the unit cost for a combination of diphtheria, pertussis, tetanus, hepatitis B, and Hib vaccines will drop by more than half to below $2·00.[32]

This estimate reflects cost-saving policy choices. First, we have elected to implement preventive interventions and assume full coverage before estimating treatment costs. This decision more than halved the cost of providing treatment at 2000 coverage levels by decreasing the number of sick children needing care. In that year, the $598 million saved through prevention would have been more than enough to cover the entire cost of treatment.

Second, we have developed and applied a comprehensive integrated delivery schedule (figure), which generates savings by reducing the number of contacts needed for delivery of preventive interventions from 35 to 18. Savings accrued through integrated delivery are greatest for interventions that need multiple contacts at times appropriate for combined delivery with other interventions, such as Hib vaccine and breastfeeding. The delivery of vitamin A supplementation by current delivery schedules, by contrast, needs a total of nine contacts, of which five occur at older ages and are not able to be combined with delivery of other child survival interventions, greatly reducing the potential savings from integrated delivery.

Third, we have assumed that countries will decide to scale up coverage to universal levels primarily through expanding intervention delivery at community level, except for the small proportion of more severe cases who need facility-based care. Strengthened efforts at community level are needed to complement the existing focus on facility-based delivery and outreach efforts. This new emphasis is likely to result in overall cost savings despite the additional supervision needed to support correct performance by the community workers.

The estimated additional cost of $5·1 billion per year represents a value for money that extends beyond the 6 million child lives saved. For example, the costs of providing interventions effective in preventing neonatal deaths will also have an important effect on the estimated 500 000 maternal deaths that occur annually and the high prevalence of birth-related injuries, infections, and disabilities for both mother and newborn.[33]

Inclusion within the price tag of the costs of maintaining and expanding key preventive interventions, such as measles vaccination and vitamin A supplementation, also represents good value for money. These successful programmes have already realised much of their mortality reduction effect, but must be sustained and expanded to universal coverage to prevent future deaths.

We return to the central question posed in this paper: will the cost of delivering known and effective child survival interventions at universal levels of coverage fall within the financial capacities of donors and developing countries? If not, a lack of political and financial commitment to scaling up delivery systems and achieving the MDG for child survival could be interpreted as a wise management choice. Our findings suggest that saving 6 million child lives a year, and thereby achieving the MDG for child survival, will require an additional $1·23 per head in annual running costs in these 42 high-mortality countries. This cost should be affordable for governments in even the poorest countries.

The cost of scaling-up to universal coverage, however, is much larger and is not included here. Donor inputs and donor convergence are needed to scale up health systems, and thereby to make possible the achievement of not only the MDG for child survival but all the Goals. Donors must live up to their promises to invest in the achievement of the MDGs. The findings presented here suggest that countries will be able to sustain these achievements, once they are attained.

How much is $5 billion dollars? How can we determine if it is affordable? These are value-laden questions, but we challenge readers with some salient comparisons. For example, $5 billion is about 6% of expenditures for tobacco products in the USA for 2003.[34] For public-health decision makers, the $5 billion needed to save 6 million child lives annually might be compared with the estimates of $12–20 billion now committed annually to the fight against HIV/AIDS.[35] These examples suggest that $5 billion is affordable, and reflects a choice being made by policymakers and donors—a choice that allows 6 million children to die each year, over 16 000 each day. Passivity by policymakers with respect to child survival means that about 170 children have died in the time needed to read this paper.

Achieving the millennium development goal for child survival is affordable. Policy choices that are effective and economical include: (1) focusing on prevention, leading to reductions in treatment costs; (2) using integrated delivery strategies within comprehensive child survival programmes, rather than parallel delivery of disease-specific interventions; and (3) expanding coverage through improved delivery at community level as a complement to facility-based services. Scaling up health delivery is the challenge, and, along with the lack of funds, will be the limiting factor in reducing child mortality by two-thirds by 2015.

Contributors

J Bryce, R Black, N Walker, and R Steketee conceptualised the analysis. N Walker developed the spreadsheets and R Black and J Bryce developed the timetable for delivery. Z Bhutta and J Lawn developed the assumptions and timetable related to neonatal interventions. J Bryce prepared the first draft of the manuscript. Subsequent revisions were made by J Bryce, R Black, and N Walker on the basis of input from all authors. All authors reviewed the final draft and approved it for submission.

Conflict of interest statement

We declare that we have no conflict of interest.

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